The Real Effects of Reference-dependent Preferences: Evidence from Mergers and Acquisitions*

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Abstract

We investigate whether and how reference-dependent preferences affect acquisitions. We find that managers pursue risky and low-quality acquisitions when investors are in the loss domain. Bidder announcement returns are higher when investors are deep in the gain or loss domain. High returns to deals with investors in the loss(gain) domain are followed by reversals (upward drifts). Investor reference-dependent preferences appear to not only cause stock mispricing around mergers but also have a real effect in shaping managers' acquisition decisions due to catering to investor' risk appetite. Moreover, changes in analysts' forecasts around mergers, but not announcement returns, predict post-merger performances.

Keywords: Prospect theory; Reference-dependent preferences; Capital gains overhang; Catering; Mergers and acquisitions; Acquirer announcement returns; Market inefficiency; Analysts' forecasts.

JEL Classification: G41; G14; G34

1. Introduction

A growing body of theoretical and empirical literature investigates how investor reference-dependent preferences (RDP) in the prospect theory of Kahneman and Tversky (1979) affect stock returns (e.g., Barberis and Xiong, 2012; Ingersoll and Jin, 2013; Wang, Yan, and Yu, 2017; An, Wang, Wang, and Yu, 2020; Barberis, Jin, and Wang, 2021). These studies make important contributions that increase our understanding of how RDP affects investors' *own* trading decisions, which contribute to several return anomalies. In this paper, we build on this literature by investigating how investor RDP affects a *firm*'s investment decision. Specifically, we examine whether managers consider investor RDP when making merger and acquisition (M&A) decisions, one of the most significant investment events in the corporate world.

A key prediction of RDP is that investors have different risk attitudes depending on whether their investments are in gains or losses relative to a reference point. As illustrated in Figure 1, conditional on a reference point, investors are risk-averse in the gain domain but become risk-seeking in the loss domain. In the M&A setting, when investors are in the loss domain, they view risky acquisitions as attractive investment opportunities, even if these acquisitions yield low returns. In contrast, when they are in the gain domain, they demand much higher returns to compensate for increased risks associated with acquisitions. If managers cater to investors' preference as suggested by the literature (e.g., Cooper, Dimitrov, and Rau, 2001; Baker and Wurgler, 2004; Baker, Greenwood, and Wurgler, 2009), RDP can have a real effect on corporate investment decision by motivating managers to choose deals with high risks/low expected returns.

We use the method in Grinblatt and Han (2005) to construct a proxy for capital gains overhang (CGO) of bidder stocks prior to the merger announcement. The bidder-level CGO reflects the normalized difference between the stock price prior to the merger announcement and the estimated investor purchase price. To capture deal quality and deal risks, we compute several performance metrics based on the change in analyst earnings expectation and post-merger operating performance. We avoid using market reactions to measure deal quality because the key hypothesis we test (i.e., the catering hypothesis) predicts stock mispricing upon announcement of the catering events.

Using a sample of more than 37,000 M&A deals that involves public bidders over the period 1981 – 2017, we begin our analysis by plotting deal quality measured by the average change in analysts' earnings forecast (Δ EPS) around the merger event using 10 evenly spaced bins on each side of reference point. Figure 2 provides a preview of our first main result, revealing a positive relation between deal quality and CGO. Figure 3 previews our second main result, which plots the average change in analysts' earnings forecast dispersion (Δ DISP), our proxy for deal risks. We observe a negative relation between deal risks and CGO. These patterns remain robust in regression analyses that control for the deal and firm characteristics, and year and industry fixed effects. We further obtain similar results using ex-post operating performance and performance volatility to measure deal quality and risks.

We next examine how CGO is related to bidder acquisition returns. Figure 4 shows a strong positive initial market reaction to merger announcements by bidders with either high or low CGO, reflecting a V-shaped pattern between bidder cumulative abnormal returns (CARs) and CGO. Our interpretation of high announcement returns to bidders with

low CGO is that investors respond favorably to the risky deals as managers cater to their risk preferences. On the other hand, the high CARs for high CGO bidders are more likely a reflection of deal quality.

The post-announcement return analysis shows that the positive market reaction to low CGO bidders is followed by a noticeable return reversal in the subsequent months, whereas the positive market reaction to high CGO bidders is followed by a further upward price drift following the acquisition announcement. We provide some evidence consistent with the explanation that the aggressive selling pressure around the M&A announcement for high CGO bidders contributes to the underpricing at the announcement and the price drift in the later period.

A recent study by Ma, Whidbee, and Zhang (2019) also documents that a reference price can affect bidder announcement returns. Specifically, the authors suggest that investors irrationally use 52-week high prices as a measure of acquirer valuation, leading to a negative relation between acquirer's reference price ratio (RPR) and acquirer's announcement return. While both our paper and Ma, Whidbee, and Zhang (2019) conclude that reference points affect acquisition returns, it is important to note that the proposed underlying mechanisms in these two papers are distinct. Therefore, to ensure that our results (that use the aggregate purchasing price as a reference level) do not simply reflect the results documented in Ma, Whidbee, and Zhang (2019) that use 52-week high prices as reference points, we follow Ma, Whidbee, and Zhang (2019) to construct RPR and run a horse-race between CGO and RPR. The result shows that when we include both CGO and RPR in the same regression, the coefficient on RPR becomes insignificant, and the

coefficient on CGO remains unaffected. This result indicates that the negative relation between RPR and announcement return is, in fact, due to the omitted variable CGO.

We next investigate the long-run return performance of bidder firms with low versus high CGO over the one-year period following the M&A announcement. We use the calendar time portfolio return (CTPR) approach and consider three alternative asset pricing models to compute the risk-adjusted returns (alphas) of bidding firms with high or low CGOs, as well as alphas for the hedge portfolio that goes long in the high CGO stocks and shorts the low CGO stocks. The first two asset pricing models we consider are the Fama and French (1993) three-factor and the Fama and French (2015) five-factor model. Both models produce significantly positive alphas for the long-short portfolio. The average monthly alpha is 0.77% (0.53%) under the three-factor (five-factor) model. The third model we examine is a recent behavioral model proposed by Daniel, Hirshleifer, and Sun (2020). We find that the return on the high-low CGO hedge portfolio loads significantly positively on both the short-term and long-term mispricing factors. The hedge portfolio alpha becomes insignificant.

Our final analysis investigates whether short-window announcement CARs can predict post-merger long-run performance. Consistent with Ben-David, Bhattacharya, and Jacobsen (2020), we find that announcement returns are not significantly related to either post-merger operating performance or long-run buy-and-hold returns. In contrast, the changes in analysts' forecasts around merger announcements are significantly positively related to both post-merger operating performance and long-term stock returns.

Our paper contributes to the literature in a number of dimensions. First, our paper adds to the growing behavioral finance literature that investigates the effect of reference

dependence. One stream of the literature suggests that reference dependence plays a role in affecting corporate financial policy, such as IPO pricing and debt financing (e.g., Loughran and Ritter, 2002; Ljungqvist and Wilhelm, 2005; Dougal, Engelberg, Parsons, and Van Wesep, 2015). Another stream of literature focuses on how investor reference dependence affects aggregate market returns or cross-sectional stock returns (e.g., Barberis and Huang, 2001; Barberis, Huang, and Santos, 2001; Barberis and Xiong, 2012; Grinblatt and Han, 2005; Frazzini, 2006; Wang, Yan, and Yu, 2017; An, Wang, Wang, and Yu, 2020). In the M&A setting, Baker, Pan, and Wurgler (2012) and Ye (2014) focus on *target* firm investors and report that investor reference dependence affects the negotiated offer price and the likelihood of merger completion. Our paper adds to this literature by showing that the reference-dependent preference that shapes *bidder* investors' risk appetite not only can cause bidder stock mispricing around M&A announcements but also has a real effect on bidder managers' selection of acquisition types.

Our paper is also related to the literature the examines managerial catering behavior. Prior studies broadly show that managers do cater to investor preference on company names, payout policy, investment sentiment, and nominal share price (e.g., Cooper, Dimitrov, and Rau, 2001; Baker and Wurgler, 2004; Li and Lie, 2006; Polk and Sapienza, 2009; Baker, Greenwood, and Wurgler, 2009). In a classic survey, Baker and Wurgler (2013) review limited evidence in the M&A setting and conclude, "*while systematic evidence is lacking, the drivers of the diversification and subsequent re-focus wave could be related to catering*." Our paper adds to this literature by providing systematic evidence suggesting managers cater to investor risk preferences when making acquisition decisions.

Our findings also have important implications regarding analyzing market reactions around merger announcements to estimate shareholders' wealth effects. Ever since Fama, Fisher, Jensen, and Roll (1969) produced evidence on how stock prices respond to new information, event studies have become standard practice in corporate finance literature. Event CAR has become the most widely used measure for value creation in M&As.[1] A crucial assumption, however, is that the market efficiently incorporates the information conveyed by acquisition announcements into the stock price. Our results show that low CGO bidders pursue low quality acquisitions yet experience high announcement returns, causing systematic bidder stock misvaluation at M&A announcement. The evidence presented in this paper casts doubt on the efficacy of using the short horizon event study methodology to capture M&A wealth effects, particularly for bidders with large unrealized capital gains or losses.

Another line of research in the M&A literature investigates the performance of bidding firms around merger and acquisition announcements. Although a large number of empirical studies examine factors such as deal and firm characteristics that may affect the announcement returns for acquirers, few studies consider whether and how bidder investor behavioral biases affect acquirer returns around M&A announcements.[2] Notable exceptions include Louis and Sun (2010) and Ma, Whidbee, and Zhang (2019).[3] We

[1] Ben-David, Bhattacharya, and Jacobsen (2020) find that among articles that focused on M&As and published in the *Journal of Finance*, *Journal of Financial Economics*, and *Review of Financial Studies* between 2007 and 2016, more than 95% used the event study methodology to measure value creation in mergers.

[2] For example, prior studies show that target public status, bidder size, market to book ratio, form of the deal (i.e., merger versus tender offer), method of payment (i.e., cash versus stock) are significantly related to bidder announcement returns (e.g., Lang, Stulz, and Walkling, 1989; Servaes, 1991; Chang, 1998; Harford, 1999; Moeller, Schlingemann and Stulz, 2004, Officer, Poulsen, and Stegemoller, 2009; Cooney, Moeller, and Stegemoller, 2009; Offenberg and Pirinsky, 2015.)

[3] Louis and Sun (2010) find evidence that investors' inattention affects the market reaction to merger announcements made on Fridays.

contribute to this literature by documenting the unrealized capital gains or losses being a significant determinant of bidder announcement returns.

Finally, our paper adds to the equity analyst literature. Despite a great number of academic papers showing a list of factors that can bias analysts' earnings forecast (e.g., Dugar and Nathan, 1995; Lin and McNichols, 1998; Dechow, Hutton, and Sloan, 2000; Bradshaw, Richardson, and Sloan, 2006), we find that changes in analysts' forecasts around mergers provide credible information, as they strongly predict post-merger operating performance and return performance. In fact, our results suggest that analysts' assessment of deal quality (as reflected in their forecast changes) is a much more reliable measure than the most used measure based on short-window stock returns.

2. Hypothesis development

Wang, Yan, and Yu (2017) provide a striking empirical fact that investor risk-return trade-off depends strongly on whether stocks are trading at a gain or at a loss relative to a reference point, namely, the purchase price. Specifically, the risk-return relation is positive among firms in which investors face prior gains, but this risk-return relation becomes negative among firms in which investors face prior losses. These findings strongly support the reference-dependent effect in the prospect theory of Kahneman and Tversky (1979), which introduces an S-shaped value function that is concave in the gain domain and convex in the loss domain relative to a reference point. In this theory, RDP implies that when facing a loss relative to a reference point, investors become risk-seeking, which contradicts the basic assumption in finance and economics that the utility function is globally concave thus, investors are uniformly risk-averse. Combined with the mental accounting (MA) of Thaler

(1980, 1985), the theoretical model suggests that investors would apply RDP to each account of different assets.

To illustrate how RDP and MA may affect investors' risk preference in M&As, Figure 1 plots the value function proposed by Tversky and Kahneman (1992). Assume an investor purchases firm *i*'s shares at $100 and the price is now $70, which represents a 30% loss in the investors' holding of the shares. Suppose this firm is considering two possible acquisitions A and B. Both acquisitions have the same expected payoff. However, acquisition A is much riskier than acquisition B. As a result, acquisition A can make the firm's stock price to either go up or down by $30 with 50-50 odds, and acquisition B can make the firm's price to either go up or down by $20 with 50-50 odds. As illustrated in Figure 1a, investors prefer acquisition A because it produces a higher utility due to the convexity.

Next, assume that the investor purchases firm *j*'s shares at $100 and the price is now $130, which represents a 30% gain in the investors' holding of the shares. Firm *j*'s investors would rank acquisition B above acquisition A but still they want to reject both acquisitions as illustrated in Figure 1b. For firm *j*'s investors to accept the relatively more favorable acquisition B, the up or down odds need to be 59.22-40.78, which would have to yield a positive expected payoff of $3.69.

In summary, Figure 1 illustrates that conditional on a reference point, investors are risk averse in the gain domain (i.e., $x>0$) but become risk seeking in the loss domain (i.e., $x<0$). In the M&A setting, when investors are in the loss domain, they view risky acquisitions as attractive investment opportunities. However, when they are in the gain domain, they demand higher returns to compensate for acquisition risks.

When making an acquisition decision, a manager who aims to maximize firm value should only consider the risks and expected payoffs of the deal and should not take into account investors' risk preference induced by RDP. However, a large body of literature provides evidence consistent with the catering theory which posits that managers can cater to investors' preference, even though it may not increase fundamental value. For example, Cooper, Dimitrov, and Rau (2001) find that the change of corporate name to Internet-related dotcom names can be shaped by catering considerations. Baker and Wurgler (2004) and Li and Lie (2006) show that managers cater to investors' dividend preference. Polk and Sapienza (2009) show that mispricing can affect investment decisions. Finally, Baker, Greenwood, and Wurgler (2009) provide evidence that managers choose to split to manage the nominal share price because investors prefer lower prices.

In the setting of mergers and acquisitions, there is some evidence suggesting that the late 1960s conglomerate wave was in part driven by efforts to cater to a temporary investor appetite for conglomerates (Ravenscraft and Scherer, 1987). We therefore hypothesize that RDP combined with catering can have a real effect on managers' acquisition decisions. Specifically, if investors are in the loss domain (thus risk-seeking), a manager caters to investor demand by undertaking acquisitions with high risks even though the anticipated synergies can be low. Conversely, a manager would prefer acquisitions that yield high enough returns to compensation the associated risks when investors are in the gain domain (therefore risk averse). The above discussion leads to the following hypothesis:

H1: Bidders with investors in the lose domain undertake M&A deals that are riskier and/or have lower deal quality relative to those with investors in the gain domain.

RDP and catering also have implications on market reactions around M&A announcements and post-announcement returns. In the loss domain, if bidders cater to investors' risk-seeking preference by choosing risky deals, the stock return upon deal announcements should increase because investors should respond favorably as they clamor for risks. As argued in Baker and Wurgler (2004) and Li and Lie (2006), a critical prediction of catering theory is that the stock return upon announcement of the catering events should increase because the capital market rewards managers, which generates managers' catering incentives in the first place. However, the initial positive market reaction reflects temporary mispricing and should reverse afterwards to reflect the true value of underlying M&A deals. This leads to our second hypothesis:

H2: Stock returns of bidders with investors in the loss domain should increase upon deal announcements but reverse in the subsequent periods.

As discussed earlier and illustrated in Figure 1b, for bidders with investors in the gain domain, managers choose acquisitions that produce high anticipated synergies to compensate for the associated risks. Therefore, the stock returns upon deals announcements should be positive. However, this positive market reaction reflects higher deal quality instead of stock overvaluation. As a result, there should not be a subsequent price reversal. This leads to our third hypothesis:

H3: Stock returns of bidders with investors in the gain domain should increase upon deals announcement and no reversal should be observed in the subsequent periods.

3. Sample Formation, Variable Construction, and Summary Statistics

3.1. Sample formation

To construct our sample, we begin with all announced U.S. M&A transactions from January 1, 1981 to December 31, 2017 in the Thomson One Banker Securities Data Company (SDC) database. We impose the following filters to obtain our sample: 1) the acquirer status is "Public"; 2) the form of deal is "Merger (M)," "Acquisition of Assets (AA)," or "Acquisition of Majority Interest (AM)"; 3) the deal value reported by SDC is at least $1 million; 4) the acquirer holds less than 50% of the shares of the target firm before the deal announcement. These steps yield a sample of 48,098 deals. We then merge these data with data from the Center for Research in Security Prices (CRSP) to obtain bidder stock returns around merger announcements as well as Compustat to obtain accounting information. Table 1 lists the steps taken to form the final sample of 37,222 observations.

3.2. Main variables construction

3.2.1. Measuring the reference point and unrealized gains/losses

We follow Grinblatt and Han (2005) to measure the investors' reference price prior to the merger announcement by calculating the average cost basis based on the following formula:

$$R_t = \frac{1}{k} \sum_{n=1}^{252} (V_{t-n} \prod_{\tau=1}^{n-1} [1 - V_{t-n+\tau}]) \, P_{t-n} \quad (1)$$

where V_t and P_t are date t's turnover ratio and stock price, respectively. The term in parentheses, which is multiplied by $P_{t-n,}$ is a weight, and k is a constant that makes the sum of the weights on past prices equal to one. The measurement window for the proxy for the purchase price is 252 trading days ending 6 trading days prior to the merger announcement. We exclude the week (i.e., 5 trading days) prior to the merger announcement to avoid

concerns that merger related information may be leaked to the market right before the public announcement. [4]

As discussed in Grinblatt and Han (2005), the weight on *Pt−n* reflects the probability that the share purchased at day $t - n$ has not been traded since. The intuition of this turnover-based measure is that if a stock had a very high turnover a year prior to the merger announcement, but turnover has been very low ever since, then most of the current holders probably bought the stock a year ago. Therefore, we can use the price a year ago as a proxy for their purchase price. Similarly, if a stock had very high turnover in the most recent month prior to the merger announcement, then most investors probably bought it recently, so we can use a more recent price as a proxy for their purchase price. The turnover-weighted reference price thus provides us a reasonable proxy for a shareholder's cost basis in the bidder's stock prior to the merger announcement. After obtaining the reference price, we compute the capital gains overhang (CGO) following Grinblatt and Han (2005). Our proxy is calculated using the following formula:

$$CGO_{t-1} = \frac{P_t - R_t}{P_t} \tag{2}$$

where P_t is the closing price 6 trading days prior to public merger announcement and R_t is the reference price.

3.2.2. Measuring deal quality

The most widely used measure of deal quality in the corporate finance literature is the bidder's abnormal returns over a short window around the M&A announcement (Ben-David, Bhattacharya, and Jacobsen, 2020). However, this measure is not suitable in our

[4] We choose this window to construct our key variable because it matches the window used in Ma, Whidbee, and Zhang (2019) for their key measure of reference price. In section 4.4, we investigate both key variables as competing explanations for merger announcement returns. As a robustness check, we calculate reference price using data from previous two or three years and find similar results.

setting as we argue in the hypothesis development section that part of the stock price response itself may very well reflect mispricing. To overcome this challenge, we construct two performance metrics that do not rely on M&A announcement returns.

Following Chen, Harford, and Li (2007), our first measure of deal quality is the change in the consensus analyst earnings forecast around the merger event (*Δ EPS*). Chen, Harford, and Li (2007) argue that the change in analyst forecast around the merger is a useful measure because it reflects analysts' assessment on how the underlying acquisition affects the bidder's future earnings. More importantly, we believe that analysts are less likely to suffer from behavior biases due to reference dependent preference and thus can have more objective assessment on the underlying deal. We compute the change in the analyst earnings forecast around both the merger announcement date (*ΔEPS (Announcement))* and the deal completion date (*Δ EPS (Completion))*. Specifically, *Δ EPS (Announcement)* is calculated as the difference between earnings forecast in the month after merger announcement and earnings forecast in the month before merger announcement, normalized by the stock price at the month-end prior to the merger announcement. Similarly, *Δ EPS (Completion)* is calculated as the difference between earnings forecast in the month after merger completion and earnings forecast in the month before merger announcement, normalized by the stock price at the month-end prior to the merger announcement. Our earnings forecast data are from I/B/E/S.

Our second measure of deal quality is the change in the bidder's operating performance. Post-merger return on assets (ROA) and cash flow performance (OCF) are widely used measures to capture deal quality (e.g., Healy, Palepu, and Ruback, 1992). Moreover, this ex-post measure of deal quality complements the ex-ante measure of

analysts' expectation as it reflects the realized synergies post-merger and is less subject to potential analysts' forecast bias suggested by prior studies. We compute change in ROA (OCF) as the difference between the bidder's average quarterly ROA (OCF) in the three-year post-completion period and the pre-merger ROA (OCF).

3.2.3. Measuring deal risk

Our measures for deal risks also use information in analysts' earnings forecasts and post-merger performance. Specifically, the first measure of deal risk is the change in analyst earnings forecast dispersion around merger announcement date or deal completion date (*ΔDISP(Announcement)* and *ΔDISP(completion))*. Dispersion of analyst beliefs likely captures a firm's idiosyncratic risk and earnings uncertainty. Thus, the change in forecast dispersion around the M&A event reflects the change in firm risk or uncertainty due to the underlying acquisition. Specifically, *ΔDISP(Announcement)* is calculated as analyst forecast dispersion in the month after deal announcement minus that in the month before the announcement. *ΔDISP(completion)* is calculated as analyst forecast dispersion in the month after deal completion minus that in the month before the announcement. We require at least two analysts following the bidder in order to compute forecast dispersion.

Our second measure of deal risk is change in post-merger operating performance volatility. Specifically, we use change in ROA volatility and change in OCF volatility to capture the deal risk. Change in post-merger ROA (OCF) volatility is calculated as the standard deviation of bidders' quarterly ROA (OCF) in the three-year post-completion period minus the pre-merger ROA(OCF) standard deviation. We only include completed deals to compute *Δ EPS (Completion), Δ DISP (Completion), Δ (ROA), Δ (OCF), Δ (ROA Volatility),* and *Δ (OCF Volatility).*

3.3. Sample overview and summary statistics

Table 1, Panel B, presents the temporal distribution of our sample. Consistent with prior studies (e.g., Andrade, Mitchell, and Stafford, 2001; Harford, 2005), we observe a large merger wave in the late 1990s and early 2000s. Table 2 presents summary statistics for the deal and firm characteristics. All variables are defined in Appendix A. All continuous variables are winsorized at the 1st and 99th percentiles. The mean (median) bidder capital gains overhang prior to the acquisition announcement is 0.2% (4%) with a large standard deviation of 20.5%. Seventeen percent of the deals are financed entirely with stock and 25% of the deals are financed entirely with cash. Seventy-nine percent of the deals have non-public target firms and less than 2% of bidders have a toehold prior to the merger announcement. Approximately 3% of the deals are tender offers and 44% of targets and bidders are from the same industry. Overall, these summary statistics show that the intertemporal patterns and deal characteristics in our data mirror prior research using samples of publicly traded bidders. [5]

4. Results on Capital Gains Overhang

4.1. Deal quality and capital gains overhang

As an initial step in examining whether managers cater to investors' risk preferences when making acquisition decisions, we plot the average change in analysts' earnings forecasts using 10 evenly spaced bins on the positive and negative side of CGO estimated separately. Our H1 posits that if managers cater to investors' risk preference induced by RDP, bidders with investors in the loss domain prefer riskier M&A deals with

[5] In untabulated analysis, we examine the correlation matrix for our sample. In general, none of the correlations warrant any concern for multicollinearity.

lower anticipated synergies relative to those in the gain domain. Therefore, we expect a positive relation between deal quality and CGO. Consistent with our expectation, Figure 2 reveals a positive relation between the level of CGO and change in analysts' earnings forecast around the M&As. Moreover, the slope is steeper in the loss domain and is flatter in the gain domain, indicating a faster decline in deal quality when investors are in deep loss domain.

We next run an ordinary least squares (OLS) regression model using the deal quality measures as the dependent variable, with CGO as the main independent variable. The regression model is specified as:

$$Deal\ quality = \alpha + \beta 1 * CGO + Controls + \varepsilon \quad (3)$$

We expect the coefficient of interest, $\beta 1$, to be positive and significant. Table 3 shows the results. Consistent with our expectation, in Column (1) of Panel A, the coefficient on CGO is positive and statistically significantly at the 1% level, indicating that analyst earnings forecasts are significantly higher for bidders with investors in the gain domain compared to those in the loss domain. In Column (2), we test whether this relation is asymmetric in the loss domain versus gain domain by separately estimating the coefficient on positive CGO and negative CGO. Specifically, we use $|CGO|^-$ and $|CGO|^+$ to replace CGO in the regression equation (3). Column (2) shows that the coefficient on $|CGO|^-$ is significantly negative and the coefficient on $|CGO|^+$ is significantly positive. Moreover, the effect is asymmetric, as the magnitude of the coefficient on $|CGO|^-$ is more than twice as large as that on $|CGO|^+$.

Economically, a one standard deviation change in CGO in the loss domain (e.g., CGO from 0 to -0.205) is associated with a lower earnings forecast by 0.25%, and one

standard deviation change in CGO in the gain domain (e.g., CGO from 0 to 0.205) is associated with a higher earnings forecast by 0.10%. These results are economically meaningful given that the average change in earnings forecast is -0.003%. Our interpretation is that investors' risk preference has a stronger influence on deal quality when they are in the loss domain compared to that in the gain domain. This is also consistent with the loss aversion feature of the prospect theory. An individual's tendency to prefer avoiding losses to acquiring equivalent gains can imply an asymmetrically stronger effect of negative CGO than positive CGO. In Columns (3) and (4), we replace *ΔEPS (Announcement)* with *ΔEPS (Completion)* and obtain very similar results.[6]

Panel B of Table 3 reports the relation of CGO and deal quality measured by bidders' post-merger operating performance. The dependent variable is change in ROA (*Δ ROA*) in Columns (1) and (2) and is change in OCF (*Δ OCF)* in Columns (3) and (4). Largely consistent with Panel A of Table 3, we again find that deal quality (measured by change in post-merger operating performance) is much higher when investors are in the gain domain compared to the loss domain. These results complement those of the change in analysts' earnings forecasts, as they show that CGO is not only related to changes in analysts' expectation, but also related to the actual realized performance post-merger.

Overall, Figure 2 and Table 3 show that the deal quality is significantly related to where investors are located relative to the reference point (i.e., the purchasing price). When investors are deep in the loss domain, managers tend to pursue acquisitions with worse

[6] In unreported results, we also use the change in analysts' stock recommendation to proxy for deal quality and find similar results. Specifically, analysts are more likely to upgrade their recommendations for positive CGO bidders and more likely to downgrade their recommendations for negative CGO bidders.

quality compared to when investors are in the deep gain domain. These results are consistent with the catering hypothesis in H1.

4.2. Deal risk and capital gains overhang

In this section, we examine the effect of CGO on deal risk. Similar to what we've done in the previous section, we first plot deal risk on CGO before we run OLS regression analysis. Our hypotheses posit that if managers cater to investors' risk preference induced by RDP, bidders with investors in the lose domain undertake M&A deals that are riskier relative to those with investors in the gain domain. Therefore, we expect that the relation between deal risk and CGO is negative. Consistent with our expectation, Figure 3 reveals a negative relation between deal risk (measured by change in analyst forecast dispersion) and the level of CGO.

Table 4, Panel A shows the regression results which further support the pattern shown in Figure 3. The coefficient on CGO in Column (1) is negative and statistically significant. In Column (2), we regress the change in analyst forecast dispersion on $|CGO|^-$ and $|CGO|^+$ separately. The results show that the overall negative relation between CGO and the change in analyst forecast dispersion is mainly driven by the negative side of CGO, indicating that managers pursue riskier acquisitions when investors are in the loss domain.

In Panel B of Table 4, we use changes in *ROA volatility* and *OCF volatility* as alternative proxies for deal risks and find robust results. The coefficients on CGO remain significantly negative, suggesting that deal risks, measured by realized post-merger operating performance volatility, significantly increase as CGO decreases, particularly in the loss domain. Taken together, Figures 2 and 3, and Tables 3 and 4 strongly support our H1. That is, bidders with investors in the lose domain undertake M&A deals that are riskier

and/or have lower anticipated synergies relative to those with investors in the gain domain, suggesting that managers cater to investors risk preferences by selecting different types of acquisitions to please investors.

5. Market Reactions to M&As

5.1. Announcement abnormal returns

As stated in the hypothesis development section, investors' reference dependent preference and manager catering behavior can have important implications on market reactions around M&A announcements. In this section, we investigate how market reacts to acquisitions made by firms whose investors are in the gain domain versus in the loss domain. Our H2 and H3 predict positive market reactions to acquisitions announced by bidders with either high or low CGO. High CGO bidders pursue high quality deals which lead to higher announcement returns. Low CGO bidders cater to investor preference by pursuing risky deals, which also leads to favorable investor response.

To test our predictions, we plot bidder announcement returns on the level of CGO. Specifically, Figure 4 shows sample means (i.e., the dots in the graph) of bidder *CAR (-2, 2)* using 10 evenly spaced bins on the positive and negative side of *CGO* estimated separately. We observe a striking V-shaped return pattern: Bidders announcement CARs are larger when investors either in deep gain or loss domain, with CARs being even higher in the deep loss domain.

Next, we examine the relation between bidders' capital gains overhang and acquisition returns employing a multiple regression analysis. Our regression model is specified as:

$$CAR(-2,2) = \alpha + \beta 1|CGO|^{-} + \beta 2|CGO|^{+} + Controls + \varepsilon \quad (4)$$

where the dependent variable is bidder *CAR(-2, 2)* and our key independent variables are $|CGO|^-$ and $|CGO|^+$. We expect both $\beta 1$ and $\beta 2$ to be positive. Table 5 presents regression results. We first simply regress acquisition announcement return on $|CGO|^-$ and $|CGO|^+$. Consistent with our expectation, Column (1) shows that the coefficients on $|CGO|^-$ and $|CGO|^+$ are both significantly positive, with t-values of 8.48 and 7.27, respectively. This relation remains robust after we control for deal/firm characteristics in Column (2) and, both industry effects and year fixed effects in Column (3). Economically, for bidders in the loss domain, a one standard deviation increase in $|CGO|$ is associated with an increase in bidder announcement returns of 1.233%, even after controlling for a broad range of deal/firm characteristics and industry/year effects in Column (3). For bidders in the gain domain, a one standard deviation increase in CGO is associated with a higher bidder announcement returns of 0.779%. Given that the average announcement return is 1.42%, an increase of 1.324% for bidders with negative CGO and an increase of 0.779% for bidders with positive CGO are economically meaningful.

Several other control variables in Table 5 also have significant effects on bidder announcement returns and are largely consistent with prior literature. For example, Chang (1998) and Officer, Poulsen, and Stegemoller (2009) report that bidders experience higher returns when acquiring private target firms. Moeller, Schlingemann, and Stulz (2004) and Boone and Mulherin (2008) report that large bidders have lower announcement returns. Method of payment and whether a deal is structured as a tender offer are also related to announcement returns (Travlos, 1987; Lang, Stulz, and Walkling, 1989; Offenberg and Pirinsky, 2015; Lin, Officer, and Shen, 2018). In addition, a bidder's recent ROA is

negatively associated with merger announcement returns, whereas the book-to-market ratio is positively associated with returns.

5.2. Ma, Whidbee, and Zhang (2019) revisited

In a recent study, Ma, Whidbee, and Zhang (2019) investigate whether investors use the 52-week high as a price reference point to evaluate the bidder firm. Their intuition is that if the acquirer's stock price is near its 52-week high, investors may perceive the stock as having a high valuation level (relative to its fundamental value) and, therefore, be reluctant to bid up the price and, instead, be inclined to sell down the price in response to an acquisition announcement. In contrast, if a bidder's price prior to announcement is well below its 52-week high, investors may perceive the acquirer's valuation to be low and, therefore, be more willing to bid up rather than to sell down the stock price. The authors refer to this as the *perceived valuation hypothesis* that predicts that the anchoring 52-week high price influences investors' responses to merger announcements.

To test the perceived valuation hypothesis, the authors construct a key variable, called the acquirer's reference price ratio (RPR), defined as the ratio of the closing price as of the sixth day prior to the announcement (t–6) to the highest closing price over the previous 252 trading days. A company with a stock price near its 52-week high will have an RPR close to one. The authors report a strong and robust negative relation between the RPR and bidder announcement-period returns.

In unreported results, we find that the correlation between CGO and RPR is 0.7. This high correlation is not surprising. Intuitively, a bidder with an RPR ratio close to 1 is likely to have a high value of CGO. The opposite is also true. While the perceived valuation hypothesis and our risk preference hypothesis are both motivated from investors reference

dependent value function, it is important to note that these two hypotheses have distinct mechanisms. The perceived valuation hypothesis states that investors use 52-week high as reference point and irrationally perceive bidders with a price close to a 52-week high as overvalued. Under the assumption that overvalued acquirers earn lower returns, a higher RPR is associated with lower announcement returns. In contrast, our hypothesis states that investors with low CGO irrationally overvalue acquisition deals because of their risk-seeking preferences.

Given the high correlation between these two main variables under each hypothesis, and to make sure that our results are not driven by the perceived valuation effect documented in Ma, Whidbee, and Zhang (2019), we include both CGO and RPR as competing explanatory variables in Table 6. In Column (1), we replicate the baseline results of Ma, Whidbee, and Zhang (2019) using the same sample period, 1981-2014. Consistent with the findings in Ma, Whidbee, and Zhang (2019), we find that RPR is significantly negatively related to bidder announcement returns over a 5-day window (coefficient = -2.58 and t-statistic = -5.48). In Column (2), we include our main variable CGO, together with RPR, to investigate the incremental effect when both variables are present. We find that the coefficient on CGO is statistically significant (t-statistic = -4.18). However, the coefficient of RPR is now reduced to -0.38 from its previously value of -2.58 in Column (1), and becomes statistically insignificant (t-statistic = -0.74). In Column (3), we replace CGO with $|CGO|^{-}$ and $|CGO|^{+}$ based on the observation that the relation between the announcement return and CGO is V-shaped. We find that our results are largely unaffected by the inclusion of RPR. We repeat this analysis using our full sample from 1981 to 2017 in Column (4) and again find similar results.

Overall, Table 6 results suggest that the capital gains overhang effect around the M&A announcement reported in section 5.1 is not driven by the previously documented investor perceived valuation effect related to a 52-week high stock price. In fact, Table 6 results suggest that the negative relation between RPR and announcement return documented in the prior study is, in fact, due to the omitted variable CGO.

5.3. Short-term post-announcement returns

In this section, we examine bidders' return performance in the subsequent months (i.e., one to two months or 21 to 42 trading days) following the acquisition announcement. As discussed in Section 2, the initial positive market reaction to acquisitions announced by bidders with negative CGO likely reflects temporary overvaluation and should reverse afterwards to reflect the true value of underlying M&A deals. In contrast, we do not expect a price decline for positive CGO bidders post announcement, as the initial positive market reaction to these bidders more likely reflects deal quality. We examine relatively short periods to avoid the "bad-model problem" discussed by Fama (1998). Moreover, the immediate reversal, if any, can be more credibly attributed to potential mispricing at the announcement.[7]

Following Agrawal, Jaffe, and Mandelker (1992), we examine the relation between the announcement return and the short-term post-announcement return. The idea is straight-forward. If there is a mispricing at the announcement, then bidder announcement CARs should predict post-announcement returns. Agrawal, Jaffe, and Mandelker (1992)

[7] However, one disadvantage of using short periods is that results cannot be identified if mispricing takes longer to be corrected. To address this potential concern, later in the paper, we use the calendar time portfolio approach to examine post-announcement returns over the subsequent one-year period.

fail to identify such a relation and conclude that their results do not support the hypothesis of market inefficiency at the merger announcement.

We first sort our sample into quintiles based on bidders' announcement returns, CAR(-2, 2), and report the average post-announcement return CAR(3, 23) and CAR(3, 44) in Table 7, Panel A. Both the average CAR(3, 23) and the average CAR(3, 44) of the high-minus-low (H-L) portfolio are insignificant, indicating that on average, CAR(-2, 2) is unrelated to post-announcement returns. This result is consistent with the finding in Agrawal, Jaffe, and Mandelker (1992).

We next separately investigate the relation between bidder announcement CARs and post-announcement returns depending on whether investors are in the gain or loss domain. Table 7, Panel B reports the results. Strikingly, we find that in the loss domain (i.e., CGO<0), the average post-announcement return decreases generally as CAR (-2, +2) increases. In sharp contrast, in the gain domain (i.e., CGO>0), the average post-announcement return increases generally as CAR(-2, +2) increases in the gain domain. The difference between the high-minus-low returns (P5-P1) among positive-CGO bidders and negative-CGO bidders is significant both statistically and economically. The return difference (P5-P1) among positive CGO and negative CGO is 1.66 percent in the one-month period following the M&A announcement, and 3.1 percent in the two-month period following the announcement. Moreover, the opposite relations between the announcement return and post-announcement return in the gain versus loss domain explain the insignificant result in Panel A.

Next, we formally examine the relation between bidders' announcement returns and short-term post-announcement returns by employing a multiple regression analysis. Our regression model is specified as:

$$CAR(a,b) = \alpha + \beta 1 CAR(-2,2) + Controls + \varepsilon \quad (5)$$

where CAR(-2, 2) is our main independent variable. We include CGO as a control variable because Grinblatt and Han (2005) show that CGO itself can predict returns and we show that CAR(-2, 2) and CGO are also correlated. Based on our hypothesis that bidders with negative CGO should experience return reversal while bidders with positive CGO should not have return reversal, we expect $\beta 1$ to be significantly negative for bidders with negative CGO and non-negative for bidders with positive CGO.

Table 8 shows the results. We first regress CAR(3, 23) and CAR(3, 44) on CGO for the full sample in Column (1) and (2), respectively. The coefficients on CAR(-2, 2) are both insignificant, consistent with what we find in the portfolio analysis. We then repeat the regression analysis for the negative CGO and the positive CGO subsample respectively. In Column (3) and (4), the results show that in the subsample of negative CGO bidders, the coefficients on CGO are significantly negative, indicating that high announcement returns are associated with low post-announcement returns when investors are in the loss domain. In Column (5) and (6), the results show that in the subsample of positive CGO bidders, the coefficients of CGO are significantly positive, indicating that high announcement returns are associated with high post-announcement returns.

Taken together, the results in Tables 5 through 8 provide evidence consistent with both H2 and H3. That is, stock returns upon announcement of the risky acquisitions increase as the risk-seeking investors respond enthusiastically to these deals. The

subsequent price reversal, which is directly related to announcement CARs for negative CGO bidders provides clear evidence of overvaluation at the merger announcement.

5.4. Explaining the price drift for positive CGO bidders

One interesting finding reported in Table 8 is the subsequent price drift for positive CGO bidders. Not only these bidders do not experience a price reversal after the initial positive market reaction, but the stock price in fact continues to increase in the subsequent months. Note that this positive relation between announcement CARs and subsequent returns is significant even after controlling for the momentum effect of CGO itself. We further confirm this return pattern in Figure 5, where we plot the bidders' cumulative average abnormal returns, from five trading days before the merger announcement to 44 days after the announcement date, for bidders with high, low, and moderate CGO, respectively. We define bidders as low CGO bidders if they are in the bottom CGO quintile. We define bidders as high CGO bidders if they are in the top CGO quintile. We define the remainder as moderate CGO bidders. Consistent with results in Table 8, Figure 5 shows a clear reversal for low CGO bidders and price drift for high CGO bidders following the merger announcements.

What explains the underreaction to merger announcements made by high CGO bidders? A potential explanation is the investor disposition effect, a tendency of investors to sell assets that have increased in value but hold those that have decreased in value. This trading behavior depending on the gain/loss relative to a reference point is well documented in prior studies (e.g. Grinblatt and Han,2005; Frazzini,2006; Barberis and Xiong, 2009; Barber and Odean, 2013). In our setting, investors of firms with high CGO already have unrealized gain even before the acquisition announcement. Around the merger

announcement, the selling pressure exacerbates because of the positive market reaction to high-quality deals. If investors do sell these winners aggressively around the merger announcements, this selling pressure can lead to underpricing at the announcement and price drift in the subsequent periods.

To test the disposition effect explanation, we perform a regression analysis of net retail selling. We focus on the retail trading because it has been documented in the literature that individual investors are more likely to exhibit disposition effect (e.g., Li and Yang, 2013).[8] Our regression model is specified as:

$$Net\ Retail\ Selling(-2,2) = \alpha + \beta 1CGO + Controls + \varepsilon \quad (6)$$

where net retail selling is calculated as the difference between the number of shares of retail-selling and the number of shares of retail-buying, deflated by the retail trading volume, over the event window (-2, +2). The sample for individual trading is from the U.S. discount broker sample introduced by Barber and Odean (2000) and is available from January 1991 to December 1996.

Table 9 reports the results on retail trading around merger announcements. We find strong evidence consistent with investor disposition effect. Specifically, Columns (3) shows that controlling for deal and firm characteristics, a one standard deviation increase in CGO is associated with a 2.8 percentage increase in net retail selling in the 5-day window surrounding the merger announcement. By separately estimating coefficients on $|CGO|^-$ and $|CGO|^+$, Column (4) further shows that the positive relation between retail selling and CGO is concentrated in the gain domain. These results suggest that the selling pressure for

[8] In unreported results, we use abnormal trading volume to proxy for selling/holding pressure. We find that positive CGO bidders experience significantly higher abnormal trading volume compared to negative CGO bidders, consistent with the notion that investors of positive CGO bidders are more likely to sell their shares at the merger announcements.

high CGO bidders around the M&A announcement is likely to contribute to the upward price drift in the post-announcement periods.

5.5. Long-term Post-merger Announcement Return Analysis

The short-term post-merger announcement return analysis reveals that bidders' stock is overvalued (undervalued) at merger announcement if the stock has a negative (positive) CGO. To complete our analysis, we investigate how bidders' CGO affects long-term post-merger announcement returns. We only include completed deals for this analysis. We acknowledge that measuring long-horizon returns can be sensitive to both methodology and the choices of matched firms (Bessembinder and Zhang, 2013). Fama (1998) shows that bad-model problems are more serious in tests involving long-term returns and suggests that average monthly returns be used to calculate the abnormal return using an asset pricing model. Yet, this calendar time portfolio approach is also subject to criticism. For example, Loughran and Ritter (2000) show that the calendar time portfolio return approach has low power in terms of detecting abnormal returns.

With these caveats in mind, we proceed to our long-term return analysis by employing the calendar time portfolio return approach to examine the one-year post-merger returns using alternative asset pricing models. We start with the Fama and French (1993) three-factor model as a control for expected returns. Panel A of Table 10 presents the results of a time-series regression. The dependent variable is the average return of a portfolio of bidders that made merger announcements during the previous 12 months minus the risk-free rate for Columns (1) to (3), and the average return of high-low portfolio for Column (4). The results show that, low CGO bidders earn a significantly negative alpha, while moderate CGO bidders and high CGO bidders earn insignificant alphas. In Column (4),

the alpha of the H-L portfolio is significantly positive, suggesting that the hedge portfolio constructed by going long in the high CGO stocks and shorting the low CGO stocks can earn an average abnormal return of 0.77% after controlling for three factors.

We next adopt a five-factor model of Fama and French (2015) and report results in Panel B of Table 10. We find that after controlling for two additional factors, the profitability factor (RMW) and the investment factor (CMA), high CGO bidders earn an average positive abnormal return while low CGO bidders earn an average insignificant abnormal return. If we go long in the high CGO stocks and short the low CGO stocks, the average abnormal return is 0.53% and statistically significant at the 5% level.

Lastly, we adopt a recent behavioral model proposed in Daniel, Hirshleifer, and Sun (2020) that creates a PEAD factor which is purported to capture short-term mispricing and FIN, a long-term mispricing factor to test whether this mispricing model can explain the long-term return pattern based on CGO. Panel C reports the results. We find that the alpha for the H-L portfolio going long in the high CGO stocks and shorting the low CGO stocks is insignificant, indicating that this mispricing model can, in fact, explain the abnormal return of the hedge portfolio constructed based on CGO in the one-year post-merger horizon. These findings provide supporting evidence consistent with the explanation that investor behavioral biases cause mispricing at the M&A announcement.

6. Predicting post-merger performance

Although stock returns around merger announcements are widely viewed as being reflective of the value creation in M&As, the evidence presented in the previous section confirms that the stocks of bidding firms around the announcement are mispriced, making

announcement CARs a biased measure for value creation in mergers. Indeed, Ben-David, Bhattacharya, and Jacobsen (2020) show that acquisition outcomes are largely uncorrelated with announcement returns and conclude that announcement returns are barely useful as a measure of the value created in acquisitions. In this section, we attempt to propose alternative measure that may better capture the value creation.

We show that investors behavior bias due to reference-dependent preference can cause the mispricing around the merger announcement. However, we argue that analysts are less likely to suffer from this behavior bias because they are unlikely to hold a large number of shares of all firms they cover. As a result, analysts may give an unbiased assessment of the underlying deal. We test this hypothesis by examining whether change in analysts' earnings forecast around the announcement can predict post-merger performance measured by the post-announcement one-year and three-year operating cash flows (deflated by the total assets) and the post-announcement one-year and three-year buy-and-hold abnormal returns (BHARs).[9]

Table 11 presents the results. Consistent with our prediction, the change in consensus analysts' earnings forecast (*ΔEPS*) significantly and positively predicts all four post-merger performance measures. All coefficients on *ΔEPS* are statistically significant at the 1% level. In contrast, similar to the finding in Ben-David, Bhattacharya, and Jacobsen (2020), the announcement return *CAR(-2, 2)* is uncorrelated with three of our four measures for post-merger performance in Columns (2), (4) and (6), and is negatively correlated with post-merger three-year BHAR in Column (8). These results suggest that the change in

[9] We are very careful when constructing these measures, especially for BHARs. To avoid any confounding effect, we compound the returns starting from the first month after post-announcement analysts' forecast date.

consensus analysts' earnings forecast around merger announcement is an informative measure of deal quality whereas the announcement CAR, despite being used as a standard proxy for value creation in M&As, does not accurately capture deal quality.

7. Conclusion

In this paper, we present novel evidence that managers cater to investors' risk preferences when making acquisition decisions. Using a comprehensive sample of mergers and acquisitions, we find that the level of capital gains overhang significantly predicts deal quality as well as deal risks. Specifically, bidders with low capital gains overhang undertake M&A deals that are riskier and/or have lower anticipated synergies relative to those with high capital gains overhang. Moreover, this catering to investors risk demand behavior has important implications on market reactions to the merger events. We document strong positive market reactions to mergers announced by bidders with either low or high capital gains overhang, creating a V-shaped return pattern at the M&A announcement. However, the positive market reaction to low CGO bidders is followed by a noticeable return reversal in the post-announcement period, whereas the positive market reaction to high CGO bidders is followed by a further upward price drift. We provide some evident suggesting that the aggressive selling pressure for high CGO bidders contribute to the underpricing at the M&A announcement.

Employing alternative asset pricing models, we examine long-horizon returns using the calendar time portfolio return approach. We find significantly positive alpha for hedge portfolios that go long in high CGO stocks and short on low CGO stocks after controlling

for Fama and French's three factors and five factors. The positive alpha is successfully explained by the recent behavioral model proposed in Daniel, Hirshleifer, and Sun (2020).

Taken together, our results indicate that investor risk demand induced by reference dependent preferences not only can cause temporary stock mispricing but has a real effect on managers' investment decisions. Our results are difficult to reconcile with the standard assumptions of rational expectations that assume capital markets are efficient with respect to public information and that any stock price movement should only reflect expected changes in firm fundamental value. Our results shed light on how investor irrational risk preference can have a real effect on corporate investments if managers cater to their taste.

Moreover, our results have important implications for the common practice that uses bidder returns over a short window to measure the wealth effect of the merger, especially for bidder stock with large unrealized capital gains or losses. We show that the change in analysts' forecasts, instead of merger announcement CARs, better reflects deal quality.

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Figure 1. Prospect theory value function: capital losses versus capital gains

This figure plots the value function proposed by Tversky and Kahneman (1992), generated by, $v(x) = x^{\alpha}$ for $x \geq 0$ and $v(x) = -\lambda(-x)^{\alpha}$ for $x < 0$, for $\alpha = 0.5$ and $\lambda = 2.5$. Figure 1a illustrates that an investor purchases firm i's shares at \$100 and the price is now \$70, which represents a \$30 loss. Suppose this firm is considering two possible acquisitions A and B. Acquisition A can make the firm's stock price to either go up or down by \$30 with 50-50 odds, and acquisition B can make the firm's price to either go up or down by \$20 with 50-50 odds. The figure shows the investor's utility of taking acquisitions A and B respectively in the lose domain. Figure 1b illustrates that the investor purchases firm *j*'s shares at \$100 and the price is now \$130, which represents a \$30 gain. Suppose firm *j* considers acquisitions A and B. Figure 1b shows the utility of taking acquisitions A and B when the investor is in the gain domain.

Figure 1a. Value function in the loss domain

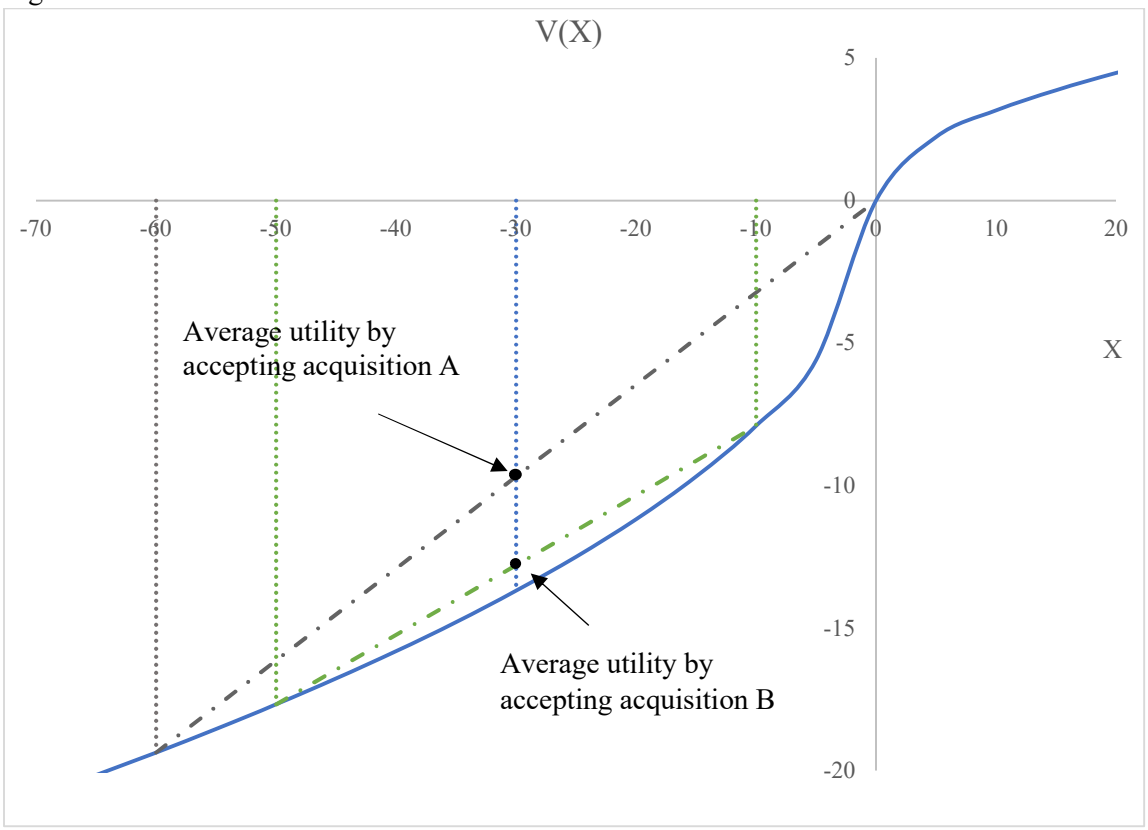

Figure 1b. Value function in the gain domain

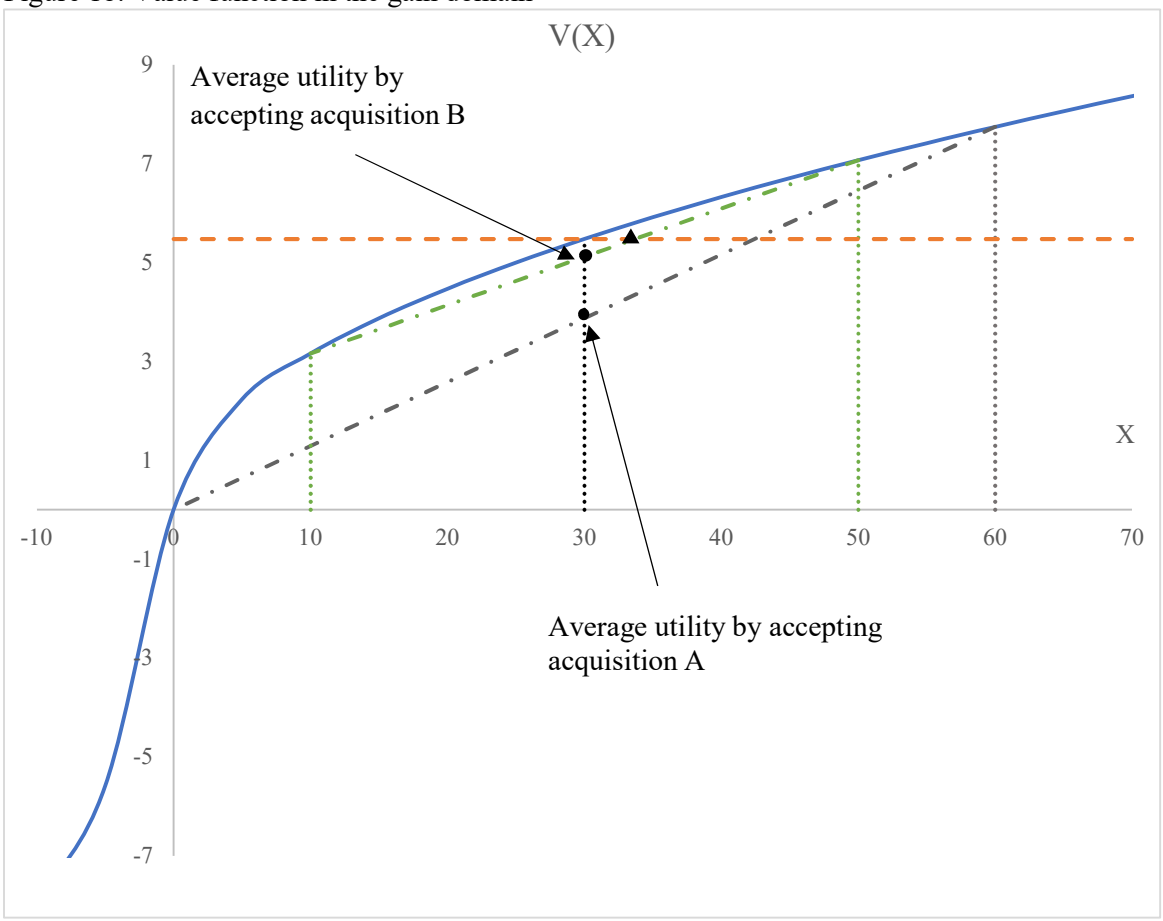

Figure 2. Capital gains overhang and deal quality

This figure plots sample means (i.e., the dots in the graph) of bidder Δ EPS (Completion) using 10 evenly spaced bins on the positive and negative side of capital gains overhang (*CGO*) estimated separately. The solid line (estimated on each side separately) is based on linear regression model. *Δ EPS (Completion)* is the consensus forecast in the month after deal completion minus the month before announcement. Following Grinblatt and Han (2005), *CGO* is the difference between share price 6 day prior to merger announcement and the market's aggregate cost basis (the reference price), scaled by the reference price. The sample includes deals announced between 1981 and 2017.

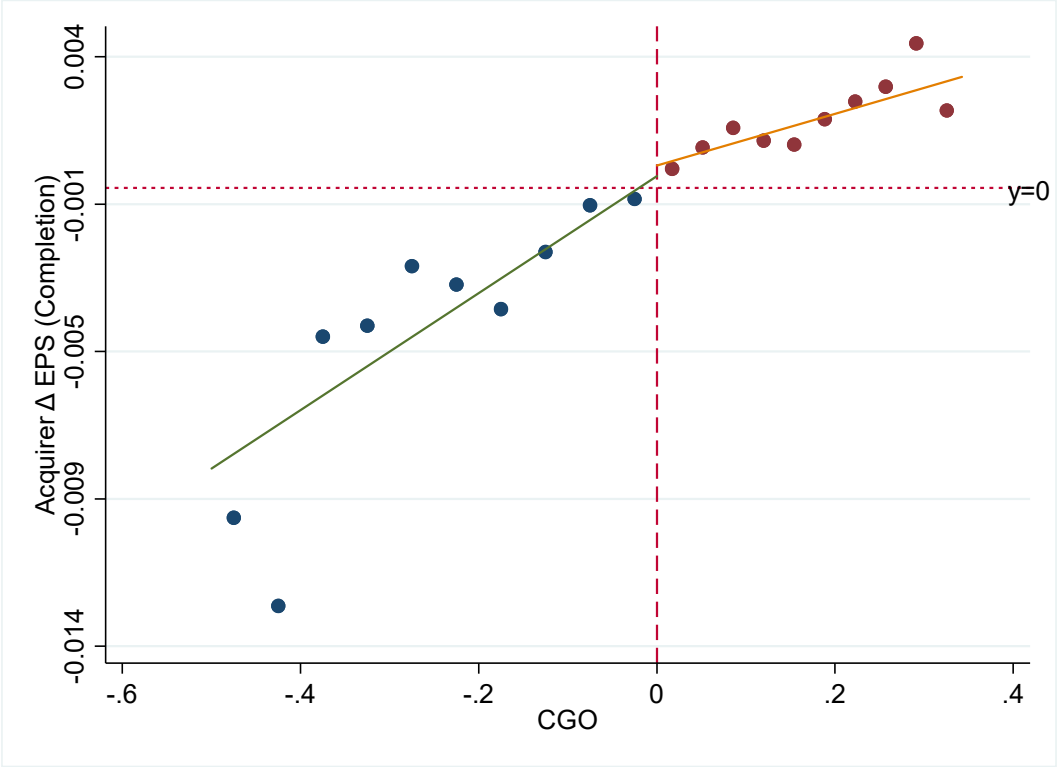

Figure 3. Capital gains overhang and deal risk

This figure plots sample means (i.e., the dots in the graph) of bidder Δ DISP (Completion) using 10 evenly spaced bins on the positive and negative side of capital gains overhang (*CGO*) estimated separately. The solid line (estimated on each side separately) is based on linear regression model. *Δ DISP (Completion)* the consensus forecast in the month after deal completion minus the month before announcement. The sample includes deals announced between 1981 and 2017.

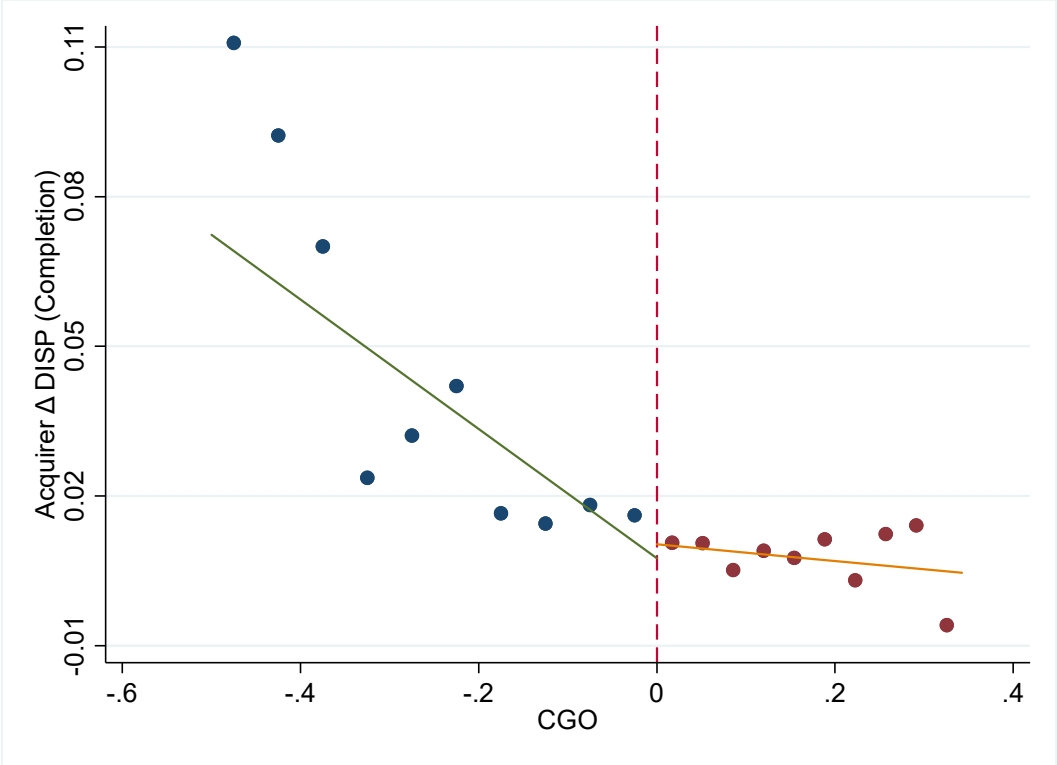

Figure 4. Capital gains overhang and bidder announcement returns

This figure plots sample means (i.e., the dots in the graph) of bidder *CAR (-2, 2)* using 10 evenly spaced bins on the positive and negative side of *CGO* estimated separately. The solid line (estimated on each side separately) is based on linear regression model. *CAR (-2, 2)* is the cumulative average abnormal returns in a five-day window surrounding the merger announcement using market-adjusted returns from the CRSP value-weighted index. Day 0 is the acquisition announcement date. The sample includes deals announced between 1981 and 2017.

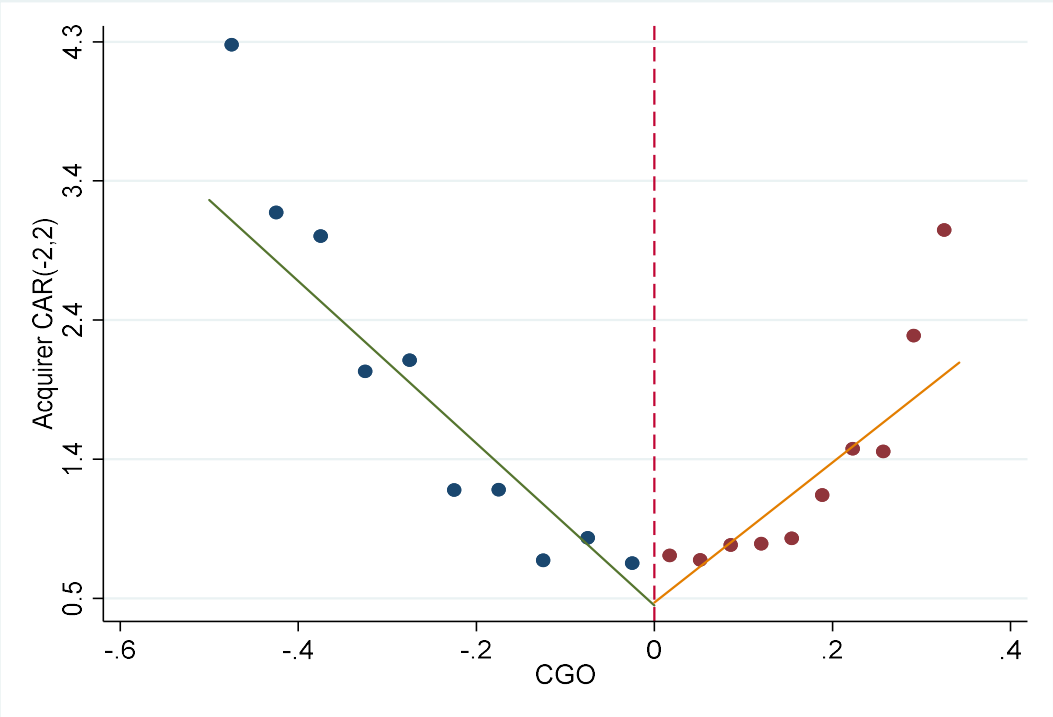

Figure 5. Bidder cumulative abnormal returns around merger announcement

This figure displays bidder cumulative abnormal return, adjusted by the market-adjusted returns from the CRSP value-weighted index around the M&A announcement. We report cumulative abnormal returns from 5 trading days prior to the merger announcement to 44 trading days after the announcement. We place bidders into three groups: low, moderate, and high capital gains overhang. The low group includes bidders in quintile 1, and the high group includes bidders in quintile 5. The rest of the bidders are placed in the middle group. The sample includes deals announced between 1981 and 2017.

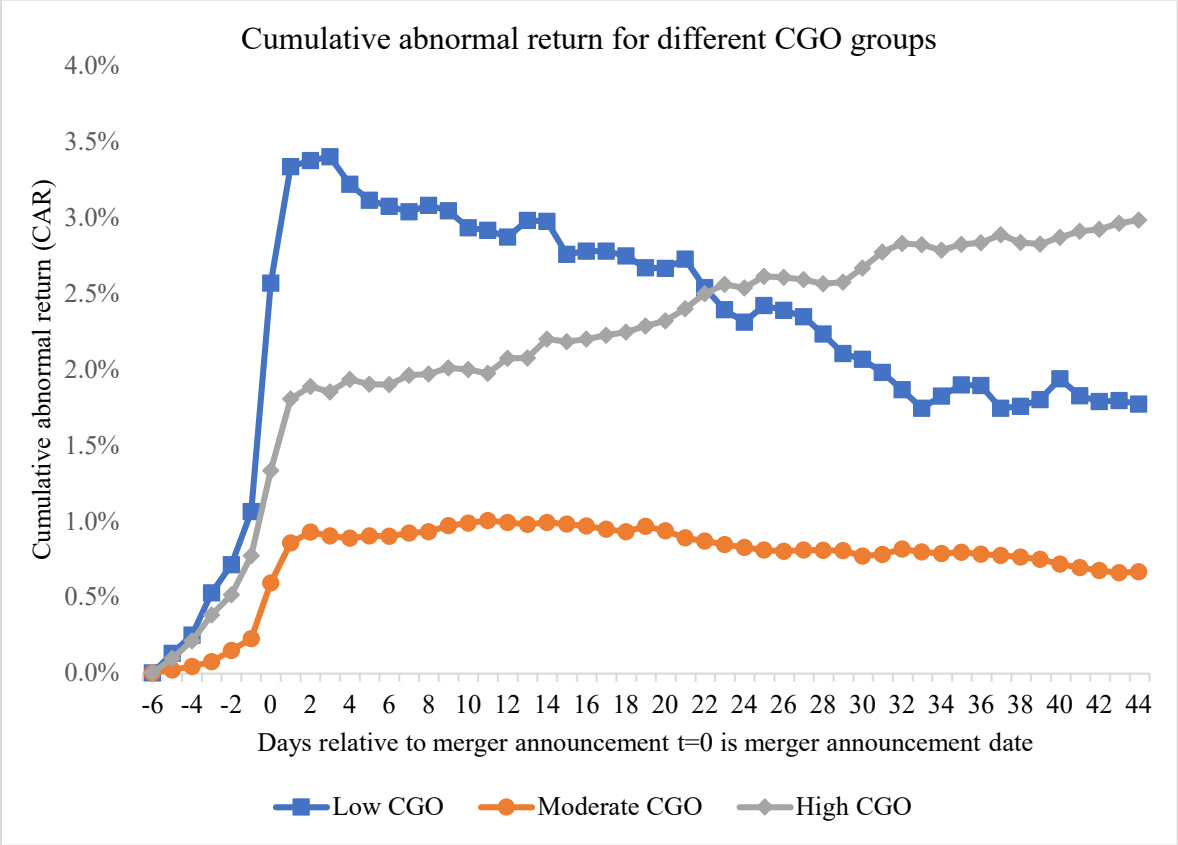

Table 1. Sample selection and characteristics

The sample consists of 37,222 deals announced between 1981 and 2017. Panel A describes the formation of our sample from the Thomson One Banker SDC. Panel B presents the temporal distribution for the full sample.

Panel A. Sample selection

Sample filters	# of deals
Date announced: January 1, 1981 to December 31, 2017, and US acquirer	284,467
Acquirer public status: P	137,866
Form of deal: AA, AM, M	100,362
Deal value ($ mil): 1	48,159
Percentage of shares held at announcement: less than 50%	48,098
Return data on CRSP and accounting data on Compustat	37,222

Panel B: Sample distribution over time

Year	Number of deals	Percent
1981	248	0.67%
1982	283	0.76%
1983	494	1.33%
1984	606	1.63%
1985	407	1.09%
1986	505	1.36%
1987	477	1.28%
1988	532	1.43%
1989	612	1.64%
1990	479	1.29%
1991	550	1.48%
1992	759	2.04%
1993	1,064	2.86%
1994	1,317	3.54%
1995	1,455	3.91%
1996	1,862	5.00%
1997	2,558	6.87%
1998	2,591	6.96%
1999	1,904	5.12%
2000	1,622	4.36%
2001	1,197	3.22%
2002	1,132	3.04%
2003	1,123	3.02%
2004	1,231	3.31%
2005	1,321	3.55%
2006	1,321	3.55%
2007	1,208	3.25%
2008	829	2.23%
2009	568	1.53%
2010	774	2.08%
2011	771	2.07%
2012	891	2.39%
2013	860	2.31%
2014	1,055	2.83%
2015	975	2.62%
2016	799	2.15%
2017	842	2.26%
Total	37,222	100%

Table 2. Summary statistics

The sample consists of 37,222 deals announced between 1981 and 2017. This table presents summary statistics for the full sample. Statistics for variables *Δ EPS (Announcement)* and *Δ EPS (Completion)* are reported in percent. Definitions of all variables are provided in the Appendix.

	N	Mean	St.Dev	Median	p5	p95
CGO	37,222	0.002	0.205	0.04	-0.375	0.240
Δ EPS (Announcement)	30,678	-0.003	1.367	0	-1.967	1.754
Δ EPS (Completion)	27,318	0.019	1.981	0.026	-3.117	2.633
Δ DISP (Announcement)	27,669	0.006	0.161	0	-0.121	0.136
Δ DISP (Completion)	24,636	0.014	0.209	0	-0.140	0.187
Δ ROA	25,641	-0.007	0.035	-0.002	-0.060	0.030
Δ OCF	25,641	-0.003	0.054	-0.000	-0.087	0.072
Δ ROA volatility	25,641	0.012	0.048	0.002	-0.026	0.092
Δ OCF volatility	25,641	0.005	0.033	0.001	-0.036	0.055
CAR(-2,2)	36,565	1.42%	11.71%	0.37%	-10.39%	15.49%
CAR(3,23)	36,564	-0.29%	11.66%	-0.50%	-19.19%	19.23%
CAR(3,44)	36,564	-0.53%	16.57%	-0.82%	-27.61%	26.88%
B/M	36,639	0.585	0.436	0.491	0.085	1.422
Bidder size	37,222	5512	16463	673	21	26375
Log(bidder size)	37,221	6.538	2.167	6.512	3.033	10.180
Stock payment	37,222	0.170	0.375	0	0	1
Cash payment	37,222	0.254	0.435	0	0	1
Private target	37,222	0.792	0.406	1	0	1
Relative size	36,655	0.379	3.026	0.089	0.004	1.310
Leverage	37,221	0.204	0.200	0.155	0	0.597
Same industry	37,222	0.444	0.497	0	0	1
Tender offer	37,222	0.034	0.181	0	0	0
Toehold	37,222	0.018	0.134	0	0	0
Hostile	37,222	0.015	0.123	0	0	0
Prior return	37,222	13.01%	54.73%	2.83%	-48.69%	108.33%
ROA	37,221	0.016	0.134	0.033	-0.202	0.148

Table 3. Deal quality and capital gains overhang

This table reports regression results of deal synergy measured by changes in analysts' earnings forecasts and post operating performance. Panel A presents the change in consensus earnings forecasts around M&As on capital gain overhang (CGO). The dependent variable is the mean difference of consensus analyst forecast on bidders' EPS post-versus-pre-merger announcements in Columns (1) to (2), and the mean difference of analyst forecast on bidders' EPS post-completion versus pre-announcement in Columns (3) to (4). Specifically, *ΔEPS (Announcement)* is the consensus forecast in the month after deal announcement minus the month before announcement. *ΔEPS (Completion)* is the consensus forecast in the month after deal completion minus the month before announcement. Only deals with at least 1 analyst following the bidder firm are included in the analyses in Panel A. Panel B presents regression results of the change in post-merger operating performance on CGO. The dependent variable is the change of bidders' quarterly return on assets (ROA) around the merger event in Columns (1) to (2), and the change of bidders' quarterly operating cash flow (OCF), deflated by total assets, around the merger event in Columns (3) to (4). Withdrawn deals are excluded in the analyses in Columns (3) to (4) of Panel A and all columns of Panel B. Definitions of all variables are provided in Appendix A. The t-statistics are calculated based on heteroskedasticity-consistent standard errors and reported in parentheses. ***, **, * correspond to statistical significance at the 1%, 5% and 10% levels, respectively.

Panel A. Changes in the consensus analyst forecast and CGO

	(1)	(2)	(3)	(4)
Dep. Var.	Δ EPS (Announcement)		Δ EPS (Completion)	
CGO	0.010***		0.012***	
	(12.01)		(9.60)	
$\|CGO\|^-$		-0.012***		-0.013***
		(-9.56)		(-7.27)
$\|CGO\|^+$		0.005***		0.008***
		(4.26)		(4.36)
Log(B/M)	-0.000	-0.000	0.000	0.000
	(-1.34)	(-1.23)	(0.12)	(0.18)
Stock payment	-0.000	-0.000	-0.001	-0.001
	(-0.47)	(-0.32)	(-1.60)	(-1.54)
Cash payment	0.000	0.000	0.000	0.000
	(0.29)	(0.27)	(1.34)	(1.33)
Private target	0.000*	0.000*	-0.000	-0.000
	(1.68)	(1.67)	(-0.13)	(-0.14)
Relative size	0.000	0.000	0.000	0.000
	(1.09)	(1.11)	(0.83)	(0.84)
Log(bidder size)	0.000	0.000	0.000*	0.000
	(0.52)	(0.06)	(1.70)	(1.46)
Leverage	-0.001	-0.001	-0.002*	-0.002*
	(-1.34)	(-1.32)	(-1.81)	(-1.82)
Same industry	0.000	0.000	0.000	0.000
	(0.25)	(0.25)	(0.63)	(0.63)
Tender offer	-0.000	-0.000	-0.003***	-0.003***
	(-0.57)	(-0.59)	(-3.50)	(-3.51)
Toehold	0.001	0.001	0.001	0.001
	(1.40)	(1.43)	(0.52)	(0.54)
Hostile	0.001	0.001	-0.001	-0.001
	(0.95)	(0.93)	(-0.42)	(-0.42)
Prior return	0.000**	0.000***	0.000***	0.000***
	(2.21)	(3.22)	(4.16)	(4.67)
ROA	-0.007***	-0.007***	-0.013***	-0.013***
	(-5.26)	(-5.44)	(-6.73)	(-6.83)
Constant	-0.000	0.001	0.002	0.003
	(-0.08)	(0.26)	(0.60)	(0.79)
Year FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Observations	30,221	30,221	26,932	26,932
R-squared	0.030	0.031	0.034	0.034

Panel B. Post-completion operating performance and CGO

	(1)	(2)	(3)	(4)
Dep. Var.	Δ ROA		Δ OCF	
CGO	0.025***		0.029***	
	(13.33)		(11.37)	
$\|CGO\|^-$		-0.026***		-0.033***
		(-10.66)		(-9.64)
$\|CGO\|^+$		0.021***		0.017***
		(6.03)		(3.73)
Log(B/M)	0.000	0.000	-0.002***	-0.002***
	(0.95)	(0.97)	(-4.34)	(-4.28)
Stock payment	-0.005***	-0.005***	-0.007***	-0.007***
	(-6.77)	(-6.73)	(-6.89)	(-6.79)
Cash payment	0.003***	0.003***	0.003***	0.003***
	(6.57)	(6.56)	(6.20)	(6.19)
Private target	0.001	0.001	0.001	0.001
	(1.57)	(1.56)	(0.98)	(0.95)
Relative size	0.000	0.000	-0.000	-0.000
	(0.08)	(0.09)	(-0.56)	(-0.56)
Log(bidder size)	0.002***	0.002***	0.003***	0.002***
	(21.01)	(20.92)	(15.57)	(15.28)
Leverage	0.004***	0.004***	0.006***	0.006***
	(3.38)	(3.37)	(4.06)	(4.04)
Same industry	0.001	0.001	0.002***	0.002***
	(1.37)	(1.37)	(3.30)	(3.31)
Tender offer	0.001	0.001	0.001	0.001
	(0.84)	(0.83)	(0.84)	(0.83)
Toehold	-0.001	-0.001	-0.001	-0.001
	(-1.05)	(-1.04)	(-0.54)	(-0.52)
Hostile	-0.002	-0.002	-0.003	-0.003
	(-0.76)	(-0.76)	(-0.85)	(-0.85)
Prior return	-0.000***	-0.000***	-0.000***	-0.000***
	(-7.34)	(-6.88)	(-4.98)	(-4.30)
ROA	-0.164***	-0.164***	0.065***	0.064***
	(-46.48)	(-46.38)	(11.83)	(11.67)
OCF			-0.656***	-0.656***
			(-71.39)	(-71.36)
Constant	-0.016***	-0.016***	-0.035***	-0.033***
	(-3.78)	(-3.68)	(-4.28)	(-4.09)
Year FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Observations	24,874	24,874	24,874	24,874
R-squared	0.341	0.341	0.480	0.481

Table 4. Deal risk and capital gains overhang

This table reports regression results of deal risk measured by change in consensus earnings forecast dispersion and post operating performance volatility. Panel A presents the regression results of the change in consensus earnings forecast dispersion around M&As on capital gain overhang (CGO). *ΔDISP(Announcement)* is the consensus forecast in the month after deal announcement minus the month before announcement and *ΔDISP(Completion)* is the consensus forecast in the month after deal completion minus the month before announcement. Only deals with at least 2 analysts following the bidder firm are included in the analyses in Panel A to be able to calculate forecast dispersion. Panel B presents regression results of post-merger operating performance volatility on CGO. The dependent variable is the change of post-merger performance volatility, measured as the change of the standard deviation of bidders' quarterly ROA around the merger event in Columns (1) to (2), and the change of the standard deviation of bidders' quarterly OCF, deflated by total assets, around the merger event in Columns (3) to (4). For independent variables, other than those in our main model, we include pre-merger ROA/OCF volatility as additional control variables. Withdrawn deals are excluded in the analyses in Columns (3) to (4) of Panel A and all columns of Panel B. Definitions of all variables are provided in Appendix A. The t-statistics are calculated based on heteroskedasticity-consistent standard errors and reported in parentheses. ***, **, * correspond to statistical significance at the 1%, 5% and 10% levels, respectively.

Panel A. Changes in analyst forecast dispersion and CGO

	(1)	(2)	(3)	(4)
Dep. Var.	Δ DISP (Announcement)		Δ DISP (Completion)	
CGO	-0.040***		-0.060***	
	(-3.96)		(-4.37)	
$\|CGO\|^-$		0.064***		0.085***
		(4.35)		(4.39)
$\|CGO\|^+$		0.015		-0.002
		(0.93)		(-0.11)
Log(B/M)	-0.001	-0.002	0.000	0.000
	(-0.82)	(-0.89)	(0.08)	(0.03)
Stock payment	0.003	0.003	0.009**	0.008**
	(1.13)	(1.02)	(2.04)	(1.97)
Cash payment	-0.002	-0.002	-0.003	-0.003
	(-0.88)	(-0.87)	(-1.08)	(-1.06)
Private target	-0.000	-0.000	-0.004	-0.004
	(-0.14)	(-0.17)	(-1.01)	(-1.03)
Relative size	0.004**	0.004**	0.014**	0.014**
	(2.42)	(2.41)	(2.54)	(2.55)
Log(bidder size)	-0.003***	-0.003***	-0.005***	-0.004***
	(-5.15)	(-4.71)	(-5.27)	(-4.95)
Leverage	0.016**	0.016**	0.023**	0.023**
	(2.11)	(2.09)	(2.20)	(2.19)
Same industry	-0.001	-0.001	-0.001	-0.001
	(-0.42)	(-0.41)	(-0.27)	(-0.26)
Tender offer	0.000	0.001	0.009	0.009
	(0.09)	(0.11)	(1.28)	(1.29)
Toehold	-0.000	-0.001	0.014	0.014
	(-0.06)	(-0.11)	(1.19)	(1.16)
Hostile	-0.002	-0.002	0.010	0.010
	(-0.31)	(-0.28)	(0.49)	(0.51)
Prior return	-0.000	-0.000	-0.000	-0.000
	(-0.46)	(-1.16)	(-0.91)	(-1.41)
ROA	0.037***	0.040***	0.046***	0.048***
	(2.74)	(2.92)	(2.68)	(2.81)
Constant	-0.003	-0.011	0.042	0.034
	(-0.07)	(-0.26)	(0.79)	(0.63)
Year FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Observations	27,026	27,026	24,088	24,088
R-squared	0.009	0.009	0.014	0.014

Panel B. Post-completion operating performance volatility and CGO

	(1)	(2)	(3)	(4)
Dep. Var.	Δ ROA Volatility		Δ OCF Volatility	
CGO	-0.032***		-0.015***	
	(-11.95)		(-8.38)	
$\|CGO\|^-$		0.036***		0.021***
		(9.85)		(8.46)
$\|CGO\|^+$		-0.021***		0.000
		(-4.47)		(0.02)
Log(B/M)	-0.003***	-0.003***	-0.003***	-0.003***
	(-6.53)	(-6.59)	(-8.35)	(-8.48)
Stock payment	0.007***	0.007***	0.003***	0.003***
	(6.94)	(6.86)	(3.92)	(3.74)
Cash payment	-0.003***	-0.003***	-0.000	-0.000
	(-5.06)	(-5.06)	(-0.02)	(-0.00)
Private target	-0.000	-0.000	0.001***	0.001***
	(-0.59)	(-0.57)	(3.01)	(3.06)
Relative size	0.000	0.000	-0.000*	-0.000*
	(0.70)	(0.70)	(-1.84)	(-1.87)
Log(bidder size)	-0.003***	-0.003***	-0.002***	-0.002***
	(-21.39)	(-21.15)	(-22.08)	(-21.44)
Leverage	-0.016***	-0.016***	-0.016***	-0.016***
	(-9.18)	(-9.16)	(-13.87)	(-13.84)
Same industry	-0.002***	-0.002***	0.000	0.000
	(-3.51)	(-3.51)	(0.37)	(0.36)
Tender offer	-0.000	-0.000	-0.000	-0.000
	(-0.02)	(-0.01)	(-0.33)	(-0.32)
Toehold	0.001	0.001	0.002*	0.002*
	(0.69)	(0.68)	(1.95)	(1.91)
Hostile	0.002	0.002	-0.000	-0.000
	(0.44)	(0.44)	(-0.04)	(-0.04)
Prior return	0.000***	0.000***	-0.000	-0.000
	(6.47)	(5.85)	(-0.72)	(-1.64)
ROA	-0.073***	-0.072***	-0.033***	-0.032***
	(-15.10)	(-14.95)	(-10.59)	(-10.30)
ROA Volatility	-0.850***	-0.850***		
	(-45.92)	(-45.94)		
OCF Volatility			-0.677***	-0.677***
			(-56.71)	(-56.75)
Constant	0.018***	0.017***	0.021***	0.019***
	(2.81)	(2.60)	(5.07)	(4.54)
Year FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Observations	24,874	24,874	24,874	24,874
R-squared	0.269	0.270	0.368	0.369

Table 5. Regression analysis of bidder announcement returns

This table reports OLS regression results of bidder announcement returns. The dependent variable is bidder *CAR (-2, 2).* The independent variable in Column (1) is capital gains overhang (*CGO*). In Columns (2) to (4), the plus and minus superscripts on the absolute valued *CGO* indicate positive or negative *CGO,* respectively. Definitions of all variables are provided in Appendix A. The t-statistics are calculated based on heteroskedasticity-consistent standard errors and reported in parentheses. ***, **, * correspond to statistical significance at the 1%, 5% and 10% levels, respectively. Returns are in percent.

	(1)	(2)	(3)
Dep. Var.		CAR(-2, 2)	
$\|CGO\|^-$	8.684***	5.578***	6.015***
	(8.48)	(5.84)	(6.01)
$\|CGO\|^+$	6.183***	4.340***	3.801***
	(7.27)	(4.74)	(3.97)
Log(B/M)		0.446***	0.404***
		(4.07)	(3.50)
Stock payment		0.621***	0.615***
		(2.86)	(2.60)
Cash payment		0.509***	0.429***
		(4.60)	(3.69)
Private target		2.400***	2.386***
		(14.50)	(14.14)
Relative size		0.310	0.306
		(1.53)	(1.52)
Log(bidder size)		-0.454***	-0.474***
		(-12.77)	(-12.38)
Leverage		0.398	0.295
		(1.29)	(0.80)
Same industry		-0.011	-0.173
		(-0.10)	(-1.26)
Tender offer		1.672***	1.711***
		(6.31)	(6.49)
Toehold		-0.133	-0.138
		(-0.40)	(-0.42)
Hostile		-0.844**	-0.743**
		(-2.26)	(-1.99)
Prior return		-0.000	0.001
		(-0.03)	(0.49)
ROA		-2.609***	-2.561***
		(-2.69)	(-2.62)
Constant	0.393***	4.765***	2.455*
	(3.84)	(4.58)	(1.67)
Year/Industry FE	No	No	Yes
Observations	36,565	35,416	35,416
R-squared	0.012	0.037	0.043

Table 6. Capital gains overhang versus the 52-week high price as a reference point

This table provides results of horse racing tests between our main independent variable, capital gains overhang (CGO), and the main independent variable in Ma et al. (2019), reference price ratio (RPR). As in Ma et al, (2019), reference price ratio is calculated as the stock price as of t-6, the sixth day prior to the announcement, divided by the highest closing price over the past 252 days relative to t-6. Column (1) reports the replicated baseline results of Ma et al. (2019) using the data from their sample period 1981-2014. Column (2) provides a direct comparison of the effect from our independent variable CGO with effect from their independent variable RPR using the data from 1981 to 2014. Column (3) uses data from 1981 to 2014. Column (4) uses data from 1981 to 2017. All control variables (i.e., *Log(B/M), Stock payment, Cash payment, Private target, Relative size, Log(bidder size), Leverage, Same industry, Tender offer, Toehold, Hostile, Prior return, ROA*) are included but not reported for brevity. Definitions of all variables are provided in Appendix A. The t-statistics are calculated based on heteroskedasticity-consistent standard errors and reported in parentheses. ***, **, * correspond to statistical significance at the 1%, 5% and 10% levels, respectively. Returns are in percent.

	(1)	(2)	(3)	(4)
VARIABLES		CAR (-2,+2)		
RPR	-2.580***	-0.380	-0.523	-0.581
	(-5.48)	(-0.74)	(-1.03)	(-1.11)
CGO		-3.521***		
		(-4.18)		
$\|CGO\|^-$			5.932***	5.657***
			(5.25)	(5.00)
$\|CGO\|^+$			3.846***	4.197***
			(3.86)	(4.19)
Control vars.	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Observations	32,960	32,960	32,960	35,416
R-squared	0.038	0.040	0.042	0.043

Table 7. Bidder post-announcement returns sorted by CAR (-2, 2) and CGO

This table reports average bidder post-announcement returns. In Panel A, our sample is sorted into quintile portfolios based on CAR(-2, 2). We report the average CAR(3, 23) and CAR(3, 44) for portfolios sorted by CAR(-2, 2),the difference in CAR(3, 23) and CAR(3, 44) between the high and low portfolios, and the t-statistics of the differences. In Panel B, the sample is first separated into negative CGO group and positive CGO group, and we repeat the analysis in Panel A for each CGO group and report corresponding statistics. *Diff-in-Diff* is the difference between the high-minus-low returns (P5-P1) among positive-CGO bidders and negative-CGO bidders. Definitions of all variables are provided in Appendix A. The t-statistics are reported in parentheses. ***, **, * correspond to statistical significance at the 1%, 5% and 10% levels, respectively. Returns are in percent.

Panel A Single-sorted portfolios by CAR(-2, 2)

Portfolio on CAR(-2, 2)	CAR(3, 23)	CAR(3,44)
P1	-0.52	-1.09
P2	0.06	-0.07
P3	-0.06	-0.21
P4	-0.30	-0.36
P5	-0.64	-0.91
P5-P1	-0.13	0.19
t-stat	(-0.55)	(0.57)

Panel B Double-sorted portfolios by CAR(-2, 2) and CGO

Portfolio on CAR(-2, 2)	CGO<0	CGO>0	Diff-in-Diff
	Average CAR(3, 23)		
P1	-0.72	-0.21	
P2	-0.37	0.13	
P3	-0.38	0.14	
P4	-0.89	0.09	
P5	-2.01	0.17	
P5-P1	-1.29***	0.38	1.66***
t-stat	(-3.03)	(1.43)	(4.71)
	Average CAR(3, 44)		
P1	-1.30	-0.65	
P2	-0.74	-0.01	
P3	-0.72	0.10	
P4	-1.36	0.18	
P5	-3.16	0.59	
P5-P1	-1.86***	1.24***	3.10***
t-stat	(-3.12)	(3.27)	(6.20)

Table 8. Regression analysis of bidder post-announcement returns

This table tests how bidder 5-day announcement returns (*CAR (-2, +2)*) are related to the post-announcement returns over the one- and two-month periods after the acquisition announcement. We include full sample in Columns (1) and (2), sample of negative CGO in Columns (3) and (4), and sample of positive CGO in Columns (5) and (6). The key independent variable is *CAR (-2, +2)* . Definitions of all variables are provided in Appendix A. The t-statistics are calculated based on heteroskedasticity-consistent standard errors and reported in parentheses. ***, **, * correspond to statistical significance at the 1%, 5% and 10% levels, respectively. Returns are in percent.

	(1)	(2)	(3)	(4)	(5)	(6)
	Full sample		CGO<0		CGO>0	
Dep. Var.	CAR(3, 23)	CAR(3, 44)	CAR(3, 23)	CAR(3, 44)	CAR(3, 23)	CAR(3, 44)
CAR(-2, 2)	-0.008	-0.009	-0.036***	-0.063***	0.035**	0.075***
	(-0.88)	(-0.61)	(-2.63)	(-3.55)	(2.32)	(2.90)
CGO	1.856***	2.701***	-0.412	-0.255	5.272***	6.993***
	(3.14)	(3.31)	(-0.43)	(-0.19)	(4.07)	(3.82)
Log(B/M)	0.123	0.327**	0.104	0.321	0.091	0.296
	(1.13)	(2.11)	(0.58)	(1.27)	(0.67)	(1.54)
Stock payment	-0.273	-0.902***	-0.918**	-2.310***	0.095	-0.078
	(-1.22)	(-2.88)	(-2.21)	(-4.06)	(0.37)	(-0.21)
Cash payment	0.252*	0.409**	0.199	0.715*	0.311*	0.240
	(1.73)	(1.99)	(0.74)	(1.90)	(1.87)	(1.00)
Private target	0.519***	0.553**	0.659**	0.808*	0.307	0.232
	(3.05)	(2.28)	(2.03)	(1.77)	(1.59)	(0.84)
Relative size	0.049	0.045	0.080***	0.114**	-0.040	-0.157**
	(1.29)	(0.64)	(2.97)	(2.49)	(-0.68)	(-2.01)
Log(bidder size)	-0.010	0.012	0.123*	0.153*	-0.072*	-0.056
	(-0.27)	(0.23)	(1.88)	(1.67)	(-1.68)	(-0.92)
Leverage	1.054**	1.626***	0.041	0.504	1.648***	2.446***
	(2.55)	(2.78)	(0.05)	(0.48)	(3.39)	(3.56)
Same industry	-0.007	0.434**	-0.191	0.168	0.094	0.546**
	(-0.05)	(2.19)	(-0.75)	(0.47)	(0.58)	(2.36)
Tender offer	0.575*	0.483	0.851	1.189	0.290	-0.040
	(1.73)	(1.05)	(1.35)	(1.36)	(0.78)	(-0.08)
Toehold	-0.227	-0.165	-0.363	-0.269	-0.151	-0.089
	(-0.50)	(-0.26)	(-0.44)	(-0.24)	(-0.29)	(-0.12)
Hostile	-1.176**	-1.333**	-0.999	-0.683	-1.317**	-1.752**
	(-2.48)	(-2.06)	(-1.15)	(-0.61)	(-2.46)	(-2.29)
Prior return	0.001	0.004	0.008*	0.010	-0.004	-0.002
	(0.66)	(1.43)	(1.80)	(1.63)	(-1.59)	(-0.48)
ROA	4.430***	7.280***	5.626***	8.098***	2.788**	5.652***
	(5.54)	(6.35)	(4.96)	(5.01)	(2.46)	(3.43)
Constant	1.454	3.272	4.131	1.863	-0.609	3.614
	(0.74)	(1.29)	(1.22)	(0.53)	(-0.26)	(1.07)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	35,415	35,415	13,430	13,430	21,983	21,983
R-squared	0.012	0.017	0.021	0.028	0.012	0.018

Table 9. Net retail selling and capital gains overhang

This table presents results of net retail selling of bidder stocks over the event window (-2, +2). Retail net selling is calculated as the difference between the number of shares of retail-selling and the number of shares of retail-buying, deflated by the retail trading volume, over the event window (-2, +2). The sample for individual trading is from the U.S. discount broker sample introduced by Barber and Odean (2000). The sample period is from January 1991 to December 1996. Definitions of all variables are provided in the Appendix A. The t-statistics are calculated based on heteroskedasticity-consistent standard errors and reported in parentheses. ***, **, * correspond to statistical significance at the 1%, 5% and 10% levels, respectively. Returns are in percent.

	(1)	(2)	(3)	(4)
Dep. Var.		Retail net selling		
CGO	0.137***	0.131***	0.136***	
	(3.79)	(2.88)	(2.89)	
$\|CGO\|^-$				-0.087
				(-1.46)
$\|CGO\|^+$				0.247**
				(2.38)
Log(B/M)		0.028***	0.033***	0.033***
		(3.08)	(3.34)	(3.33)
Stock payment		0.005	-0.002	-0.003
		(0.25)	(-0.12)	(-0.16)
Cash payment		0.028	0.022	0.022
		(1.44)	(1.13)	(1.12)
Private target		0.056***	0.055***	0.055***
		(2.68)	(2.61)	(2.61)
Relative size		-0.000	-0.000	-0.000
		(-0.88)	(-0.74)	(-0.69)
Log(bidder size)		0.004	0.003	0.004
		(1.11)	(0.68)	(0.80)
Leverage		0.018	0.032	0.031
		(0.48)	(0.73)	(0.71)
Same industry		-0.017	-0.030**	-0.030*
		(-1.19)	(-1.97)	(-1.94)
Tender offer		0.189***	0.174***	0.173***
		(3.56)	(3.35)	(3.32)
Toehold		-0.017	0.003	0.003
		(-0.27)	(0.05)	(0.05)
Hostile		0.025	0.029	0.030
		(0.43)	(0.50)	(0.52)
Prior return		-0.000	-0.000	-0.000
		(-0.07)	(-0.11)	(-0.40)
ROA		-0.083	-0.074	-0.068
		(-1.39)	(-1.21)	(-1.10)
Constant	-0.031***	0.113	-0.026	-0.046
	(-4.49)	(1.45)	(-0.20)	(-0.35)
Year/Industry FE	No	No	Yes	Yes
Observations	7,007	6,822	6,822	6,822
R-squared	0.002	0.008	0.021	0.022

Table 10. Long-term post-merger returns: The calendar time portfolio approach

This table reports results on bidders' post announcement long-term returns using the calendar-time portfolio approach. For this analysis, we only include completed deals. The dependent variable is the average return of a portfolio of bidders that made merger announcements during the previous 12 months minus the risk-free rate. For this analysis, we form portfolios from January 1982 to December 2017. We report results on the full sample and subsamples based on bidder capital gains overhang type. Panel A presents the Fama and French (1993) three-factor monthly alphas of Calendar-time portfolio returns (CTPR). Panel B presents the Fama and French (2015) five-factor monthly alphas of CTPR. Panel C presents alphas of 3-factor risk-and-behavioral model from Daniel et al. (2020). Definitions of all variables are provided in Appendix A. The t-statistics are calculated based on heteroskedasticity-consistent standard errors and reported in parentheses. ***, **, * correspond to statistical significance at the 1%, 5% and 10% levels, respectively.

Panel A: Three-factor model of Fama and French (1993)

	(1)	(2)	(3)	(4)
Sample	Low CGO	Moderate CGO	High CGO	H-L
Alpha	-0.632***	-0.096	0.139	0.770***
	(-3.69)	(-1.54)	(1.58)	(4.29)
MKT	1.241***	1.042***	1.101***	-0.140***
	(28.63)	(52.36)	(46.53)	(-3.11)
SMB	0.874***	0.482***	0.707***	-0.167
	(8.56)	(10.82)	(18.53)	(-1.64)
HML	-0.097	0.102***	-0.208***	-0.111
	(-1.06)	(2.62)	(-4.83)	(-1.25)
Observations	444	444	444	444
R-squared	0.785	0.939	0.911	0.051

Panel B: Five-factor model of Fama and French (2015)

	(1)	(2)	(3)	(4)
Sample	Low CGO	Moderate CGO	High CGO	H-L
Alpha	-0.304	-0.069	0.225**	0.529**
	(-1.35)	(-0.93)	(2.51)	(2.39)
MKT	1.130***	1.029***	1.071***	-0.059
	(20.47)	(47.62)	(44.58)	(-1.05)
SMB	0.730***	0.493***	0.672***	-0.058
	(7.86)	(13.60)	(17.67)	(-0.63)
HML	0.150	0.159***	-0.139***	-0.289***
	(1.38)	(3.49)	(-3.03)	(-2.64)
RMW	-0.538***	0.017	-0.135**	0.404**
	(-3.68)	(0.34)	(-2.38)	(2.56)
CMA	-0.393	-0.140*	-0.117	0.276
	(-1.64)	(-1.94)	(-1.55)	(1.25)
Observations	444	444	444	444
R-squared	0.810	0.940	0.913	0.106

Panel C: Market factor with Daniel et al. (2020) long- and short-horizon mispricing factors

	(1)	(2)	(3)	(4)
Sample	Low CGO	Moderate CGO	High CGO	H-L
Alpha	0.268	0.184	0.438***	0.169
	(0.97)	(1.63)	(3.10)	(0.71)
MKT	1.066***	1.015***	1.038***	-0.028
	(17.15)	(34.87)	(27.19)	(-0.53)
FIN	-0.602***	-0.142***	-0.410***	0.191**
	(-6.56)	(-4.33)	(-7.69)	(2.10)
PEAD	-0.578***	-0.176**	0.038	0.616***
	(-3.89)	(-2.26)	(0.41)	(4.52)
Observations	444	444	444	444
R-squared	0.757	0.878	0.841	0.146

Table 11. Predicting bidders' post-merger performance: Change in analysts' forecasts versus merger announcements CARs

This table reports regression results of bidders' post-merger operating performance and buy-and-hold returns. Post-merger operating performance is measured by the one-year or average three-year operating cash flow (deflated by the total assets). Columns (1), (3), (5) and (7) present results on whether the change in consensus analyst earnings forecasts around M&As (*ΔEPS*) can predict post-merger performance. Columns (2), (4), (6) and (8) present results on whether the five-day CAR surrounding M&A announcements (*CAR (-2, 2)*) can predict long-term performance. We only include completed deals in the post-merger performance analysis. All control variables (i.e., *Log(B/M), Stock payment, Cash payment, Private target, Relative size, Log(bidder size), Leverage, Same industry, Tender offer, Toehold, Hostile, Prior return, ROA*) are included but not reported for brevity. Definitions of all variables are provided in Appendix A. The *t*-statistics are calculated based on heteroskedasticity-consistent standard errors and reported in parentheses. ***, **, * correspond to statistical significance at the 1%, 5% and 10% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dep. Var.	Δ OCF_1Y		Δ OCF_3Y		BHAR_1Y		BHAR_3Y	
ΔEPS	0.181***		0.149***		0.651***		1.213***	
	(4.90)		(4.02)		(2.66)		(3.22)	
CAR(-2, 2)		0.005		-0.006		0.032		-0.085**
		(0.86)		(-1.07)		(1.13)		(-2.19)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	24,625	28,390	21,159	24,413	28,671	33,435	28,673	33,439
R-squared	0.087	0.095	0.121	0.129	0.040	0.043	0.071	0.082

Appendix Table A1. Variable definitions

All independent variables are measured as of the fiscal year-end before the merger announcement, unless otherwise specified. All continuous variables are winsorized at the 1st and 99th percentiles.

Variable	Definition
Dependent Variable	
BHAR	Buy-and-hold abnormal return, adjusted by the market value-weighted return.
CAR(a,b)	Cumulative abnormal return, adjusted by the market value-weighted return, measured over the event window (a, b).
Δ DISP	Change of analyst forecast dispersion.
Δ EPS	Change of consensus analyst forecast on bidders' EPS, scaled by the most recent month-end stock price prior to the merger announcement.
Δ ROA	The difference of the average bidders' quarterly return on assets (ROA) in the three-year post-completion period and the corresponding measure in the year prior to the merger announcement.
Δ OCF	The difference of the average bidders' quarterly operating cash flow (OCF), deflated by total assets, in the three-year post-completion period and the corresponding measure in the year prior to the merger announcement.
Δ ROA volatility	The difference of the standard deviation of bidders' quarterly ROA in the three-year post-completion period and the corresponding measure in the year prior to the merger announcement.
Δ OCF volatility	The difference of the standard deviation of bidders' quarterly OCF in the three-year post-completion period and the corresponding measure in the year prior to the merger announcement.
Independent Variable	
B/M	Book value of equity divided by the market value of equity
Bidder size	The acquirer's book value of assets
CGO	Capital gains overhang, calculated as the stock price as of t-6 minus the reference price as of t-6, the sixth day prior to the announcement, divided by the stock price as of t-6. The reference price is calculated over the past 252 days relative to t-6 based on model (9) in Grinblatt and Han (2005)
$\|CGO\|^-$	The absolute value of negative CGO.
$\|CGO\|^+$	The absolute value of positive CGO.
Cash payment	An indicator variable equal to one if the total consideration is paid in cash
Hostile	An indicator variable equal to one if the SDC classifies the deal as hostile or unsolicited.
Leverage	Book value of debt divided by the book value of assets
Ln(Bidder size)	Natural log of bidder size
Ln(B/M)	Natural log of the book to market ratio
OCF	Operating cash flow, deflated by total assets.
Prior return	Cumulative abnormal return, adjusted by the market value-weighted return, from 257 days prior to the merger announcement (i.e., day t-257) to 6 days prior to the merger announcement (i.e., day t-6)
Private target	An indicator variable equal to one if the SDC classifies the target public status as a subsidiary or a private firm

Relative size	Deal value divided by the acquirer's book value of assets
Retail net selling	The difference between the number of shares of retail-selling and the number of shares of retail-buying, deflated by the retail trading volume, over the event window (-2, +2)
ROA	Return on assets, calculated as net income divided by the book value of assets
RPR	Reference price ratio, calculated as the stock price as of t-6, the sixth day prior to the announcement, divided by the highest closing price over the past 252 days relative to t-6 (Ma, Whidbee, and Zhang 2019)
Same industry	An indicator variable equal to one if the acquirer and the target share the same three-digit Standard Industrial Classification Code (SIC)
Stock payment	An indicator variable equal to one if the total consideration is paid in stock
OCF volatility	The standard deviation of bidders' quarterly OCF in the year prior to the merger announcement.
ROA volatility	The standard deviation of bidders' quarterly ROA in the year prior to the merger announcement.
Tender offer	An indicator variable equal to one if the deal is classified as a tender offer
Toehold	An indicator variable equal to one if the acquirer owns 5% or more of the target before the announcement