Firm Size, Idiosyncratic Risk, and Shareholder Gains in Corporate Acquisitions

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Abstract

Acquisitions announced by small acquirers (other things equal) are associated with greater abnormal returns than those announced by large acquirers. The evidence presented in this paper is consistent with the hypothesis that the differential market response stems from greater overreaction in the presence of short selling constraints. I find a difference in abnormal announcement returns only in acquisitions of private and subsidiary targets. Using idiosyncratic volatility of acquirers' shares as a proxy for the cost of short selling reveals that differential abnormal returns are associated with greater temporary price pressure and costlier short sales. I document that greater short-term market overreaction is followed by larger price reversals. The coefficient on acquirer size is subsumed by the coefficient on idiosyncratic volatility in the event study regressions, further supporting the hypothesis that the effect of acquirer size on abnormal returns reflects temporary mispricing arising from limits to arbitrage.

The evidence is inconsistent with the hypothesis that large acquirers' overpayment for the target and/or greater operating synergies by small acquirers explain the size effect in shareholder gains.

1. Introduction

Existing evidence indicates that small public firms' acquisition announcements create more (size adjusted) shareholder value than those of large public firms. Indeed, acquisitions announced by small acquirers (other things equal) are associated with greater abnormal returns than those announced by large acquirers (e.g. Moeller, Schlingemann, Stulz (2004) and (2005), Faccio, McConnell, Stolin (2006), Masulis, Cong, Xie (2007), Offenberg (2009), Harford, Humphery-Jenner, Powell (2012), and others).

Attempting to explain this empirical regularity, this paper explores whether small acquirers simply make more profitable acquisitions than their large peers. Alternatively, the acquirer size effect can be the result of market overreaction to news about acquisitions effecting stocks of small and large firms differently. Since it is more costly to sale short stocks of small firms, the overreaction to the acquisition news is more noticeable for small acquirers leading to the acquisition size effect.

In efficient markets abnormal stock returns around corporate events reflect the event's impact on shareholder wealth, as long as the event is unanticipated (Brown and Warner (1980)). If market efficiency holds the empirical result that small acquirers' announcements consistently generate greater abnormal stock returns suggests that – other things held constant – their shareholders are better off because the acquisition increases the (size adjusted) fundamental value of the firm to a greater extent. Such explanation would be consistent with the theory of the firm. Coase (1937) proposes that an optimal firm size exists where the marginal cost of production utilizing internal coordination is equal to that of employing the external price mechanism. In this framework acquisitions made by firms below the optimal size the optimal size (likely small firms) could

generate more (size adjusted) shareholder wealth than acquisitions by firms above the optimal size (likely large firms), because the former would have a greater potential for enhancing profitability.

Short selling constraints present an important market friction as they block pessimistic traders from trading on their valuations to earn an expected profit. This leads to a truncated distribution of traders' views on the underlying value of the stock and introduces a positive bias in the equilibrium price (Miller (1977)). The extent of mispricing is even greater if noise traders also participate in the trading pool (De Long, Shleifer, Summers, and Waldmann (1990)).

Stocks with high idiosyncratic volatility are subject to limited short selling; the possibility that the price of the stock will take an adverse swing during the horizon of the arbitrage transaction dissuades rational arbitrageurs from taking positions (Pontiff (2006)). The absence of arbitrage in the presence of uncertainty activates the mechanisms described in Miller (1977) and De Long et al (1990) and induces the price to overreact to news. Such overreaction is followed by a corresponding reversal as the stock price eventually converges to investor expectations based on fundamental information.

I start by introducing a measure of firm size in the spirit of Coase (1937): a categorical variable that classifies an acquirer as "small" if its total assets fall at or below 40th percentile of the industry asset distribution and "large" if its total assets fall at or above the 60th percentile to accommodate industry variation. Additionally, I employ the log of the acquirer's total assets as a second measure of acquirer. The results are similar for both measures.

Next, I investigate how the impact of firm size varies by the organizational form of the target and the form of payment. The empirical evidence indicates that the wedge in abnormal returns between small and large acquirers' announcements comes from acquisitions of private and subsidiary targets. I find no significant difference in abnormal returns among small and large

acquirers in the case of public targets. The figures reveal that when the target is a public firm the difference in abnormal returns among small and large acquirers is not statistically significant.

My results show a significantly greater positive announcement effect for acquisitions of private firms and subsidiaries of public firms: the mean and median three-day abnormal returns are significantly positive and economically meaningful (1.9% and 0.9% respectively). This result is consistent with the extant literature. Chang (1998) documents that acquisitions of private targets are more profitable than acquisitions of public targets due to less competition for the target, more information revealed during private negotiations, and the subsequent presence of blockholders created from the target's shareholders. Officer (2007) shows that the discount for private targets is also related to liquidity provision. Faccio, McConnell and Stolin (2006) confirm international evidence that shareholder wealth is enhanced by acquisitions of private targets.

To examine the empirical validity of the fundamental explanation I test the relationship between the impact of acquirer size and the price paid for the target. Moeller, Schlingemann, and Stulz (2004) document that greater abnormal announcement returns generated by small acquirers' deal announcements are associated with lower deal premiums for the targets. In the extant literature the deal premium is calculated as the total deal value over the target firm's market capitalization prior to the acquisition announcement. This measure has three limitations. First, it is restricted to transactions where the target is a publicly listed firm. Second, a high deal premium may arise either because the bidder pays a greater excess amount over the fair market valuation for controlling the target's assets or because the target's equity is temporarily undervalued by the market, but the target's shareholders negotiate a price that reflects a higher long-term valuation. Third, the deal premium is affected by differences in the target's capital structure: in an acquisition of control over the target firm the acquirer takes over not only the target's assets but also its debt.

A high deal premium may reflect that the target has low financial leverage, therefore the acquisition improves the combined firm's balance sheet, whereas a low deal premium may signify that the acquirer takes over large loans incurred by the target.

I introduce a novel measure for the target premium that can be calculated for private and subsidiary targets: the change in acquirer goodwill as a fraction of total deal value. FASB Statement of Financial Accounting Standard 141(R) on Business Combinations requires acquirers to record the excess payment over the fair value of net assets (i.e. assets minus liabilities), as goodwill[1]. Estimation of fair market values, and recording the excess as goodwill is subject to stringent audit requirements. Hence, if a large fraction of the compensation is recorded as goodwill it implies that the acquirer paid a substantial premium for the target either in expectation of substantial match-specific synergies or owing to managerial hubris. Fuller, Netter, and Stegemoller (2002) document that the same acquirer often makes several acquisitions with substantially different deal characteristics within the same fiscal year. In order to address concerns regarding the ambiguity caused by multiple acquisitions, I restrict this test to the sample to acquirers with a single deal per fiscal year.

The results are inconsistent with the hypothesis that differences in the target premium are responsible for the effect of acquirer size on shareholder gains. I find that large acquirers do tend to pay greater premiums, but this difference has a negligible effect on abnormal returns and does

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[1] Paragraph 34 of SFAS 141(R) states:
"The acquirer shall recognize goodwill as of the acquisition date, measured as the excess of (a) over (b) below:
a. The aggregate of: (1) The consideration transferred measured in accordance with this Statement, which generally requires acquisition-date fair value (paragraph 39) (2) The fair value of any noncontrolling interest in the acquiree (3) In a business combination achieved in stages, the acquisition-date fair value of the acquirer's previously held equity interest in the acquiree.
b. The net of the acquisition-date amounts of the identifiable assets acquired and the liabilities assumed measured in accordance with this Statement."

not affect the coefficient on acquirer size in the event study regressions. Hence, the acquirer size effect on shareholder gains does not arise from overpayment.

I continue by investigating whether the difference in announcement abnormal returns comes from small acquirers' ability to create greater long-term shareholder value. Comparing changes in operating return on assets and sales growth for small and large acquirers in the two post-merger fiscal years relative to the two pre-merger fiscal years reveals that small acquirers experience better operating efficiency and greater sales growth than large acquirers. However, in regressions of shareholder gains the coefficients on these variables are not statistically significant once we control for the relative size of the deal.

Next, I examine whether the impact of acquirer size on acquisition announcement abnormal returns comes from short-selling constraints. Is it the case that market participants overreact to all acquisitions and for large acquirers sophisticated short sellers limit the price increase?

Short selling limitations cannot be measured directly, because the volume of short positions that would prevail if short-selling was freely available, is unobservable. I gauge short selling constraints by the idiosyncratic volatility of the acquirer's shares based on Pontiff (1996) and (2006) documenting that idiosyncratic volatility represents the highest cost faced by arbitrageurs that discourages rational traders from taking short positions.

Following Ang, Hodrick, Xing, and Zhang (2006) I measure idiosyncratic volatility as the standard deviation of the daily abnormal returns over those predicted by the Fama-French three factor model during the 200-day period ending on the sixth day before the acquisition announcement using estimation parameters from annual Fama-McBeth regressions.

I sort acquirers into "high idiosyncratic risk" and "low idiosyncratic risk" categories based on whether their shares' idiosyncratic volatility was above or below the median for the overall sample, and the firm size category.

I find that abnormal returns are significantly greater for acquirers with high idiosyncratic volatility than for those with low idiosyncratic volatility. This association remains robust within the categories of small and large acquirers.

The hypothesis that short selling constraints induce differences in shareholder gains is corroborated by differences in abnormal trading turnover and in the volume of short interest. Announcements of acquirers with high idiosyncratic volatility are accompanied by significantly greater abnormal trading volume (calculated following Bamber (1987)) in the three event days. In contrast, average short positions in the month of the announcement are significantly lower for acquirers with high idiosyncratic risk.

Greater abnormal returns for high idiosyncratic volatility acquirers are followed by greater subsequent reversals, providing further support for the overreaction hypothesis.

A steady pattern emerges from the data: as the market responds to the good news of the acquirer's announcement to buy a private or subsidiary target, shares with high idiosyncratic volatility respond with greater abnormal trading turnover. Since short sellers tend to avoid these stocks the buying pressure leads to greater abnormal returns. This overreaction is followed by a correspondingly larger reversal in the subsequent month.

Lastly, I introduce a control for the idiosyncratic volatility of the acquirer's shares in the event study regressions of shareholder gains on firm and deal characteristics. The results show that the effect of idiosyncratic volatility subsumes the effect of acquirer size in the regression and improves the overall fit.

I conclude that the apparent impact of acquirer size on shareholder gains in corporate acquisitions reflects investor overreaction associated with short-selling constraints. Although fundamental differences exist among small and large acquirers, these are not causing the size effect in shareholder gains.

My paper contributes to the literature in documenting how short-selling limitations induce a bias in abnormal returns in event studies on mergers and acquisitions. This finding has an important implication: failing to account for this market friction may lead to biased coefficients in other independent variables and a misinterpretation of the evidence regarding shareholder gains.

The second contribution is direct evidence on the link between short selling constraints and market overreaction to good news. This finding supplements the phenomenon discussed in Fox, Glosten, and Tetlock (2010) that when true-news-spreading short-selling is limited, prices will form bubbles resulting in an overall mispricing.

Finally, my paper contributes to the corporate finance literature on measuring the target premium in acquisitions of private and subsidiary targets where information on the target's prior market capitalization is not available.

The paper proceeds as follows: Section 2 provides a review of the literature that forms the context of my study. Section 3 describes the sample and reports how shareholder gains differ along firm size and the organizational form of the target. Section 4 reports the results and Section 5 concludes the paper.

2. Related Literature

This paper builds on two strands of literature: the literature on corporate acquisitions and the empirical corporate finance literature on costly arbitrage and market overreaction.

Moeller, Schlingemann, and Stulz (2004) document that a size effect exists in acquisition event abnormal returns: the wealth of small acquirers' shareholders increases by about two percent more than that of large acquirers in three days surrounding the announcement. They find evidence that large acquirers pay higher deal premiums for public targets, and interpret this overpayment as a sign of greater managerial hubris that leads to less efficient acquisition decisions. Masulis, Wang, and Xie (2007), Offenberg (2009), and Harford, Humphery-Jenner, and Powell (2012) confirm that large acquirers experience lower abnormal returns at the time of the acquisition announcement but these papers examine the role of corporate governance in shareholder value creation, rather than economic fundamentals. Faccio, McConnell, and Stolin (2006) find a significant negative coefficient on acquirer size in acquisitions of unlisted targets in 17 Western European Countries.

The hypothesized better post-merger economic performance of small acquirers is refuted by Ben-David and Roulstone (2008) who report that calendar time portfolios formed of small acquirers' shares underperform those of large acquirers in the 12 and 36 months post-merger period, and this underperformance is particularly strong among stock-financed acquisitions.

My paper adds to this literature by establishing that differential shareholder gains among small and large acquirers is present only in acquisitions of private and subsidiary targets. In the case of public targets the coefficient on acquirer size is insignificant in univariate regressions of three-day abnormal returns. Moreover, my results show that differential shareholder gains are not related to overpayment patterns and changes in operating synergies once we control for the relative size of the deal.

The paper also builds on the behavioral finance literature on how short selling impediments contribute to securities mispricing. Miller (1977) shows that short selling constraints induce an upward bias in the equilibrium price by excluding pessimistic traders' views from the price formation process. De Long et al (1990) model how the unpredictability of noise traders' beliefs can make arbitrage ineffective and deter smart money arbitrageurs from driving the stock price to the stock's fundamental value. In analyzing the closed-end fund discount, Pontiff (1996) documents that idiosyncratic risk is the largest cost of holding a security and it is strongly related to the level of mispricing. Shleifer and Vishny (1997) model how specialized arbitrageurs are discouraged from taking positions in securities with high idiosyncratic risk if short selling requires resources for maintaining a risky margin position. Pontiff (2006) demonstrates that rational arbitrageurs will assign lower optimal weights to securities with high idiosyncratic risk even if their capital is not limited, therefore these securities are more prone to mispricing. Ang et al (2006) find a strong negative relationship between idiosyncratic volatility and average returns. Using short-rebate fees to estimate short selling costs Drechsler and Drechsler (2014) document that stocks that are expensive to short carry a premium net of the short selling fees and capture a substantial fraction of anomaly returns.

My paper contributes to this literature by documenting that short selling limitations have a substantial impact on abnormal returns in event studies when the event is associated with stock price increases. Specifically, my results provide empirical evidence in support of Miller (1977) and De Long, Shleifer, Summers, and Waldmann (1990) that short selling limitations induce a market overreaction that is followed by a corresponding reversal as the price gradually adjusts to fundamental expectations.

3. Data

The sample includes completed mergers and acquisitions of US targets between 1990 and 2012 from the SDC Mergers and Acquisitions database matched to CRSP and Compustat. I restrict targets to public companies, private companies and subsidiaries of private companies. I require CRSP return information for the year preceding the acquisition announcement and Compustat data for at least five fiscal years: two fiscal years before and two fiscal years after the effective fiscal year of the acquisition. I set the minimum deal value, defined as the total consideration paid by the acquirer excluding fees and related expenses, to $10 million and eliminate transactions where the deal value relative to the market capitalization of the acquirer 11 days before the announcement is less than 1%. In order to avoid repeat partial acquisitions I require that the acquirer controls less than 50% of the target before the acquisition and obtains 100% ownership. I exclude transactions with missing information on the announcement date, effective date, deal value, target organizational form, or payment form. These procedures result in 8,802 acquisitions.

Acquirers are assigned to industry groups the 48 industries defined in Fama and French (1997) based on their primary SIC codes in Compustat in the fiscal year of the acquisition. I classify firms to "small" and "large" categories based on their total assets relative to the industry asset distribution.

In the neoclassical framework, the Coasian theory of the firm implies that the tradeoff between production by internal coordination and outsourcing from the market determines a range of optimal size for firms. Intuitively, this depends on the nature of core activities: the optimal asset size is larger for firms in heavy manufacturing industries than for those providing services. Hence, I classify an acquirer as "small" if its total assets fall at or below the 40th percentile of the industry asset distribution. Correspondingly, an acquirer is classified "large" if its total assets fall at or

above the 60th percentile of the industry asset distribution. In order to avoid any possible ambiguity coming from variations around the median I intentionally omit firms whose total assets fall between the 40th and 60th percentiles from these categories. I supplement this categorical measure with the log of acquirer total assets as a continuous measure of size.

Table 1 shows the summary statistics for the sample. Firm characteristics are measured at the beginning of the fiscal year of the acquisition announcement.

[Insert Table 1 here]

Small and large acquirers do not show significant differences in the level of Tobin's Q. To the extent that Tobin's Q proxies for a firm's growth opportunities, this finding implies that no clear relationship exists between a firm's growth opportunities and its size. Small acquirers have lower equity market valuations and lower operating efficiency than large acquirers.

In accordance with the literature reporting an association between firm size and financial constraints (e.g. Kaplan and Zingales (1997), Whited and Wu (2006), Hadlock and Pierce (2010)), small acquirers in the sample have lower leverage ratios than large acquirers. On the other hand they have greater levels of excess cash measured as cash reserves over the predicted industry-year median (as specified in Harford (1999)) suggesting that they have been accumulating cash reserves to finance their acquisition plans.

The size of the acquisition relative to the acquirer's prior market capitalization is indicative of the economic magnitude of the acquirer's investment. Asquith, Bruner, and Mullins (1983) highlight the importance of relative deal size: abnormal returns upon acquiring a particular target will be greater for a small acquirer than a large one even if the acquisition itself offers equal net

present value to both of them. I find that small acquirers undertake acquisitions of a substantially greater relative size than their large peers.

Acquirers in the two size categories also differ in other deal characteristics: small acquirers tend to buy less public and more private targets and have a greater propensity to finance their deals with stock, rather than cash. I define an acquisition to be diversifying if the target is in a different Fama-French 48 industry category than the acquirer. I find no significant differences in the proportion of diversifying acquisitions.

Substantial differences exist in the trading characteristics of small and large acquirers' shares. Differences in the Amihud illiquidity measure show that small acquirers' shares are less liquid than those of their large peers. This result is in accordance with the well-known relationship between firm size and liquidity in the market microstructure literature (Demsetz (1968), Amihud (2002)).

I also find large differences in the idiosyncratic volatility of small and large acquirers' shares. Following Ang, Hodrick, Xing, and Zhang (2006) I measure idiosyncratic volatility as the standard deviation of daily abnormal returns over the three-factor model calculated in the 200 trading days starting 206 days prior to the announcement. Average and median idiosyncratic volatilities exhibited by small acquirers (3.7% and 3.2% respectively) are more than 50% greater than those of large acquirers (2.3% and 2.0% respectively).

I measure announcement abnormal returns as the three-day cumulative residuals over the Fama and French three-factor model estimated over a 200-day period that ends on the 6th day preceding the acquisition news.

Panel A of Table 2 shows three-day cumulative abnormal returns categorized by the organizational form of the target and the method of payment for the overall sample and subsamples of small and

large acquirers. Acquirer size is not associated with statistically significant differences in acquisitions of public targets. However, transactions by small acquirers are associated with significantly higher three-day cumulative abnormal returns in acquisitions of private and subsidiary targets, regardless of the form of the payment. Hence, the impact of acquirer size in the overall sample comes from the subsample of acquisitions of private and subsidiary targets, which make up 79% of the total number of acquisitions. The finding that acquisitions of private and subsidiary targets are associated with positive abnormal returns (average and median three-day abnormal returns are 1.9% and 0.9% respectively) is in accordance with Chang (1998), Officer (2007), and Faccio, McConnell and Stolin (2006).

Panel B of Table 2 shows regression results with three-day cumulative abnormal returns as the dependent variable. The results corroborate the findings in Panel A: acquirer size does not have a significant association with shareholder gains in acquisitions of public targets, while in acquisitions of private and subsidiary targets small acquirers experience greater abnormal returns. Panel C of Table 2 shows the analysis for the sign of the announcement news. In column (1) the coefficient on the indicator variable for the target being a public firm is significantly negative, reinforcing that such events are bad news to the market. Concurrently, regressions (2) and (3) report significantly positive coefficients on the indicators of private or subsidiary targets, showing that the market views these events as good news.

[Insert Table 2 here]

4. Empirical analysis

4.1. Shareholder value creation

Coase's theory of the firm proposes that diminishing marginal returns to management determine the optimal scope of the firm at the point where the marginal cost of internal coordination is equal to that of obtaining the input from the external market. In this framework firms that are smaller than the optimal size can obtain greater efficiency gains by acquisitions than their large peers.

I consider three efficiency indicators: excess payment for the target over the fair market value of its assets, changes in operating return on assets, and changes in sales growth in the two post-merger fiscal years relative to the two pre-merger fiscal years[2].

Moeller, Schlingemann, and Stulz (2004) document that large acquirers pay higher deal premiums for their targets than small acquirers. Such overpayment implies greater managerial hubris at large firms that leads to less efficient acquisition decisions that is reflected in the difference in shareholder gains. In the paper deal premium is measured as the total deal value relative to the market capitalization of the target firm 50 days before the announcement, hence it is available only for public targets. I introduce a different measure of the target premium: goodwill recorded in relation to the acquisition as a fraction of total deal value. FASB rules require acquirers to record the excess payment over the fair value of net assets, as goodwill. Estimation of fair market values, and recording the excess as goodwill is subject to stringent audit requirements. Hence if a large fraction of the compensation is recorded as goodwill that implies that the acquirer paid a substantial premium for the target. Direct information on goodwill recorded for each transaction is not available, thus as a proxy I use the change in the acquirer's goodwill (less goodwill impairments and goodwill amortization) as a proxy for the goodwill that was recorded

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[2] Since financial statements in the effective fiscal year of the merger are affected by the accounting for the combination, this year is excluded from the comparisons.

for the transaction[3]. Fuller, Netter, and Stegemoller (2002) document that the same acquirer often makes several acquisitions with substantially different deal characteristics within the same fiscal year. In order to address ambiguity caused by multiple acquisitions, I restrict this test to the sample of acquirers with a single deal per fiscal year.

Operating synergies can arise from either cost savings or increasing sales. Hence, I gauge the change in average operating return on assets and average sales growth in the two years that follow the effective fiscal year of the merger relative to the two years that precede it.

Panel A of Table 3 shows the summary for the overall sample and the subsamples of small and large acquirers. I find statistically significant differences in all three measures: small acquirers tend to pay lower premiums for their targets, better utilize their assets, and accelerate sales growth.

Panel B of Table 3 reports results of regressing shareholder gains on measures of economic efficiency with controls for the relative size of the deal and acquirer size evaluated by the categorical small firm variable and the log of the firm's total assets. All specifications include industry and time fixed effects and standard errors clustered by acquirer.

Columns (1) and (4) demonstrate that if the relative deal size is omitted from the regression, excess payment has a significant negative effect, while improvements in economic efficiency have a significant positive impact on shareholder gains. However, columns (2) and (5) show controlling for relative deal size absorbs the impact of operating synergies and decreases the significance of the target premium. This finding suggests that the market is aware that the scope of operating synergies depend significantly on the magnitude of the investment, and the relative size of the deal is indicative of the net present value added to the firm. Another potential explanation is related to

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[3] FASB rules allow the acquirer to record negative goodwill if the fair market value of the target's assets are higher than the total deal value. For this reason the fraction of excess payment relative to the total deal value may be negative.

the finding of Bradley, Desai, and Kim (1988) analyzing acquisitions of public targets, that "target shareholders capture the lion's share of the gains from tender offers". If this statement also holds for acquisitions of private and subsidiary targets, then it is not surprising that the impact of relative deal size absorbs the impact of operating synergies.

In order to see the association between the impact of acquirer size on shareholder gains, the target premium and economic efficiency indicators, columns (3) and (6) show the regressions omitting the target premium and synergy measures. The significance and magnitude of the coefficient on acquirer size is not materially affected and the fit of the regression remains unchanged.

Altogether, these results indicate that the effect of firm size on shareholder gains does not arise from overpayment for the target and differences in operating synergies.

[Insert Table 3 here]

4.2. Short selling constraints

4.2.1. Acquirer size, idiosyncratic volatility, abnormal trading turnover, and short-selling constraints

The data reveals that the impact of acquirer size on shareholder gains in acquisitions of private and subsidiary targets is persistent over time and industries. I conjecture that the effect of acquirer size reflects the market's overvaluation of the acquisitions that is not tempered for small firms due to short sales constraints. In the Miller (1977) model, limitations on short sales impact the way disagreement among traders is reflected in the equilibrium price: since traders with pessimistic valuations are not able to profit from their analysis, riskier stocks surrounded by greater disagreement are bid up to higher prices. Such mispricing can reach a higher level if irrational noise traders are also present on the virtual trading floor and they take bullish positions on the basis of the positive signal embedded in the news of acquiring a private or subsidiary target (De Long, Shleifer, Summers, and Waldmann (1990)).

Small firms tend to have greater idiosyncratic volatility, lower liquidity, less institutional ownership and more information asymmetry, than large firms. All of these factors present impediments to short selling. Idiosyncratic volatility has been shown to have the strongest association with limited short selling as arbitrageurs are dissuaded by the possibility that an adverse price movement during the holding horizon will eliminate their profits (Pontiff (1996) and (2006)). Stambaugh, Yu, and Yuan (2015) model the inherent asymmetry in arbitrage: arbitrageurs are more reluctant to take positions in high idiosyncratic volatility stocks when these are overpriced due to the maintenance margin required: if the price increases, arbitrageurs need to react immediately by increasing the capital tied up in the margin.

Motivated by these theories and the related empirical evidence I employ idiosyncratic volatility as the proxy for short-selling constraints. Following Ang, Hodrick, Xing, and Zhang (2006) I calculate idiosyncratic volatility as the standard deviation of daily abnormal returns over those predicted by the Fama-French three factor model. Parameter estimates for calculating abnormal returns are based on annual Fama-McBeth regressions of daily returns on market returns with standard errors clustered at the firm level. Median idiosyncratic volatility is 2.28% for the overall sample, 3.24% for small acquirers and 2.08% for large acquirers. I sort acquirers into high and low idiosyncratic risk categories based on whether the idiosyncratic volatility of their shares exceeds the sample median and repeat the sorting within the size categories of small and large acquirers.

Table 4 shows comparisons of three-day cumulative abnormal announcement returns, cumulative reversal in the twenty-two trading days following the announcement period, three-day abnormal trading turnover, and short interest outstanding in the month of the announcement. I find statistically significant differences among acquirers with high and low idiosyncratic volatilities along all of these dimensions.

Panel A demonstrates that acquirers with high idiosyncratic volatility have significantly greater abnormal returns than their peers both in the overall sample and within the subsamples of small and large acquirers. I find that the majority of small acquirers (73.5%) has high idiosyncratic volatility, whereas the majority of large acquirers (58.5%) has low idiosyncratic volatility as benchmarked against the sample median.

Panel B reports cumulative reversals in the twenty-two trading days that follow the three event days. The results support the hypothesis that the impact of acquirer size on shareholder gains

reflects market overreaction: acquirers with high idiosyncratic volatility experience not only greater abnormal returns, but also greater reversals than acquirers with low idiosyncratic volatility.

It is interesting to note that reversals are substantial in all categories. This finding supports findings in the behavioral finance literature (e.g. DeBondt and Thaler (1985)) that investors overreact to news and such overreaction is followed by a reversal.

Panel C documents three-day cumulative abnormal trading turnover around the announcement[4]. The results show that acquirers whose idiosyncratic risk is above the group median experience substantially greater abnormal trading turnover than acquirers whose idiosyncratic risk is below the group median. Small acquirers experience greater abnormal trading turnover than large acquirers, which corresponds to the underlying associations between size, idiosyncratic risk, and illiquidity.

Panel D reports average short interest positions from the Compustat short interest file in the month of the acquisition announcement. In agreement with the predictions of the literature on the relationship between idiosyncratic volatility and short selling constraints, outstanding short interest is significantly lower for acquirers with high idiosyncratic volatility in both size categories. It is important to note, that the Compustat file provides monthly (or in recent years biweekly) reported short interest: the number of shares that are in outstanding short positions. Blau, Van Ness, and Van Ness (2011) show that the correlation between these outstanding short interest and short trading volume is only 45%. Even though, short interest is an imperfect proxy for the actual short selling volume, it is indicative of the direction of the relationship between short sales and the idiosyncratic volatility of the acquirer's shares.

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[4] Note: trading turnover information was missing for 110 observations in the CRSP volume data, so these transactions are not included in the comparisons in Panel C of Table 4.

Taken together with the positive news presented by the acquisition announcement, the findings of greater abnormal trading turnover and lower short interest indicate that abnormal returns are higher in the case of acquirers with high idiosyncratic volatility due to greater buying pressure surrounding the announcement of the acquisition.

[Insert Table 4 here]

4.2.2. Idiosyncratic volatility and the effect of acquirer size on shareholder gains

The cross-sectional regressions analysis confirms that greater abnormal returns experienced by shareholders of small acquirers reflect short selling constraints.

Panel A of Table 5 shows that the idiosyncratic volatility of the acquirer's shares subsumes the impact of acquirer size on shareholder gains in the regression: coefficients on size in columns (1) and (3) which do not control for idiosyncratic volatility are statistically significant, but those in columns (2) and (4) which control for idiosyncratic volatility are not.

Panel B of Table 5 reports results of the cross-sectional analysis with the full set of control variables employed in the literature. Acquirer characteristics are measured in the beginning of the fiscal year of the acquisition announcement. Excess cash refers to cash holdings over the predicted level for the industry and fiscal year based on macroeconomic and firm-specific variables following Harford (1999). Illiquidity refers to the average Amihud measure in the 12 months preceding the acquisition announcement calculated from monthly prices and returns. Target premium refers to the fraction of total deal value recorded as goodwill. Cash transactions include those where 100% of the payment took place in cash. A deal is classified as a diversifying acquisition if prior to the announcement the target belonged to a different Fama-French 48 industry category than the acquirer based on its primary SIC code.

Columns (1) and (3) include a control for the target premium measured as the fraction of the total deal value recorded as goodwill for the subsamples of acquirers who made a single acquisition in a fiscal year. Fuller, Netter, and Stegemoller (2002) documents, frequent acquirers' acquisitions often have various deal characteristics. Different levels of the excess payment would lead to ambiguity in the measure of target premium, hence I reduce the sample to those acquisitions where my measure is straightforward. Columns (2) and (4) show the results without this restriction.

I find that idiosyncratic volatility and relative deal size drive shareholder gains in acquisitions of private and subsidiary targets. The premium paid for the target and indicators of operating synergy are not statistically significant. Consistent with earlier studies on acquisitions of private targets (Chang (1998), Faccio, McConnell, and Stolin (2006)) other control variables also exert a statistically insignificant effect on shareholder gains. Acquirer overvaluation measured by the market to book equity ratio (Rhodes-Kropf and Viswanathan (2004), Rhodes-Kropf, Robinson and Viswanathan (2005)) has a significant negative impact on abnormal returns in the first regression specification, but this effect is not present in the other specifications.

The regressions demonstrate that the impact of idiosyncratic volatility subsumes the impact of acquirer size on shareholder gains. This result provides strong support for the hypothesis that higher abnormal returns experienced by small acquirers reflect market overreaction due to short selling constraints. Greater subsequent reversals experienced by acquirers with high idiosyncratic volatility reinforces the overreaction diagnosis.

[Insert Table 5 here]

5. Conclusion

This paper examines the sources of the well-known effect of lower announcement returns in corporate acquisitions for larger acquirers. Indeed, I find that average announcement abnormal returns are 2.4% greater (and median abnormal returns are 1.1% larger) if the acquirer is a small firm. I find that this effect in the overall sample stems from acquisitions of private and subsidiary targets, which interpreted by the market as good investment opportunities.

My analysis shows that short selling constraints, proxied by the idiosyncratic volatility of the acquirer's shares, explain the wedge in shareholder gains. Short selling limitations allow for a market overreaction that is followed by a corresponding reversal. I also document that announcements by acquirers whose shares are subject to short-selling limitations are accompanied by greater abnormal trading turnover, but lower short interest than announcements by acquirers whose shares are not.

The evidence documented in this paper indicates that differential announcement effects of small versus large acquirers are not explained by differential economic efficiency.

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Appendix: Variable Definitions

Variable	Definition
Announcement Abnormal Returns	Cumulative abnormal returns (CARs) over the returns predicted by the Fama-French (1993) 3-factor model summed in three event days starting one day before the announcement. The 3-factor model parameters are estimated over the 200-day period starting 206 days before the announcement of the acquisition.
Announcement Abnormal Trading Turnover	Cumulative abnormal trading turnover summed in three event days starting one day before the announcement over the predicted turnover. Prediction parameters are generated in the 12-month period preceding the month of the acquisition announcement, following Bamber (1987). Trading turnover is calculated as the ratio of daily shares volume (divided by half) to the total number of shares outstanding. Predicted turnover is calculated in monthly regressions of daily turnover on the basis of the following model: $\ln(TO_{it}) = \alpha_i + \beta_i\left(\ln\left(TO_{mkt,t}\right)\right)$ where market turnover refers to the equally weighted average turnover of all CRSP stocks on a given day. Cumulative abnormal trading turnover is winsorized at the 1st and 99th percentiles.
Change in Operating Return on Assets	The difference between the average operating return on assets in the two years that follow the effective fiscal year of the acquisition and the average operating return on assets in the two preceding years. Operating return on assets is calculated from Compustat as {ebitda/at} and winsorized at the 1st and 99th percentiles.
Change in Sales Growth	The difference between the average sales growth in the two years that follow the effective fiscal year of the acquisition and that in the two preceding years. Sales growth is calculated from Compustat as { sale$_{(t)}$/sale$_{(t-1)}$-1} and winsorized at the 1st and 99th percentiles.
Diversifying Merger Indicator	=1 if the acquirer's primary Fama-French 48 industry group is different from the target's primary Fama-French 48 industry group.
Excess Cash	The difference between the firm's cash holdings scaled by total assets and the predicted median for the Fama-French 48 industry

	in the fiscal year following Harford (1999) and winsorized at the 1st and 99th percentiles.
Idiosyncratic Risk	Standard deviation of the residuals in regressions of daily stock returns on the three Fama and French (1993) factors following Ang, Hodrick, Xing, and Zhang (2006) in the 200-day period ending 6 days before the acquisition announcement, winsorized at the 1st and 99th percentiles. Parameter estimates for the predicted returns are obtained by annual Fama-McBeth regressions.
Illiquidity	Average daily ratio of absolute stock return to dollar trading volume, following Amihud (2002). Calculated from CRSP data as 1,000,000 * abs(ret) / abs(prc)*volume. Winsorized at the 1st and 99th percentiles.
Industry	The industry grouping of the firm based on the 48 Fama-French (1992) industry categories assigned by the firm's Compustat SIC code in the fiscal year.
Log(Assets)	Logarithm of the total book assets, constructed for each firm-year at the beginning of the fiscal year. Winsorized at the 1st and 99th percentiles
Leverage	Long-term debt over market capitalization in the beginning of the fiscal year, constructed for each firm-year. Calculated from Compustat as dltt / (cshpri * prcc_f) and winsorized at the 1st and 99th percentiles.
Market to book	Market capitalization over the book value of total equity in the beginning of the fiscal year. Calculated from Compustat as (cshpri * prcc_f) / ceq and winsorized at the 1st and 99th percentiles.
Private Target Indicator	=1 if the target is a private firm in SDC, otherwise 0.
Public Target Indicator	=1 if the target is a publicly listed firm in SDC, otherwise 0.
Pure Cash Deal	=1 if the transaction was financed entirely by cash according to SDC, otherwise 0.
Relative Deal Size	Total transaction value in SDC divided by the acquirer's market capitalization at the beginning of the fiscal year from Compustat. Winsorized at the 1st and 99th percentiles.
Short Interest Ratio	Short interest (Compustat Supplemental Short Interest file, item: adjusted short interest) relative to the total number of acquirer shares outstanding. Winsorized at the 1st and 99th percentiles.

Small Firm Indicator	=1 if the book value of total assets (Compustat item at) falls within the 40th percentiles of the distribution in the firm's industry;
	=0 if the book value of total assets falls between the 60th and 100th percentiles of the distribution in the firm's industry.
	Industry specifications follow the 48 industry categories in Fama and French (1997).
Subsidiary Target Indicator	=1 if the target is listed firm in SDC as a subsidiary of another firm, otherwise 0.
Target Premium	Change in goodwill net of goodwill amortization and pre-tax goodwill impairment (Compustat items gdwl, gdwlam, and gdwlip) divided by the total deal value from SDC. Calculated for acquisitions of private and subsidiary targets where the acquirer made a single announcement within a fiscal year. Winsorized at the 1st and 99th percentiles.
Tobin's Q	Tobin's Q measured as the market to book assets ratio following Adam and Goyal (2008) as the sum of (equity market capitalization + preferred stock + debt in current liabilities + long term debt) over the book value of total assets. Calculated from Compustat as ((prcc_f * cshpri) + pstk + lct+ dltt − txditc) /at.

Table 1: Summary Statistics

This table contains averages and medians (in parentheses) for the sample. Acquirers are classified small if their total assets at the beginning of the fiscal year of the acquisition are at or below the 40th percentile for the industry distribution and large if those are at or above the 60th percentile. Values for t and z statistics (the latter in parentheses) reflect the two-sided difference in means test and the nonparametric equality-of-medians test for the significance of the difference between the high and the low idiosyncratic volatility group. ***, ** and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Firm characteristics reflect values at the beginning of the fiscal year of the acquisition announcement. Relative deal size is measured as total deal value over the acquirer's maket capitalization. Excess cash represents deviation of cash holdings from the industry-year median prediction following Harford (1999). Idiosyncratic volatility is measured as the standard deviation of daily abnormal returns relative to the Fama-French 3-factor model in the 200 day time period ending on the 6th day before the acquisition announcement following Ang et al (2006). Illiquidity is measured over the 12 month preceding the acquisition announcement by the Amihud measure using monthly average returns and prices. Variables are winsorized at the 1st and 99th percentiles. Variable definitions are included in the Appendix.

Variable	All	Small	Large	t and z stats	
Total assets (USD million)	11,153	222	13,089	-6.1	***
	(990)	(88)	(1,971)	(-46.5)	***
Market value of equity (USD million)	8,841	257	12,160	-13.9	***
	(1,157)	(116)	(2,280)	(-46.0)	***
Tobin's Q	2.06	2.03	2.10	-1.1	
	(1.55)	(1.52)	(1.58)	(-1.6)	*
Market to book equity	3.42	3.21	3.55	-2.7	***
	(2.45)	(2.11)	(2.59)	(-8.3)	***
Operating return on assets	13.1%	7.8%	14.3%	-17.1	***
	(13.4%)	(11.9%)	(13.7%)	(-8.8)	***
Sales growth	25.6%	23.9%	24.8%	-0.5	
	(13.3%)	(11.9%)	(13.1%)	(-2.7)	***
Leverage (Book)	19.7%	15.4%	20.4%	-8.7	***
	(16.7%)	(7.4%)	(17.9%)	(-12.1)	***
Excess cash	0.7%	6.8%	-1.2%	14.7	***
	(-1.1%)	(1.2%)	(-2.0%)	(13.5)	***
Relative deal size	27.7%	66.6%	18.7%	30.7	***
	(8.5%)	(32.6%)	(5.3%)	(31.8)	***
Fraction of cash deals	32.2%	20.6%	34.9%	-9.5	***
Fraction of diversifying deals	41.7%	42.3%	42.4%	0.0	
Fraction of public targets	21.2%	12.1%	24.8%	-9.3	***
Fraction of private targets	42.8%	56.0%	39.2%	10.6	***
Fraction of subsidiary targets	35.9%	31.7%	35.9%	-2.7	***
Idiosyncratic volatility	2.6%	3.7%	2.3%	32.9	***
	(2.2%)	(3.2%)	(2.0%)	(25.9)	***
Illiquidity (Amihud measure)	0.195	1.049	0.032	0.190	***
	(0.002)	(0.060)	(0.001)	(41.6)	***
Number of observations	8,802	1,117	6,306		

Table 2: Acquirer Size, Target Organizational Form and Announcement Abnormal Returns

Panel A: Summary of announcement abnormal returns

This table shows the average and the median three-day cumulative abnormal returns estimated using the Fama-French three-factor model over a 200 trading day period starting 205 trading days before the acquisition announcement. Median values are placed below the means in parentheses. Small acquirers are those whose total assets at the beginning of the fiscal year of the acquisition were at or below the 40th percentile of the industry asset distribution in a given fiscal year, whereas large acquirers are those whose total assets were at or above the 60th percentile. If 100% of the consideration for the target took place in cash I classify the transaction as a cash payment transaction, otherwise I classify it as stock and mixed payment transaction. Values for t and z statistics (the latter in parentheses) reflect the two-sided difference in means test and the nonparametric equality-of-medians test for the significance of the difference between the small and the large group. ***, ** and * indicate significance at the 1%, 5%, and 10% levels, respectively. Abnormal returns are significantly different from zero in all categories.

	All	Small	Large	t and z stats	
All targets, all payment forms	1.2%	3.1%	0.7%	9.5	***
	(0.6%)	(1.5%)	(0.4%)	(7.7)	***
Number of observations	8,802	1,117	6,306		
All targets, cash payment	1.2%	3.1%	0.9%	5.3	***
	(0.7%)	(1.6%)	(0.6%)	(4.1)	***
Number of observations	2,837	230	2,205		
All targets, stock and mixed payment	1.2%	3.1%	0.6%	7.9	***
	(0.6%)	(1.5%)	(0.4%)	(6.7)	***
Number of observations	5,965	887	4,101		
Public targets, all payment forms	-1.1%	-1.8%	-1.1%	-1.1	
	(-0.5%)	(-0.4%)	(-0.5%)	(-0.4)	
Number of observations	1,869	136	1,564		
Public targets, cash payment	0.5%	2.0%	0.4%	1.3	
	(0.2%)	(2.1%)	(0.2%)	(1.7)	*
Number of observations	592	20	536		
Public targets, stock and mixed payment	-1.9%	-2.5%	-1.8%	-0.8	
	(-1.3%)	(-0.7%)	(-1.3%)	(0.6)	
Number of observations	1,277	116	1,028		
Private and subsidiary targets, all payment forms	1.9%	3.8%	1.3%	9.1	***
	(0.9%)	(1.7%)	(0.7%)	(7.1)	***
Number of observations	6,933	981	4,742		
Private and subsidiary targets - cash payment	1.4%	3.2%	1.0%	4.7	***
	(0.8%)	(1.5%)	(0.7%)	(3.5)	***
Number of observations	2,245	210	1,669		
Private and subsidiary targets - stock and mixed payment	2.1%	3.9%	1.5%	7.4	***
	(1.0%)	(1.8%)	(0.8%)	(6.0)	***
Number of observations	4,688	771	3,073		

Panel B: Announcement abnormal returns and target organizational form

This table reports the association between acquirer size and acquisition announcement abnormal returns by target organizational form using two alternative measures of size: the binary indicator for small acquirers and the log of the acquirer's total assets. Three-day cumulative abnormal returns estimated using the Fama-French three-factor model over a 200 trading day period starting 205 trading days before the acquisition announcement. All regression specifications contain industry and year fixed effects. Standard errors are clustered at the firm level. P-values are included in parentheses. ***, ** and * indicate significance at the 1%, 5% and 10% levels, respectively.

	Public targets		Private targets		Subsidiary targets	
	(1)	(2)	(3)	(4)	(5)	(6)
Intercept	6.00	3.89	5.71 ***	9.78 ***	0.82	5.56 ***
	(0.41)	(0.56)	(0.00)	(0.00)	(0.50)	(0.00)
Small firm indicator	-0.87		2.48 ***		2.48 ***	
	(0.38)		(0.00)		(0.00)	
Log of total assets		0.15		-0.60 ***		-0.633 ***
		(0.21)		(0.00)		(0.00)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Acquirer industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	1,700	1,869	3,101	3,770	2,622	3,163
Adjusted R-squared	0.03	0.03	0.03	0.03	0.02	0.03

Panel C: Announcement abnormal returns and target organizational form

This table shows the relationship between acquisition announcement abnormal returns and the organizational form of the target firm. All regression specifications contain industry and year fixed effects. Standard errors are clustered at the firm level. P-values are included in parentheses. ***, ** and * indicate significance at the 1%, 5% and 10% levels, respectively.

	(1)		(2)		(3)	
Intercept	3.99	*	2.79		2.43	
	(0.06)		(0.18)		(0.25)	
Public target indicator	-3.02	***				
	(0.00)					
Private target indicator			0.99	***		
			(0.00)			
Subsidiary target indicator					1.29	***
					(0.00)	
Small firm indicator	1.23	***	1.59	***	1.93	***
	(0.00)		(0.00)		(0.00)	
Relative deal size	1.46	***	1.06	***	0.97	***
	(0.00)		(0.01)		(0.02)	
Year FE	Yes		Yes		Yes	
Acquirer industry FE	Yes		Yes		Yes	
Number of observations	7,423		7,423		7,423	
Adjusted R-squared	0.05		0.03		0.03	

Table 3: Firm Size and the Economic Efficiency of Acquisitions

Panel A: Summary of differences in target premium and performance improvements

This table shows average and median (in parentheses) differences in performance measures related to acquisitions of private and subsidiary targets. Target premium is measured as the change in goodwill net of goodwill amortization and impairment, recorded in the effective year of the merger as a fraction of the total deal value. This metric is calculated for acquirers that made a single acquisition in the fiscal year to avoid ambiguity stemming from multiple deals with different deal characteristics in a fiscal year. Changes in operating return on assets and sales growth are evaluated by the difference between the averages of the two post-merger and the two pre-merger fiscal years (thus excluding the effective fiscal year of the acquisition). Variables are winsorized at the 1st and 99th percentiles. Variable definitions are included in the Appendix. Values for t and z statistics (the latter in parentheses) reflect the two-sided difference in means test and the nonparametric equality-of-medians test. ***, ** and * indicate significance at the 1%, 5% and 10% levels respectively.

	All	Small	Large	t and z stats	p-values	
Premium paid for target	54.5%	31.8%	67.1%	-4.4	0.00	***
	(5.0%)	(3.6%)	(5.7%)	(-1.7)	(0.08)	*
Number of observations	4,301	762	2,718			
Change in operating return on assets	-1.4%	0.3%	-1.7%	8.1	0.00	***
	(-0.9%)	(-0.6%)	(-0.8%)	(4.7)	(0.00)	***
Number of observations	8,802	1,117	6,306			
Change in sales growth	-5.1%	8.8%	-7.7%	9.7	0.00	***
	(-1.6%)	(6.1%)	(-2.5%)	(10.80)	(0.00)	***
Number of observations	8,802	1,117	6,306			

Panel B: Shareholder gains, economic efficiency indicators, and acquirer size

This table shows how target premium and operating synergies affect shareholder gains upon the announcement of the acquisition. The sample includes acquisitions of private and subsidiary targets. The dependent variable is the three-day cumulative abnormal returns over the Fama-French three-factor model in the 200-day period starting 205 days before the acquisition announcement. Columns (1), (2), and (3) include observations where the acquirer size is either small, i.e. the firm's total assets at the beginning of the fiscal year of the acquisition were at or below the 40th percentile of the industry asset distribution, or it is large, i.e. the acquirer's total assets were at or above the 60th percentile. Relative deal size is calculated as the total deal value over the acquirer's market capitalization in the beginning of the fiscal year of the acquisition. Columns (4), (5), and (6) include all observations where the target premium could be calculated. Variables are winsorized at the 1st and 99th percentiles. Variable definitions are included in the Appendix. All specifications include year and industry fixed effects. Standard errors are clustered at the acquirer level. P-values are included in parentheses. ***, ** and * indicate significance at the 1%, 5% and 10% levels respectively.

	(1)		(2)		(3)		(4)		(5)		(6)	
Intercept	2.46	*	1.62		1.42		7.34	***	3.93	***	3.82	***
	(0.05)		(0.18)		(0.22)		(0.00)		(0.00)		(0.00)	
Premium paid for target	-0.11	***	-0.08	**			-0.08	**	-0.06	*		
	(0.00)		(0.04)				(0.04)		(0.09)			
Change in operating return on assets	4.36	*	2.42				3.69	*	1.62			
	(0.08)		(0.33)				(0.10)		(0.46)			
Change in sales growth	0.76		0.28				0.96	**	0.46			
	(0.20)		(0.64)				(0.04)		(0.33)			
Small acquirer indicator	2.34	***	0.87	**	0.91	**						
	(0.00)		(0.04)		(0.03)							
Log of total assets							-0.65	***	-0.27	***	-0.28	***
							(0.00)		(0.00)		(0.00)	
Relative deal size			3.20	***	3.30	***			3.42	***	3.53	***
			0.00		0.00				(0.00)		(0.00)	
Number of observations	3,480		3,480		3,480		4,301		4,301		4,301	
Adjusted R-Squared	0.03		0.06		0.06		0.03		0.07		0.07	

Table 4: Shareholder gains and short selling constraints

Panel A: Announcement abnormal returns and idiosyncratic volatility

This table reports the average and median (in parentheses) three-day cumulative abnormal returns in acquisitions of private and subsidiary targets for acquirers classified according to the idiosyncratic volatility of their shares. CARs refer to the three-day cumulative abnormal returns estimated using the Fama-French three-factor model over a 200 trading day period starting 205 trading days before the acquisition announcement. Small acquirers are those whose total assets at the beginning of the fiscal year of the acquisition were at or below the 40th percentile of the industry-year asset distribution in a given fiscal year, whereas large acquirers are those whose total assets were at or above the 60th percentile.

Idiosyncratic volatility is measured as the standard deviation of daily abnormal returns over those predicted by the Fama-French 3 factor model in the 200 trading day period ending 6 trading days before the acquisition announcement. Parameters are estimated from annual Fama-McBeth regressions with standard errors clustered at the firm level. High idiosyncratic volatility acquirers are those whose standard deviation of daily abnormal returns was greater than the group median of 2.28% for the overall sample, 3.24% for small acquirers, or 2.07% for large acquirers. Low idiosyncratic volatility acquirers are those whose idiosyncratic volatility was at or below the median. Values for t and z statistics (the latter in parentheses) reflect the two-sided difference in means test and the nonparametric equality-of-medians test for the significance of the difference between the high and the low idiosyncratic volatility group. ***, ** and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	All	High IV	Low IV	t and z stats	p-values	
Three-day CARs - all acquirers	1.9%	2.7%	1.0%	9.2	0.00	***
	0.9%	1.7%	0.6%	8.4	0.00	***
Number of observations	6,933	3,422	3,511			
Number of small acquirers		721	260			
Number of large acquirers		1,970	2772			
Three-day CARs - small acquirers	3.8%	4.9%	2.8%	3.0	0.00	***
	1.7%	2.8%	1.4%	2.0	0.05	**
Number of observations	981	462	519			
Three-day CARs - large acquirers	1.3%	1.9%	0.8%	5.5	0.00	***
	0.7%	1.3%	0.5%	5.3	0.00	***
Number of observations	4,742	2,325	2,417			

Panel B: Announcement abnormal return reversals and idiosyncratic volatility

This table reports the average and median (in parentheses) cumulative abnormal returns for twenty-two trading days starting on the second trading day that follow the acquisition announcement. Values for t and z statistics (the latter in parentheses) reflect the two-sided difference in means test and the nonparametric equality-of-medians test for the significance of the difference between the high and the low idiosyncratic volatility group. ***, ** and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	All	High IV	Low IV	t and z stats	p-values	
Twenty-two-day CAR reversals - all acquirers	-1.8%	-2.8%	-0.9%	-5.6	0.00	***
	-1.1%	-2.4%	-0.5%	-5.5	0.00	***
Number of observations	6,787	3,359	3,428			
Twenty-two-day CAR reversals - small acquirers	-2.7%	-5.0%	-0.8%	-4.1	0.00	***
	-1.9%	-4.6%	-1.0%	-4.0	0.00	***
Number of observations	971	457	514			
Twenty-two-day CAR reversals - large acquirers	-1.5%	-2.2%	-0.9%	-3.5	0.00	***
	-0.9%	-1.7%	-0.5%	-3.2	0.00	***
Number of observations	4,636	2,272	2,364			

Panel C: Announcement abnormal trading turnover and idiosyncratic volatility

This table reports the average and median (in parentheses) three-day cumulative abnormal trading turnover in acquisitions of private and subsidiary targets for acquirers classified according to the idiosyncratic volatility of their shares. Trading turnover is calculated as the ratio of daily shares volume (divided by half) to the total number of shares outstanding. Three-day abnormal trading turnover is measured following Bamber (1987) as the cumulative residuals from the predicted trading turnover winsorized at the 1st and 99th percentiles. Predicted trading turnover is calculated on the basis of monthly regressions of the daily turnover on the market turnover in the twelve months preceding the month of the announcement. Market turnover is measured by the equally weighted average turnover of all CRSP stocks on a given day.

Values for t and z statistics (the latter in parentheses) reflect the two-sided difference in means test and the nonparametric equality-of-medians test for the significance of the difference between the high and the low idiosyncratic volatility group. ***, ** and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	All	High IV	Low IV	t and z stats	p-values	
Abnormal trading turnover - all acquirers	30%	39%	21%	8.0	0.00	***
	16%	25%	10%	7.5	0.00	***
Number of observations	6,803	3,352	3,451			
Abnormal trading turnover - small acquirers	57%	81%	37%	6.2	0.00	***
	40%	77%	22%	6.3	0.00	***
Number of observations	952	448	504			
Abnormal trading turnover - large acquirers	22%	28%	16%	5.5	0.00	***
	12%	16%	8%	4.7	0.00	***
Number of observations	4,661	2,283	2,378			

Panel D: Short interest and idiosyncratic volatility

This table reports the average and median (in parentheses) short interest in acquisitions of private and subsidiary targets for acquirers classified according to the idiosyncratic volatility of their shares. Short interest is measured as the ratio of short positions to the total number of shares outstanding in the month of the acquisition announcement calculated from Compustat.

Values for t and z statistics (the latter in parentheses) reflect the two-sided difference in means test and the nonparametric equality-of-medians test for the significance of the difference between the high and the low idiosyncratic volatility group. ***, ** and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	All	High IV	Low IV	t and z stats	p-values	
Short interest - all acquirers	20.3%	16.6%	23.8%	-20.5	0.00	***
	13.3%	8.3%	28.4%	-19.1	0.00	***
Number of observations	6,933	3,422	3,511			
Short interest - small acquirers	21.6%	17.6%	25.2%	-8.0	0.00	***
	17.8%	8.6%	29.7%	-7.7	0.00	***
Number of observations	981	462	519			
Short interest - large acquirers	19.8%	15.6%	23.8%	-19.6	0.00	***
	12.9%	7.3%	29.0%	-18.0	0.00	***
Number of observations	4,742	2,325	2,417			

Table 5: Shareholder Gains, Acquirer Size and Idiosyncratic Risk

This table shows how acquirer size and idiosyncratic volatility affect shareholder gains in acquisitions of private and subsidiary targets. The dependent variable is the three-day cumulative abnormal return over the Fama-French three-factor model in the 200-day period starting 205 days before the acquisition announcement. Columns (1) and (2) include observations where the acquirer size is either small, i.e. the firm's total assets at the beginning of the fiscal year of the acquisition were at or below the 40th percentile of the industry-year asset distribution, or it is large, i.e. the acquirer's total assets were at or above the 60th percentile. Columns (3) and (4) include all observations and measure acquirer size by the log of the firm's total assets. Relative deal size is calculated as the total deal value over the acquirer's market capitalization in the beginning of the fiscal year of the acquisition.

In Panel B acquirer characteristics are measured in the beginning of the fiscal year of the acquisition announcement. Tobin's Q is calculated as the market to book assets ratio as the sum of (equity market capitalization + preferred stock + debt in current liabilities + long term debt) over the book value of total assets following Adam and Goyal (2008). Excess cash refers to cash holdings over the industry-year predicted level following Harford (1999). Illiquidity refers to the average Amihud measure in the 12 months preceding the acquisition announcement calculated from monthly prices and returns. Target premium refers to the fraction of total deal value recorded as goodwill. Cash transactions include those where 100% of the payment took place in cash. A deal is classified as diversifying if the target belonged to a different industry than the acquirer based on the Fama-French 48 industry categories.

Variables are winsorized at the 1st and 99th percentiles. Variable definitions are included in the Appendix. All specifications include year and industry fixed effects. Standard errors are clustered at the acquirer level. P-values are included in parentheses. ***, ** and * indicate significance at the 1%, 5% and 10% levels respectively.

Panel A: Announcement abnormal returns, acquirer size, and idiosyncratic risk

	(1)		(2)		(3)		(4)	
Intercept	1.70		0.82		3.83	***	1.72	
	(0.15)		(0.51)		(0.00)		(0.23)	
Idiosyncratic risk			44.75	***			48.41	***
			(0.01)				(0.00)	
Small acquirer indicator	0.89	***	0.36					
	(0.01)		(0.36)					
Log of total assets					-0.26	***	-0.10	
					(0.00)		(0.16)	
Relative deal size	3.17	***	2.87	***	3.26	***	3.04	***
	(0.00)		(0.00)		(0.00)		(0.00)	
Number of observations	5,723		5,723		6,933		6,933	
Adjusted R-squared	0.05		0.06		0.06		0.07	

Panel B: Cross-sectional analysis of announcement abnormal returns

	(1)		(2)		(3)		(4)	
Intercept	0.74		1.02		0.99		1.93	
	(0.59)		(0.43)		(0.52)		(0.18)	
Idiosyncratic risk	64.85	***	42.70	***	75.47	***	49.14	***
	(0.00)		(0.01)		(0.00)		(0.00)	
Small firm indicator	0.02		0.37					
	(0.90)		(0.38)					
Log of total assets					-0.03		-0.10	
					(0.78)		(0.14)	
Market to book	-0.08	**	-0.04		-0.05		-0.03	
	(0.04)		(0.15)		(0.15)		(0.34)	
Acquirer leverage (book)	-0.07		0.43		-0.12		0.15	
	(0.95)		(0.56)		(0.89)		(0.81)	
Acquirer excess cash	-0.62		-0.32		-1.27		-0.88	
	(0.63)		(0.73)		(0.25)		(0.28)	
Illiquidity	0.10		0.06		0.08		0.05	
	(0.59)		(0.68)		(0.64)		(0.71)	
Relative deal size	2.50	***	2.65	***	2.85	***	2.83	***
	(0.00)		(0.00)		(0.00)		(0.00)	
Premium paid for target	-0.06				-0.06			
	(0.14)				(0.14)			
Change in operating return on assets	1.60		-0.53		0.58		-0.22	
	(0.53)		(0.78)		(0.80)		(0.90)	
Change in sales growth	0.36		0.31		0.61		0.42	
	(0.57)		(0.37)		(0.23)		(0.41)	

Cash payment	0.08	-0.09	0.15	-0.02
	(0.76)	(0.64)	(0.54)	(0.91)
Diversifying	-0.14	0.00	-0.20	-0.09
	(0.67)	(0.99)	(0.48)	(0.69)
Number of observations	3,480	5,723	4,301	6,933
Adjusted R-squared	0.06	0.06	0.08	0.07