The influence of short selling on negative press coverage of firms

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Abstract

We hypothesize that after a relaxation of short selling constraints, an escalation in short selling activity will heighten incentives for short sellers to accelerate price discovery by revealing their negative information. Consistent with this conjecture, we find that the overall sentiment of media coverage tilts significantly more negative for pilot relative to control firms following exogenous relief of short sale constraints. We find a more pronounced effect for media-initiated articles relative to firm-initiated press releases. Further, following abnormal increases in short interest there is a significantly greater increase in negative news flow for pilot relative to non-pilot firms. Finally, we find that stock returns of firms with lower short selling constraints become significantly more sensitive to negative news reports.

JEL: D80, G14, G18, G11, M40

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Introduction

The incentives of firm managers and other capital market participants interact with existing market frictions to influence the production, dissemination, and market consequences of firm-specific information. While market frictions derive from many sources, in this paper we consider limits to arbitrage deriving from regulations governing short sales of securities in U.S. equity markets. Fundamentals-based short sellers invest in information production to isolate overpriced firms and then take short positions to profit from the identified mispricing. However, the willingness of investors to undertake such investments and aggressively short sell target stocks will depend on constraints they face in shorting shares. If, despite such constraints, an investor chooses to gather information and short sell a stock, they risk the possibility that an increase in stock price will generate losses and costly margin calls. To mitigate this risk, short sellers may seek to disseminate their negative information publicly to accelerate price discovery and reduce the duration of mispricing gaps. In this regard, the financial press is a powerful information intermediary that can serve as a channel for short sellers to reveal their negative information to the market.

In this paper, we investigate the extent to which greater short selling activity is associated with negative news reports about firms in the financial press. The central premise underlying our empirical strategy is that a relaxation of short selling constraints will increase short sellers' incentives to uncover profitable short selling opportunities and escalate short selling activity. We hypothesize that such increased short selling activity will result in business press articles reflecting higher levels of negative content. We also hypothesize that greater shorting activity will increase the intensity with which the market impounds negative press reports into stock price. We provide robust evidence consistent with these two hypotheses.

Our first hypothesis builds on two features of short selling. First, prior research supports the claim that short sale constraints inhibit short sellers from investing in information production to root out overpriced stocks.[1] Second, short sellers holding risky short positions have incentives to publicize their private information to accelerate price discovery and reduce the duration of overpricing gaps (e.g., Ljungqvist and Qian, 2016; Kovbasyuk and Pagano, 2020).[2] While established short sellers may credibly disclose negative reports under their own names (e.g., Ljungqvist and Qian, 2016), others are unwilling to face retaliation by a target's management (Bushman et al., 2022; Lamont, 2012). We posit that credible media outlets represent an important dissemination channel for short sellers. While we are unaware of research directly examining this, there is anecdotal evidence that journalists selectively utilize short sellers as sources.[3] There is also evidence that following the public disclosure of fraud allegations by activist short sellers under their own names, there is a significant increase in sustained negative media coverage of targeted firms (Bushman et al., 2022). Further, Fox et al. (2010) document a significant elevation in negative media reporting following abnormally high short selling in a firm's stock. Research showing that the financial press systematically tilts its news selection process toward negative news suggests that journalists would welcome negative news tips (Neissner and So, 2018). Extending this literature, we consider whether relaxation of short sale constraints induces a systematic tilt towards negative news in the financial press's coverage of affected firms.

Our second hypothesis builds on evidence that short selling affects the stock price discovery process (e.g., Boehmer and Wu, 2013; Saffi and Sigurdsson, 2011). Short sale constraints can limit

[1] See for example Miller (1977); Diamond and Verrecchia (1987); Duffie et al. (2002): Chu et al. (2020), Drechsler and Drechsler (2014), Israel and Moskowitz (2013), Hirshleifer et al. (2011), Asquith et al., (2005), Nagel (2005), Jones and Lamont (2002); and Geczy et al. (2002). See also the extensive discussion of this in Fox et al. (2010).
[2] For example, the public availability of such information can encourage investors long in a stock, who do not face short selling costs, to sell if they deem the information credible (e.g., Ljungqvist and Qian, 2016).
[3] See for example "Market Hardball: Aggressive Methods of Some Short Sellers Stir Critics to Cry Foul" (*The Wall Street Journal*, September 5, 1985) and "The Catastrophe Capitalist' (*New York Magazine*, December 5, 2008).

arbitrage opportunities and interfere with the timely flow of negative news into prices (e.g., Jones and Lamont, 2002; Lamont and Thaler, 2003; Diamond and Verrecchia, 1987). Chu et al. (2020) provide evidence that well-known asset pricing anomalies weaken following the relief of short sale constraints, showing that the short legs of anomaly portfolios exclusively drive this result by becoming significantly less profitable, with no effect on long leg portfolios. We extend this literature by exploring how a reduction in short selling constraints influences the speed and intensity of price discovery around negative business press reports.

To draw causal inferences about relations between short selling and negative financial press reporting, we require an exogenous source of short selling activity. To this purpose, we focus on the Reg SHO experiment, which induced a release in short-sale constraints in a random subset of listed stocks. From May 2, 2005 to August 6, 2007, the SEC suspended short-sale price restrictions (i.e. the uptick rule) for a randomly selected group of stocks (the pilot stocks). The SEC designed this policy to provide an exogenous relief of short sale constraints for one-third of the Russell 3000 universe in order to assess the effect of short selling on market outcomes.[4]

A paper by Heath et al. (2022) argues that reusing natural experiments to examine different dependent variables raises the probability of Type I errors. To address this, the authors recommend, among other things, that researchers reusing an experiment attempt to verify the steps of the causal chain underpinning the hypothesis under consideration. With respect to Reg SHO specifically, researchers should show evidence that Regulation SHO changed something that could plausibly affect the posited dependent variable. We hypothesize that reduced short sale constraints increase informed short selling activities, which increases reporting of negative news by the business press. Thus, a significant increase in short selling activity is a necessary condition for an increase in

[4] Black and Litvak (2017) argue that that the SEC busted its own randomization experiment for some of the largest one-pilot firms. Our results are robust to excluding these larger firms from the sample.

informed short selling activity. There is indeed robust evidence that this is the case. Deither et al. (2009a) and Boehmer et al. (2020a), among others, find that short selling volume increases for pilot firms relative to non-pilot firms during Reg SHO. Di Maggio et al. (2021) document that shares on loan significantly increase for pilot stocks during the Reg SHO period.[5] This increase is economically significant, where pilot firms reflect short interest levels that are 9.8% higher than non-pilot stocks during Reg SHO. Second, our hypothesis posits that increased short selling activity is a catalyst that precipitates more negative news coverage. As discussed later, we establish that the level of negative news coverage *subsequent* to abnormal build-ups of short interest increases more for pilot firms than for controls during Reg SHO.[6]

We measure the sentiment of media coverage using RavenPack News Analytics, which covers all news disseminated via Dow Jones Newswires and the Wall Street Journal. RavenPack news sentiment scores reflect assessments of the tone in a given article (i.e., positive versus negative news), as well as the strength of the positive or negative news. RavenPack also distinguishes between media-initiated news and press releases initiated by the firm, a feature that we exploit to distinguish media activities from firms' voluntary disclosure decisions. We construct our media sentiment variable by averaging RavenPack media sentiment scores during a given quarter over all relevant articles reflecting novel news about a firm.

Using a difference-in-difference design, we designate as treatment firms all pilot firms exempted from short sale price tests under Regulation SHO, and all remaining Russell 3000 companies as control firms. Consistent with our hypothesis, we find that following the

[5] Specifically, for shares on loan as a fraction of total shares outstanding. Campello et al. (2020) also document a significant increase in shares on loan as a fraction of total shares outstanding significantly for pilot stocks.
[6] Moreover, in several specifications, the statistical significance of our estimates passes the adjusted critical values for multiple hypotheses testing, as computed by Heath et al. (2022) using the Romano and Wolf (2005) sequential ordering approach.

implementation of Regulation SHO, the overall sentiment of media coverage tilts significantly more negative. The effect of removing short selling constraints is economically significant, resulting in a 9.2% within-group standard deviation decrease in tone for pilot relative to control firms. When we limit the analysis to small NYSE firms, this effect increases to a 14.3% within-group standard deviation decrease in tone. Importantly, the difference in negative press coverage between pilot and control groups disappears after the end of the experiment when all firms face identical short selling rules. These results are robust to a battery of robustness tests. Overall, these results are consistent with short selling constraints having a significant impact on information flows to capital markets via the business press.

Two mechanisms could explain the decrease in the average news sentiment following relief of short selling constraints. First, the volume of articles could stay constant while news sentiment becomes more negative (intensive margin). Second, the number of negative articles could increase relative to positive articles and increase average sentiment (extensive margin). We find no evidence that short selling constraints affect the number of positive articles relative to negative articles. Thus, we interpret our results as speaking primarily to the intensive margin, where news sentiment becomes more negative, but the relative volume of articles does not significantly change. This is plausible as short sellers are only one of many potential sources of information for the media. That is, while the media's decision to write an article may not necessarily depend on short sellers' information, the availability of such information influences the content of the resulting article. [7]

Next, we distinguish between firm-initiated press releases and articles initiated by the media. This distinction is important as firms may strategically disclose in the face of greater short selling pressure. There is conflicting evidence to date on how short selling constraints influence voluntary

[7] We thank an anonymous reviewer for this suggestion.

disclosures. Chen et al. (2020) finds that managers react to greater short selling pressure by releasing more good news forecasts, Bao et al. (2018) and Clinch et al. (2019) finds that firms increase bad news disclosures, and Li and Zhang (2015) finds that managers do not change the likelihood of issuing good versus bad news forecasts.[8] Extending this literature by examining firm press releases, we find no evidence that press release sentiment decreases during Reg SHO, in contrast to media-initiated articles where sentiment tilts significantly more negative.

Our hypotheses presume that a reduction in short-sale constraints will increase information collection, and that short sellers holding risky short positions will seek to publicize their negative information through the business press. To the extent that this is true, we expect that following abnormal build-ups of short positions, there will be a significantly greater increase in negative news flows for pilot firms relative to non-pilot firms during Reg SHO. The idea is that more aggressive information collection will result in on average more negative information underlying short sales. To explore this, we examine the relation between abnormal changes in short interest and future media sentiment. We find that, following abnormal increases in short interest, there is a 13.1% within-group standard deviation tone decrease for pilot relative to control firms during Reg SHO, but no difference before or after the experiment. While this is consistent with increased short selling activity precipitating more negative news coverage, we acknowledge that more aggressive information collection may also allow pilot firms to better anticipate the future disclosure of newsworthy negative disclosures by firms. However, if increased short selling activity derives primarily from short sellers anticipating eventual release of negative information that would occur

[8] Fang et al. (2016) and Massa et al. (2015) document that that pilot firms have lower discretionary accruals relative to non-pilots during the Reg SHO program. Black et al. (2019) claim that Fang et al. (2016) is not replicable. Fang et al. (2019) reject this claim and offer a battery of evidence supporting the case that their accruals result is indeed replicable.

regardless of Reg SHO, we would not expect to see an overall increase in negative news for pilots during Reg SHO.

In our final analysis, we explore how short sale constraints influence the intensity with which investors impound negative press news into stock prices. In this regard, prior research documents that the stock price of pilot firms become more sensitive to negative earnings surprises and management forecast news.[9] In this spirit, we hypothesize that lower short selling costs will increase the sensitivity of stock prices to negative media news. We find that the sensitivity of stock prices to negative news coverage is 56% larger for pilot relative to non-pilot firms following implementation of Reg SHO. Importantly, the difference in stock price sensitivity to negative news disappears in periods when both pilot and control firms are subject to the short sale regulations.

Our study contributes along several dimensions. First, we contribute to the literature examining the role of the media as an information intermediary. Our analyses directly address the call by Miller and Skinner (2015) for research that develops a more complete theory of the role of the media in financial markets, including consideration of the media's interaction with other players in financial markets (see also Call et al., 2020). While many papers independently examine short sellers as informed traders and the media as an important information intermediary, we provide novel evidence consistent with interactions between short sellers and the financial press influencing negative media coverage. Our evidence suggests that credible media outlets serve as a dissemination channel for informed short sellers, thus complementing the growing literature examining the disclosure decisions of activist short sellers who publicly release negative reports about target firms (e.g., Bushman et al., 2022; Mitts, 2020; Ljungqvist and Qian, 2016; Appel and Fos, 2020; Zhao,

[9] Li and Zhang (2015) find that stock prices of the pilot firms become more sensitive to negative forecast news after Reg SHO relative to the control group. Grullon et al, (2015) document that pilot firms show larger negative abnormal returns relative to the control group on negative earnings surprises after the passage of Reg SHO. Fang et al. (2016) find the absence of significant PEAD following extreme negative earnings surprises for pilot firms during the pilot program.

2020; Brendel and Ryans, 2021). Our focus on regulation driven short sale constraints also extends the literature examining how interactions between securities regulation and the incentives of market participants shape the information environment of public firms (e.g., Leuz and Wysocki, 2016).

We complement and extend the literature examining the influence of short selling constraints on price discovery (e.g., Chu et al., 2020; Boehmer and Wu, 2013; Saffi and Sigurdsson, 2011), as well as research examining the business press as a source of informational advantage for short sellers (e.g., Engelberg et al., 2012; Fox et al., 2010). Our results suggest that reduced short sale constraints are associated with higher sensitivity of stock returns to negative media coverage. Finally, our paper extends the accounting literature on short selling and voluntary disclosure (e.g., Bao et al., 2018; Chen et al., 2020; Clinch et al., 2019; Li and Zhang, 2015) by examining relations between short selling constraints and firms' press release decisions.

We organize the reminder of the paper as follows. Section 2 develops our conceptual framework in the context of the related literature. Section 3 describes our measures of short selling constraints and media sentiment. Section 4 discusses our analyses of relations between short selling constraints and media tilt. Section 5 presents results of our analysis of how short selling costs impact relations between negative news and speed of price adjustments. Section 6 provides robustness analysis and section 7 summarizes and concludes the paper.

2. Related Literature and Conceptual Framework

A large literature examines the business press as a critical information intermediary in capital markets. An independent literature examines short sellers as informed traders. We synthesize these literatures by exploring how interactions between short sellers and the business press influence negative media coverage. In section 2.1, we discuss Reg SHO and our identification strategy for

inferring a causal connection between short selling constraints and negative media coverage. Section 2.2 discusses the role of short selling in shaping firms' media coverage.

2.1. Regulation SHO and the Identification Strategy

Short sellers holding risky short positions have incentives to publicize their private information to accelerate price discovery and reduce the duration of overpricing gaps (e.g., Ljungqvist and Qian, 2016; Kovbasyuk and Pagano, 2020). To disseminate negative information, short sellers may pitch negative stories about targets directly to business journalists, or they may publicly reveal their short thesis through other channels that act as a catalyst for negative news media coverage. Some activists disclose under their own names, while others disclose under pseudonyms. Bushman et al. (2022) find that following public disclosure of fraud allegations by activist short sellers under their own names, there is a significant increase in sustained negative media coverage of the targeted firm. Mitts (2020) examines disclosures by pseudonymous short sellers, providing evidence that pseudonymous short sellers systematically manipulate stock prices through false articles and manipulative options trading.[10] Mitts (2020) does not consider the effect of pseudonymous short sellers on business press coverage of targets. We cannot distinguish between these different groups of short sellers in our data, and so our analyses of relations between short selling constraints and negative business press coverage considers the joint effect of all short sellers.

To identify a causal link between short-selling activity and negative media coverage, we use the Reg SHO experiment conducted by the SEC between from May 2, 2005 to August 6, 2007. In this experiment, the SEC removed existing short sale price tests for a randomly selected group of about 1000 stocks (pilot stocks) from the Russell 3000.[11] The SEC ranked Russell 3000 stocks listed

[10] Block (2022) provides counter evidence and argues that the conclusions in Mitts (2020) are without basis.
[11] The SEC suspended the uptick rule for the NYSE and the bid rule for NASDAQ. Under NYSE uptick rules a short sale was only allowed on a plus tick, or on a zero tick only if the most recent price change preceding the trade was a plus

on NYSE, NASDAQ, and AMEX by average daily traded volume and selected every third firm as pilot firm in order to generate a stratified random sample representative of the cross-section of stocks. We follow prior literature by using a difference-in-differences design in which pilot firms comprise the treatment group and the remaining Russell 3000 stocks the control group.

An important concern with using Reg SHO as an exogenous shock to short selling constraints is that other papers have used this experiment to examine a range of other dependent variables. In this regard, Heath et al. (2022) argue that reusing an experiment to examine different dependent variables raises the probability of Type I errors due to multiple hypotheses testing. While there is no definitive solution to this problem, the authors argue that researchers at a minimum need to recognize this problem and recommend several steps to address this concern. First, they recommend that researchers reusing an experiment verify the steps of the causal chain underpinning the hypothesis under consideration. In the context of our analysis, this requires that we verify the condition that Reg SHO actually led to a significant increase in short selling activity for pilot firms, and that actual short selling activity is associated with an increase in negative news sentiment.

There is robust evidence that Reg SHO did in fact increase shorting activity. Deither et al. (2009a), Black and Litvak (2017) and SEC (2007) find that short selling volume increases for pilot firms relative to non-pilot firms during Reg SHO. Di Maggio et al. (2021) and Campello et al. (2020) finds an increase in short interest, documenting that shares on loan significantly increase for pilot stocks relative to control firms during the Reg SHO period. Further, as we document in Section 4.4, the level of negative news coverage *subsequent* to abnormal build-ups of short interest increases more for pilot firms than for controls during Reg SHO

tick. Under the NASDAQ bid rule, short sales were not allowed at or below the (inside) bid when the current inside bid was at or below the previous inside bid.

However, while overall short selling activity increased, it is important to note that shorting activity can increase via at least two distinct channels. First, lower constraints can incentivize more fundamental-based shorting in which short sellers invest in information production to isolate overpriced firms and then short sell to profit from the identified mispricing.[12] Second, Reg SHO could increase use of arbitrage strategies (Black and Litvak, 2017). For example, Chu et al. (2020) posit that short sale constraints serve as a limit to arbitrage and test this hypothesis by examining whether Reg SHO affected the profitability of eleven well-known asset-pricing anomalies. Chu et al. (2020) finds that the returns to these anomaly strategies became significantly weaker on portfolios constructed with pilot stocks during the pilot period. Further, the effect comes only from the short legs of the anomaly portfolios. In addition, Boehmer et al. (2020a) show that the relative trading aggressiveness of short sellers increased for pilot firms during Reg SHO and argue that this is consistent with higher index arbitrage activity.

We cannot quantify the extent to which increased shorting activity during Reg SHO derives from fundamental-based shorting strategies relative to non-fundamental arbitrage strategies. This empirical question is beyond the scope of our paper. However, we note that if the increase in short selling activity is exclusively driven by non-fundamental, long-short arbitrage strategies that do not involve production of fundamental, firm-specific information, we would not expect to see a systematic increase in negative news reporting by the business press.

In a second recommendation, Heath et al. (2021) suggest that researchers reusing an experiment should assess the validity of the exclusion restriction against existing findings in the

[12] It is also possible that some short sellers seek to profit from misleading the market by disseminating false negative news about a target. While we cannot definitively rule this out, we think it unlikely that it plays a major role in our setting. The RavenPack data we use covers highly credible media outlets (Dow Jones Newswires and the Wall Street Journal). The journalists working for these outlets have incentives to mitigate the risk of false information by scrutinizing the credibility of short sellers. Short sellers also have incentives to protect their reputation for honesty in order to protect their future access to this distribution channel. See, for example, the discussion in "Market Hardball: Aggressive Methods of Some Short Sellers Stir Critics to Cry Foul" (*The Wall Street Journal*, September 5, 1985).

literature. To address this concern, we first note that a number of these previous papers examine the influence of Reg SHO on firms' decision-making and find evidence consistent with firm managers taking actions to mitigate negative consequences of higher short selling pressure.[13] That is, if firm managers perceive an increased probability that Reg SHO will increase short selling pressure on their firms, they may take actions to preempt fundamental-based short selling opportunities. This does not require that there be an actual increase in short selling. In contrast, we hypothesize that an actual increase in information collection and short selling precipitates negative news flows in the business press to accelerate price discovery.

For example, Fang et al., (2016) and Massa et al. (2015) document that pilot firms engage in less in earnings management and improve corporate governance. He and Tian (2016) find that that the quality, value, and originality of patents generated by treatment firms improve significantly more for pilot firms, suggesting that short sellers mitigate managerial myopia in investment decisions. Campello et al. (2020) find that firms respond to a decline in shorting constraints by repurchasing shares and increasing investment, consistent with their responding to manipulative shorting threats by signaling firm value through observable corporate policies. Chen et al. (2019) show that managers of pilot firms increase cash dividend payouts to signal that their stock is not overvalued and counteract intensified short-selling pressures. We argue that it is unlikely that such variables are the drivers of a systematic increase in negative news reports in the financial press. While we make no claim to exhaustive coverage, we do control for a number of variables previously used as dependent variables in previous studies using Reg SHO. These include the probability of informed trading (De Angelis et al., 2017), short interest (Diether et al., 2009a; Grullon et al., 2015), standard deviation

[13] See Internet Appendix to: Reusing Natural Experiments," Table IA2: Reported Outcome Variables in Heath et al. (2022) for a list of the dependent variables examined using

of returns (Alexander and Peterson, 2008; Diether et al., 2009a), asset growth, R&D expenses (Grullon et al., 2015; Campello et al., 2020), and analyst forecast errors (Ke et al, 2020).

2.2. Media Coverage of Firms and Short Selling

An evolving literature examines the role of the business press in collecting and disseminating value-relevant information to capital market participants (e.g., Miller and Skinner, 2015; Tetlock, 2014). Tetlock, et al. (2008) and Engelberg (2008) show that the qualitative content of information contained in news stories can predict both earnings surprises and short-term returns. Engelberg and Parsons (2011) provide evidence that the media has a causal impact on investor behavior by comparing the behaviors of investors with access to different media coverage of the same information event. Dougal et al. (2012) find that specific financial columnists have a causal effect on short-term aggregate stock market prices. Bushee et al. (2010) document that press coverage reduces bid-ask spreads and increases depth around earnings announcements, where Fang and Peress (2009) find that stocks with low media coverage have higher returns than stocks with high coverage. While this literature generally takes media coverage as given, we allow for the possibility that informed short sellers directly influence media coverage.

In this paper, we extend and complement this media literature as well as a growing literature on activist short sellers who disclose their positions and their opinions on target firms, backing their short thesis with detailed data on allegedly mispriced assets (e.g., Ljungqvist and Qian, 2016). The idea is that short sellers holding risky positions publicize their information to accelerate price discovery and reduce the duration of overpricing gaps (e.g., Kovbasyuk and Pagano, 2020). For example, Ljungqvist and Qian (2016) provide evidence that disclosures by activist short sellers encourage investors long in a stock, who do not face short selling costs, to aggressively sell and drive the stock prices down. Ljungqvist and Qian (2016) note that the responses of long investors

will depend on their assessment of a short seller's credibility. Not all short sellers will have the requisite name recognition. Further, short sellers who disclose negative reports under their own names face potential litigation risk and other attacks from a target firm's managers (Lamont 2012; Walker and Forbes 2013). Thus, we hypothesize that short sellers lacking reputational capital or willingness to face retaliation by firms will view credible media outlets as a viable channel through which to drive their negative information into stock prices.

A key premise of our paper is that informed short sellers take short positions in overpriced stocks and then seek to disseminate their information via various information channels, including the media. There is strong evidence that short sellers are informed traders. Several papers document that when short interest or volume is high, future returns are low (e.g., Senchack and Starks, 1993; Asquith et al., 2005; Diether et al., 2009b; Kelly and Tetlock, 2017). While this evidence is consistent with informed short sellers, it does not speak to the source of their information advantage. For example, traders can sell short in anticipation of future negative announcements by firms or other independent parties (e.g., Christophe et al., 2004; Christophe et al., 2010; Karpoff and Lou, 2010; Boehmer et al., 2020b). There is evidence that short sellers' trading advantage comes from their superior ability to extract information, especially negative information, from published media reports (Engelberg et al., 2012).[14] However, if the increased short selling during Reg SHO derives primarily from short sellers anticipating the eventual release of negative information that would occur anyway or shorting in the aftermath of published news reports, we would not expect to see an increase in negative news for pilots during Reg SHO.

3. Measuring Short Selling Constraints and Media Sentiment

[14] For more discussion of the view that public news events present profitable trading opportunities for traders highly skilled in information processing, see Kandel and Pearson (1995) and Engle et al. (2012).

We capture changes in short selling constraints using the Rule 202T pilot program of Regulation SHO. We adopt a difference-in-difference design with treatment firms designated as all pilot firms in the Russell 3000 index exempted from short sale price tests under Regulation SHO, with all remaining firms designated as control firms (or non-pilot firms).

Our news coverage data is from RavenPack News Analytics, a daily dataset that assigns a sentiment score to business news stories using a range of textual analysis techniques. RavenPack's Composite Sentiment Score (CSS) reflects an assessment of the tone of the news in a given article (i.e., positive or negative news) as well as the strength of the news the article contains. Following prior studies (e.g., Bushman et al., 2017), we eliminate news flashes (articles composed of only a headline and no body text), hot-news-flashes and tabular-material (news article composed of a headline and mostly tabular data). We further restrict our sample to full-size articles with a relevance score of 75 and above. RavenPack assigns a relevance score to indicate how strongly a firm features in the underlying news story. The scores range from 0 (low relevance) to 100 (high relevance). Scores above 75 signify that the article is relevant for a firm. Finally, we focus on articles most likely to convey novel news about a firm by only utilizing articles with Event Novelty Scores (ENS) of 100. ENS indicates how novel a news story is within a 24-hour time window by assigning a score of 100 to articles covering a news event about a firm for the first time, where subsequent articles about the same event receive lower scores.

To examine relations between short selling constraints and news sentiment, we operationalize media sentiment by computing the average of RavenPack's Composite Sentiment Score (CSS) over the quarter ending one day before the earnings announcement date.[15] CSS scores

[15] Niessner and So (2017) also exclude earnings announcement dates when computing their coverage measures, using the 50 trading days ending 5 days before firms' quarterly earnings announcements. Our results are robust to including the earnings announcement date.

range between 0 to 100, with a score above 50 indicating positive news; a score equal to 50, neutral news; and a score below 50, negative news.[16]

Table 1 summarizes the sample selection process. We start with 62,888 observations with accounting, equity and analyst data from 2000 to 2010. Next, we merge the dataset with RavenPack resulting in a sample with 45,487 observations. After limiting our sample period to the years 2003 to 2009, we have 43,184 observations. Furthermore, we limit our analyses to observations with non-missing data accounting, market and coverage data, yielding a final sample of 29,722 observations. We designate the period from January 2003 through April 2005 as the pre-pilot period (*Pre)*, from May 2005 through July of 2007 as the pilot program *(During)*, and from August 2007 through October 2009 as the post-period (*Post)*.[17] The final sample contains 2,188 firms composed of 725 treated firms and 1463 control firms. As shown in table 1, our final sample maintains the same proportion of treatment and control firms as that of the overall experiment.

Table 2 presents descriptive statistics for the first quarter of 2004, which predate the announcement of the SHO experiment. The variable *Tone* reflects the overall RavenPack media sentiment score. We also disaggregate *Tone* into media-initiated articles and firm-initiated press releases, designated as *FM Tone* and *PR Tone*, respectively. Table 2 reports that in 2004Q1 there are no significant differences in media sentiment between pilot firms and controls.[18] *Tone* has a mean value for pilot (control) firms of 51.15 (51.03), which indicates a slightly positive tilt (recall that 50 reflects neutral sentiment).[19] When we split sentiment into *FM Tone* and *PR Tone* measures, table 2

[16] See Appendix A for a more detailed description of RavenPack's CSS measure. All variables are defined in the Appendix A and we annually winsorize all continuous variables at the 1% and 99% levels across quarters.
[17] We use January 2003 to April 2005 as our pre-period for all of our sentiment tests because RavenPack has limited coverage before 2003. However, our results are robust to using a pre-period from March 2002 to July 2004
[18] We find qualitatively similar results if we use all quarters of 2003 instead of only data from 2004Q1.
[19] Similar to Fang et al. (2016), we observe that the pilot group and the control group are statistically similar in market-to-book, size, return on assets, leverage, asset growth, and research and development. Further, untabulated estimations from Probit models show that firm characteristics do not predict the likelihood of the firm being selected in the pilot

shows that pilot (control) firm press releases have mean sentiment of 52 (51.99), indicating a positive tilt, while financial media exhibits a slightly positive (negative) tilt with mean sentiment of 50.22 (49.97).

4. Does Relieving Short Selling Constraints Increase Negative Media Coverage

4.1 Main empirical specification

Following Fang et al. (2016), our primary empirical specification uses the following difference-in-difference design:

$$Tone_{it} = \alpha_1 I(Pilot) * I(During) + \alpha_2 I(Pilot) * I(Post) + Controls + \delta_i + \delta_t + \varepsilon_{it} \quad (1)$$

In this specification, *Tone* is the average *overall* RavenPack media sentiment score. In later analyses, we will also separately consider media-initiated articles and firm-initiated press releases. *I(During)* is an indicator variable set equal to one for observations occurring during the period May 2005 to end of July 2007, and zero otherwise. *I(Post)* is an indicator variable equal to one during the time period August 2007 to October 2009, and zero otherwise. *I(Pilot)* is an indicator variable set equal to one for observations related to pilot firms in any period, and zero otherwise. δ_i and δ_t represent firm fixed effects and year-quarter fixed effects, respectively. Our main variables of interest in (1) are the interaction term *I(Pilot)*I(During)* and *I(Pilot)*I(Post)*. We predict that the coefficient α_1 on the interaction term *I(Pilot)*I(During)* will be negative, reflecting a significant decrease in media sentiment for pilot firms during the experiment relative to control firms. We also predict that there will be no difference between pilot and control firms after the experiment ends as both groups face the same short selling constraints.

program from Reg SHO (p-value = .76 for the model). This evidence is consistent with the unpredictability of the experiment and mitigates endogeneity concerns.

We include a range of variables to control for firm characteristics related to a firm's information environment. Specifically, we control for firm size (*Size*) since larger firms are likely to attract relatively higher media coverage. Similarly, the media may cover firms based on profitability (*ROA*), growth opportunities (*MTB*), research and development expenses (*RD*) and asset growth (*Asset growth*). We include leverage (*Leverage*) to control for firms' capital structure and financial distress likelihood, which may influence the sentiment of media coverage.

We also add controls that capture properties of firms' publicly traded equity as past equity performance may affect investors' attention and thus influence coverage decisions of the financial press. These additional controls include lagged stock returns (*Ret*); stock returns volatility (*StdRet*); trading volume (*Vol*); and illiquidity (*Illiquidity*).

Finally, we include analyst coverage (*Coverage*), analyst forecast error (*SUE*) and forecast dispersion (*DispFor*), probability of informed Trade (*PIN*) and open short interest (*SIR*) to control for potential demand for firm-specific information and dispersion on market expectation. We define all variables in Appendix A.[20] We cluster standard errors by firm.

4.2 Short Selling Constraints and Negative Media Coverage: Empirical Results

Table 3 reports results from estimating equation (1). In columns (1)-(3) we limit the analysis to the pre and during periods, where column (4) includes pre, during and post periods. The dependent variable is *Tone*, which is the quarterly average of the overall RavenPack media sentiment score. Column (1) presents the results including only firm and year-quarter fixed effects, while column (2)-(3) gradually add controls for firm fundamentals. In columns (1) through (3), the coefficient on the interaction term *I(Pilot)*I(During)*, α_1, is negative and significantly different from zero. This shows

[20] In our main specification, we control for several variables examined in prior Regulation SHO studies (e.g. PIN, StdRet, AssetGrowth, SIR, R&D, and SUE). This conservative specification contributes to the validity of the research design by providing incremental evidence to previously examined effects of Reg SHO (Heath et al., 2022). See Appendix A for detailed descriptions of all variables.

that following the reduction in short selling constraints, media coverage sentiment for pilot firms decreased significantly relative to that of control firms. Importantly, we find in column (4) that the coefficient of *I(Pilot)*I(Post)* is statistically insignificant, indicating that media sentiment becomes similar to pilot and control firms once they have similar short selling constraints after the experiment.[21] This result bolsters the validity of our inferences that short selling constraints have causal effects on the information flow to capital markets.

All of our specifications include firm fixed effects and so examine within firm changes in tone. As a result, we assess economic significance by focusing on within firm standard deviations, following Mummolo and Peterson (2018) and deHaan (2021). Focusing on specification (4), we compare our estimated average treatment effect of -0.07 with the standard deviation of *Tone* after demeaning it (0.76). This implies that the effect of relaxing short selling constraints results in a 9.2% within-group standard deviation decrease in tone for pilot relative to control firms (10.5% if we consider column (3)). Collectively, the results are consistent with short selling constraints playing a role in the incentives of short sellers to produce and disseminate information to capital markets.

Black and Litvak (2017) argue that that the SEC busted its own randomization experiment by randomly selecting "original control" firms, picking the largest third, and suspending the uptick rule for trading in these firms' shares after regular trading hours. These firms became, in effect, "partly treated" – the uptick rule applied only during regular trading hours. Therefore, the authors argue that the experiment was only clean for small firms. Furthermore, the authors argue that the effect on small NYSE stocks should more pronounced relative to NASDAQ stocks.[22]

[21] The coefficient of *I(Pilot)* I(Post)* is statistically indistinguishable to the coefficient of *I(Pilot)* I(During)*. This result is consistent with the media sentiment of the control group getting more negative instead of the media sentiment of the pilot group reversing to the pre-SHO levels. We interpret this evidence as consistent with our main results. The coefficients are also similar in terms of economics significance.

[22] Small firms are defined as firms with *log(mktcap)* < 7.9 before the announcement of the experiment. We are agnostic about what to expect for NASDAQ firms. While Black and Litvak (2017) predict a more muted effect, some prior studies do find significant effects of Reg SHO on NASDAQ firms (e.g., Diether, Lee, and Werner, 2009a; Chen, Chen, and

To rule out the possibility that the busting of the experiment confounds our results, we examine whether the decrease in news sentiment observed on Table 3 is present in subsamples where the experiment is unambiguously valid. Specifically, we restrict our sample to small stocks as defined by Black and Litvak (2017) and consider NYSE-traded stocks and NASDAQ stocks separately for completeness. Table 4 presents the results. Column (1) shows the results for *Small* firms. Column (2) estimates our difference-in-difference model for small firms traded on NYSE *(Small & NYSE)* and Column (3) focuses on small firms traded on NASDAQ. For both *Small* and *Small & NYSE* firms, the coefficient on *I(Pilot)*I(During)* is negative and significant, while the coefficient is smaller and not statistically significant for small NASDAQ stocks. Similar to Table 3, we find that for all columns the coefficient of *I(Pilot)*I(Post)* is statistically insignificant, indicating that media sentiment becomes similar to pilot and control firms once they have similar short selling constraints after the experiment.

Focusing on specification (2), *Small & NYSE*, we assess economic significance by comparing our estimated average treatment effect of -0.12 with the standard deviation of *Tone* after demeaning it (0.84). This implies that the effect of relaxing short selling constraints results in a 14.3% within-group standard deviation decrease in tone for pilot relative to control firms. Note that this economic significance is 55% higher than the effect reported in Table 3, where firms of all sizes are pooled (14.3/9.2 = 1.55). The greater effect for small firms is consistent with findings in Grullon et al. (2015).

To further assess the validity of our results, we estimate a dynamic difference-in-difference model where we interact *I(Pilot)* with indicator variables for each calendar year in the period before and during SHO. We use the year of 2004 as our baseline. Figure 1 displays the difference in news

Chou, 2020; and Gong, 2020). Our main objective with this analysis is to establish that partially treated firms do not confound our results.

sentiment for pilot firms relative to control firms over time. Consistent with Table 3, we observe a significant decrease in news sentiment during SHO. The difference in news sentiment, however, disappears after the end of the experiment. Figure 1 also suggests that there were no significant differences in news sentiment before Regulation SHO. This result alleviates concerns that pilot and control firms exhibited different news sentiment trends pre-experiment and support our results in Table 4 about the validity of the experiment.

4.3 Number of Articles: Intensive versus Extensive Margin

Our analyses focus on the effect of lower short selling constraints on news sentiment. Two mechanisms could explain this result. First, the volume of articles could remain constant while news sentiment becomes more negative. Second, the number of negative articles could increase relative to positive articles and increase average sentiment. To explore these mechanisms, we examine the effect of Reg SHO on the number of positive and negative news a firm receives in a given quarter. Table 5 presents the results. In panel A, we look at the total number of articles (irrespective of tone). In panel B, we look at the number of positive or negative articles separately.[23] For both panels, we find that the coefficients of I(Pilot)*I(During) and I(Pitot)*I(Post) are not statistically significant at conventional levels. Collectively, these results suggest that Reg SHO had little effect on the number of articles (extensive margin). Thus, we interpret our results as speaking to the intensive margin where news sentiment becomes more negative, but the relative volume of articles does not significantly change. This is plausible as short sellers are only one of many potential sources of information for the media. That is, while the media's decision to write an article may not necessarily depend on short sellers' information, the availability of such information influences the content of the resulting article.

[23] Specifically, we look at the number of total positive or negative articles, with articles including both FM articles and PR articles. Across both panel A and B, we use unlogged measures. Our inferences are similar if we use logged variables.

4.4 Distinguishing media-initiated coverage and firm-initiated press releases

We thus far not distinguished articles initiated by the media from firm-initiated press releases. However, increased short selling pressure may elicit changes in disclosure strategies by firms that differ substantially from changes in short sellers' information dissemination strategies and news coverage decisions of the financial press. Firms' managers' may adopt press release strategies to counteract increased flows of negative news by imbuing their press releases with a more positive spin, by releasing negative news earlier given that short sellers are likely to drive it into prices anyway, or by reducing the precision of bad news to minimize its impact on stock prices.[24]

We examine how firms' press release strategies respond to changes in short selling costs. We disaggregate media sentiment into press releases initiated by the firm (*PR Tone*) and news initiated by outsiders (*FM Tone*). We then run a difference in differences specification separately for each sentiment variable. Per discussions with RavenPack, we can identify firm-initiated articles if 1) the news is relevant (relevance > 90), 2) RavenPack classifies the article \as a press release, and 3) there are no other firms mentioned on the same news ID. These criteria together indicate that the firm is likely to have initiated the article. Table 6 reports the results of this analysis. Column 1 to 4 suggest that *I(Pilot)*I(During)* is negative and significant for *FM Tone,* but not for *PR Tone*. Similar to our results in Table 3 and 4, we find that *I(Pilot)*I(Post)* is not statistically different than zero for all columns.[25] These results suggest that media-initiated news is primarily driving the change in information flow to capital markets.

[24] Chen et al. (2019) finds that managers react to increase in short selling pressure by releasing more good news. Clinch et al. (2019) finds that firms significantly increase bad news disclosure with no effect on good news, and Li and Zhang (2015) find that managers do not change the likelihood of issuing a good or a bad news forecasts but do reduce the precision of bad news forecasts. Bao et al. (2018) finds that the relation between residual short interest and future negative disclosures by firms increases for pilot relative to control firms during Reg SHO. Fang et al. (2016) find that firms decrease earnings management behavior following a reduction short selling cost.

[25] We note, however, that the coefficient of *I(Pilot)*I(Post)* is statistically indistinguishable to the coefficient of *I(Pilot)*I(During).*

4.5 Direct relation between abnormal short interest and subsequent media tone

A central idea underlying our hypothesis is that Reg SHO will heighten short sellers' incentives to reveal their private information to the media *after* establishing their short positions. In this subsection, we directly explore this link by examining relations between abnormal changes in short interest and future media sentiment. We retrieve monthly observations of firms' open short interest and examine the extent to which abnormal short interest levels predict future negative news sentiment. Specifically, we estimate the following model by subsample period (pre, during, post):

$$Future\_Tone_{it} = \beta_1 I(Pilot) * SIR + \beta_2 SIR + \delta_i + \delta_t + \varepsilon_{it} \quad (2)$$

Future_Tone is the average media sentiment in the 30 days following the 15th day of the month.[26] *SIR* is the short interest ratio, measured as open short interest as a percentage of total shares outstanding. Short interest data comes from Compustat Short Interest, which reports open short positions on the 15th day of each month.[27] Our main coefficient of interest is that of *I(Pilot)* SIR*, which captures the difference in how abnormal short selling is related to future media sentiment for pilot firms relative to control firms. By including firm fixed effects, this specification focuses on abnormal short interest by considering variation of *SIR* around the within firm average *SIR*.

Our objective is to examine the extent to which the intensity of negative news coverage subsequent to abnormal build-ups of short interest increases more for pilot firms than for controls during Reg SHO. The idea is that more aggressive information collection will result in on average more negative information underlying short sales. To the extent that this is true, we expect that β_1 will be negative and statistically significant *only* during the Reg SHO experiment. Table 7 presents the results of estimating equation 2. Consistent with our conjecture, we find that the coefficient of *I(Pilot)* SIR* is negative and statistically significant only during Reg SHO (p-value < 0.01).

[26] Our results are similar if we use 15 days or 20 days after the disclosure of short selling positions.
[27] https://wrds-web.wharton.upenn.edu/wrds/ds/compd/sec_shortint/index.cfm?navId=83).

Importantly, we find no significant difference between the pilot and control groups *pre* and *post* experiment. Focusing on column (4) of Table 7, we compare our estimated coefficient of -0.013 with the standard deviation of *Future_Tone* after demeaning it (0.70). One standard deviation of *SIR* (5.568) is equivalent to 10.5% (0.013 * 5.568/0.70) of a within standard deviation of *Future_Tone.* Overall, this analysis establishes that the level of negative news coverage *subsequent* to abnormal build-ups of short interest increases more for pilot firms than for controls during Reg SHO.

5. Short Selling Costs and Associations between Negative News and Stock Returns

To the extent that lower short selling constraints increase short selling activity, it is plausible that stock prices would more efficiently incorporate information from negative press coverage. The idea is that lower limits to arbitrage will increase incentives for short sellers to more aggressively seek out and trade on negative news, and thereby heighten the relation between stock returns and negative news. We predict that relative to control firms, the stock returns of pilot firms will decrease significantly more in response to negative media during the treatment period.

To investigate this claim, we run an OLS regression of daily stock returns on contemporaneous news sentiment for that day. We limit the analysis to firm days for which there is at least one news article reported in RavenPack. For ease of exposition, we run the analysis separately for the pre-period and the treatment period. *I(Negative)* is an indicator variable set equal to one if average news sentiment on a given day is negative, and zero otherwise. Table 8 reports the results of this analysis. We find that the coefficient on the interaction term *I(Negative)*I(Pilot)* is negative and statistically significant only during the pilot period. Focusing on specification (4), we see that stock price decreases by 11.5 basis points more in response to negative news for pilots relative to control firms during Reg SHO. To put this in perspective, the response to negative news for non-pilot firms during Reg SHO is -19.9 basis points. This implies that the response for pilot

firms is 56% larger than for non-pilots ((11.5+19.9)/19.9). Finally, we also find that stock returns of pilot and control firms respond similarly to negative news in the period before and after the Reg SHO experiment.

The results in this section provide evidence consistent with a relaxation in short selling constraints decreasing limits to arbitrage and increasing sensitivity of stock returns to negative media coverage. This evidence combined with our earlier analyses show that a relaxation of short selling constraints impact leads to a more negative tilt in firms' media coverage and fundamental change in the relation between negative news and stock price formation.

6. Additional Tests

In this section, we report the results from a range of robustness and additional tests. First, we re-estimate equation (1) using entropy-balancing matching and propensity-score matching. Matching techniques may help us better identify the effect of removing short selling constraints on media tone by synthetically creating and restricting our analyses to comparing pilot firms to "nearly" identical firms in the control group that were not treated. Table 9 presents the results of this additional test. Columns 1 and 2 present the results for the entropy-balanced sample. We balance the pilot and control firms using all of the controls in Table 3 on the first and second moment (mean and variance). Columns 3 and 4 present the result for the propensity-score matched sample.[28] Across all columns, we observe that the coefficient of I(Pilot)*I(During) is negative and statistically significant. Interestingly, the magnitude of the estimates remains stable across columns and are consistent with previous estimates. Furthermore, we find that the coefficient of I(Pilot)*I(Post) is negative but not statistically significant.

[28] We use nearest neighbor matching allowing for up to three neighbors.

We also conduct two placebo analyses to evaluate if our results are due to spurious correlation. In our first placebo analysis, we randomize one-third of the control firms into a placebo treatment group (*pseudo_pilot*) and compare them with the remaining control firms. This analysis holds constant the length of the experiment and helps us assess whether media sentiment was changing for reasons unrelated to the relaxation of short selling constraints. The main coefficients of interest are those on *I(Pseudo_pilot)*I(During)* and *I(Pseudo_pilot)*I(Post)*. Specifically, *I(Pseudo_Pilot)* equals one for control firms that were randomly assigned a pseudo treatment, zero otherwise. Table 10 panel A presents the results. Column 1 presents the results without any time-varying controls. Column 2 presents the results of estimating our most conservative model. Across both columns, the coefficient of *I(Pseudo_pilot)*I(During)* and *I(Pseudo_pilot)*I(Post)* are positive and statistically insignificant.

In our second placebo analysis, we repeat our main test by randomizing the treatment date instead of which firms got treated (Ke et al., 2020 – Table 5). This placebo analysis holds constant the comparison of treated firms and control firms but tries to assess whether time-specific changes drive our results. Our main coefficient of interest is that *of I(Pilot)*I(Placebo_During)*. Specifically, *I(Placebo_During)* is an indicator variable equal to one for observations after August 2003 but before June 2004, and zero otherwise. The pre-period ranges from January of 2003 to August of 2003. Table 10 panel B presents the results. The results suggest that news sentiment did not differ for pilot and non-pilot firms for this pseudo-experiment. This result bolsters our confidence that unobservable cross-sectional variation across firms is not driving our results.

In untabulated tests, we repeat our main analysis clustering the standard errors by firm and time, finding similar results. Furthermore, our inferences remain the same if we restrict our analyses only to comparing the pre period with the period when short selling constraints were removed for

pilot firms; if we delete financial and utility firms; or if we change the pre-period to start before the announcement of the experiment. Collectively, these additional tests corroborate our main findings that short selling constraints affect the information flow to capital markets.

7. Summary and Conclusion

A complex interaction of market institutions, securities regulation and incentives shapes the availability of firm-specific information about publicly traded firms to the capital markets. While securities law in some cases mandates public disclosure by firms, it can also influence the information environment by shaping the incentives of market participants to collect and disseminate information via trading activities and public disclosure. In this paper, we investigate the extent to which constraints placed on short sales by U.S. securities regulations affect the reporting of negative news about firms by the business press. As noted by Diamond and Verrecchia (1987) and others, short selling constraints are consequential and can impede the flow of negative news into stock prices. While many papers independently examine short sellers as informed traders and the media as an important information intermediary, we examine how a shift in the rules of the game defined by securities law alters the incentives of short sellers to exploit the financial press as a dissemination channel for negative news. Our analyses directly address the call by Miller and Skinner (2015) for research that develops a more complete theory of the role of the media in financial markets, including consideration of the media's interaction with other players in financial markets (see also Call et al., 2020).

We hypothesize that increased short selling activity will result in business press articles reflecting higher levels of negative content and an increase in the intensity with which the market impounds negative press reports into the stock price. To draw causal inferences about relations between short selling and negative financial press reporting, we use the Reg SHO experiment, which

induced a relaxation in short-sale constraints in a random subset of listed stocks. We carefully consider the issue of Type I errors associated with reusing the Reg SHO experiment (Heath et al., 2022). Following exogenous relief of short sale constraints, we find that the overall sentiment of media coverage tilts significantly more negative for pilot relative to control firms. There is a more pronounced effect for small NYSE firms, and for media-initiated articles relative to firm-initiated press releases. Further, following abnormal increases in open short positions, there is a significantly greater increase in negative news flows for pilot relative to non-pilot firms. Finally, we find that stock returns of pilot firms become significantly more sensitive to negative news reports. Overall, our evidence suggests that credible media outlets serve as an important dissemination channel for informed short sellers, and provides new insights into how interactions between securities regulation and the incentives of market participants shape the information environment of public firms.

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Appendix A

Variable name	Variable Definition
MAIN VARIABLES	
CSS	Composite Sentiment Score from 0 to 100. Extracted from RavenPack. It represents the news sentiment of a given story by combining various sentiment analysis techniques.
Tone	Average Composite Sentiment Score for a firm in a given quarter. Tone is the average CSS over the 90 days prior to the earnings announcement date of the current quarter. Sentiment data is from Ravenpack Dow Jones Edition.
FM Tone	Financial Media tone. FM Tone is the average Composite Sentiment Score from media-initiated news. FM Tone is the average over the 90 days prior to the earnings announcement date of the current quarter. Sentiment data is from Ravenpack Dow Jones Edition.
PR Tone	Press-release tone. PR Tone is the average Composite Sentiment Score from news initiated by the firm. PR Tone is the average tone measures over the 90 days prior to the earnings announcement date of the current quarter. Sentiment data is from Ravenpack Dow Jones Edition.
#Articles	The number of total articles published about a firm in the 90 days prior to the earnings announcement. The number of total articles include both financial media and press-releases articles. #Articles is compiled using data from Ravenpack Dow Jones Edition.
#FM Articles	The number of financial media articles published in the 90 days prior to the earnings announcement date of the current quarter. #FM Articles is compiled using data from Ravenpack Dow Jones Edition.
#PR Articles	The number of press release articles published in the 90 days prior to the earnings announcement date of the current quarter. #PR Articles is compiled using data from Ravenpack Dow Jones Edition.
I(Pilot)*I(During)	Indicator function equals one if firm is in the Pilot Program during the experiment period, zero otherwise.
I(Pilot)	Indicator variable equals one if firm is in the Pilot Program, zero otherwise. Pilot data is from Vivian Fang's website.
I(During)	Indicator variable equals one for time periods between May 2005 and July 2007, and zero otherwise.
I(Post)	Indicator variable equals one between August 2007 to October 2009, zero otherwise
CONTROL VARIABLES	
MTB	Market to book, measured as the market value of equity at quarter *t* divided by the book value of equity at quarter *t*. Accounting data is from Compustat Quarterly.
Size	Natural log of Total Assets,at quarter *t*. Accounting data is extracted from Compustat Quarterly.
ROA	Return on Assets, measured as the operating income before depreciation at quarter *t* divided by total assets at quarter *t-1*. Accounting data is from Compustat Quarterly.

Leverage	Leverage is current liabilities plus long term debt over total assets, all measured at quarter *t*. Accounting data is from Compustat Quarterly.
Asset Growth	Total Asset Growth, measured as the logarithm ratio of total assets at quarter *t* divided by total assets at quarter *t-1*. Accounting data is from Compustat Quarterly.
RD	Research and Development expenses, measured at quarter *t*. Accounting data is from Compustat Quarterly.
PIN	Probability of Informed trading measure at quarter *t*. Quarterly PIN data was download from Stephen Brown's website.
StdRet	12-month standard deviation of daily returns return, measured using data from 360 days before the end of the current quarter until the end of the quarter *t*. Market data is from CRSP.
Ret	12-month cumulative daily return, measured using data from 360 days before the end of the current quarter until the end of the quarter *t*. Market data is extracted from CRSP
Illiquidity	12-month moving average of daily illiquidity, measured using data from 360 days before the end of the current quarter until the end of the quarter *t*. Market data is from CRSP.
SIR	Short Interest Ratio in percentage terms. SIR is the short interest extracted from Compustat Supplemental Short Interest File via WRDS. Short Interest range from 0 to 100, with higher values meaning higher amount of short selling.
SIR_Rank	SIR_Rank is the percentile amount of short interest. SIR_Rank range from 1 to 10 in which higher percentile means higher amount of short selling.
SUE	Current average analyst forecast error. Forecast error is ACTUAL – Estimated. Forecast computed using data from I/B/E/S.
Coverage	Number of analysts following a firm at quarter *t*. Forecast data is extracted from I/B/E/S.
DispFor	Earnings forecast dispersion measured as the standard deviation of all forecasts for the current quarterly earnings. Forecast data is from I/B/E/S.

Figure 1: Difference in news sentiment across time for pilot and control firms.

This figure plots the average difference in sentiment for pilot and control firms across time. Specifically, we estimate the equation, $Tone_{it} = \beta_0 + \beta_1 I(Pilot) * I(Year)_t + X\Gamma + \epsilon_{it}$. Tone is the quarterly average Composite Sentiment Score from RavenPack. Each dot represents the coefficient associated with *I(Pilot)*I(Year),* and the lines represent the associated 90% confidence interval. *I(Pilot)* is equal to one if the firm is in the pilot program, zero otherwise. $I(Year)_t$ equals one for a given year, zero otherwise. X is a vector of controls that include *ROA, Book-to-Market, Size, Leverage, Asset Growth, R&D, PIN, StdRet, Ret, Iliquidity, SIR_Rank, Coverage, SUE, DispFor*. See appendix A for details of the variables. Standard errors are clustered by firm.

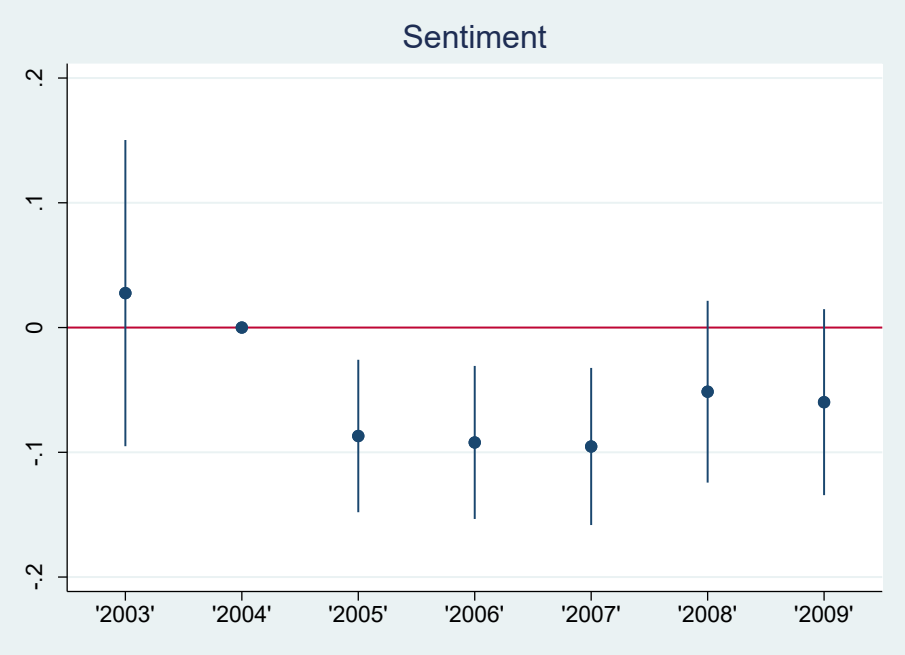

Table 1: Sample Selection

Filters	Observations	Unique firms	Treated Firms
Compustat, CRSP and IBES data from 2000 - 2010 for Russell 3000 firms	62,868	2734	889 (32,9%)
After deleting observations of firms not covered by RavenPack	45,487	2587	845 (32,7%)
After deleting observations not included in study period	43,184	2524	824 (32,6%)
After deleting observations with missing accounting or market variables	29,722	2188	725 (33,1%)

Table 2: Descriptive Statistics

	Pilot			Control			T-statistic for the differences between the pilot and control firms	
	Mean	Median	Std. Dev	Mean	Median	Std. Dev	Mean	Median
Tone	51.15	51.33	1.46	51	51.2	1.78	1.42	-0.8
FM Tone	50.22	50.49	2.46	49.97	50.15	2.90	1.6	-1.2
PR Tone	52	52	1.32	51.99	52	1.41	0.07	-0.01
Controls								
MTB	3.74	2.63	3.22	3.55	2.79	3.19	1.03	-0.14
Size	7.19	6.94	1.71	7.18	7.04	1.71	0.09	-0.06
ROA	0.04	0.03	0.04	0.03	0.03	0.04	0.8	-1.04
Lev	0.32	0.31	0.27	0.33	0.31	0.28	0.43	0.05
AssetGrowth	0.05	0.03	0.10	0.05	0.03	0.11	0.23	0.26
RD	19.09	0	64.22	21.18	0	70.06	0.52	0.83
PIN	0.15	0.13	0.07	0.15	0.14	0.07	1.2	1.25
StdRet	0.03	0.03	0.01	0.03	0.03	0.01	2.01	1.61
Ret	0	0	0.07	-0.01	-0.01	0.07	2.06	-1.59
Illiq	0.31	0.03	1.17	0.31	0.03	1.15	0	0.88
SIR_Rank	0.04	0.03	0.05	0.04	0.03	0.05	0.24	-0.15
Coverage	7.47	6	5.49	6.98	5	5.10	1.59	-1.3
SUE	0.01	0.01	0.10	0.02	0.01	0.11	0.3	-0.02
DispFor	0.02	0.01	0.06	0.03	0.01	0.08	1.51	0.36

This table presents the descriptive statistics by group for the first quarter of 2004, the quarter before the selection of firms to the pilot group. We present the statistics separately for the pilot and control firms. See Appendix A for all variable definitions.

Table 3: Sentiment Analysis

Dep. Variable:	*Tone*			
	(1)	(2)	(3)	(4)
I(Pilot)*I(During)	-0.07**	-0.07**	-0.08***	-0.07**
	(-2.35)	(-2.41)	(-2.71)	(-2.33)
I(Pilot)*I(Post)				-0.04
				(-1.12)
MTB		0.00	0.00	0.00
		(1.20)	(0.98)	(1.25)
Size		0.06	0.05	0.08***
		(1.63)	(1.14)	(3.02)
ROA		0.72*	0.51	0.37
		(1.93)	(1.35)	(1.31)
Leverage		-0.15**	-0.15**	-0.09*
		(-2.19)	(-2.19)	(-1.95)
AssetGrowth		0.19***	0.18**	0.14**
		(2.69)	(2.56)	(2.44)
RD		-0.00**	-0.00**	-0.00***
		(-2.28)	(-2.11)	(-3.06)
PIN			-0.51**	-0.20
			(-2.49)	(-1.29)
StdRet			-1.57	-0.26
			(-0.82)	(-0.28)
Ret			0.09	0.00
			(1.18)	(0.00)
Iliquidity			0.01	0.00
			(0.61)	(0.27)
SIR_Rank			0.39	-0.02
			(1.51)	(-0.11)
Coverage			0.00	0.00
			(0.84)	(0.31)
SUE			0.09*	0.03
			(1.78)	(0.89)
DispFor			-0.12	-0.05
			(-0.95)	(-0.61)
N	20989	20989	20989	29722
Periods Included:	Pre & Dur	Pre & Dur	Pre & Dur	Pre & Dur & Post
R^2	0.77	0.77	0.77	0.77
Year-Qtr FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes

This table examines the effect of relaxing short selling constraints on news sentiment. Specifically, we estimate the equation: $Tone_{it} = \beta_0 + \beta_1 I(Pilot) * I(During) + I(Pilot) * I(Post) + X\Gamma + \epsilon_{it}$. *Tone* is the quarterly average Composite Sentiment Score from RavenPack. Our main variables of interest are *I(Pilot)*I(During)* and *I(Pilot)* I(Post)*. *I(Pilot)* is equal to one if the firm is in the pilot program, zero otherwise. *I(During)* is equal to one between May 2005 and July 2007, and zero otherwise. *I(Post)* is equal to one between August 2007 to October 2009, and zero otherwise. X is a vector of controls that include *ROA, Book-to-Market, Size, Leverage and Asset Growth, R&D, PIN, StdRet, Ret, Iliquidity, SIR, Coverage, SUE, DispFor,* and fixed effects. Standard errors are clustered by firm. All variables are defined in the appendix A. ***, **, * indicates significance at the 0.01, 0.05, 0.10 level, respectively.

Table 4: Sentiment Analysis – Small Firm Subsample Analyses

Dep. Variable: Tone / Subsample:	*Small*	*Small & NYSE*	*Small & NASDAQ*
	(1)	(2)	(3)
I(Pilot)*I(During)	-0.10**	-0.12**	-0.09
	(-2.30)	(-2.00)	(-1.59)
I(Pilot)*I(Post)	-0.04	-0.10	0.00
	(-0.79)	(-1.57)	(0.07)
MTB	0.00	0.00	0.00
	(1.43)	(0.89)	(0.77)
Size	0.09**	0.02	0.11**
	(2.43)	(0.34)	(2.55)
ROA	0.57*	-0.44	1.00**
	(1.65)	(-0.79)	(2.28)
Leverage	-0.12**	-0.10	-0.08
	(-2.04)	(-1.08)	(-1.10)
AssetGrowth	0.19***	0.02	0.25***
	(2.68)	(0.19)	(2.88)
RD	-0.00	-0.00	-0.00
	(-1.52)	(-1.64)	(-0.89)
PIN	-0.26	-0.21	-0.37
	(-1.31)	(-0.60)	(-1.52)
StdRet	-0.09	0.18	-1.57
	(-0.07)	(0.10)	(-0.81)
Ret	0.03	0.07	-0.01
	(0.36)	(0.66)	(-0.12)
Iliquidity	0.01	-0.00	0.00
	(0.32)	(-0.08)	(0.05)
SIR_Rank	-0.17	-0.18	-0.29
	(-0.82)	(-0.57)	(-1.06)
Coverage	0.00	-0.00	0.00
	(0.16)	(-0.21)	(0.70)
SUE	-0.01	0.08	-0.06
	(-0.10)	(1.28)	(-0.75)
DispFor	-0.08	0.03	-0.19
	(-0.64)	(0.18)	(-1.32)
N	19080	8403	10611
R^2	0.72	0.69	0.74
Year-Qtr FE	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes

This table examines the effect of short selling constraints on news sentiment for different subsamples based on Black and Litvak (2017). We estimate the equation: $Tone_{it} = \beta_0 + \beta_1 I(Pilot) * I(During) + I(Pilot) * I(Post) + X\Gamma + \epsilon_{it}$. *Tone* is the quarterly average Composite Sentiment Score from RavenPack. Our main variables of interest are *I(Pilot)*I(During)* and *I(Pilot)* I(Post)*. *I(Pilot)* is equal to one if the firm is in the pilot program, zero otherwise. I(During) is equal to one between May 2005 and July 2007, and zero otherwise. *I(Post)* is equal to one between August 2007 to October 2009, and zero otherwise. Column 1 records estimations for the Small subsample (lnmkt $<$ 7.9). Column 2 (3) exhibits the estimated coefficients for small firms that are listed on the NYSE (NASDAQ). X is a vector of control variables. See Appendix A for all variable definitions.. Standard errors are clustered by firm. ***, **, * indicates significance at the 0.01, 0.05, 0.10 level, respectively.

Table 5: Number of Articles Analysis

Panel A: Number of Total Articles, Financial Media, and Press Releases

	#Articles	#FM Articles	#PR Articles
I(Pilot)*I(During)	0.11	0.18	-0.07
	(0.34)	(0.98)	(-0.36)
I(Pilot)*I(Post)	-0.27	0.04	-0.30
	(-0.67)	(0.17)	(-1.42)
N	29722	29722	29722
R^2	0.87	0.93	0.76
Controls	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes

Panel B: Number of Total Articles by Sentiment

	#GoodNews Articles	#BadNews Articles
I(Pilot)*I(During)	-0.02	0.06
	(-0.10)	(1.13)
I(Pilot)*I(Post)	-0.18	-0.01
	(-0.63)	(-0.08)
N	29722	29722
R^2	0.86	0.92
Controls	Yes	Yes
Year FE	Yes	Yes
Firm FE	Yes	Yes

This table examines the effect of short selling constraints on the number of articles written about a company in a given quarter. Specifically, we estimate the equation: $Y_{it} = \beta_0 + \beta_1 I(Pilot) * I(During) + I(Pilot) * I(Post) + X\Gamma + \epsilon_{it}$. In panel A, Y_{it} is one of three measures of number of articles: the total number of articles (#Articles, column 1), the number of full articles (#FM Articles, column 2), or the number of press releases (#PR Articles, column 3). Controls refer to the controls included in Table 3 column 4. In panel B, Y_{it} is one of two measures of media coverage: the number of total articles with positive sentiment (column 1) or the number of articles with negative sentiment (column 2). Our main variables of interest are *I(Pilot)*I(During)* and *I(Pilot)* I(Post)*. *I(Pilot)* is equal to one if the firm is in the pilot program, zero otherwise. I(During) is equal to one between May 2005 and July 2007, and zero otherwise. *I(Post)* is equal to one between August 2007 to October 2009, and zero otherwise. ***, **, * indicates significance at the 0.01, 0.05, 0.10 level, respectively.

Table 6: Distinguishing Firm-initiated Press Releases and Media-initiated Articles

Dep. Variable:	*FM Tone*		*PR Tone*	
	(1)	(2)	(3)	(4)
I(Pilot)*I(During)	-0.093*	-0.103**	-0.027	-0.029
	(-1.92)	(-2.07)	(-1.06)	(-1.15)
I(Pilot)*I(Post)	-0.050	-0.051	-0.011	-0.014
	(-1.01)	(-1.03)	(-0.38)	(-0.49)
MTB		0.008**		0.000
		(2.32)		(0.13)
Size		0.072*		0.045**
		(1.72)		(2.12)
ROA		0.947*		0.216
		(1.84)		(0.88)
Leverage		-0.168**		-0.045
		(-2.10)		(-1.03)
AssetGrowth		0.237**		0.069
		(2.12)		(1.48)
RD		-0.000**		-0.000***
		(-2.09)		(-3.38)
PIN		-0.431		-0.148
		(-1.45)		(-1.10)
StdRet		1.670		-2.853***
		(1.16)		(-2.94)
Ret		-0.151		0.076
		(-1.25)		(1.37)
Iliquidity		-0.002		0.004
		(-0.05)		(0.35)
SIR_Rank		-0.184		-0.010
		(-0.69)		(-0.06)
Coverage		0.000		0.001
		(0.00)		(0.50)
SUE		-0.055		0.003
		(-0.74)		(0.09)
DispFor		-0.033		-0.086
		(-0.18)		(-1.00)
N	29722	29722	29722	29722
R^2	0.79	0.80	0.75	0.75
Year-Qtr FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes

This table disaggregates media sentiment into news initiated by outsiders (*FM Tone*) and press releases initiated by the firm (*PR Tone*). Specifically, we estimate the following linear model: $Y_{it} = \beta_0 + \beta_1 I(Pilot) * I(Dur) + \beta_1 I(Pilot) * I(Post) + X\Gamma + \eta_{it}$. Y_{it} is one of two measures of news sentiment: *FM tone* or *PR Tone*. *FM Tone* is the quarterly average tone articles not initiated by the firm. *PR Tone* is the quarterly average tone for firm-initiated press releases. Our main variables of interest are *I(Pilot)*I(During)* and *I(Pilot)* I(Post)*. *I(Pilot)* is equal to one if the firm is in the pilot program, zero otherwise. *I(During)* is equal to one between May 2005 and July 2007, and zero otherwise. *I(Post)* is equal to one between August 2007 to October 2009, and zero otherwise. X is a vector of control variables. Standard errors are clustered by firm. All variables are described in the Appendix A. ***, **, * indicates significance at the 0.01, 0.05, 0.10 level, respectively.

Table 7: Relation between Abnormal Short Interest and Future News Sentiment

Dep. Variable:	*Future_Tone*					
Period:	*Pre*		*During*		*Post*	
	(1)	(2)	(3)	(4)	(5)	(6)
I(Pilot) SIR*	0.001	0.002	-0.013***	-0.013***	-0.004	-0.003
	(0.20)	(0.31)	(-3.30)	(-3.17)	(-1.26)	(-0.97)
SIR	0.006*	0.007*	-0.001	-0.005	-0.012***	-0.007***
	(1.76)	(1.87)	(-0.34)	(-1.39)	(-5.76)	(-3.43)
Turnover		0.015*		0.020*		-0.043***
		(1.72)		(1.88)		(-5.21)
Volatility		-0.900***		-0.617**		0.313
		(-3.59)		(-2.67)		(1.30)
InstOwn		-0.084		0.202**		0.119
		(-1.02)		(2.10)		(1.11)
Size		-0.281***		0.114***		-0.415***
		(-5.37)		(2.81)		(-8.35)
N	17041	17038	18120	18120	13864	13864
Year-Month FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes

This table reports the association between short interest and future news sentiment for the three subperiods of our study: before (*pre*), during (*During*), and after the Regulation SHO experiment (*Post*). Specifically, we estimate the following model at the firm-month level: $Future\_Tone_{im} = \beta_0 + \beta_1 I(Pilot) * SIR + \beta_2 SIR + X\Gamma + \eta_{it}$. $Future\_Tone_{im}$ is the average news sentiment for the month after the disclosure of short interest positions for firm *i*. *SIR* is the short interest ratio (in percentage, ranging from 0 to 100) form a given firm in a given month. Our variable of interest if *I(Pilot)* SIR*. *I(Pilot)* is equal to one if the firm is in the pilot program, zero otherwise. X is a vector of controls that include past return volume (*Turnover*), return volatility (*Volatility*), Institutional Ownership (*InstOwn*), and *Size*. Standard errors are clustered by month. ***, **, * indicates significance at the 0.01, 0.05, 0.10 level, respectively.

Table 8: Stock Price Sensitivity to News

Dep. Variable:	R_{it}					
Period:	*Pre*		*During*		*Post*	
	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
I(Pilot)*I(Negative)	0.040	0.039	-0.116***	-0.115***	0.003	0.001
	(1.09)	(1.06)	(-3.69)	(-3.67)	(0.06)	(0.01)
I(Negative)	-0.200***	-0.193***	-0.198***	-0.199***	-0.283***	-0.278***
	(-8.73)	(-8.48)	(-10.20)	(-10.35)	(-9.51)	(-9.37)
R_{it-1}		-3.117***		-3.294***		-2.975***
		(-7.11)		(-7.20)		(-6.27)
NumberArticles		0.019		0.000		0.029**
		(1.63)		(0.03)		(2.13)
Coverage		-0.003		-0.006*		-0.010*
		(-0.63)		(-1.80)		(-1.80)
MTB		0.000		-0.000		-0.001
		(0.69)		(-1.35)		(-1.49)
Size		-0.220***		-0.147**		-0.318***
		(-2.66)		(-2.43)		(-3.05)
N	81436	81436	85596	85596	70832	70832
Date FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes

This table presents the results of estimating the following regression at the firm-day level $R_{it} = \beta_0 + \beta_1 I(Pilot)*I(Negative) + X\Gamma + \eta_{it}$ for the three subperiods of our study: before (*pre*), during (*During*), and after the Regulation SHO experiment (Post). R_{it} is firm is market-adjusted daily return at date t. Our main variable of interest is the information content of negative news for the treatment group, which is captured by the interaction *I(Negative)*I(Pilot)*. *I(Negative)* is equal to one if *CSS* < 50, and zero otherwise. X is a vector of control variables that include lagged daily market-adjusted return (return it-1), analyst following, and the number of articles about the firm on day t, and fixed effects (firm and date). Standard errors are clustered by date. ***, **, * indicates significance at the 0.01, 0.05, 0.10 level, respectively.

Table 9: Robustness Analyses

Dep. Variable: Tone / Matching Method:	Entropy-Balanced Sample		Propensity-Score Matched Sample	
	(1)	(2)	(3)	(4)
I(Pilot)*I(During)	-0.06**	-0.07**	-0.06*	-0.07**
	(-2.06)	(-2.27)	(-1.95)	(-2.14)
I(Pilot)*I(Post)	-0.03	-0.03	-0.05	-0.05
	(-0.93)	(-0.91)	(-1.37)	(-1.44)
MTB		0.00*		0.00
		(1.75)		(1.28)
Size		0.06**		0.06**
		(2.34)		(2.19)
ROA		0.40		0.37
		(1.25)		(1.12)
Leverage		-0.08		-0.08
		(-1.54)		(-1.54)
AssetGrowth		0.17***		0.16**
		(2.72)		(2.52)
RD		-0.00***		-0.00***
		(-3.44)		(-3.18)
PIN		-0.29*		-0.23
		(-1.65)		(-1.32)
StdRet		0.13		-0.10
		(0.12)		(-0.10)
Ret		-0.02		-0.03
		(-0.22)		(-0.37)
Iliquidity		0.01		0.01
		(0.56)		(0.70)
SIR_Rank		-0.11		-0.13
		(-0.56)		(-0.59)
Coverage		0.00		-0.00
		(0.53)		(-0.19)
SUE		0.02		0.03
		(0.50)		(0.67)
DispFor		-0.13*		-0.15*
		(-1.66)		(-1.68)
N	29722	29722	27168	27168
R^2	0.77	0.77	0.78	0.78
Year-Qtr FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes

This table reports robustness analyses of the effect of short selling constraints on news sentiment. Specifically, we estimate the equation: $Tone_{it} = \beta_0 + \beta_1 I(Pilot) * I(During) + I(Pilot) * I(Post) + X\Gamma + \epsilon_{it}$. *Tone* is the quarterly average Composite Sentiment Score from RavenPack. Our main variables of interest are *I(Pilot)*I(During) and I(Pilot)* I(Post). I(Pilot)* is equal to one if the firm is in the pilot program, zero otherwise. *I(During)* is equal to one between May 2005 and July 2007, and zero otherwise. *I(Post)* is equal to one between August 2007 to October 2009, and zero otherwise. Columns 1 and 2 present the results for an entropy-balanced sample. Columns 3 and 4 present the results matching pilot and control firms based on accounting characteristics. X is a vector of control variables. Standard errors are clustered by firm. All variables are defined in the appendix A. ***, **, * indicates significance at the 0.01, 0.05, 0.10 level, respectively.

Table 10: Placebo Regressions

Panel A: Pseudo Treatment (holding constant experiment dates)

Dep. Variable:	*Tone*	
	(1)	(2)
I(Pseudo_Pilot)*I(During)	0.01	0.01
	(0.13)	(0.11)
I(Pseudo_Pilot)*I(Post)	0.01	0.01
	(0.23)	(0.22)
N	18014	18014
R^2	0.70	0.70
Controls	No	Yes
Year-Qtr FE	Yes	Yes
Firm FE	Yes	Yes

Panel B: Pseudo Experiment Date (holding constant pilot and control firms)

Dep. Variable:	*Tone*	
	(1)	(2)
I(Pilot)*I(Pseudo_During)	0.00	-0.00
	(0.02)	(-0.01)
N	4724	4724
R^2	0.71	0.71
Sample Period	June 2002 – June 2004	
Pseudo-During	July 2003 – June 2004	
Controls	No	Yes
Year-Qtr FE	Yes	Yes
Firm FE	Yes	Yes

This table reports the estimates of placebo regressions designed to assess the robustness of our main results. In Panel A, we randomized a set of control firms into a pseudo pilot group and held constant the length of the experiment. Specifically, *I(Pseudo_Pilot)* is an indicator variable equals one for a control firm that is assigned a pseudo treatment, zero otherwise. *I(During)* and *I(Post)* follows the definition from Table 3. In Panel B, we create a pseudo treatment date, and hold constant the treatment and control group. Specifically, *I(Pseudo_During)* is an indicator variable equals to one between July 2003 to June 2004, zero otherwise. Standard errors are clustered by firm. All variables are defined in the appendix A. ***, **, * indicates significance at the 0.01, 0.05, 0.10 level, respectively.