

A Short Walk on Wall Street

Does Short Selling Exposure Improve M&A Quality?

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December 2017

Abstract

We examine whether short sellers are a source of effective corporate governance in the context of M&A. Using a sample of 9,386 U.S. mergers & acquisitions from 2002 to 2016, we find that acquirers subject to more short interest experience significantly higher announcement period abnormal stock returns. Our results indicate that short sellers are a channel through which financial markets discipline management. The effect is more pronounced for acquirers with high leverage, high Tobin's q , weaker recent stock performance, and smaller total assets. We also find indicative evidence that the explanatory power of short selling on announcement period bidder returns is higher than that of internal governance mechanisms identified in previous studies. Finally, using a S.E.C. regulatory experiment, we show that short selling constraints might interfere with the beneficial disciplining force of short sellers on acquisitions.

Keywords: Short Selling, Mergers & Acquisitions, Corporate Governance, Regulation SHO, Governance by Trade

JEL Classification: G18, G34, G38

Acknowledgement: We are grateful to our supervisor Prof. Michael Halling who advised us with great expertise and invaluable advice throughout this thesis.

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Glossary

ATP	Antitakeover Provision
CAR	Cumulative Abnormal Return
CEO	Chief Executive Officer
E-Index	Entrenchment Index, governance metric developed by Bebchuk et al. (2008)
ISS	Institutional Shareholder Services, provider of a widespread corporate governance data base
M&A	Mergers & Acquisitions
SDC	SDC Platinum, U.S. M&A data bank by Thomson Reuters
S.E.C.	Securities and Exchange Commission

1. Introduction

Only four days after the collapse of the investment bank Lehmann Brothers in September 2008, the S.E.C. surprised the markets by instituting an emergency order that banned short selling for a large number of public firms. In doing so, U.S. authorities followed the argumentation frequently put forward by short selling critics. Because short investors take a bet on falling stock prices, these trades are accused of destabilizing financial markets, causing price pressure on individual securities, and providing an incentive to manipulate equity prices (Goldstein and Guembel 2008). Despite these affirmative views, reactions to the installation of the ban have been critical. Practitioners doubt that the order provided significant support for endangered stocks. Increased transaction cost and reduced liquidity, however, were measurable market effects largely attributed to the absence of short selling¹.

In fact, there is wide empirical support for the notion that short sellers are an important element that improves the efficiency of financial markets. By incorporating negative views of pessimistic investors, short sellers increase the informativeness of stock prices (Diamond and Verrecchia 1987) and thus improve overall market efficiency and the price discovery process (Karpoff and Lou 2010). However, positive effects of short selling are not restricted to the dimension of market quality. Recent studies provide evidence that short sellers are skilled at identifying financial misconduct (e.g. Hirshleifer et al. 2011) and induce more efficient financing and investment decisions (Gilchrist et al. 2005). Finally, Massa et al. (2013) argue that the threat of short of selling improves a firm's internal governance.

This paper further explores the implications of short selling on corporate governance. Public awareness for the need of effective mechanisms that discipline corporations intensified after a series of scandals, including Enron and Worldcom, and the following introduction of the Sarbarnes-Oxley Act of 2002. In the field of research, studies on the issue of corporate governance date back to Berle and Means (1932) who first discussed the agency conflicts arising from the separation of ownership and control in the modern organization. Since then, an extensive body of research has accumulated that documents the significance of governance and its substantial

¹Story, L. (2008, October 7). A Debate as a Ban on Short-Selling Ends: Did It Make Any Difference?. The New York Times. Retrieved from <http://www.nytimes.com>

implications on shareholder wealth (e.g. Gompers et al. 2003). In a recent development, a new strand of literature seeks to explore the disciplining force exerted by financial markets. Increased interest in this area is closely tied to the growing landscape of activist investors (Bebchuk and Weisbach 2010) and the governance exerted by large shareholders. Admati and Pfleiderer (2009) suggest that these blockholders discipline management by the threat of selling their shares - a concept termed as following the "Wall Street Walk".

Our study examines if this mechanism is also effective when the threat of exit arises from short sellers. This paper investigates if governance improvements through short selling also translate to the context of M&A. We thereby contribute to the research on governance by financial markets. As transactions are considered strategically decisive and known to aggravate manager-shareholder conflicts (Jensen and Meckling 1976), it is of great practical relevance to identify mechanisms that influence M&A outcomes.

We use a sample of 9,386 completed M&As in the period from 2002 to 2016 and examine the effect of short selling exposure on acquisition quality as measured by abnormal bidder announcement returns. We find that firms facing more short interest experience significantly higher abnormal stock returns. In subsequent steps, we compare the disciplining power of short sellers to that of previously established internal governance mechanisms in the context of M&A. Our findings suggest that short interest is the mechanism associated with the highest explanatory power. Lastly, we exploit a randomized experiment that decreased short selling costs for a subset of public firms and explore how regulatory changes impact the disciplining force of short sellers. The experimental setup enables us to analyze the effect of short selling on M&A in an isolated setting and thereby also addresses potential endogeneity considerations. The resulting evidence, albeit insignificant, points in the direction of better acquisitions if short selling constraints are lifted.

The above findings contribute to the literature on short selling and corporate governance by documenting a new dimension in which short sellers affect corporate decisions. Additionally, we add to the research body on determinants of M&A profitability.

The remainder of this paper is organized as follows. Section 2 reviews prior empirical work on corporate governance and M&A, governance by trade, and short selling as a governance mechanism. Building on this, section 3 presents three hypotheses that guide this study. In section 4, we describe our data set and the construction of regression variables. Section 5 documents empirical results on the impact of short selling on M&A quality. Section 6 outlines limitations of this paper and points out avenues of future research. Finally, section 7 concludes this study.

2. Related Literature

This paper investigates if short selling is an effective governance mechanism that improves M&A quality. Our review of prior literature accounts for the novelty of this link by following a two-step approach. First, we survey the role of governance as critical determinant of M&A outcomes. Secondly, the review elaborates on the disciplining force exerted by short sellers. Finally, we establish a connection between the two research fields based on recent academic contributions.

2.1 Corporate Governance and Disciplining by Trade

It is widely recognized that corporate governance substantially affects shareholder wealth (e.g. Bebchuk et al. 2008). The body of research that has accumulated on governance related questions is both extensive and interdisciplinary (Bebchuk and Weisbach 2010).

Within the field of corporate governance, two strands of empirical work are of particular interest to this study. First, our analysis relates to M&A, one of the most decisive categories of corporate activity. Comprehensive research investigates the disciplining force of governance mechanisms in the context of mergers & acquisitions. The second strand relates to the disciplining effect of financial markets on managers, a field that has recently experienced renewed interest.

2.1.1 The Impact of Corporate Governance on Firm Value and M&A Quality

M&As rank among the strategically most decisive corporate activities (Malmendier and Tate 2005). At the same time, acquisitions have the potential to aggravate the agency conflict between shareholders and managers inherent in the organizational setup (Jensen and Meckling 1976). There is widespread recognition that managers might undertake inefficient projects to realize private benefits (Gompers et al. 2003), a phenomenon captured by the concept of "empire building" (Jensen 1986). Morck et al. (1990) substantiate this notion by identifying a set of acquisition types that

yield major benefits to managers but hurt shareholders, e.g. diversifying acquisitions. The potentially resulting value destruction is especially severe if a manager is entrenched and cannot be removed easily. Corporate governance accounts for this conflict and proposes countermeasures. By employing governance rules, shareholders ensure that managers act in their best interest and reduce agency costs resulting from the separation of management and finance (Edmans and Manso 2010). Furthermore, Shleifer and Vishny (1997) propose that corporate governance is concerned with the mechanisms that suppliers of financial resources use to receive a return on their investment from the firm’s managing party.

In a much regarded series of papers, Gompers et al. (2003), Bebchuk et al. (2008), and Bebchuk and Cohen (2005) systematically analyze the link of corporate governance to firm value and returns. Their research contributions find a positive association of less entrenched managers, and thereby stronger corporate governance structures, to higher firm value realizations and increased abnormal returns. Section 5.2 discusses key elements of this series of academic work.

Building on this evidence, Masulis et al. (2007) establish a link between corporate governance, managerial entrenchment, and M&A quality. Their study finds that acquirers protected by more anti-takeover provisions realize lower abnormal takeover announcement returns. This key finding suggests that corporate governance plays an important role for the quality of M&A decisions and thereby sets the foundation for our study.

Given the substantial shareholder wealth implications of mergers & acquisitions, it is of practical importance to understand which factors drive successful transaction outcomes. We contribute to the literature by investigating if the newly identified governance mechanism of short selling has a similar effect on M&A quality as internal governance mechanisms that have previously been identified to drive profitable acquisitions. Recent literature suggests that short sellers discipline corporate management in various context. Our study examines if this also applies to the field of M&A.

2.1.2 Disciplining by Trade as Alternative to Shareholder Activism

Financial theory suggests that market mechanisms play an important role in monitoring management (e.g. Holmström and Tirole 1993). Recently, blockholders and the tactics they use to discipline management experienced renewed interest. Traditionally, it was argued that a high level of concentrated ownership is desirable for effective corporate governance. In particular, such a structure is often believed to enhance value because it provides a large enough incentive to actively engage

in costly monitoring and to take corrective action (e.g. Kahn and Winton 1998; Admati et al. 1994). Only with a substantial ownership stake, an activist realizes sizable gains from costly monitoring efforts, providing a remedy to the classical "free rider" problem (Admati and Pfleiderer 2009). As an example, actions taken by hedge funds to enhance firm value are perceived an important source of corporate governance (e.g. Kahan and Rock 2007; Brav et al. 2008).

However, in reality many firms do not have large blockholders and shares are dispersed among numerous small investors (Faccio and Lang 2002). The free rider hypothesis implies that such ownership structures should reduce efficiency in monitoring and in correcting management. Motivated by this apparent contradiction, Admati and Pfleiderer (2009), Edmans (2009), and Edmans and Manso (2010) conduct a series of research. They find that as direct intervention becomes less efficient given multiple small blockholders, another governance mechanism becomes more important: trading. Instead of intervening directly in case a manager does not operate in the interest of shareholders, i.e. extracts private benefits or makes value-destructive acquisitions, blockholders can act on this information by exiting and selling their shares to liquidity traders. This reaction to shareholder dissatisfaction is commonly referred to as following the "Wall Street Walk". Two competing viewpoints analyze the governance implications of the blockholder exit channel. Traditional research argues that high market liquidity undermines corporate governance because it becomes easier for large shareholder to sell their shares, impairing the incentive to actively improve governance quality and intensifying the managerial myopia problem (Bhide 1993). Recent literature, however, suggests that increased trading might exert beneficial effects on corporate governance and constitutes a form of activism by itself (Admati and Pfleiderer 2009). By selling shares in response to value destructive managerial behaviour, blockholders can negatively influence stock prices. These trades expose private information acquired by insiders and move prices towards their fundamental value. Furthermore, if managerial compensation is tied to equity value, trading enables shareholders to efficiently punish poor executive performance. Edmans (2009) shows that the threat of informed trades by blockholders disciplines managers to invest for long-run growth. In related work, Edmans and Manso (2010) establish that more blockholder trading increases the informativeness of prices and in turn prompts higher managerial effort. These insights are further substantiated by McCahery et al. (2016) and Chen et al. (2007) who provide direct evidence of governance through trading and document that the threat of exit is the primary instrument used by institutional investors to discipline management.

We contribute to this strand of research by investigating if governance by trade also disciplines management if the threat of exit is not exerted by insiders but by external investors in the form of short sellers.

2.2 Short Selling Implications on Market Quality and Managerial Discipline

2.2.1 The Impact of Short Selling on Market Quality

Short selling is a controversial activity. Management, financial institutions, governments, and investors continuously contribute to a heated debate.

Arguing in favor of short selling, it is widely accepted that these trades increase market efficiency (e.g. Saffi and Sigurdsson 2010; Karpoff and Lou 2010; Boehmer and Wu 2012). If unrestricted, short selling helps to incorporate less optimistic views which balance the opinions of bullish market participants and increases the informativeness of stock prices (Diamond and Verrecchia 1987). Evidence on short selling constraints, for instance in the form of pre-borrowing agreements (comp. Jain et al. 2013), underlines the importance of bearish trading for market quality. In particular, research on short selling bans and restrictive policies across different markets¹ documents that restrictions to short investing impair metrics of market efficiency (e.g. Beber and Pagano 2013). Supporting this critical notion, then S.E.C. regulator Christopher Cox voiced regrets about the U.S. 2008 short selling ban as the costs, specifically in the form of reduced liquidity, had likely outweighed the benefits of the regulation².

Critics of short selling, however, argue that these trades undermine confidence in financial markets. As illustrated by short selling bans following the financial crisis of 2007-2008, governments tend to follow this concern in times of financial turbulence. Goldstein and Guembel (2008) provide evidence in support of short selling critics and find that short investors can exert substantial downward pressure on financial securities and in turn induce managers to focus excessively on short term goals. By design, a short bet is most profitable if the price of the targeted stock decreases strongly. As a result, short sellers are commonly accused of engaging in stock price manipulation (Gerard and Nanda 1993). Finally, also the discussed market quality enhancing dimension of short selling is not undisputed. Among others, Battalio and Schultz (2006) find no strong evidence of enhanced market metrics in their study.

¹A selection of relevant studies includes Ho (1996), Rhee (2003), Billingsley and Kovacs (2011), and Frino et al. (2011)

²Younglai, R. (2008, December 31). SEC chief has regrets over short-selling ban. Reuters. Retrieved from <http://www.reuters.com>

2.2.2 Short Selling as a Governance Mechanism

Standard short selling literature primarily focuses on the documented effect of short sales on market quality and returns³. However, reducing short selling to this area in isolation fails to capture the information gathering dimension of the trading strategy. As short sellers pursue a costly approach, they go to great lengths to produce and process information about their targets (He and Tian 2014). Diamond and Verrecchia (1987) further point out that short sellers do not sell shares for liquidity reasons which implies that related trades are rarely uninformed. In Boehmer et al. (2008), stock performance decreases in short selling intensity, providing evidence that short investors possess an information advantage. It is therefore conceivable that short sellers, similar to blockholders, trade on private information. This understanding motivates a strand of research that investigates how short sellers identify and blow the whistle on unfavorable announcements and corporate misconduct. In fact, different studies show that short sellers predict write-down announcements (Liu et al. 2012) and credit downgrades (Henry et al. 2015), punish high accruals (Hirshleifer et al. 2011), and identify financial misconduct significantly before the misrepresentations become publicly revealed (Karpoff and Lou 2010).

These findings demonstrate the effectiveness of short sellers in unveiling corporate information. Therefore, it is no surprise that managers pay critical attention to this group of investors and often feel severely scrutinized. After the S.E.C. removed short selling constraints in 2008, 85% of board members questioned by a NYSE Euronext survey argued in favor of reinstituting the previous constraints "as soon as practical" (Opinion Research Corporation 2008). This suggests that managers are aware of short selling and the associated effect on their firms. At the same time, however, there is little empirical evidence on the potential impact of short sales on actual managerial behavior and corporate decision making. A study by Gilchrist et al. (2005) constitutes an exception. Their paper demonstrates that shares are overvalued when short selling constraints are in place, artificially reducing the cost of capital of affected firms and resulting in distorted financial decisions as well as over-investment.

Building on the suggested connection between short selling, financial markets, and corporate decisions, two contemporaneous papers establish a direct link between

³An extensive but not exhaustive list includes Aitken et al. (1998), Ali and Trombley (2006), Allen and Postlewaite (1993), Asquith and Meulbroek (1996), Asquith, Pathak, and Ritter (2005), Boehmer, Jones, and Zhang (2008), Boehmer, Jordan, and Huszar (2010), Bris, Goetzmann, and Zhu (2007), Chen, Hong, and Stein (2002), Cohen et al. (2007), Cohen, Diether, and Malloy (2007), Dechow et al. (2001), Desai et al. (2002), Diether, Lee, and Werner (2008), Figlewski and Webb (1993), Gerard and Nanda (1993), Greenwood (2009), Harrison and Kreps (1978), Henry and Koski (2010), Hong and Stein (2003), Jones and Lamont (2002), Lamont and Thaler (2003), Miller (1977), Ofek and Richardson (2003), Ofek, Richardson, and Whitelaw (2004), Scheinkman and Xiong (2003), Senchack and Starks (1993).

short selling and corporate governance. Using a controlled experiment (pilot program of Regulation SHO, comp. section 5.3.1) that removes constraints on short selling for a subset of firms, De Angelis et al. (2013) find that downside risk increases for treated firms. As a consequence, affected companies reduce managerial protection by adopting more antitaker provisions. In a survey across 23 developed countries, Massa et al. (2013) document that internal governance improves when short selling activity increases. Because of information gathered by short sellers, negative news will faster be incorporated into stock prices. As a consequence, all investors, including those with a short-term horizon, become more motivated to invest into governance, resulting in an overall increase in managerial discipline.

This paper further elaborates on the disciplining effect of short sellers on corporate decisions focusing on the dimension of M&A quality. We expect that higher short interest on a firm's stock exerts similar effects as the threat of exit by a blockholder. Because of their inside knowledge, discipline exerted by blockholders is generally categorized an internal mechanism of corporate governance. In our study, we investigate if governance by trade is also effective in disciplining management if exerted by external market participants, namely in the form of short sellers.

3. Hypotheses

Three hypotheses structure the remainder of this paper. Hypothesis 1 constitutes the central research question of this study. Substantiating our findings, Hypothesis 2 and 3 motivate two further analyses in more specific contexts.

H1. *Short selling is an effective governance mechanism that improves the quality of M&A.*

Our main research question relates to the recently proposed governance function of short selling. In general, more efficient corporate governance is associated with higher firm value and better returns. Masulis et al. (2007) establish that better governed firms also engage in higher quality M&A. Extending on these insights, we put forward the hypothesis that firms with higher short interest make better acquisitions as measured by abnormal announcement returns.

H2. *The disciplining force of short selling exceeds the established impact of internal governance mechanisms in the context of M&A.*

The presence of certain critical governance provisions, summarized by the E-Index, and a firm's board structure has important implications for M&A quality. It is our aim to test how these internal metrics compare to the governance exerted by financial markets in the form of short selling. In order to put forward a testable hypothesis, we formulate the expectation that the explanatory power of short selling on M&A quality exceeds that of these internal governance provisions.

H3. *Regulatory constraints impair the governance effect of short selling on M&A.*

Our third hypothesis explores the impact of policy making on short selling. In 2005, the S.E.C. implemented a regulatory experiment that represented an exogenously induced variation of short selling costs for a random subset of pilot firms. We hypothesize that treated firms experience more scrutiny by short sellers and that M&A quality increases as a consequence.

4. Data Description and Variables Construction

4.1 Research Data

We extract M&A transaction data from the SDC Platinum Financial Securities data base by Thomson Reuters. The sample spans 15 years from 2002 to 2016. Year 2002 constitutes the first year after the Dotcom Bubble and 2016 is the last year for which all required data items are available.

The sample construction of this study requires information from a substantial number of data bases. In a sequential procedure, we merge data sources involving transaction data, stock information, short selling information, and firm fundamentals. For subsequent analyses, we also integrate data on CEO wealth, board characteristics, institutional shareholding, firm governance, as well as a regulatory experiment. In the process, we create an extensive data foundation for this study. Used data bases are listed in the appendix in table A.1.

All transactions included in the initial sample meet the following six criteria:

1. The transaction is completed.
2. The acquirer owned less than 50% of the target's equity before the transaction and 100% afterwards.
3. The transaction size is at least \$1 million and 1% of the bidder's market value of equity, as measured 11 trading days prior to deal announcement.
4. The acquirer is covered on the monthly Compustat Supplemental Short Interest File during the twelve months preceding the deal announcement.
5. The acquirer has annual financial statements information available on Compustat for the fiscal year prior to deal announcement.
6. Daily stock returns for the acquirer's main shares are available by the Center for Research in Security Prices (CRSP) from 210 days prior to acquisition announcement until two days afterwards.

Accounting for these characteristics, our final sample includes 9,386 U.S. mergers & acquisitions by 3,401 acquirers.

Year	No. Acqu.	Perc. of Sample	Mean Acquirer Mkt. Val. of Equity (\$mil), Median	Mean Deal Value (\$mil), Median	Mean Rel. Size, Median
2002	347	3.7	5,060	451	0.21
			967	91	0.07
2003	365	3.9	4,409	463	0.18
			1,099	97	0.07
2004	636	6.8	2,710	430	0.23
			757	72	0.08
2005	885	9.4	3,985	560	0.21
			660	53	0.08
2006	910	9.7	4,069	428	0.22
			853	65	0.08
2007	845	9.0	5,049	431	0.23
			895	64	0.08
2008	557	5.9	3,853	387	0.23
			665	57	0.09
2009	413	4.4	5,549	829	0.23
			669	54	0.08
2010	554	5.9	6,170	495	0.19
			1,067	92	0.08
2011	568	6.1	4,234	545	0.21
			1,054	92	0.08
2012	664	7.1	3,363	354	0.21
			896	73	0.07
2013	619	6.6	4,070	418	0.21
			1,210	90	0.08
2014	756	8.1	4,842	620	0.21
			1,073	100	0.08
2015	702	7.5	7,029	1,116	0.27
			1,278	105	0.09
2016	565	6.0	8,710	870	0.24
			1,531	135	0.10
Total	9,386	100.0	4,807	557	0.22
			942	79	0.08

The sample consists of 9,386 U.S. mergers and acquisitions from 2002 to 2016 covered by SDC Platinum. Variable definitions are listed in the Appendix.

Table 4.1: Sample Distribution by Announcement Years

Table 4.1 lists the yearly number of M&A deals for our observation period. M&A activity increased steadily from 2002 onward and reached its peak with 910 transactions in 2006, the year before the financial crisis. In 2009, the number of transactions decreased substantially but steadily recovered in the following years. The table also states yearly means and medians for acquirer market values of equity, deal values, and relative sizes. Acquirer market values indicate a trend towards larger buyers starting in 2012. Possible reasons for this development could be a bullish stock market and larger acquirers being more involved in M&A. For relative deal sizes, mean values are consistently higher than medians, documenting a strong effect of large acquisitions.

4.2 Variables Construction

The following sections elaborate on the construction of three categories of regression variables. First, acquirers' announcement period cumulative abnormal returns (CAR) serve as the dependent variable throughout this paper. Secondly, short interest on an acquirer's stock is the main variable of interest. Thirdly, a set of other determinants of bidder CARs provides an extensive range of control variables. Summary statistics for all discussed variables are presented in table 4.3. Observed values are in line with those found in previous studies (e.g. Moeller et al. 2004; Masulis et al. 2007; He and Tian 2014).

4.2.1 Bidder Cumulative Abnormal Return

Our dependent variable is the acquirer five-day cumulative abnormal return (CAR) that captures the announcement effect of an acquisition. The market reaction upon deal announcement proxies for the quality of an acquisition from a shareholder value perspective. Abnormal returns for the acquirer's stock are calculated using the market model which is calibrated 210 to 11 trading days prior to the announcement date as reported by SDC Platinum. In case an acquirer trades under different stock classes, we use the security denoted as "primary stock" by the CRSP/Compustat Linking Table. The model parameters for a given stock ($\hat{\alpha}$ and $\hat{\beta}$) are estimated using the market model regression, with the S&P 500 as the market return¹:

$$R_{i,t} = \alpha_i + \beta_i R_{M,t} + \epsilon_{i,t} \quad (4.1)$$

¹Instead of the S&P 500, the CRSP value-weighted return could be used to capture the market return. Please note that the correlation between these two indices exceeds 99% for our observation period, rendering the choice of the benchmark index uncritical.

CARs are calculated as the sum of abnormal returns over a five-day event period starting two days prior to the announcement date and ending two days afterwards:

$$CAR_i(-2, +2) = \sum_{\tau=-2}^{+2} R_{i,\tau} - \hat{\alpha}_i - \hat{\beta}_i R_{m,\tau} \quad (4.2)$$

Without adding too much noise to the data, using a five-day event window addresses potential announcement date inaccuracies in the SDC Platinum data base (see Fuller et al. 2002), prior leakage of deal information, and possible market time lags in incorporating the news.

Table 4.2 provides an overview of mean and median abnormal acquirer returns depending on consideration method and target ownership status. Cash deals are approximately twice as common as stock deals. A substantial fraction of targets in our sample are privately owned, followed by subsidiary firms and relatively few publicly listed companies. The average CAR for the entire sample is positive at 1.07%. Our sample confirms key assumptions of the Pecking Order Theory (Myers and Majluf 1984): Cash deals are perceived more favorably by the market than deals in which stocks are the payment method of choice. The acquisition of subsidiary targets is associated with the highest average CAR of 1.87%, followed by a 1.05% return for privately held firms. Deals involving public targets are related to the lowest average CAR of -0.57%. These observations confirm those of prior studies (e.g. Moeller et al. 2004 and Masulis et al. 2007). All mean CARs for the reported subgroups are different from zero at a 1% significance level.

		Whole Sample	All Cash	Some Stock	Public Target	Private Target	Subsidiary Target
CAR	Mean	1.07***	1.01***	0.89***	-0.57***	1.05***	1.87***
	Median	0.44	0.52	0.11	-0.49	0.50	0.83
No. Obs.		9,386	4,347	2,257	1,498	4,642	3,211

Remark: *, **, and *** indicate statistical significance for two-sided t-tests at the 10%, 5%, and 1% level, respectively.

Table 4.2: CARs and Payment Method / Ownership Status

4.2.2 Short Interest

We obtain information on short interest from the Compustat Supplemental Short Interest File. The file provides the number of shares held short (denoted as "Short Position" in equation 4.3) for a given security and usually provides one entry per month. For the construction of the short interest variable, we use the shares shorted

on the last business day on or before the 15th of each month for the last twelve months preceding the deal announcement. For each data point, we match the respective number of shares outstanding from CRSP. Following standard literature, we calculate the short interest variable by dividing the sum of the twelve mid-month short interest positions by the sum of the twelve corresponding values of total shares outstanding (Grullon et al. 2015; Karpoff and Lou 2010):

$$ShortInterest_{i,t} = \frac{\sum_{m=-12}^{-1} ShortPosition_m}{\sum_{m=-12}^{-1} SharesOutstanding_m} \quad (4.3)$$

The resulting values capture the level of short interest over a medium term horizon. This method has the benefit of smoothing out the occasionally high volatility in short positions while still providing a stable estimator for the level of scrutiny exerted by short sellers for a given firm at a certain point in time.

4.2.3 Other Determinants of Acquirer Return

In order to account for other potential determinants of acquirer returns, we control for four additional groups of variables that are standard to the literature (comp. among others: Harford et al. 2012; Masulis et al. 2007; Moeller et al. 2004; Travlos 1987). These groups include Bidder Characteristics, Deal Characteristics, Board Structure & CEO Wealth, and Other Influencing Factors. Section 5 adds these covariates to the regression in a sequential procedure. Detailed formulas for the derivation of all variables are stated in table A.2 of the appendix.

Bidder Characteristics

Acquirer characteristics can impact both the degree to which a firm engages in M&A activity as well as how these transactions are perceived by the market. Following previous literature, we control for bidders' Total Assets, Tobin's q, Leverage, and Stock Price Runup. Most variables are calculated as of the fiscal year end prior to deal announcement. The variable Stock Price Runup is the only exception and measured using the 200 day estimation window of the market model.

Total Assets commonly exhibit a negative relation to acquirer returns. Humphery-Jenner and Powell (2014) support this notion using a large sample across 45 countries. Roll (1986) argues that managerial hubris is more common in large firms, resulting in higher takeover premia and lower financial synergies associated with a deal. Moreover, Moeller et al. (2004) suggest that larger firms are more difficult to acquire, isolating managers from the market of corporate control. Accordingly, we expect the coefficient for Total Assets to be negative. In order to account for the large dispersion in acquirer sizes in our sample (comp. table 4.3), we use the log

transformation of Total Assets to facilitate a more realistic comparison for acquirers of different asset sizes (comp. Harford et al. 2012).

Tobin's q proxies for the market valuation of a company relative to its book assets. With respect to M&A announcement returns, prior research on the effect of Tobin's q documents ambiguous implications. Lang et al. (1991) and Servaes (1991) find that firms with high Tobin's q exhibit better CARs for tender offer acquisitions and when the target is a public firm. On the contrary, Dong et al. (2006) show that Tobin's q proxies for overvaluation. This would suggest that takeovers by firms with high Tobin's q are a bad signal to the market, particularly if the bidder funds the transaction with equity. Overall, we have no strong expectation on the coefficient of this variable.

Leverage: Extending on Maloney et al. (1993) and Moeller et al. (2004), we expect financial leverage to have a positive overall effect on announcement returns. High levels of debt commonly go along with lower free cash flows and lower managerial discretion, leading to more discipline. As a result, acquisitions are less likely to be driven by private benefits that hurt shareholder wealth. Moreover, high leverage increases the risk of financial distress, motivating management to avoid any wasteful spending to optimize their own job security (comp. Gilson 1989, 1990). On the contrary, Garvey and Hanka (1999) argue that leverage increases a firm's takeover protection and thus isolates managers from removal through the market for corporate control.

Stock Price Runup: In line with Masulis et al. (2007), we include stock price runup as an additional covariate. The item captures the buy-and-hold performance of the acquirer stock relative to the S&P 500 during the 200-days of the market model estimation period (day -210 to day -11). Modeled this way, the variable enables us to account for the potential effect of an outstanding recent performance of a bidder's stock. If such an outperformance is present, overoptimistic investor sentiment might be the result, tempting managers to engage in less diligent M&A activity. We therefore expect the variable coefficient to be negative.

Deal Characteristics

We account for deal characteristics that are critical to announcement returns and control for Relative Deal Size, High Tech Industry affiliation, Diversifying Acquisitions, Purchase Consideration Method, and Previous Ownership Structure of the target.

Relative Size: Prior research documents that relative size matters for bidder announcement returns. Asquith et al. (1983) and Moeller et al. (2004) find that for most acquirers, announcement returns increase in targets that are larger relative to their own size. We therefore anticipate a positive regression coefficient.

High Tech is a dummy variable with a value of one if both the bidder and the target primarily operate in a high tech sector (comp. Loughran and Ritter 2004). As in Masulis et al. (2007), we interact the High Tech variable with Relative Size. A successful post-merger integration is believed to be more difficult for large tech companies based on challenges related to the dimensions of intellectual property and human capital. These factors can be adversely affected by increased employee turnover often resulting from an integration. This rationale suggests negative coefficients for the High Tech variable and the interaction term.

Diversifying Acquisition is a binary variable that takes a value of one if buyer and target do not operate in the same industry. Consistent with previous empirical work, we adopt the 48 industry classification introduced by Fama and French (1997) and use targets' and bidders' primary SIC codes as reported by SDC Platinum. Diversifying acquisitions are commonly perceived as destructive to shareholder wealth (comp. Morck et al. 1990). Finance theory suggests that shareholders can diversify on their own while managers may use diversification for the purpose of personal gains. These gains include increased job security if a CEO buys a target that fits her own strengths, reduced firm risk (Amihud and Lev 1981), and personal entrenchment (Shleifer and Vishny 1989). Even though some recent papers find that a diversification discount does not necessarily apply in every setting (Villalonga 2004a, 2004b; Campa and Kedia 2002), we expect a negative coefficient for this variable.

Payment Method & Target Ownership: Finally, purchase consideration and previous target ownership are recognized to affect announcement returns. It is widely accepted that acquisitions paid for with shares are perceived more critically by the market because of negative signaling effects associated with the implied equity issue (Myers and Majluf 1984). Among others, Travlos (1987) demonstrates that takeovers generate lower announcement returns when they are paid for with shares. At the same time, also the ownership status of the target matters. Moeller et al. (2004) show that announcement returns of private and subsidiary targets exceed those of public ones and relate this to the liquidity discount harvested by the buyer. Finally, purchase consideration and ownership status matter in interaction. For instance, Chang (1998) and Fuller et al. (2002) show that the market perceives stock consideration more positively when it is used for the acquisition of non-public targets. In these cases, the target's ownership is often concentrated and the transaction creates a new shareholder in the acquiring firm that is large enough to exert a monitoring role. In order to capture the used payment method, we create the dummy variables "Cash" and "Stock" that equal one if the takeover is fully cash-financed and if the deal is at least partly stock-financed, respectively. Please note that data from SDC Platinum also includes the consideration categories "Other" and "Unknown". If an observation falls into these categories, the "Cash" and "Stock"

variables receive a value of zero. We account for previous target ownership by introducing the dummy variables "Public", "Private" and "Subsidiary" which take on a value of one depending on the respective prior owner. In some cases, SDC Platinum also reports the ownership categories "J.V." and "Govt.". In these rare cases, all three ownership dummies equal zero. In order to fully capture the interactive effects of purchase consideration and ownership structure, we follow Masulis et al. (2007) and combine the two sets of variables, resulting in six interaction terms. We exclude the "Stock x Subs." variable from all regressions to avoid perfect multicollinearity.

Board Structure and CEO Wealth

The structure of a company's leadership is another factor impacting how markets respond to M&A announcements. We control for CEO/Chairman Duality, Board Size, Board Independence, and CEO Wealth-Performance Sensitivity. Incorporating these variables, we account for the design of an acquiring firm's board and the top executive's financial stake in the firm. All data items are extracted as of the fiscal year end preceding each acquisition.

CEO/Chairman Duality, Board Size, and Board Independence influence how effectively a firm's board operates. The variables are accessed from Institutional Shareholder Services (ISS). Because of a change in ownership, the data base has a break point between 2006 and 2007. Even though the data before and after this break is retrieved from separate sources, we find that the structure of the data is consistent enough to be used in combination.

CEO/Chairman Duality is a binary variable taking a value of one if a Chief Executive Officer also serves as the Chairman of the Board. Empirical evidence suggests that CEOs with a dual mandate obtain a higher compensation (Core et al. 1999) and are less likely to lose their jobs in times of poor firm performance (Goyal and Park 2002). It is therefore that dual mandate executives are perceived to be more entrenched and can afford to be less diligent in M&A decisions. Thus, we expect a negative coefficient in the regression.

Board Size: Various studies show that larger boards have an adverse impact on corporate performance. Yermack (1996) and Guest (2009) find that Tobin's q, profitability ratios, and share returns decrease as company boards grow. These effects are assumed to result from less effective communication and a more complex decision making process. The Board Size variable includes the number of members on the acquirer's board in the regression and is expected to have a negative coefficient.

Board Independence measures the percentage of unaffiliated directors on the acquirer's board. ISS defines independence as "no material² connection to the company

²ISS defines *material* as: "a standard of relationship (financial, personal or otherwise) that a reasonable person might conclude could potentially influence one's objectivity in the boardroom

other than the board seat”. The impact of board independence on firm performance is subject to a controversial debate. The dominant public opinion favors independent boards, a view reflected in the long-term trend towards more outside directors in U.S. corporations (Bhagat and Black 1999). Empirical research, however, falls short to confirm a clear link between board independence and firm performance (Hermalin and Weisbach 2003; Bhagat and Black 2001). This also applies to the link between announcement returns and board independence. While Byrd and Hickman (1992) establish a positive relationship, Masulis et al. (2007) find no significant results. Taken together, we have no clear expectation for the regression coefficient.

CEO Wealth-Performance Sensitivity: CEO Equity ownership intends to align the financial interests of the chief executive with those of shareholders. CEOs with substantial equity holdings directly bear negative effects of wasteful M&A decisions via the associated stock price decrease. This effect directly diminishes a CEO’s personal equity wealth and is believed to be an effective countermeasure to empire building. Lewellen et al. (1985) substantiate this notion and find that bidder returns are positively related to managerial stock ownership. CEO Wealth-Performance Sensitivity captures the concept of CEO equity exposure, measuring the dollar change in a chief executive’s wealth for a 100 percentage point increase in firm value, divided by the annual cash compensation. Being scaled by annual compensation, this metric has the benefit of allowing for comparisons between firms of different sizes and compensation standards (Edmans et al. 2008). We access wealth sensitivity data from the website of Alex Edmans who co-publishes the measure. It is our expectation that CEOs whose wealth is more sensitive to the company’s stock engage in M&A more carefully and therefore anticipate a positive regression coefficient.

Other Influencing Factors

The final control variables address Maximal Institutional Ownership and the competitiveness of the acquirer’s industry.

Maximal Institutional Ownership: As discussed in Section 2.1.2, large institutional shareholders are often considered beneficial to a firm’s governance. These actors tend to be skilled monitors and have a large enough incentive to engage in potentially costly shareholder activism to discipline management. The Maximum Institutional Ownership variable states the fractional equity stake of the acquirer’s largest institutional shareholder if this value is higher than 5%, and 0 otherwise. We use the Thomson Reuters Institutional Holdings data base to obtain the most recent ownership information of the respective acquirer and match it to each observation. Building on previous empirical work, we expect a positive coefficient.

in a manner that would have a meaningful impact on an individual’s ability to satisfy requisite fiduciary standards on behalf of shareholders”.

Product market competition is commonly argued to constitute one of the most important factors preventing managerial inefficiency, as competitive environments go along with small margins of safety and the quick exploitation of ineffective behaviour by rivals (Shleifer and Vishny 1997; Hart 1983). In line with Gillan et al. (2003), the following two variables address the concept of competitive structure in the regressions.

Competitive Industry proxies for the sales fragmentation of an acquirer’s industry, as calculated using the Herfindahl Index. To construct the index, we use all available Compustat firms to calculate the sum of squared relative firm sales for each Fama French industry and year. It is assumed that industries with a higher fragmentation of sales (i.e. lower Herfindahl index values) are characterized by greater competition. Competitive Industry is a dummy variable that equals one if the acquirer’s industry is in the bottom quartile of the 48 Fama French industries ranked by Herfindahl index values.

Unique Industry: In order to capture the uniqueness of an acquirer’s industry, all available Compustat firms are used to calculate the median ratio of Selling Expenses over Sales for each Fama French industry and year. According to Titman and Wessels (1988) a higher SE/Sales ratio corresponds to more uniqueness which is in turn related to lower competition. The variable takes a value of one if the acquirer operates in an industry in the top quartile of the 48 Fama French industries ranked by Selling Expenses over Sales.

We expect firms in more competitive and less unique industries to make better acquisitions, resulting in positive and negative coefficients for the variables Competitive Industry and Unique Industry, respectively.

Variable	Mean	Std. Dev.	Q1	Median	Q3
CAR and Short Interest					
CAR	1.07	7.75	-2.23	0.44	3.59
Short Interest	0.04	0.04	0.01	0.02	0.05
Bidder Characteristics					
Total Assets (\$mil)	5,806.00	16,338.26	352.60	1,098.00	3,523.00
Market Value of Equity (\$mil)	4,807.00	17,394.30	314.20	941.80	2,815.00
Tobin's Q	1.77	1.00	1.14	1.45	2.01
Leverage	0.18	0.16	0.04	0.14	0.28
Stock Price Runup	0.09	0.35	-0.11	0.04	0.23
Deal Characteristics					
Public (Dummy)	0.16	0.37	0.00	0.00	0.00
Private (Dummy)	0.49	0.50	0.00	0.00	1.00
Subsidiary (Dummy)	0.34	0.47	0.00	0.00	1.00
All Cash Deal (Dummy)	0.46	0.50	0.00	0.00	1.00
Some Stock Deal (Dummy)	0.24	0.43	0.00	0.00	0.00
Diversifying Acqu. (Dummy)	0.46	0.50	0.00	0.00	1.00
High Tech Deal (Dummy)	0.17	0.37	0.00	0.00	0.00
Relative Size	0.22	0.39	0.03	0.08	0.22
Board Structure and CEO Wealth					
CEO Wealth Sensitivity	17.00	42.13	2.88	5.88	12.48
CEO/Chairman Duality (Dummy)	0.48	0.50	0.00	0.00	1.00
Board Size	9.23	2.37	8.00	9.00	11.00
Indep. Board Members (%)	0.76	0.12	0.67	0.78	0.88
Other Influencing Factors					
Competitive Industry (Dummy)	0.59	0.49	0.00	1.00	1.00
Unique Industry (Dummy)	0.36	0.48	0.00	0.00	1.00
Max. Inst. Ownership (>5%)	0.08	0.05	0.06	0.08	0.11

The sample consists of 9,386 U.S. mergers and acquisitions from 2002 to 2016. Variable definitions are listed in the Appendix.

Table 4.3: Summary Statistics - Full Sample

4.3 Outliers and Data Adjustments

We exclude five transactions with extreme CARs of more than 100% from our original sample. These observations are associated to acquirers with very low market capitalization and immense relative transaction sizes. For transparency, we report these observations in table A.3 of the appendix.

In order to mitigate the impact of outliers in the data, we winsorize all non-binary control variables at the 1st and 99th percentiles.

The variables of interest in this paper (Short Interest, E-Index, Staggered Boards) are not subject to strong outliers and remain unadjusted.

5. Empirical Results

5.1 Short Interest

The following subsections investigate the main hypothesis of this paper. In various regressional setups, we analyze how short interest influences acquirer cumulative abnormal returns around the announcement date of an acquisition. We start with a regression of 9,324 transactions and involve bidder and deal characteristics as control variables. In a sequential procedure, covariates will be added and discussed. In all regressions, heteroskedasticity robust standard errors are clustered on the acquirer level and reported in parentheses. For brevity, year fixed effects coefficients remain unreported when included in the regression.

5.1.1 Baseline Regressions

Table 5.1 reports the essential regression setup of this study. All three model specifications control for the full set of bidder and deal characteristics discussed in section 4.2. Regression (1) does not include year fixed effects and the competitive setup in the acquirer’s industry. Regression (2) does not account for competitive structure, while regression (3) controls for both of these factors.

The regression estimates for the Short Interest variable in the three models exhibit stable coefficients between 4.62% and 4.84%. All coefficients have t-statistics of about 2.4, corresponding to the 5% significance level. The results support our hypothesis that Short Interest has a material disciplining effect in the context of M&A. Therefore, *ceteris paribus*, short selling seems to work as a governance mechanism. The coefficient of model (3) predicts that a ten percentage point increase in Short Interest is associated with 0.47% higher announcement returns. This effect suggests a substantial effect of short selling activity on shareholder value in the field of M&A: for an acquirer with an average market cap in our sample, a one standard deviation increase in Short Interest enhances shareholder wealth upon deal announcement by \$10.1 million¹.

For the control variables included in the regression set, we find that both magni-

¹Average Market Cap: \$4.8 bn.; Std. Short Interest: 0.04438; Regression Coefficient: 0.04735

	Dependent Variable: CAR (in %)		
	(1)	(2)	(3)
Short Interest 12M	4.624** (1.926)	4.838** (1.987)	4.735** (1.990)
log(Total Assets)	-0.363*** (0.054)	-0.374*** (0.054)	-0.379*** (0.054)
Tobin's Q	-0.327*** (0.112)	-0.320*** (0.112)	-0.324*** (0.112)
Leverage	-0.041 (0.626)	-0.137 (0.634)	0.049 (0.657)
Stock Price Runup	-1.119*** (0.301)	-1.127*** (0.307)	-1.124*** (0.307)
Rel. Size	3.377*** (0.497)	3.378*** (0.496)	3.358*** (0.500)
High Tech	-0.590** (0.258)	-0.574** (0.260)	-0.672** (0.284)
High Tech x Rel. Size	-2.050*** (0.766)	-2.041*** (0.765)	-2.023*** (0.764)
Div. Acqu.	-0.792*** (0.168)	-0.794*** (0.169)	-0.778*** (0.169)
Stock x Public	-3.921*** (0.336)	-3.944*** (0.342)	-3.949*** (0.351)
Cash x Public	-0.158 (0.312)	-0.156 (0.313)	-0.186 (0.316)
Stock x Private	-0.102 (0.335)	-0.118 (0.338)	-0.126 (0.343)
Cash x Private	-0.706*** (0.194)	-0.718*** (0.199)	-0.713*** (0.199)
Cash x Subs.	0.083 (0.228)	0.067 (0.230)	0.054 (0.231)
Competitive Ind.			-0.254 (0.173)
Unique Ind.			0.285 (0.213)
Constant	4.437*** (0.525)	4.631*** (0.654)	4.702*** (0.674)
Year Fixed Effects	No	Yes	Yes
Observations	9,324	9,324	9,324
R ²	0.062	0.064	0.065
Adjusted R ²	0.061	0.061	0.062

Notes: *p<0.1; **p<0.05; ***p<0.01

The sample consists of 9,324 U.S. mergers and acquisitions from 2002 to 2016. The dependent variable is the five-day CAR in percentage points. Heteroskedasticity robust standard errors are clustered on the acquirer level and reported in parentheses.

Table 5.1: Reg. - Short Interest

tude and statistical significance are relatively stable across the three models. More specifically, we find that (a) firm size has significant negative effects on announcement returns which is in line with the intuition presented in section 4.2.3. Our results predict that a 100% increase in firm assets is associated with a 0.38 percentage point decrease in bidder returns. Moreover, the regressions show (b) a significant negative coefficient for Tobin's q , suggesting that the hypothesized overvaluation component of the factor dominates in our sample. For (c) Leverage, we find ambiguous non-significant coefficient signs resulting in the conclusion that high levels of debt do not discipline management towards better M&A decisions. (d) The coefficient for Stock Price Runup is negative and highly significant. A ten percentage point stock outperformance compared to the S&P 500 goes along with a 0.11 percentage point decrease in announcement returns. This insight supports the notion that an outstanding recent stock performance may tempt management to engage in less diligent M&A decisions. In line with our expectation, (e) larger relative deal sizes are associated with significantly higher CARs. (f) Both the High Tech variable and the High Tech/Relative Size interaction term are significant and negative, supporting the viewpoint that high tech deals are perceived critically by the market, especially when relative deal sizes are high. With respect to (g) Industry Competition, the coefficient is negative, while the Unique Industry coefficient is positive. Even though these coefficients do not reach the level of statistical significance, these findings are at odds with the general expectation that higher product market competition prompts better M&A decisions and, in turn, announcement returns.

The Payment Method and Ownership Status interaction term coefficients motivate further inferences. Of the six interaction variables accounted for in the regressions, only Stock x Public and Cash x Private yield significant coefficients. Sorting the variables by announcement returns, we find that the most profitable deals are purely cash financed acquisitions of subsidiary targets. As all other included variables exhibit negative coefficients, the omitted Stock x Subsidiary interaction term has the second highest value, followed by Stock x Private, Cash x Public, and Cash x Private. Finally, stock financed public targets receive the least favorable market reaction. In agreement with table 4.2, the variables also reveal that subsidiary deals receive the most positive overall market reaction, followed by transactions involving private and public targets. Stock-financed acquisitions of non-public targets produce ambiguous effects upon announcement. Contrary to Chang (1998) and Fuller et al. (2002), stock deals are not without reservation superior to cash financing in this context, but produce better results for private targets and worse results for subsidiary targets. It is noteworthy that deals in which public targets are acquired using cash exhibit better bidder returns than deals with cash-financed private targets. It is one possible interpretation that the positive signaling effect of cash financing in

public markets exceeds the liquidity discount harvested when buying a privately held company.

Except for the competitive structure in the acquirer industry, our findings on included control variables confirm those of previous studies (e.g. Moeller et al. 2004; Masulis et al. 2007).

5.1.2 CEO Wealth and Board Characteristics

As outlined in section 4.2.3, a firm’s leadership structure can influence announcement returns. Table 5.2 presents a regression set that also accounts for the dimensions of Board Characteristics and CEO Wealth Sensitivity. Regression (1) replicates the third baseline regression of the previous section (see table 5.1) using the new sample which also requires CEO and board data availability (without including CEO and Board Characteristics as control variables). Regression (2) and (3) separately control for Board Structure and CEO Wealth, while Regression (4) controls for all new factors simultaneously. For brevity, payment and ownership interaction terms are suppressed in the output. The additional data requirements for CEO and Board variables reduce the number of observations in our sample to 3,446, 3,499, and 4,773.

The coefficients in the new regression set show that the effect of Short Interest slightly decreases in magnitude, taking on a value of 2.71% in regression (4). For the control variables, we find that coefficients of the initially introduced characteristics mostly remain stable. The newly included variables CEO/Chairman Duality and Board Size are negatively related to bidder returns which is in line with our expectation. Board Independence exhibits a negative coefficient, supporting the notion that more independent boards do not necessarily result in more successful M&A. For CEO Wealth Sensitivity, the regression produces a minimal coefficient which indicates that larger CEO stock holdings do not enhance M&A quality in our sample.

A detailed analysis of the regression results also reveals that coefficients for the Short Interest variable are stable across the different models and not statistically significant in each of the four setups. This finding allows for two critical inferences. First, coefficients are stable both for regressions that include Board and CEO characteristics as control variables and for regression (1) which accounts for none of these factors. This demonstrates that CEO and Board variables do not have a strong effect on the coefficient of interest. Also, none of the new variables exhibits a significant regression coefficient, rendering the dimension of CEO Wealth and Board Characteristics of subordinate importance in our setup. Secondly, contrary to the baseline regressions, the variable of interest becomes non-significant in the new regression set. This observation also applies to model (1) which uses the

same specification as baseline regression three where a significant effect is detected. This insight suggests that the non-significance of the Short Interest variable in this regression set is not driven by the added CEO and Board control variables, but by the reduced and differently composed sample. The requirement of additional CEO and Board data items reduces the number of observations by up to 62%. By design, sample reductions impact statistical significance via often increased standard errors. However, in the given case, also the way in which the sample is reduced matters. Both the ISS Directors data base and the Scaled Wealth-Performance Sensitivity data base, which are used to construct the new data items, primarily cover larger firms. Appendix table A.4 summarizes bidder characteristics for the sample of this subsection. The statistics show that acquirers, albeit in most dimensions comparable to those of section 5.1, are much larger on average, both by market capitalization and total assets. In a later subsection (Section 5.1.4), we document that the effect of short interest on bidder returns is more pronounced for smaller acquirers. This type of bidders is certainly less represented in the sample of this analysis.

	Dependent Variable: CAR (in %)			
	(1)	(2)	(3)	(4)
Short Interest 12M	2.684 (2.485)	2.637 (2.467)	3.081 (2.324)	2.706 (2.498)
log(Total Assets)	-0.392*** (0.073)	-0.356*** (0.087)	-0.327*** (0.065)	-0.372*** (0.089)
Tobin's Q	-0.099 (0.138)	-0.117 (0.137)	-0.157 (0.125)	-0.110 (0.141)
Leverage	-0.774 (0.893)	-0.803 (0.893)	-1.030 (0.785)	-0.871 (0.900)
Stock Price Runup	-1.196** (0.479)	-1.378*** (0.483)	-1.561*** (0.385)	-1.205** (0.487)
Rel. Size	1.880** (0.814)	1.881** (0.812)	2.316*** (0.732)	1.880** (0.815)
High Tech	-1.102*** (0.361)	-1.110*** (0.361)	-0.841*** (0.313)	-1.127*** (0.368)
High Tech x Rel. Size	-2.035 (1.280)	-2.167* (1.300)	-1.721* (1.036)	-2.024 (1.280)
Div. Acqu.	-0.486** (0.208)	-0.485** (0.207)	-0.495*** (0.190)	-0.487** (0.209)
Competitive Ind.	-0.164 (0.208)	-0.164 (0.205)	-0.087 (0.188)	-0.168 (0.208)
Unique Ind.	-0.033 (0.276)	-0.0003 (0.273)	-0.038 (0.252)	-0.022 (0.280)
CEO/Chairman Duality		-0.044 (0.206)		-0.091 (0.208)
Board Size		-0.020 (0.049)		-0.016 (0.049)
Board Indep.		-0.455 (0.831)		-0.461 (0.859)
CEO Wealth Sensitivity			0.001 (0.002)	0.001 (0.003)
Constant	3.389*** (0.873)	3.747*** (0.971)	3.573*** (0.806)	3.759*** (0.982)
Year Fixed Effects	Yes	Yes	Yes	Yes
Payment x Ownersh. Dummies	Yes	Yes	Yes	Yes
Observations	3,446	3,499	4,773	3,446
R ²	0.057	0.058	0.054	0.057
Adjusted R ²	0.049	0.049	0.048	0.048

Notes: *p<0.1; **p<0.05; ***p<0.01

The used samples include 3,446 and 4,773 U.S. mergers and acquisitions from 2002 to 2016. The first regression resembles the specification of baseline regression 3, thereby not controlling for the additional CEO/Board data items. The other regressions account for these variables in different specifications. Interaction terms of payment method and target ownership status are suppressed. Heteroskedasticity robust standard errors are clustered on the acquirer level and reported in parentheses.

Table 5.2: Reg. - Short Interest incl. CEO Wealth and Board Chars.

5.1.3 Institutional Shareholding and Full Regression Set

In a last regression set, we account for the dimension of institutional ownership. Firms with large owners are commonly believed to have a more effective corporate governance structure. Table A.5 (reported in the appendix) includes two regressions that account for the Maximal Institutional Ownership variable. Requiring data for this factor decreases our sample size to 7,638 observations. We find that the Short Interest coefficient remains stable compared to the baseline regressions and significant, now indicating a value of 5.25% in the second specification. For Maximal Institutional Ownership, we find that the variable exhibits a negative effect with a coefficient of -0.45. This effect, albeit insignificant and small in magnitude, stands at odds with our expectation.

To provide a full overview, table A.5 also reports a third regression that includes the full set of covariates used throughout this section. The Short Interest variable remains stable in magnitude but loses statistical significance, in line with the sample reduction discussed in section 5.1.2.

5.1.4 Further Analyses and Sensitivity Checks

In order to better grasp the positive effect of Short Interest on acquirer returns, we investigate how the metric interacts with other determinants of CAR. In separate regressions, we construct interaction terms of Short Interest with all bidder characteristics, the deal characteristics Relative Size and High Tech, as well as the Unique Industry and Competitive Industry regressors. For most variables, we find insignificant interaction coefficients. However, the effect of Short Interest increases in Leverage and Tobin's q at the 10% significance level and decreases in Stock Price Runup at the 5% significance level. Building on these findings, we create sensitivity regressions for the three variables which are reported in tables A.6, A.7, and A.8. While controlling for an extensive set of variables², we separate the sample into two subgroups, splitting the sample by the median of the variable in question.

Investigating the effect of the Short Interest dependent on small/large values of Tobin's q , table A.6 shows that the impact on bidder returns is significant and more pronounced when acquirers belong to the above-median group of this variable. For smaller Tobin's q acquirers, the effect is insignificant. One explanation might be that Tobin's q also proxies for overvaluation. CEOs of potentially overvalued companies that face high levels of short interest are aware that lower quality M&A decisions will quickly be discovered by the bearish group of short sellers. These investors in turn have a particular interest to use the M&A event to communicate the overvaluation to other market participants in order to capitalize on their strategy. With respect to

²Bidder characteristics, deal characteristics, industry competition, and year fixed effects

leverage, table A.7 documents strongly contrasting effects of Short Interest for the two subgroups. For the above-median group, the coefficient is more than four times larger and significant at the 1% level. To the contrary, we find an insignificant and small coefficient for firms with below-median leverage. The finding supports a notion put forward by Kecskés et al. (2012) who find that firms with high short interest have lower credit rankings and are more likely to have their rating downgraded. It is reasonable to assume that the management of these firms also engages in M&A more carefully. Finally, our results on Stock Price Runup (A.8) show that the effect of Short Interest is significant and more than twice as large when the acquirer exhibits a below-median stock performance (relative to the S&P 500) during the 200 day estimation period. We do not find a significant effect for the large runup group. These findings suggest that executives of firms with a poor recent stock track record behave more diligent in the context of high short selling exposure. As they just have experienced the adverse force of critical investor sentiment, it is conceivable that firm managers engage with increased carefulness when a bearish investor group forms up against them.

In extension to Short Interest effects identified using interaction variables, we run a set of further sensitivity checks based on median grouping. We account for small/large acquirer market values of equity (table A.9) and small/large bidder total assets (table A.10). In both cases we find that the effect of Short Interest on CAR is more pronounced for smaller buyers. Stepwise, we increase the relative size threshold to 5% and to 10%. Our results show that the effect clearly increases for larger relative deal sizes (table A.11). Separately, we also exclude banks as well as the years of the financial crisis 2007/08 from our analysis and find that the coefficients remain largely unchanged (A.12). Finally, we measure Short Interest over a three months horizon (instead of twelve months) and find stable, albeit slightly smaller, coefficients (table A.13). For all subgroups, the coefficients of Short Interest on bidder returns remain significant.

Concluding this section, we establish that a positive effect of Short Interest on M&A announcement returns appears to be robust and significant in large sample sizes. This effect is particularly pronounced for firms with high Tobin's q , high leverage, and low Stock Price Runup. Also, the coefficient is stronger for smaller acquirers and larger relative deal sizes. Summarizing the evidence, we can confirm Hypothesis 1 of this study.

5.2 Short Interest and Internal Governance Mechanisms

In the following subsections we compare the explanatory power of Short Interest on bidder returns to that of traditional internal governance metrics. The analysis addresses Hypothesis 2 of this study.

5.2.1 Internal Governance Metrics

In the beginning of the 2000s, a major wave of empirical work identified that corporate governance mechanisms substantially affect shareholder wealth. In an influential paper, Gompers et al. (2003) use 24 governance provisions to construct a "Governance Index", for which each existent provision increases a firm's index value by one and higher index values correspond to more managerial entrenchment. The researchers show that firms with less entrenched managers (lower index values) significantly outperform their peers in long-run stock returns and firm values. Extending on this approach, Bebchuk et al. (2008) construct an "Entrenchment Index" (E-Index), composed of the six governance provisions³ they consider most important from a legal standpoint and for managerial entrenchment. Bebchuk et al. find that the six element E-Index has a stronger association with long-run stock returns and firm value than the Governance Index, while the remaining 18 governance provisions used by Gompers et al. are not significantly related to firm performance. Finally, Bebchuk and Cohen (2005)⁴ complement these studies and identify Staggered Boards as the governance provision with the strongest adverse impact on the value of publicly traded firms.

Masulis et al. (2007) build on insights from this sequence of papers and examine M&A as one potential channel through which entrenched management negatively affects shareholder wealth. Their study directly links the Governance Index (Gompers et al. 2003), the E-Index (Bebchuk et al. 2008), and Staggered Boards to announcement returns from firm acquisitions. Across all three dimensions, Masulis et al. find that acquirers with more protected managers engage in less profitable M&A. The effect is most pronounced for the Staggered Board variable, followed by the E-Index.

The next regression set investigates how the recognized disciplining force of internal governance mechanisms (E-Index and Staggered Boards) compares to the discipline exerted by financial markets in the form of short selling. Accounting for

³The six provisions are: staggered boards, limits to shareholder bylaw amendments, poison pills, golden parachutes, and supermajority requirements for merger and charter amendments

⁴The studies by Bebchuk et al. (2008) and Bebchuk and Cohen (2005) were both circulated as working papers in 2004, resulting in interdependencies not reflected by the divergent final publishing years.

data availability, we do not regard the Governance Index (Gompers et al. 2003) in the analysis. Following our second hypothesis, we anticipate short interest to exhibit a stronger explanatory power on M&A quality than the established internal governance metrics.

5.2.2 Regressions on Short Interest and Internal Gov. Metrics

The following subsection introduces a regression set that includes Short Interest, E-Index, and Staggered Boards as variables of interest. A detailed analysis compares the regression coefficients of the variables in question.

For the setup of the new regressions, we match each observed transaction in our sample with governance data for the corresponding acquirer. As the Institutional Shareholder Service (ISS) data base only provides information for a subset of Compustat firms, the additional requirement substantially reduces our sample size. Moreover, the governance data base has an important break point between 2006 and 2007 that leads to various inconsistencies, impairing the comparability of data items. To ensure data consistency, we only use observations from 2007 onward. The resulting sample includes 2,511 transactions.

Variable	Mean	Std. Dev.	Q1	Median	Q3
CAR	0.76	6.1	-1.9	0.39	3.2
Short Interest	0.051	0.048	0.02	0.035	0.066
Entrenchment Index	3.4	1	3	3	4
Staggered Board	0.44	0.5	0	0	1
Total Assets (\$mil)	10,470	26,091	930	2,572	7,388
Market Val. of Equity (\$mil)	9,809	27,337	1,023	2,235	7,044

The sample consists of 2,511 U.S. mergers and acquisitions between 2007 and 2016. All transactions are listed in SDC Platinum and covered by the ISS Governance data base. Variable definitions are listed in the Appendix.

Table 5.3: Summary Statistics - Short Interest and Tradit. Gov. Mechan.

Table 5.3 reports summary statistics for takeovers included in the regression set. Staggered Board is a binary variable that takes a value of one if an acquirer has an accordingly structured board at the time of deal announcement. The Entrenchment Index variable sums up the number of existent governance provisions out of the six key elements identified by Bebchuk et al. (2008) for each acquirer. The statistics show that 44% of all takeovers are carried out by bidders with a staggered board.

The average number of governance provisions in place is 3.4. Moreover, E-Index variation is relatively small: bidders in the first quartile have three provisions in place while those in the third quartile have four. Average CARs are positive at 0.76%, lower than the average of 1.07% in the full observation set used of section 5.1.1. As ISS mainly covers large listed corporations, average values for Total Assets and Market Value of Equity are about twice as high compared to our initial set of observations.

Extending on section 5.1 and previous literature, we anticipate positive regression coefficients for Short Interest and negative ones for E-Index and Staggered Boards. Table 5.4 reports the results of this subsection. All regressions use the same set of control variables. The results demonstrate that the coefficients for all three variables of interest point in the anticipated directions. The coefficient for Short Interest is positive at 1.38% and thus smaller than in the baseline regressions of section 5.1.1. Similar to regressions with smaller sample sizes in previous sections, the coefficient does not reach the level of significance. For both E-Index and Staggered Boards we observe coefficients that are very small and non-significant at -0.05% and -0.005%, respectively. These results are unexpected as Masulis et al. (2007) identify significant coefficients of -0.333% and -0.524% for the same variables in their data set. We discuss potential reasons for our divergent findings in subsection 5.2.3. For the included set of control variables, the observed regression coefficients are stable across all three model specifications and in line with those of section 5.1. For brevity, the Payment x Ownership interaction terms are suppressed in the regression output.

In order to better compare the explanatory power of Short Interest, E-Index, and Staggered Boards, we calculate the expected change in acquirer market value of equity upon deal announcement in response to a one standard deviation change of each variable. The market capitalization of the average acquirer in our sample is \$9.81 billion. Accordingly, a one standard deviation change in Short Interest affects shareholder wealth upon deal announcement by an estimated \$6.52 million. In comparison, the same change implies an equity value variation of \$4.96 million for the E-Index variable and \$0.24 million for Staggered Boards. The evidence suggests that Short Interest indeed appears to be the most effective mechanism contributing to disciplined M&A decision making. However, the results should be interpreted with caution for two reasons. First, none of the three coefficients reaches the level of statistical significance. Secondly, results for E-Index and Staggered Boards in our sample materially deviate from findings of prior studies.

	Dependent Variable: CAR (in %)		
	(1)	(2)	(3)
Short Interest 12M	1.382 (2.891)		
E-Index		-0.050 (0.129)	
Stag. Board			-0.005 (0.255)
log(Total Assets)	-0.358*** (0.096)	-0.375*** (0.092)	-0.372*** (0.094)
Tobin's Q	0.104 (0.183)	0.103 (0.183)	0.108 (0.183)
Leverage	-0.249 (1.114)	-0.199 (1.125)	-0.159 (1.124)
Stock Price Runup	-1.356** (0.630)	-1.358** (0.631)	-1.364** (0.632)
Rel. Size	2.536** (1.093)	2.542** (1.093)	2.536** (1.093)
High Tech	-1.409*** (0.432)	-1.439*** (0.435)	-1.431*** (0.433)
High Tech x Rel. Size	-1.211 (1.225)	-1.213 (1.222)	-1.218 (1.226)
Div. Acqu.	-0.584** (0.260)	-0.596** (0.259)	-0.597** (0.259)
Competitive Ind.	-0.510* (0.262)	-0.522** (0.264)	-0.514* (0.263)
Unique Ind.	0.443 (0.344)	0.473 (0.348)	0.468 (0.345)
Constant	3.781*** (1.066)	4.167*** (1.196)	3.957*** (1.068)
Year Fixed Effects	Yes	Yes	Yes
Payment x Ownersh. Dummies	Yes	Yes	Yes
Observations	2,501	2,502	2,502
R ²	0.048	0.048	0.048
Adjusted R ²	0.038	0.038	0.038

Notes: *p<0.1; **p<0.05; ***p<0.01

The sample consists of 2,502 U.S. mergers and acquisitions between 2007 and 2016. Heteroskedasticity robust standard errors are clustered on the acquirer level and reported in parentheses.

Table 5.4: Reg. - Short Interest and Tradit. Gov. Mechan.

5.2.3 Governance Data Quality Concerns

The potential key factor driving the unexpected regression results for E-Index and Staggered Board is a probable data integrity problematic associated with the ISS governance data base.

Historically, information on governance provisions was provided by the Investor Responsibility Research Center (IRRC). In 2007, the resource was acquired by Institutional Shareholder Services (ISS) and continued under a new operator. The takeover went along with substantial data changes. These changes impact our study in two dimensions. First, ISS discontinued the reporting of numerous data items. As one of the results, it is now impossible to reconstruct the Governance Index (Gompers et al. 2003). Secondly, various elements included in the E-Index appear to be reported inconsistently before and after the break point. As most studies on the impact of the E-Index and Staggered Boards rely on samples ending before 2007, it is difficult to compare our results to those of previous studies.

We run various quality checks to account for these issues. First, in order to assess the reporting consistency of E-Index components between 2006 and 2007, we measure correlations between the two data years. As governance provisions tend to be stable over time, the correlation should be close to one. Indeed, this was the case for all tested years before the break point. From 2006 to 2007, however, values for several E-Index components are almost uncorrelated from one year to the next. This notion strongly suggests inconsistencies between the two data bases. Secondly, we investigate why the substantially negative coefficients for E-Index and Staggered Boards found by Masulis et al. (2007) turn out to be small and insignificant in the sample of our study. One conjecture could be that negative effects on bidder returns of these metrics have indeed simply dissolved in the last ten years. To test this hypothesis, we analyze how the effects of E-Index and Staggered Boards on CAR have changed over time. As illustrated in appendix section A.7, we identify no long-term trend that could explain less influential effects in our data. In our working process, we reached out to representatives of WRDS and ISS in an attempt to find solutions on the data issues. While both providers confirmed the notion of data consistency breaches and started their own investigations, a conclusive explanation for our findings could not be provided.

Considering these factors, we argue that the results presented in section 5.2.2 serve as indicative evidence on the effect of Short Interest, E-Index, and Staggered Boards on the quality of M&A. However, these results should be interpreted conservatively. Considering the regression sets and constraining factors, we conclude that the empirical evidence is statistically not robust enough to confirm our second hypothesis.

5.2.4 Endogeneity Considerations

The regressions in sections 5.1 and 5.2 include an extensive set of control variables in order to account for other factors that might influence M&A announcement returns. This approach ensures that the models and their results are not actually affected by hidden effects of these determinants. Nevertheless, it is not possible to completely rule out that regression outcomes are substantially driven by endogeneity issues. For instance, short interest could proxy for the attention level of a stock in the community of professional investors. If a certain company becomes subject of intense discussions, this may be reflected in high short interest and motivate chief executives to engage in M&A more carefully. Another classical problem of causal inferences in a regression setup is reversed causality. For the context of our study, however, we consider it unlikely that higher quality M&A could positively affect a firm's exposure to short sellers.

In order to address endogeneity considerations, the following section 5.3 considers a setup in which a variation in short selling exposure occurred in a fully exogenous fashion. In particular, we exploit a natural experiment in the form of a regulatory change by the Securities and Exchange Commission.

5.3 Short Selling Regulation and Governance Quality

The U.S. Securities and Exchange Commission established Regulation SHO in 2005 to update the existing short selling regulation. In order to better understand the implications of short selling constraints, a pilot experiment was launched to test the effects of considered regulatory changes. The program motivates the third hypothesis of this paper and serves our study in two dimensions. First, it enables us to investigate how policy changes resulting in lower short selling constraints affect the disciplining effect of short sellers. Secondly, the experiment allows us to address potential endogeneity concerns referring to causality.

5.3.1 Regulation SHO

U.S. authorities have a history of regulating the activity of short sellers in order to account for potentially adverse market effects, e.g. in the form of "bear raids" (Massa et al. 2013). A key element of U.S. short selling regulation was the "uptick rule", established in 1938 as a response to financial market turbulences of the Great Depression. The rule constituted a price test that prevented stocks from being consecutively sold short without trading higher at least one time before the next short sale could be executed. Until its repeal in 2007, the provision provided grounds for a controversial debate. Critics argued that the uptick rule posed no effective short selling constraint (Boehmer et al. 2008) and that bearish investors could bypass the price test using options (SEC 2007). To the contrary, a set of studies finds that the uptick rule significantly interfered with the execution of short sales (e.g. Alexander and Peterson 1999) and that some firms even switched exchanges to benefit from the protection of the uptick rule (Lamont 2012).

To assess the actual necessity of short selling price tests, the S.E.C. introduced Regulation SHO⁵ and conducted an experiment⁶ that removed the uptick rule for a pilot group of stocks, thereby reducing short selling costs for these securities. Constructing the pilot group, every third firm in the Russell 3000 index ranked by trading volume was selected for treatment while the remaining securities formed the control group. This selection process resulted in a quasi-random sample composition where the exogenous decrease in short selling costs for pilot stocks constitutes the only distinguishing feature (e.g. Fang et al. 2014).

The pilot experiment of Regulation SHO is a unique research opportunity that has motivated several recent studies examining the fundamental implications of short

⁵Securities Exchange Act Release No. 50103 (July 28, 2004), 69 FR 48008 (August 6, 2004)

⁶Securities Exchange Act Release No. 50104 (July 28, 2004), 69 FR 48032 (August 6, 2004)

selling. A S.E.C. paper finds that the removal of short selling constraints has only limited effects on returns, equity prices, and market quality (SEC 2007). Other studies relate the pilot program to investment decisions (Grullon et al. 2015), bond yields (Kecskés et al. 2012), firm innovation (He and Tian 2014), equity incentives (De Angelis et al. 2013), voluntary disclosure practices (Li and Zhang 2015), and earnings management (Fang et al. 2016).

Our analysis adds to the body of Regulation SHO motivated research by investigating how M&A quality is affected by the reduction in short selling constraints for pilot firms. We anticipate that the removal of the uptick rule for pilot stocks increases the risk of being scrutinized by short sellers, thereby increasing the risk of retaliation upon the announcement of bad M&A decisions. We therefore expect that the governance power of short selling is higher for pilot firms, leading to better M&A announcement returns in this subsample.

5.3.2 Sample Construction

Compared to the two previous empirical sections (5.1 and 5.2), this part of our study introduces two additional inclusion criteria for transactions. First, bidder firms need to be members of the Russel 3000 index of the year 2004, the stock index used by the S.E.C. to design the SHO policy experiment. We also require a Russell 3000 membership status for all control stocks in order to ensure that pilot and control groups are as comparable as possible. Secondly, all considered transactions need to be announced between July 28, 2004 (declaration date of the experiment) and August 6, 2007 (termination date). We start with the announcement date instead of the date on which short selling restrictions were lifted for pilot stocks (May 2, 2005). This is in line with the notion that rational actors should incorporate the future impact of the policy change as soon as it is announced. Grullon et al. (2015) document significant increases of short selling activity for pilot already upon the announcement of the program, suggesting that the market reacted immediately and well before the actual removal of the price test. We hypothesize that this translates to a firm’s decision makers and their approach towards M&A as soon as the notice about program inclusion becomes public.

Table 5.5 documents summary statistics of M&A transactions carried out by pilot and control firms in the specified time frame. Concerning the number of takeovers, pilot firms are responsible for close to one third of all transactions which corresponds well to their one-third share in the Russell 3000 index. The statistics also report means and t-tests for both groups. Even though the pilot and control groups have been created in a quasi-random procedure, their transaction behaviour do not appear to be fully equivalent. One possible explanation could be that Regulation SHO

	Pilot			Control			t-Stat
	Mean	Med	SD	Mean	Med	SD	
CAR	0.93	0.35	6.9	0.48	0.26	5.5	-1.5
Short Interest (%)	0.042	0.028	0.041	0.045	0.033	0.041	1.3
Rel. Size	0.18	0.064	0.31	0.15	0.06	0.26	-1.7*
Value Transact. (\$mil)	639	109	2,479	564	88	2,521	-0.58
Market Val. Eq. (\$mil)	4,917	1,416	13,544	6,190	1,231	21,553	1.3
Total Assets	5,605	1,468	14,080	7,191	1,370	20,002	1.7*
Tobin's Q	1.9	1.5	1	1.9	1.5	0.93	-0.78
Leverage	0.17	0.13	0.16	0.16	0.12	0.14	-1.8*
No. Transactions	562			1,176			

The sample consists of 1,738 U.S. mergers and acquisitions from July 28, 2004 to August 6, 2007. T-Statistics refer to differences in variable means, where *, **, and *** indicate statistical significance for two-sided t-tests at the 10%, 5%, and 1% level, respectively.

Table 5.5: Summary Statistics - Regulation SHO

motivated firms in both groups to engage in M&A differently. In line with our initial expectation, bidder returns in this sample are higher for pilot firms, giving a first indication for a disciplining effect of increased exposure to short sellers. With respect to short interest, however, the average short positions faced by both subgroups do not differ substantially. This observation is in line with an internal analysis by the SEC (2007) that also finds no material differences in short interest levels for pilot and control groups. The summary statistics also show that pilot firms buy somewhat larger targets while being smaller in total assets and market value of equity.

5.3.3 Regressions on Regulation SHO

In the next section, we use a set of regression models to investigate how bidder returns are affected by the regulatory experiment. In particular, we analyze how abnormal M&A announcement returns differ for pilot and control firms.

The new variable of interest in the models is "SHO Pilot Inclusion" which is a binary variable taking on a value of one if the acquiring company was included in the SHO pilot group, and 0 otherwise. Table 5.6 presents three regression models with alternative specifications. All models control for bidder and deal characteristics and suppress Payment Method x Ownership Status interaction terms in the regression output. Model (3) includes the largest set of control variables by also accounting for industry competitive structure and year fixed effects.

In line with our expectation, SHO Pilot Inclusion has a positive coefficient of 0.159% in regression model (3). This value is relatively small in economic magnitude but stable across the three specifications. With a t-value of 0.52, however, the coefficient does not reach the level of statistical significance. A number of factors could cause this finding. Considering the small magnitude of the coefficient, it is one potential explanation that the pilot program simply did not have a strong effect on short selling activity and M&A decisions. We only expect a significant regression coefficient in this analysis if the uptick rule constituted a substantial constraint for short sellers in practice. Empirical evidence on the real effects of the price test on short selling, however, is mixed (comp. Diether et al. 2009). Another concern relates to the randomization aspect of the pilot program. In the design of the test, the S.E.C. intended to create two comparable subgroups of the Russell 3000 index. Nevertheless, it could be the case that the two groups are not completely equivalent in every aspect. Table 5.5 provides some evidence that pilot firms exhibit different characteristics concerning their M&A activity. As a result, it is conceivable that the subgroups might not have been a perfectly random draw from the overall sample with regards to the dimension of M&A. The notion of imperfect randomization is supported by the fact that some studies approach the effects of Regulation SHO in a difference-in-differences framework (e.g. Grullon et al. 2015; He and Tian 2014). Finally, compared to variables of interest considered in other SHO related studies (e.g. firm innovation by He and Tian 2014), acquisitions are relatively infrequent corporate events. As a result, the sample for this analysis decreases to 1,732 observations, potentially interfering with statistical significance as well.

Analyzing the control variables reported in this regression set we find stable coefficients across different model specifications. In general, most values are comparable to those of the models in previous sections of this study. The coefficients for Competitive Industry and Unique Industry are an exception and now point in the directions anticipated in section 4.2.3.

To substantiate our findings, we run two sensitivity regression which are reported in the appendix under A.14. Regression (1) refers to the same period of time as the initial model, however the control group is no longer restricted to firms that were part of the Russell 3000 index. As a result, the sample size increases substantially to 2,644 observations. Regression (2) uses the official starting date of the experiment (May 2, 2005) on which short selling constraints were lifted as the beginning of the observation period, further cutting down the sample size. While the coefficient points in the positive direction in model (1) it becomes negative in model (2). Please note that both coefficient values for SHO Pilot Inclusion are small and insignificant.

It is an additional aim of this section to address the question of endogeneity by

considering a setup where short selling variation is exogenous. The evidence of this section indicatively supports the notion that increased short selling exposure leads to better announcement returns which supports the findings of section 5.1. With regard to the dimension of policy making, our results provide moderate evidence that less restrictive regulation favors the efficient use of corporate resources through the channel of more diligent mergers and acquisitions. Overall, this section provides some support for Hypothesis 3. However, due to insignificant regression coefficients, this indication is not strong enough to justify a confirmation.

	Dependent Variable: CAR (in %)		
	(1)	(2)	(3)
SHO Pilot Inclusion	0.170 (0.306)	0.172 (0.306)	0.159 (0.305)
log(Total Assets)	-0.181* (0.101)	-0.195* (0.103)	-0.193* (0.102)
Tobin's Q	-0.208 (0.227)	-0.208 (0.227)	-0.177 (0.229)
Leverage	-1.357 (1.213)	-1.309 (1.229)	-1.253 (1.272)
Stock Price Runup	-1.346** (0.664)	-1.332** (0.666)	-1.377** (0.670)
Rel. Size	4.427*** (1.266)	4.425*** (1.272)	4.471*** (1.276)
High Tech	0.066 (0.464)	0.071 (0.465)	0.273 (0.507)
High Tech x Rel. Size	-6.657*** (2.451)	-6.727*** (2.440)	-6.742*** (2.445)
Div. Acqu.	-0.205 (0.294)	-0.245 (0.297)	-0.192 (0.304)
Competitive Ind.			0.423 (0.333)
Unique Ind.			-0.503 (0.369)
Constant	2.717** (1.115)	2.424** (1.123)	2.275** (1.148)
Year Fixed Effects	No	Yes	Yes
Payment x Ownersh. Dummies	Yes	Yes	Yes
Observations	1,732	1,732	1,732
R ²	0.084	0.085	0.087
Adjusted R ²	0.076	0.076	0.077

Notes: *p<0.1; **p<0.05; ***p<0.01

The sample consists of 1,732 U.S. mergers and acquisitions from the announcement date of SEC Regulation SHO (July 28, 2004) to the end of the regulation pilot (August 6, 2006). All acquirers were members of the Russel 3000 stock index. Heteroskedasticity robust standard errors are clustered on the acquirer level and reported in parentheses.

Table 5.6: Reg. - Regulation SHO

6. Limitations and Future Research

In the process of this study, we identified several potential avenues for future research that fall beyond the scope of this paper. This subsection provides an overview of these topics and is guided by our three hypotheses.

Section 5.1 of this paper is concerned with the first hypothesis and demonstrates a significant link between short selling and M&A quality. Our detailed analysis uncovers an emphasized effect for bidders with high leverage, high Tobin's q , and subpar recent stock performance. We put forward first conjectures for mechanisms that might drive these effects. However, future research is warranted to assess the precise ways in which short interest induces better M&A and why exactly the effect is more pronounced for particular sub-groups.

In accordance with our second hypothesis, section 5.2 compares the disciplining force of short selling on M&A to that of the internal governance mechanisms E-Index and Staggered Board. The identified empirical results do not allow for a strong statement on Hypothesis 2. We suppose that the available sample is substantially impacted by non-robust governance data and therefore does not provide for more robust findings. In order to address the research question in more detail, further empirical work is needed. Future efforts could include gaining a more profound understanding of the root cause of the documented data issues, developing new ways to effectively address them, and reassessing the research question building on a more robust data foundation.

Results from section 5.3 suggest that regulatory constraints may impair the positive disciplining force of short selling, providing some evidence in support of Hypothesis 3. However, this connection is not statistically robust. In order to substantiate the proposed relationship, it would be of interest to supplement the empirical analysis of this paper with a qualitative element. It is known that management in general opposed the removal of short selling constraints when the regulation was established. To better understand the motivation for the adverse opinions, future researchers could reach out to M&A decision makers of pilot firms to better understand in how far the removal of short selling constraints affected their actual decision making processes and behaviours.

In addition to substantiating the empirical results of this study, future research

could further investigate the proposed connection of short selling and M&A. First, the exact mechanisms that drive enhanced M&A decision making upon increased short interest could be studied. For instance, the observed effect might be caused by a lower number of bad acquisition or an increase in good ones. Secondly, future studies could extend our research to other geographic regions. This study has identified an effect for the USA, where financial markets have a prominent role. It would be interesting to see if short selling also relates to M&A quality in other geographies like Europe or Asia. Thirdly, short selling data could be captured in new ways. Short interest measures the level of realized short selling activity. As an alternative, the dimension of lendable shares could be introduced to the analysis. As short sellers need to borrow stocks in the process of setting up a position, it is conceivable that the threat of short selling is stronger for firms whose large shareholders are more willing to provide their shares to bearish market participants. Thus, the metric of lendable shares might be suitable to capture the potential threat of unrealized short selling (see Massa et al. 2013 for a detailed discussion of the variable).

7. Conclusion

This study investigates the impact of short selling on M&A quality. Motivated by recent empirical work on the link between short selling and corporate decisions, we extend this research strand to the field of mergers and acquisitions. To our knowledge, this paper is the first to investigate this relationship in a detailed empirical analysis. The study contributes to literature on corporate governance, short selling, and M&A quality.

Building on a data set of 9,386 acquisitions by public U.S. firms from 2002 to 2016, we find robust evidence that short selling increases the quality of M&A. Accounting for an extensive set of control variables, our empirical results suggest that a ten percentage point increase in short interest results in 0.48% higher abnormal acquirer returns around the announcement of an acquisition. This result is statistically significant at the 5% level and robust to different regression model specifications. One possible channel through which short interest might improve M&A quality is that of increased scrutiny exerted by short sellers. As a consequence, affected corporate decision makers might engage in M&A activity more diligently. We further find that the effect of short selling on M&A quality is more pronounced for acquirers with high leverage, high Tobin's q , weak prior stock performance, and smaller sizes. The effect also increases in relative deal sizes.

To substantiate our findings, we also compare the disciplining force of short selling to that of internal governance mechanisms that are recognized to discipline management. In a final step, we exploit a S.E.C policy experiment that induced exogenous variation in short selling exposure. We find indicative evidence that the discipline by financial markets in the form of short selling exceeds that of internal governance provisions in the context of M&A. Also, moderate evidence suggests that less stringent short selling regulation may help to reinforce the governing effect of short selling on M&A quality. While these two findings are in line with our expectations, the coefficients do not reach the level of statistical significance.

One challenge to the investigation of short selling implications in this study relates to the comparison of the discipline exerted by short sellers to that of internal governance mechanisms. The exercise is complicated by a change in the way governance information has been collected over time. Addressing these constraints to

our research in the future will open up interesting avenues of empirical work.

We believe that our study has significant implications, especially for the field of regulation. Traditionally, a controversial debate discusses the positive and negative effects of short sellers. The argumentations put forward by both sides largely focus on the dimension of market quality. Supported by recent academic work, it is our proposition that short selling has in fact more far-reaching implications. The empirical evidence of this paper suggests that short sellers exert positive externalities on the quality of M&A and thereby foster the efficient use of resources. As a consequence, regulatory measures like the removal of the uptick rule and the reinstitution of the "alternative uptick" in 2010¹ need to be evaluated not only under market quality considerations but also have to account for less obvious implications of short selling - for instance, effective corporate governance.

¹Securities Exchange Act Release Release No. 34-61595 (February 26, 2010)

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A. Appendix

A.1 Data Sources

Used data sources and dates of retrieval are summarized in table A.1.

Name	Date Retrieved	Source
Thomson Reuters SDC Platinum M&A Data	2017-10-16	Thomson Reuters
Thomson Reuters Institutional (13f) Holdings	2017-10-27	WRDS
COMPUSTAT Fundamentals	2017-10-26	WRDS
COMPUSTAT Execucomp	2017-10-31	WRDS
COMPUSTAT Supplemental Short Interest File	2017-10-27	WRDS
CRSP Value Weighted S&P 500 Returns	2017-10-21	WRDS
CRSP Daily Stock	2017-10-21	WRDS
Institutional Shareholder Services Governance Data	2017-10-24	WRDS
Institutional Shareholder Services Directors Data	2017-11-07	WRDS
SHO Regulation Pilot Sample	2017-10-12	SEC Website (<i>link</i>)
Russell 3000 Index list of 2004	2017-10-16	Provided by Russell Inv. Group
Scaled Wealth-Performance Sensitivity Data	2017-10-30	Alex Edmans' Website (<i>link</i>)
Fama French Industry Classification	2017-10-16	Kenneth French's Website (<i>link</i>)

Table A.1: Data Sources

A.2 Variable Definitions

Definitions of the variables used throughout this paper are summarized in table A.2. COMPUSTAT item names are reported in brackets, when applicable.

Variable	Definition
CAR and Governance Variables	
CAR (-2, +2)	Five-day cumulative abnormal return, calculated using the market model. Model parameters are calibrated from day 210 to day 11 prior to deal announcement with the S&P 500 as market index.
E-Index	Entrenchment index as introduced by Bebchuk Cohen and Ferrell (2004). It includes the six most important antitakeover provisions and adds one index point for every provision that is present. Higher index levels signal more protected and entrenched managers.
Staggered Board	Dummy variable: 1 if the bidder has a staggered board, 0 otherwise.
Short Interest	Sum of the 12 monthly short interest figures before deal announcement over the sum of the 12 respective monthly figures of shares outstanding.
Bidder Characteristics	
Total Assets (\$mil)	Log transformation of total assets as stated in bidder's annual balance sheet before announcement (item: AT).
Market value of equity (\$mil)	Acquirer stock price multiplied by number of shares outstanding eleven trading days prior to deal announcement.
Tobin's Q	Market value of assets (items: AT - CEQ + CSHO x PRCC_F) over book value of assets (item: AT), as of the fiscal year end before deal announcement.
Leverage	Book value of debt (items: DLTT + DLC) over market value of equity (items: CSHO x PRCC_F).
Stock Price Runup	Relative buy-and-hold stock return compared to S&P 500. Returns are measured from trading day -210 to -11 prior to deal announcement. The difference is stated in percentage points. Return data is extracted from CRSP.
Deal Characteristics	
Public Target	Dummy Variable: 1 if public target, 0 otherwise.
Private Target	Dummy Variable: 1 if private target, 0 otherwise.
Subsidiary Target	Dummy Variable: 1 if subsidiary target, 0 otherwise.

All Cash Deal	Dummy Variable: 1 if deal purely cash-financed, 0 otherwise.
Some Stock Deal	Dummy Variable: 1 if deal (partly) stock-financed, 0 otherwise.
Diversifying Acquisition	Dummy Variable: 1 if bidder and target do not share the same Fama French industry (48 industries classification), 0 otherwise.
High Tech Deal	Dummy Variable: 1 if bidder and target both operate in high tech industries as defined by Loughran and Ritter (2004), 0 otherwise. For both entities, the SIC codes reported by SDC Platinum serve as identification criteria.
Relative Size	Transaction value as reported in SDC Platinum divided by acquirer market value of equity eleven trading days prior to deal announcement.
Board Structure and CEO Wealth	
CEO Wealth Sensitivity	The dollar change in CEO wealth for a 100 percentage point change in firm value, divided by annual cash compensation, as defined by Edmans et al. (2008).
CEO/Chairman Duality	Dummy Variable: 1 if CEO is also Chairman of the board, 0 otherwise.
Board Size	Number of directors on acquiring firm's board.
Indep. Board Members (%)	Percentage of independent directors on acquiring firm's board.
Other Influencing Factors	
Competitive Industry	Dummy Variable: 1 if acquirer's primary industry is in the top quartile of most competitive Fama French industries in the acquisition year. Higher industry competition is measured by lower Herfindahl-Indices, in terms of sales (item: SALE). 0 otherwise.
Unique Industry	Dummy Variable: 1 if acquirer's primary industry is in the top quartile of Fama French industries in terms of median Selling Expenses over Sales (items: XSGA / SALE). Higher SE/Sales ratios typically correspond to more unique and less competitive industries. 0 otherwise.
Max. Inst. Ownership ($\geq 5\%$)	Equity holding of largest institutional shareholder in percent, where minimum shareholding is 5%. 0 otherwise.

Table A.2: Variable Definitions

A.3 Excluded Outliers

Date An- nounced	Name Acquirer	CAR	Acquirer Market Cap.	Deal Value	Rel. Size
2003-02-07	OptiCare Health Systems Inc	103%	4.9	7.2	1.5
2013-08-01	Standard Register Co	367%	14.9	218.0	14.7
2014-03-28	BioFuel Energy Corp	106%	17.3	275.0	15.9
2015-09-28	Sanchez Production Partners LP	153%	15.3	345.8	22.5
2016-08-03	Tellurian Inc	130%	7.1	146.8	20.6

Table A.3: List of Excluded Outliers

A.4 Summary Statistics - Incl. CEO and Board Items

Variable	Mean	Std. Dev.	Q1	Median	Q3
Total Assets (\$mil)	9,441.00	21,055.66	859.60	2,367.00	6,851.00
Market Value of Equity (\$mil)	9,102.00	24,960.05	989.20	2,163.00	6,426.00
Tobin's Q	1.81	0.92	1.21	1.54	2.07
Leverage	0.15	0.13	0.05	0.13	0.23
Stock Price Runup	0.08	0.27	-0.09	0.04	0.21

The sample consists of 3,460 U.S. mergers and acquisitions from 2002 to 2016 for which data on CEO Wealth Sensitivity and Board Structure is available.

Table A.4: Summary Statistics - CEO/Board Items Available

A.5 Institutional Shareholding and Full Variable Regression

	Dependent Variable: CAR (in %)		
	Inst. Shareholding Reg. 1	Inst. Shareholding Reg. 2	Full Regression Set
	(1)	(2)	(3)
Short Interest 12M	5.413*** (2.098)	5.252** (2.099)	3.510 (2.538)
Max. Inst. Ownership (%)	-0.642 (1.673)	-0.450 (1.672)	-2.011 (2.508)
log(Total Assets)	-0.425*** (0.056)	-0.431*** (0.057)	-0.369*** (0.091)
Tobin's Q	-0.212* (0.116)	-0.214* (0.116)	-0.129 (0.143)
Leverage	-0.323 (0.691)	-0.174 (0.709)	-0.647 (0.920)
Stock Price Runup	-1.328*** (0.328)	-1.333*** (0.328)	-1.319*** (0.484)
Rel. Size	2.830*** (0.575)	2.808*** (0.578)	1.476* (0.894)
High Tech	-0.988*** (0.272)	-1.053*** (0.295)	-1.142*** (0.378)
High Tech x Rel. Size	-1.282 (0.904)	-1.273 (0.905)	-1.942 (1.302)
Div. Acqu.	-0.737*** (0.174)	-0.723*** (0.174)	-0.485** (0.212)
Stock x Public	-3.890*** (0.358)	-3.872*** (0.373)	-2.789*** (0.490)
Cash x Public	-0.128 (0.334)	-0.153 (0.338)	0.490 (0.424)
Stock x Private	-0.093 (0.336)	-0.080 (0.344)	0.576 (0.518)
Cash x Private	-0.710*** (0.208)	-0.700*** (0.208)	-0.133 (0.279)
Cash x Subs.	0.106 (0.242)	0.082 (0.242)	0.430 (0.297)
Competitive Ind.		-0.344* (0.176)	-0.160 (0.213)
Unique Ind.		0.248 (0.215)	0.071 (0.286)
CEO/Chairman Duality			-0.017 (0.210)
Board Size			-0.028 (0.051)
Board Indep.			-0.626 (0.875)
CEO Wealth Sensitivity			0.001 (0.003)
Constant	4.945*** (0.724)	5.079*** (0.742)	4.096*** (1.087)
Year Fixed Effects	Yes	Yes	Yes
Observations	7,638	7,638	3,314
R ²	0.063	0.063	0.056
Adjusted R ²	0.059	0.060	0.046

Notes: *p<0.1; **p<0.05; ***p<0.01

The used samples include 3,314 and 7,638 U.S. mergers and acquisitions from 2002 to 2016. Regressions 1 and 2 report the effect of Max. Inst. Shareholding as an additional regressor. Regression 3 reports results including all variables discussed throughout this paper. Heteroskedasticity robust standard errors are clustered on the acquirer level and reported in parentheses.

Table A.5: Reg. - Max. Inst. Shareholding and Full Regression Set

A.6 Sensitivity Regressions

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	Dependent Variable: CAR (in %)	
	Small Tobin's q	Large Tobin's q
	(1)	(2)
Short Interest 12M	3.393 (2.971)	4.748* (2.676)
log(Total Assets)	-0.412*** (0.072)	-0.380*** (0.086)
Tobin's Q	1.449* (0.751)	-0.393*** (0.146)
Leverage	0.639 (0.806)	1.005 (1.205)
Stock Price Runup	-1.569*** (0.441)	-0.808* (0.432)
Rel. Size	3.077*** (0.621)	3.976*** (0.862)
High Tech	-0.378 (0.522)	-0.622* (0.371)
High Tech x Rel. Size	-1.845* (0.985)	-2.524** (1.139)
Div. Acqu.	-0.903*** (0.248)	-0.612** (0.243)
Stock x Public	-3.026*** (0.436)	-5.277*** (0.668)
Cash x Public	0.063 (0.447)	-0.419 (0.439)
Stock x Private	0.331 (0.462)	-0.423 (0.514)
Cash x Private	-0.691*** (0.258)	-0.747** (0.301)
Cash x Subs.	0.423 (0.339)	-0.307 (0.319)
Competitive Ind.	-0.436* (0.246)	-0.113 (0.254)
Unique Ind.	0.661** (0.311)	0.008 (0.314)
Constant	2.965** (1.235)	4.643*** (1.057)
Year Fixed Effects	Yes	Yes
Observations	4,653	4,671
R ²	0.078	0.062
Adjusted R ²	0.072	0.056

Notes: *p<0.1; **p<0.05; ***p<0.01

The sample consists of 9,324 U.S. mergers and acquisitions from 2002 to 2016, where regression 1 (regression 2) includes 4,653 (4,671) transactions of acquirers with below (above) median Tobin's q. Heteroskedasticity robust standard errors are clustered on the acquirer level and reported in parentheses.

Table A.6: Sensitivity - Small / Large Tobin's Q

	Dependent Variable: CAR (in %)	
	Small Leverage	Large Leverage
	(1)	(2)
Short Interest 12M	1.895 (2.766)	7.969*** (2.872)
log(Total Assets)	-0.422*** (0.074)	-0.364*** (0.086)
Tobin's Q	-0.325*** (0.118)	0.022 (0.389)
Leverage	3.897 (2.957)	0.540 (1.036)
Stock Price Runup	-1.717*** (0.414)	-0.575 (0.459)
Rel. Size	3.107*** (0.849)	3.519*** (0.622)
High Tech	-0.727** (0.360)	-0.124 (0.476)
High Tech x Rel. Size	-1.718 (1.051)	-2.645** (1.097)
Div. Acqu.	-0.743*** (0.246)	-0.688*** (0.238)
Stock x Public	-4.087*** (0.486)	-3.917*** (0.519)
Cash x Public	-0.632 (0.421)	0.422 (0.501)
Stock x Private	-0.468 (0.456)	0.390 (0.560)
Cash x Private	-0.967*** (0.329)	-0.497** (0.237)
Cash x Subs.	-0.005 (0.364)	0.019 (0.303)
Competitive Ind.	-0.436* (0.263)	-0.088 (0.232)
Unique Ind.	0.113 (0.283)	0.468 (0.336)
Constant	6.005*** (1.012)	2.998*** (1.089)
Year Fixed Effects	Yes	Yes
Observations	4,669	4,655
R ²	0.061	0.081
Adjusted R ²	0.055	0.075

Notes: *p<0.1; **p<0.05; ***p<0.01

The sample consists of 9,324 U.S. mergers and acquisitions from 2002 to 2016, where regression 1 (regression 2) includes 4,669 (4,655) transactions of acquirers with below (above) median Leverage. Heteroskedasticity robust standard errors are clustered on the acquirer level and reported in parentheses.

Table A.7: Sensitivity - Small / Large Leverage

	Dependent Variable: CAR (in %)	
	Small Runup	Large Runup
	(1)	(2)
Short Interest 12M	5.994** (2.844)	2.672 (2.772)
log(Total Assets)	-0.342*** (0.077)	-0.360*** (0.075)
Tobin's Q	-0.383** (0.169)	-0.296** (0.145)
Leverage	0.377 (1.049)	-0.376 (0.780)
Stock Price Runup	-2.262** (1.084)	-0.532 (0.443)
Rel. Size	3.729*** (0.747)	2.772*** (0.553)
High Tech	-0.396 (0.401)	-0.942** (0.387)
High Tech x Rel. Size	-3.365*** (1.010)	-0.623 (0.988)
Div. Acqu.	-0.831*** (0.262)	-0.690*** (0.218)
Stock x Public	-4.028*** (0.506)	-3.807*** (0.483)
Cash x Public	-0.237 (0.423)	-0.048 (0.484)
Stock x Private	-0.300 (0.514)	-0.039 (0.457)
Cash x Private	-0.847*** (0.304)	-0.575** (0.263)
Cash x Subs.	0.033 (0.366)	0.024 (0.288)
Competitive Ind.	-0.435 (0.271)	-0.074 (0.217)
Unique Ind.	0.296 (0.313)	0.214 (0.288)
Constant	5.565*** (1.243)	4.121*** (0.889)
Year Fixed Effects	Yes	Yes
Observations	4,660	4,664
R ²	0.075	0.053
Adjusted R ²	0.069	0.047

Notes: *p<0.1; **p<0.05; ***p<0.01

The sample consists of 9,324 U.S. mergers and acquisitions from 2002 to 2016, where regression 1 (regression 2) includes 4,660 (4,664) transactions of acquirers with below (above) median Stock Price Runups in the 200 day estimation period. Heteroskedasticity robust standard errors are clustered on the acquirer level and reported in parentheses.

Table A.8: Sensitivity - Small / Large Stock Price Runup

	Dependent Variable: CAR (in %)	
	Small Mkt. Cap.	Large Mkt. Cap.
	(1)	(2)
Short Interest 12M	7.692*** (2.617)	5.699** (2.617)
log(Total Assets)	-0.676*** (0.070)	-0.195*** (0.070)
Tobin's Q	-0.567*** (0.136)	-0.172 (0.136)
Leverage	0.725 (0.742)	-0.681 (0.742)
Stock Price Runup	-1.123** (0.437)	-0.943** (0.437)
Rel. Size	3.784*** (0.712)	1.868*** (0.712)
High Tech	-0.408 (0.312)	-1.138*** (0.312)
High Tech x Rel. Size	-2.852*** (0.978)	-0.465 (0.978)
Div. Acqu.	-0.868*** (0.186)	-0.726*** (0.186)
Stock x Public	-4.580*** (0.425)	-3.004*** (0.425)
Cash x Public	-0.986*** (0.347)	0.086 (0.347)
Stock x Private	-0.413 (0.458)	0.278 (0.458)
Cash x Private	-1.011*** (0.230)	-0.347 (0.230)
Cash x Subs.	0.397* (0.232)	-0.174 (0.232)
Competitive Ind.	-0.413** (0.181)	-0.007 (0.181)
Unique Ind.	0.458* (0.254)	0.075 (0.254)
Constant	7.345*** (0.845)	2.307*** (0.845)
Year Fixed Effects	Yes	Yes
Observations	4,661	4,663
R ²	0.075	0.044
Adjusted R ²	0.069	0.037

Notes: *p<0.1; **p<0.05; ***p<0.01

The sample consists of 9,324 U.S. mergers and acquisitions from 2002 to 2016, where regression 1 (regression 2) includes 4,661 (4,663) transactions of acquirers with below (above) median Market Values of Equity. Heteroskedasticity robust standard errors are clustered on the acquirer level and reported in parentheses.

Table A.9: Sensitivity - Small / Large Mkt. Values of Equity

	Dependent Variable: CAR (in %)	
	Small Total Assets	Large Total Assets
	(1)	(2)
Short Interest 12M	7.712*** (2.972)	5.928** (2.607)
log(Total Assets)	-0.559*** (0.169)	-0.222*** (0.072)
Tobin's Q	-0.396*** (0.153)	-0.192 (0.124)
Leverage	-0.403 (1.055)	0.860 (0.758)
Stock Price Runup	-1.066*** (0.388)	-0.867* (0.476)
Rel. Size	4.516*** (0.734)	1.729*** (0.610)
High Tech	-0.366 (0.435)	-0.890*** (0.317)
High Tech x Rel. Size	-3.020** (1.177)	-0.930 (0.758)
Div. Acqu.	-0.913*** (0.276)	-0.606*** (0.185)
Stock x Public	-6.128*** (0.745)	-2.567*** (0.350)
Cash x Public	-0.834 (0.777)	0.229 (0.326)
Stock x Private	-0.603 (0.489)	0.355 (0.408)
Cash x Private	-0.939*** (0.310)	-0.389* (0.217)
Cash x Subs.	0.096 (0.399)	0.097 (0.253)
Competitive Ind.	-0.451 (0.290)	-0.202 (0.180)
Unique Ind.	0.139 (0.348)	0.316 (0.242)
Constant	6.152*** (1.361)	2.762*** (0.879)
Year Fixed Effects	Yes	Yes
Observations	4,669	4,655
R ²	0.077	0.051
Adjusted R ²	0.071	0.044

Notes: *p<0.1; **p<0.05; ***p<0.01

The sample consists of 9,324 U.S. mergers and acquisitions from 2002 to 2016, where regression 1 (regression 2) includes 4,669 (4,655) transactions of acquirers with below (above) median Total Assets. Heteroskedasticity robust standard errors are clustered on the acquirer level and reported in parentheses.

Table A.10: Sensitivity - Small / Large Total Assets

	Dependent Variable: CAR (in %)	
	Rel. Size over 5%	Rel. Size over 10%
	(1)	(2)
Short Interest 12M	7.060** (3.270)	8.376** (3.270)
log(Total Assets)	-0.501*** (0.101)	-0.593*** (0.101)
Tobin's Q	-0.350* (0.204)	-0.392* (0.204)
Leverage	-0.181 (1.163)	0.523 (1.163)
Stock Price Runup	-0.924* (0.526)	-0.706 (0.526)
Rel. Size	3.081*** (0.579)	3.049*** (0.579)
High Tech	-0.881 (0.584)	-0.942 (0.584)
High Tech x Rel. Size	-1.907** (0.851)	-1.932** (0.851)
Div. Acqu.	-0.987*** (0.322)	-1.220*** (0.322)
Stock x Public	-4.269*** (0.502)	-4.654*** (0.502)
Cash x Public	-0.258 (0.555)	-0.080 (0.555)
Stock x Private	-0.063 (0.594)	-0.155 (0.594)
Cash x Private	-1.040** (0.426)	-1.388*** (0.426)
Cash x Subs.	0.104 (0.457)	0.475 (0.457)
Competitive Ind.	-0.231 (0.329)	-0.227 (0.329)
Unique Ind.	0.221 (0.394)	0.393 (0.394)
Constant	6.144*** (1.222)	5.981*** (1.222)
Year Fixed Effects	Yes	Yes
Observations	6,017	4,077
R ²	0.071	0.079
Adjusted R ²	0.066	0.073

Notes: *p<0.1; **p<0.05; ***p<0.01

The used samples include 4,077 and 6,017 transactions from 2002 to 2016. Regressions 1 and 2 exclusively consider transactions with minimum relative deal sizes of 5% and 10%, respectively. Heteroskedasticity robust standard errors are clustered on the acquirer level and reported in parentheses.

Table A.11: Sensitivity - Alternative Rel. Size Thresholds

	Dependent Variable: CAR (in %)	
	Without Banks	Without 2007/2008
	(1)	(2)
Short Interest 12M	4.663** (2.211)	5.186** (2.211)
log(Total Assets)	-0.414*** (0.058)	-0.383*** (0.058)
Tobin's Q	-0.310** (0.125)	-0.350*** (0.125)
Leverage	-0.301 (0.695)	0.046 (0.695)
Stock Price Runup	-1.079*** (0.329)	-1.143*** (0.329)
Rel. Size	3.293*** (0.521)	3.495*** (0.521)
High Tech	-0.440 (0.307)	-0.823*** (0.307)
High Tech x Rel. Size	-1.886** (0.871)	-1.555* (0.871)
Div. Acqu.	-0.718*** (0.180)	-0.779*** (0.180)
Stock x Public	-4.607*** (0.379)	-3.963*** (0.379)
Cash x Public	-0.021 (0.344)	-0.063 (0.344)
Stock x Private	-0.121 (0.362)	-0.153 (0.362)
Cash x Private	-0.691*** (0.213)	-0.656*** (0.213)
Cash x Subs.	-0.007 (0.246)	0.110 (0.246)
Competitive Ind.	-0.359** (0.183)	-0.089 (0.183)
Unique Ind.	-0.060 (0.226)	0.373* (0.226)
Constant	5.141*** (0.710)	4.610*** (0.710)
Year Fixed Effects	Yes	Yes
Observations	8,446	7,932
R ²	0.062	0.068
Adjusted R ²	0.058	0.064

Notes: *p<0.1; **p<0.05; ***p<0.01

The sample comprises between 7,932 and 8,446 U.S. mergers and acquisitions from 2002 to 2016. Regression 1 excludes all transactions with acquirers primarily operating in the Banking Industry, as classified by Fama and French (1997). Regression 2 excludes all transactions of the financial crisis years 2007 and 2008. Heteroskedasticity robust standard errors are clustered on the acquirer level and reported in parentheses.

Table A.12: Sensitivity - Without Banks / Financial Crisis
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	Dependent Variable: CAR (in %)	
	(1)	(2)
Short Interest 3M	3.518*	3.440*
	(1.989)	(1.990)
log(Total Assets)	-0.371***	-0.376***
	(0.054)	(0.054)
Tobin's Q	-0.311***	-0.316***
	(0.112)	(0.112)
Leverage	-0.137	0.054
	(0.635)	(0.657)
Stock Price Runup	-1.142***	-1.138***
	(0.307)	(0.307)
Rel. Size	3.379***	3.359***
	(0.496)	(0.500)
High Tech	-0.563**	-0.666**
	(0.260)	(0.284)
High Tech x Rel. Size	-2.043***	-2.025***
	(0.764)	(0.763)
Div. Acqu.	-0.798***	-0.783***
	(0.169)	(0.169)
Stock x Public	-3.941***	-3.948***
	(0.342)	(0.352)
Cash x Public	-0.162	-0.193
	(0.313)	(0.316)
Stock x Private	-0.113	-0.123
	(0.338)	(0.343)
Cash x Private	-0.712***	-0.708***
	(0.199)	(0.199)
Cash x Subs.	0.075	0.061
	(0.230)	(0.231)
Competitive Ind.		-0.254
		(0.173)
Unique Ind.		0.294
		(0.213)
Constant	4.624***	4.693***
	(0.654)	(0.674)
Year Fixed Effects	Yes	Yes
Observations	9,324	9,324
R ²	0.064	0.064
Adjusted R ²	0.061	0.061

Notes: *p<0.1; **p<0.05; ***p<0.01

The sample consists of 9,324 U.S. mergers and acquisitions from 2002 to 2016. Heteroskedasticity robust standard errors are clustered on the acquirer level and reported in parentheses.

Table A.13: Sensitivity - Short Interest Three Months

	Dependent Variable: CAR (in %)	
	(1)	(2)
SHO Pilot Inclusion	0.332 (0.313)	-0.080 (0.358)
log(Total Assets)	-0.344*** (0.098)	-0.191 (0.118)
Tobin's Q	-0.390** (0.194)	-0.005 (0.281)
Leverage	-0.050 (1.400)	-1.187 (1.491)
Stock Price Runup	-0.621 (0.555)	-1.153 (0.818)
Rel. Size	3.820*** (0.759)	3.970*** (1.171)
High Tech	-0.435 (0.473)	0.235 (0.573)
High Tech x Rel. Size	-2.564** (1.302)	-5.380** (2.503)
Div. Acqu.	-0.484 (0.303)	-0.510 (0.342)
Competitive Ind.	0.202 (0.305)	0.032 (0.370)
Unique Ind.	0.040 (0.363)	-0.472 (0.459)
Constant	4.079*** (1.022)	2.818** (1.289)
Year Fixed Effects	Yes	Yes
Payment x Ownersh. Dummies	Yes	Yes
Only Russell 3000 Firms	No	Yes
Start Date	2004-07-28	2005-05-02
Observations	2,644	1,283
R ²	0.092	0.070
Adjusted R ²	0.086	0.057

Notes: *p<0.1; **p<0.05; ***p<0.01

The used samples include 1,283 and 2,644 U.S. mergers and acquisitions affected by S.E.C. Regulation SHO and announced before August 6, 2007. The first regression differs from the base case by also considering transactions of bidders not included in the Russel 3000 index of year 2004. The second regression only includes transactions after the date effective of the regulation (May 2, 2005), as compared to the announcement date used in the base case. Heteroskedasticity robust standard errors are clustered on the acquirer level and reported in parentheses.

Table A.14: Reg. - Regulation SHO, Alternative Specifications

A.7 Coefficients for E-Index and Staggered Board Over Time

Figures A.1 and A.2 show the behaviour of regression coefficients for CAR on E-Index and Staggered Board over time. Each data point on the blue / green lines corresponds to a regression using a data subset composed of the transactions for the year in question. In both figures, the graph to the left shows the coefficient per year without accounting for control variables in the regression ("Correlation"). The second graphs show the regression coefficients that control for bidder and deal characteristics. All graphs also display the coefficients for the whole sample of all observation years of this study, as well as the coefficient values found by Masulis et al. (2007) for their observation period. The controlled regressions performed by Masulis et al. (2007) included the same set of control variables, but additionally account for the non-significant variables "Free Cash Flow" and "Industry M&A". The yearly data points show that the coefficients behave in a highly volatile manner over time. Whole-sample coefficients in our 2007-2016 data are consistently above those found by Masulis et al. (2007) and of smaller absolute magnitude. Note that there are no clear trends in the values for the yearly coefficients. Implications of this observation are two-fold. First, the exhibited volatility explains why the regression models over all years do not find significant coefficients for E-Index and Staggered Board. Second, there is no overarching trend in the coefficients (i.e. a decreasing correlation over time) that could explain differences compared to the values found by Masulis et al..

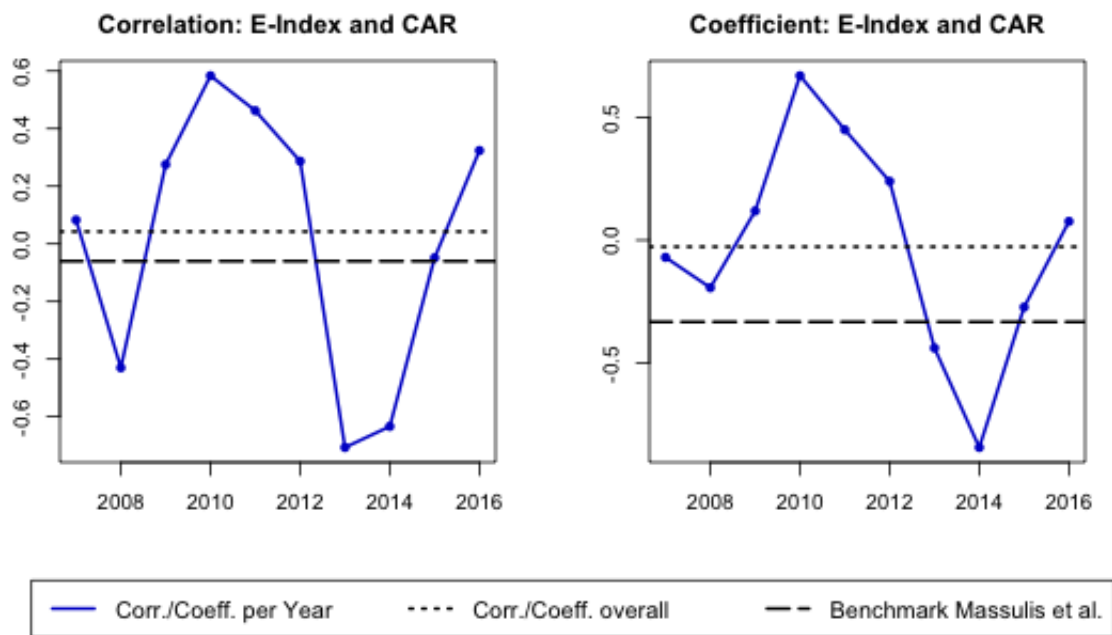


Figure A.1: E-Index - Coefficients for CAR over time

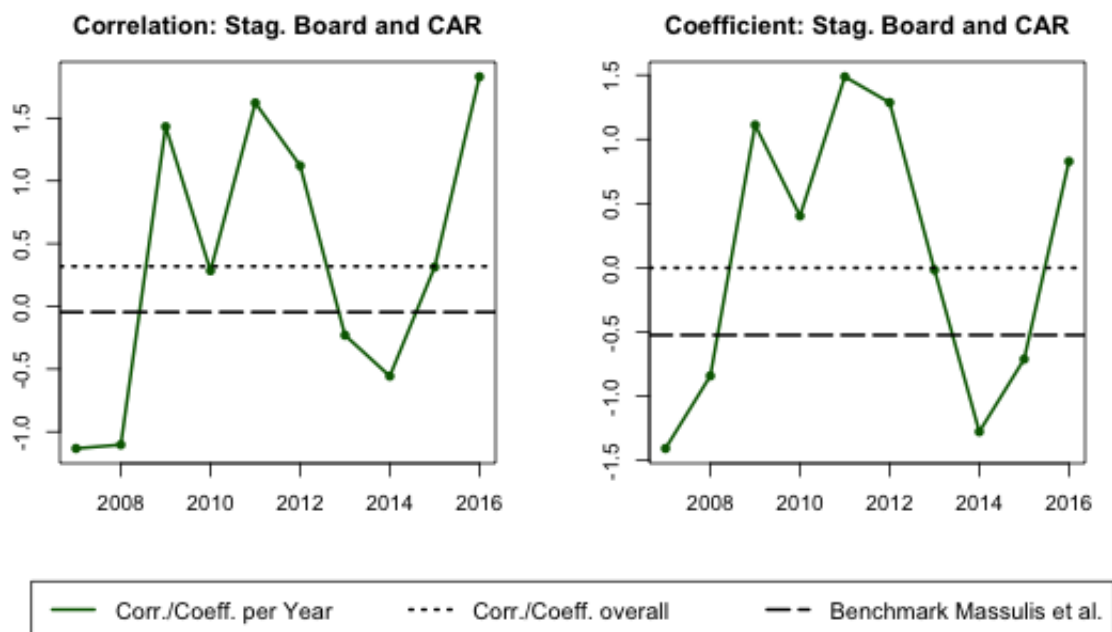


Figure A.2: Staggered Board - Coefficients for CAR over time