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## Article

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# Facebook posting activity and the selective amplification of earnings disclosures

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## ABSTRACT

This study examines the determinants of Facebook activity levels with a particular focus on Facebook activity around earnings announcements. Facebook activity is generally higher for firms with higher levels of analyst following, individual ownership, and trading volume, indicating that it is responsive to investor demand effects. Facebook activity also increases around earnings announcements, with the increase being largely attributable to posts containing earnings news. In general, therefore, firms use Facebook posts to amplify earnings news. Such activity is selective, however; it is lower for firms with high levels of information asymmetry, for firms reporting earnings that exactly meet the consensus analyst forecast amount, and when the earnings news is negative but the accompanying price movement is positive. Hence, firms appear to use Facebook to manage the level of attention paid to earnings news.

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## 1. Introduction

The rise of network-based dissemination of information over the past 20 years has given rise to fundamental changes in how firms communicate with the public. In this study, we examine companies' use of one such network channel: Facebook. Corporate Facebook pages allow interested parties to obtain a wide variety of information about the companies they follow on Facebook. Hence, Facebook should serve as a mechanism for reducing information asymmetry among market participants and leveling the playing field for investors seeking relevant information. We examine the role of Facebook as a financial information disclosure channel for businesses. In particular, we take the perspective that Facebook posting activity falls within the realm of

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voluntary disclosure choices. Furthermore, in the context of mandated reports such as earnings announcements, Facebook posting decisions reflect a firm's voluntary choice as to whether to amplify mandated disclosure information.

Over the 2009 to 2012 period covered by our data, we find that for the subset of firms involved in Facebook posting, the intensity of their posting increased substantially. In the first months of 2009, posting levels averaged fewer than three posts per month, or less than one post a week. By the end of 2012, posting intensity levels averaged around 25 posts per month, or nearly one post per day. In general, posting activity increases with analyst following and individual ownership level, consistent with posting serving primarily as an information conduit to individual investors. Posting activity is also positively related to the volume of trading activity of a firm's stock, thereby connecting corporate Facebook activity levels with equity market information flow as captured by trading activity.

Facebook posting activity is generally higher during earnings announcement periods than during non-announcement periods. When subdividing posting activity into posts that do and do not mention earnings, we find that the heightened level of posting during announcement periods is largely attributable to the subset of posts that explicitly mention earnings. Hence, in general, firms use Facebook posting as a means of amplifying reported earnings news. The likelihood of a firm engaging in such earnings posting activity, however, decreases with analyst following. As analysts are also a channel for conveying earnings news to market participants, this inverse relation is consistent with the notion that firms use Facebook posts when other dissemination channels are limited.

Announcement-period posting activity, however, is also negatively associated with pre-existent bid-ask spread levels. Hence, firms avoid posting about their earnings when existent pre-disclosure information environments are poor and information asymmetry is high. Interestingly, while most firms display similar levels of non-earnings posts (i.e., posts that do not mention earnings) during the announcement and non-announcement periods, high bid-ask spread firms also display lower levels of non-earnings posts during earnings disclosure periods, presumably to avoid bringing any sort of attention to themselves via Facebook.

As spread is our primary measure of pre-disclosure information asymmetry, the finding of a negative relation between spread and posting activity is related to the evidence of a negative relation between announcement period change in spread and announcement-related tweeting activity documented in [Blankespoor et al. \(2014\)](#). We, however, do not find any reliable evidence of a negative relation between change in announcement period spread and announcement-period posting activity. Hence, information asymmetry seems better understood as a determinant of Facebook posting than as something affected by Facebook posting, at least with respect to earnings news.

Facebook posting activity during the announcement period is also a means for firms to manage the level of attention paid to the content of the earnings announcement. Engaging in posting activity during the announcement period can bring attention to the firm, while not doing so can reduce attention. We consider how such Facebook posting activity differs conditional on the news conveyed by the market as well as how the market responds to such news, as reflected in contemporaneous market returns. We find little evidence of any sort of relation between posting activity and seasonal random walk forecast error in earnings. Under certain conditions, however, posting activity does appear to be affected by news related to analyst forecast errors. Specifically, while posting activity generally increases during announcement periods, these increases are severely attenuated when reported earnings exactly equal forecasted earnings (i.e., earnings "just meet" analyst expectations) or when the forecast error news is unfavorable but the accompanying market price movement is favorable (that is, when the market is seemingly discounting the unfavorable earnings news).

The finding that managers avoid bringing attention to negative earnings performances when the market is valuing the firm favorably is, to our knowledge, the first evidence suggesting that firms condition their disclosure amplification decisions on how the market is responding to news. Similarly, by not posting about earnings results that just meet analyst forecasts, firms avoid bringing potentially unwelcome attention to just how close they came to not meeting the earnings target. Such behavior in managing the attention given to their disclosures is consistent with broader literature on managers employing disclosure strategies aimed at hiding or minimizing mandated disclosures of bad news by, for instance, reporting earnings outside of trading hours,

disclosing on Fridays, and disclosing when large numbers of other firms are disclosing.<sup>3</sup> In those settings, however, firms seek to exploit exogenous structural variation in market attention, while in our study firms are much more proactive: they decide to bring attention by posting or avoid attention by not posting.

Our evidence is also broadly consistent with the notion that firms favor the dissemination of favorable news over unfavorable news, a general relation documented in [Kothari et al. \(2009\)](#) that [Jung et al. \(2018\)](#) show for the dissemination of earnings news via Twitter.<sup>4</sup> Specifically, the two settings where our analysis indicates that firms are less likely to post on Facebook both involve unfavorable news. In one case, the earnings news is explicitly unfavorable (the firm did not meet the forecast, even though the market does not seem to be taking it as such), and in the other case, the news is implicitly unfavorable (results that just meet forecasts) given that firms generally are more likely to beat forecasts than to meet or fall short of them. However, the evidence uniquely identifies another important exception: when the market is responding negatively to negative news, firms do disclose on Facebook, likely in response to the negative market feedback.

Finally, we also investigate whether firms alter their non-earnings posting activity in the announcement period as a possible way to further manage the level of attention paid to their earnings disclosures. That is, firms might ramp up their non-earnings posts in the announcement period as a means of distracting attention from unfavorable earnings news or of drawing attention to favorable news. In fact, we find no evidence of increased non-earnings posting activity in the announcement period conditional on earnings news per se. We do find that, relative to other firms, firms with earnings that “just meet” the analyst forecast consensus and those with negative earnings news but positive associated price movements display lower non-earnings posting activity. That is, firms appear to unconditionally avoid bringing attention to themselves via Facebook posts when the earnings news is nominally ambiguous or when it is contrary to current market sentiment on the firm.

The rest of the paper is organized as follows. Section 2 provides background and reviews the relevant literature. Section 3 explains the research questions and design. Section 4 describes the data and variables. Section 5 presents the results, and we offer conclusions in Section 6.

## 2. Background

Companies have long used traditional media along with certain Internet-based disclosure channels, such as corporate websites, message boards, and RSS feeds. Internet-based disclosure channels increase the speed of dissemination but are not much different from traditional media; both generally allow communication from companies to investors, and investors still need to perform searches to get information from these sources. Social media is distinct from traditional media mainly because it allows the creation and exchange of user-generated content, and it delivers information directly to users. Moreover, companies can collect user-related metadata (user location, age, network, etc.) based on user interactions. Companies are increasingly using social media with the help of professional public relations (PR) practitioners to enhance customer-firm interaction. Existing literature has highlighted the benefits of corporate social media usage. [Eyrich, Padman, and Sweetser \(2008\)](#) find that social media has moved from “buzz word” status to being a strategic tool. Successful use of social media for business depends on building an online community and absorbing the dynamics of the community. [Rishika et al. \(2013\)](#) find that high levels of social media activity increase participation by customers, who exhibit a strong patronage of the firm, thus increasing firm profitability. [Tirunillai and Tellis \(2012\)](#) show that online reviews and chatter are leading indicators of stock-market performance. The importance of social media in business is also highlighted by [Luo et al. \(2013\)](#), who show that social media-based metrics are significant leading indicators of firm equity value and stronger predictors than online behavioral metrics like Google searches and web traffic.

Companies use many social media platforms, including Facebook, Twitter, YouTube, and Google Plus. Among them, Facebook and Twitter are the most frequently used. One of the benefits of using social media for information dissemination is that it pushes the information directly to users (using so-called “push

<sup>3</sup> See [deHaan et al. \(2015\)](#) for a comprehensive discussion and analysis.

<sup>4</sup> [Crowley et al. \(2018\)](#), however, find that tweet propensities increase for both good and bad news announcements. Interestingly, they use market sentiment-based measures to determine the direction of the news. Hence, their findings align to some degree with our evidence that firms with poor earnings news post when the market sentiment about the firm, as reflected in contemporaneous returns, is negative.

technology”). Once a user subscribes to a page, all new information made available on that page is also immediately available to the user, saving the user effort and time that would otherwise be expended searching for relevant information from multiple sources. Facebook and Twitter are the most popular social media platforms for corporate disclosures. This study focuses on Facebook disclosures because most of the disclosures on Twitter (tweets) and other similar platforms are generally also available on Facebook concurrently, either through simultaneous disclosures or through Facebook-link applications. Moreover, Facebook has a much broader reach, with 2.23 billion monthly active users, compared to 335 million for Twitter.<sup>5</sup> In addition, Twitter has a character limit (140 per tweet till late 2017, 280 now), whereas Facebook does not; this gives the latter more flexibility for disclosures.

As company Facebook pages generally disclose public news, they rarely serve as an original source of new information to external parties. Hence, as a disclosure mechanism, Facebook primarily serves as a means for firms to broaden the level of attention paid to what is being disclosed. In other words, it is a device for amplifying disclosures. Such amplification can play an important role in the overall information dissemination process. Broad dissemination can reduce informational friction even in the absence of genuine news (Fang and Peress, 2009). There is evidence of investors trading in response to stale news and stale disclosures (Tetlock, 2011; Drake et al., 2012), suggesting that they find such information useful even though it may already be fully impounded into prices.

In August 2008, the Securities and Exchange Commission (SEC) provided guidance on using corporate websites to disclose information to the market. With a view to increasing market transparency, the SEC also encouraged the use of internet “push” technologies. The SEC became serious about companies’ use of Facebook for disclosure purposes only after the huge market movement following Netflix CEO Reed Hastings’ announcement on his Facebook page that Netflix’s monthly viewing exceeded 1 billion hours for the first time in June 2012. On April 2, 2013, the SEC recognized the use of social media for disclosure purposes and issued a report that stated “companies can use social media outlets like Facebook and Twitter to announce key information in compliance with Regulation Fair Disclosure (Regulation FD) so long as investors have been alerted about which social media will be used to disseminate such information.” Companies had already been using Facebook and other social media platforms for disclosure purposes. General Electric made the following statement on its quarterly earnings report (April 19, 2013): “GE’s Facebook page and Twitter accounts contain a significant amount of information about GE, including financial and other information for investors. GE encourages investors to visit these websites from time to time, as information is updated and new information is posted.” The increasing popularity of social media as a communications tool led the SEC to provide additional specific guidance on the dissemination of genuine third-party commentary that could be useful to consumers (on March 2014) and issue new compliance and disclosure interpretations (on April 21, 2014).

The literature on social media disseminations, however, is still at an early stage. Blankespoor et al. (2014) show that dissemination of firm-initiated news via Twitter is associated with lower bid-ask spreads and greater depths, consistent with reduction in information asymmetry. Analyzing companies’ Facebook data, Lee, Hutton, and Shu (2015) find that social media disclosures related to recall announcements attenuate the negative price reactions. Chawla et al. (2016) find that news tweets help diffuse stale news and lower bid-ask spread. Cade (2018) shows that when faced with valid criticisms, companies can benefit from addressing the criticisms directly on social media or from redirecting attention to positive information (relative to not responding). There is evidence that social media is changing the public relations (Eyrich et al. 2008), marketing (Tirunillai and Tellis, 2012), and information systems landscapes (Luo et al., 2013). However, corporate use of social media for disclosure purposes remains largely unexplored.

Jung et al. (2018) examines Twitter usage for corporate disclosures. They find that firms are less likely to disseminate via Twitter when they have bad earnings news to report, consistent with prior voluntary disclosure findings such as Kothari et al. (2009). Social media is a unique channel for disclosure. Another concurrent working paper by Crowley et al. (2018) show that firms engage in discretionary disclosure on Twitter, but they do not find differential disclosure behavior based on news direction. Our study highlights this unique aspect of

<sup>5</sup> <http://www.statista.com/statistics/272014/global-social-networks-ranked-by-number-of-users/> (last accessed: December 2018) lists monthly active users at 2.234 billion for Facebook, 335 million for Twitter, and 303 million for LinkedIn, etc.

social media disclosure and shows how firms opportunistically adjust their disclosure behavior in response to market reaction to reported news.

### 3. Research questions

In the empirical analyses that follow, we examine factors underlying cross-sectional variation in firm posting activity levels. Among the subset of firms engaging in posting activity, we first identify what factors are associated with higher or lower levels of posting. More specifically, we examine what factors lead firms to post about their earnings news. We examine both general firm-level factors (e.g., information asymmetry) and news-specific factors (e.g., good news vs. bad news).

In developing our research questions, we draw extensively on the voluntary disclosure literature. Facebook posts (of financial performance information in particular) typically only re-post items that have already been disclosed through more conventional disclosure channels and so do not strictly fit into the voluntary disclosure (of news) framework. However, many of the same factors that the literature argues influence firms' decisions to engage in voluntary disclosure seem likely to be similarly salient for their decisions about whether to re-disclose or amplify a prior disclosure.

The voluntary disclosure literature indicates that disclosure activity generally increases with firm size (e.g., Cox, 1985; Waymire, 1985; Lang and Lundholm, 1993). In the research on disclosure choices more aligned with amplification, such as the amount of financial information provided on corporate websites (Ettredge et al., 2002) and the provision of earnings conference calls (Frankel et al., 1999), there is also support for a positive relation between the choice to amplify disclosure and firm size. Hence, we expect a positive relation between size and posting frequency.

Investor demand for information also seems likely to influence firm decisions to engage in posting activity. Hence, firms with higher analyst following and higher trading activity levels would be expected to face greater investor demand for information, as these measures reflect investor interest in the firm. Additionally, Facebook seems to be a much more relevant communication medium for individual rather than institutional investors. Hence, we expect posting activity to increase with the level of individual ownership in the firm (measured inversely by the percentage of institutional ownership). Finally, incentives for a firm to engage in voluntary disclosure are expected to increase with information asymmetry (Lang and Lundholm, 1993). Consistent with this notion, Ettredge et al. (2002) document a positive relation between information asymmetry and the amount of financial information that firms voluntarily post on their websites.

Our evaluation of the underlying factors affecting Facebook posting activity during earnings announcement periods considers two distinct perspectives of what drives such activity. The first factor stems from the firm desiring to disseminate relevant information regarding its financial performance to interested investors. That is, Facebook postings are a mechanism for amplifying earnings disclosures. Such earnings news amplification would be evidenced by higher levels of Facebook disclosure activity during announcement periods relative to non-announcement periods. Hence, we examine whether Facebook posting activity is higher during earnings announcement periods relative to non-announcement periods.

If, indeed, firms use Facebook posts to amplify earnings news, then it is possible that they do so opportunistically. In particular, conventional voluntary disclosure and attention theory suggests that firms may be more interested in disclosing/amplifying good news than bad news. Recent evidence in deHaan et al. (2015) indicates that when the news is unfavorable, managers time their earnings disclosures to occur when they believe market attention is lower (e.g., on Fridays or after hours). (Conversely, they avoid disclosing during low-attention times when the news is favorable.) Hence, we investigate whether managers are more prone to engage in attention-drawing Facebook posting activity when the earnings news is favorable than when it is not favorable. Similarly, within the subset of firms reporting unfavorable earnings news, we investigate whether those firms experiencing contemporaneous positive price movements are more disinclined to post to avoid calling attention to an unfavorable earnings performance that the market is seemingly discounting.

Finally, it is also possible that firms use Facebook posts as a mechanism for distracting attention from unfavorable earnings news. That is, they may intentionally raise the level of their non-earnings-related posting activity during announcement periods as a means not of amplifying earnings news but of diluting or burying it. We investigate this possibility by examining the level of non-earnings posts by firms reporting unfavorable

earnings news. If, in fact, such non-earnings posting activity is higher for these firms relative to other firms, it would suggest that some announcement-period posting is aimed more at distraction than at amplification.

#### 4. Facebook data

Facebook's platform allows information to quickly reach many users who are connected through this network. While there are no restrictions on which companies can use Facebook for disclosures, larger companies are more likely to take advantage of the broad and dynamic reach of social media. In this study, we focus our analyses on large companies. Our initial sample consists of all firms included in the S&P 500 index in 2012. We examined the corporate websites of each of these firms as of November 2012 for the presence of a Facebook link. We also searched for these firms by name on Facebook itself. We identified 301 Facebook-active firms. We obtained posting records for these firms based on posting activity reported on their Facebook pages. As we limit our analysis to the 2009–2012 period, however, we did not collect detailed information on pre-2009 posting activity. Moreover, as our interest is in Facebook posting activity for those firms with Facebook pages, each of these firms enters our sample based on the date of its first Facebook post—its Facebook start date. Hence, a firm with a start date prior to 2009 enters at the start of 2009, while a firm with a start date in 2011 only appears after this date. Some companies have multiple Facebook pages, including a page for corporate news and different pages for different products. We collected information from Facebook pages for corporate news; for companies with more than one Facebook page, we only collected information from the corporate news-related pages.

The final sample includes 172,221 firm-days over the sample period. We extract all posts on these company Facebook pages for each day in our sample period. Next, we calculate the total number of posts on a day (posts per day) as the sum of posts by a company on that day. Companies do not post on their Facebook pages every day; the mean (median) number of posts per day is 0.967 (1.00), the maximum number of posts on a day in our sample is six, and the average length of posts in our sample is 178 characters.

The period examined is formative for Facebook involvement by firms. At the beginning of 2009, only 11 firms from the 2012 S&P 500 had Facebook pages. By 2012, this number had risen to 301 based on our sample identification strategy. Fig. 1 shows the evolution of Facebook usage for corporate disclosures over the sample period, as represented by monthly average posts per firm with a Facebook page from 2009 to 2012. The sharp increase in Facebook activity is conspicuous. At the beginning of our sample period, Facebook-active firms on average posted fewer than five posts per month. By the end of our sample period, firms on average made almost 25 posts per month. This upward trend in posting indicates that companies rapidly became more active on their Facebook pages over the time period under examination.

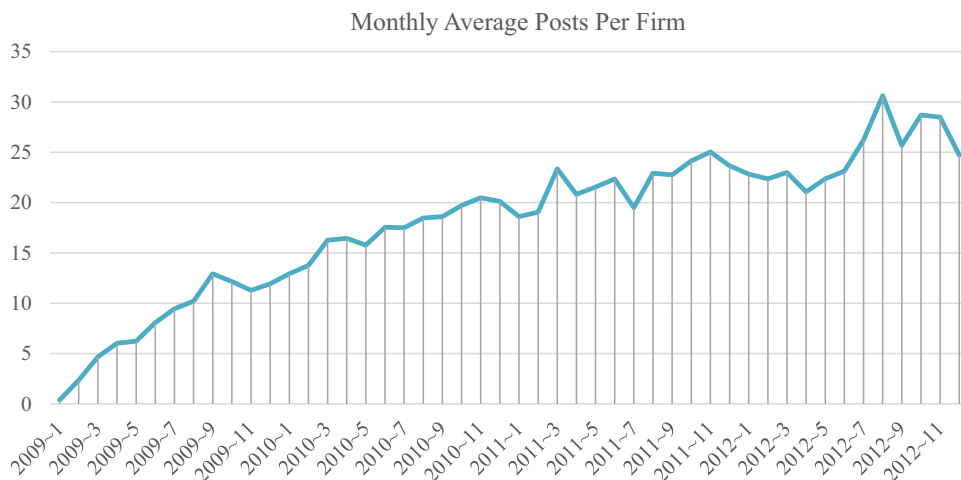


Fig. 1. The monthly average posts per firm over the sample period, 2009 to 2012. Monthly average posts per firm is the average posts per firm with a Facebook page during that month.

## 5. Empirical analyses

Our empirical analysis consists of two parts. In the initial section, we examine factors influencing the general level of Facebook activity by companies. In the second section, we focus on Facebook posting during earnings announcement periods.

### 5.1. Factors associated with Facebook posting

We examine factors associated with Facebook posting activity at the quarterly level for firms with (active) Facebook accounts by estimating the following equation:

$$\begin{aligned} \text{AvgNumPost}_{i,q} = & \text{Quarter Fixed Effects} + b1 * \text{Size}_{i,q-1} + b2 * \text{Analysts}_{i,q-1} \\ & + b3 * \text{InstOwnership}_{i,q-1} + b4 * \text{Book-to-Market}_{i,q-1} + b5 * \text{AbsReturn}_{i,q} \\ & + b6 * \text{Turnover}_{i,q} + b7 * \text{Spread}_{i,q} + e_{i,q} \end{aligned} \quad (1)$$

where:

$\text{AvgNumPost}_{i,q}$  is the average of NumPost per trading day by firm  $i$  in quarter  $q$  and NumPost is calculated as  $\log(1 + \text{Posts per day by a firm})$ .

$\text{Size}_{i,q-1}$  is the decile rank of size (log of total assets) for firm  $i$  in quarter  $q-1$ , scaled to vary from 0.1 to 1.0.

$\text{Analysts}_{i,q-1}$  is the log of analyst following for firm  $i$  in quarter  $q-1$ .

$\text{InstOwnership}_{i,q-1}$  is shares owned by institutional investors scaled by shares outstanding for firm  $i$  in quarter  $q-1$ .

$\text{Book-to-Market}_{i,q-1}$  is the decile rank of book value of equity scaled by market value of shares outstanding for firm  $i$  in quarter  $q-1$ .

$\text{AbsReturn}_{i,q}$  is the average absolute return for firm  $i$  in quarter  $q$ .

$\text{Turnover}_{i,q}$  is the average trading volume scaled by average number of shares outstanding for firm  $i$  in quarter  $q$ .

$\text{Spread}_{i,q}$  is the difference between offer and bid, scaled by the average of offer and bid for firm  $i$  in quarter  $q$ .

As discussed in the development of our research questions, we expect posting activity to increase with firm size, analyst following, trading activity (i.e., turnover), and non-institutional ownership levels (measured inversely by InstOwnership). We apply one-quarter lags of these variables, as we also expect them to be predictive of future Facebook activity levels. We also expect posting activity to be more common as information asymmetry, measured by AbsReturn and Spread, increases. Growing companies, as measured by Book-to-Market, tend to have more information to disclose. Hence, we expect them to use Facebook to amplify their disclosures.

We estimate Eq. (1) using firm-quarter observations from our sample of identified posting firms, subject to the constraint that at least one Facebook post must have been made by the firm over the quarter. Additionally, data must be available for purposes of estimating all of the right-hand side variables in Eq. (1) for a firm-quarter to be included in the analysis. Panel A of Table 1 provides descriptive information on all of Eq. (1) variables for the 2990 firm-quarter observations that meet this constraint. Though firms average just under one Facebook post per trading day, at 0.967 posts per day, posting activity ranges as high as six posts per trading day in a quarter. Firms in our sample have an average size (total assets) of \$13.55 billion and on average have 15 analysts following them. Technology firms tend to have higher analyst followings; in our sample, Broadcom, Texas Instrument, Intel, Google, and Cisco have multiple quarters with 38 or more analysts. Every firm in our sample has at least one analyst following it over the sample period. Institutional ownership averages 73.2% of outstanding shares but ranges between 0% and 100%. Panel B of Table 1 provides pairwise correlation information. In general, correlations among the variables are modest, with a notable exception being correlation involving firm size. Size is highly positively correlated with analyst following (0.601 correlation) and highly negatively correlated with spread (−0.402 correlation). Size also exhibits somewhat less pronounced negative correlations with institutional ownership (−0.304), book-to-market (−0.287) and turnover (−0.283).



Table 1

Variable	N	Mean	Std Dev	Min	P10	P25	P50	P75	P90	Max			
<i>Panel A: descriptive statistics</i>													
Posts Per Day	172,221	0.967	1.246	0.000	0.000	0.000	1.000	1.000	3.000	6.000			
Quarterly NumPost Per Day	2990	0.516	0.412	0.000	0.051	0.188	0.442	0.741	1.093	2.981			
Size <sub>q-1</sub>	2990	0.570	0.278	0.100	0.200	0.300	0.600	0.800	1.000	1.000			
Number of Analysts	2990	15.378	7.505	1.000	6.000	10.000	15.000	20.000	26.000	40.000			
Analysts <sub>q-1</sub>	2990	2.668	0.526	0.693	1.946	2.398	2.708	3.045	3.296	3.689			
InstOwnership <sub>q-1</sub>	2990	0.732	0.216	0.000	0.510	0.657	0.779	0.871	0.949	1.000			
Book-to-Market <sub>q-1</sub>	2990	0.534	0.285	0.100	0.200	0.300	0.500	0.800	0.900	1.000			
AbsReturn <sub>q-1</sub>	2990	0.008	0.004	0.001	0.005	0.005	0.007	0.009	0.015	0.025			
Spread <sub>q-1</sub>	2990	0.026	0.012	0.006	0.015	0.018	0.024	0.033	0.040	0.118			
Turnover <sub>q-1</sub>	2990	0.271	0.154	0.048	0.126	0.174	0.230	0.332	0.458	1.238			
AbsAbnReturn <sub>q</sub>	2990	0.033	0.035	0.000	0.004	0.009	0.021	0.043	0.078	0.183			
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[13]
<i>Panel B: Correlations: Pearson (below diagonal), spearman (above diagonal)</i>													
[1] Posts Per Day	1	<b>0.617</b>	-0.010	<b>0.216</b>	<b>0.076</b>	0.033	<b>0.092</b>	<b>-0.072</b>	-0.009	<b>-0.080</b>	-0.022	0.017	0.038
[2] Quarterly NumPost Per Day	<b>0.694</b>	1	<b>-0.080</b>	<b>-0.390</b>	<b>0.040</b>	0.022	<b>0.139</b>	<b>-0.060</b>	0.021	<b>-0.081</b>	-0.011	<b>0.067</b>	0.031
[3] AbnPost[-5, -1]	0.013	<b>-0.081</b>	1	<b>0.123</b>	<b>0.101</b>	-0.002	-0.023	0.014	-0.005	0.030	-0.006	-0.033	-0.022
[4] AbnPost[0, +1]	<b>0.289</b>	<b>-0.257</b>	<b>0.151</b>	1	<b>0.121</b>	-0.004	<b>-0.055</b>	-0.001	-0.020	-0.005	-0.008	<b>-0.034</b>	-0.021
[5] AbnPost[+2, +5]	<b>0.073</b>	0.027	<b>0.099</b>	<b>0.181</b>	1	-0.028	<b>-0.040</b>	-0.011	0.011	-0.019	-0.006	-0.008	-0.013
[6] Size <sub>q-1</sub>	0.034	0.035	0.000	0.000	-0.020	1	<b>0.601</b>	<b>-0.304</b>	<b>-0.287</b>	0.007	<b>-0.402</b>	<b>-0.283</b>	<b>-0.196</b>
[7] Analysts <sub>q-1</sub>	<b>0.044</b>	<b>0.084</b>	-0.031	<b>-0.048</b>	-0.034	<b>0.592</b>	1	<b>-0.038</b>	<b>-0.139</b>	-0.026	<b>-0.084</b>	<b>0.140</b>	<b>-0.077</b>
[8] InstOwnership <sub>q-1</sub>	<b>-0.067</b>	<b>-0.066</b>	0.009	0.002	-0.019	<b>-0.140</b>	<b>0.091</b>	1	0.033	0.018	<b>0.267</b>	<b>0.363</b>	<b>0.114</b>
[9] Book-to-Market <sub>q-1</sub>	0.002	0.031	-0.014	-0.035	0.010	<b>-0.295</b>	<b>-0.154</b>	0.033	1	-0.013	<b>0.224</b>	<b>0.066</b>	<b>0.095</b>
[10] AbsReturn <sub>q-1</sub>	<b>-0.048</b>	<b>-0.050</b>	0.011	-0.011	-0.022	0.007	-0.021	0.023	-0.010	1	<b>0.423</b>	0.022	<b>0.114</b>
[11] Spread <sub>q-1</sub>	-0.017	-0.023	-0.017	-0.006	-0.019	<b>-0.412</b>	<b>-0.155</b>	<b>0.107</b>	<b>0.237</b>	<b>0.446</b>	1	<b>0.561</b>	<b>0.331</b>
[12] Turnover <sub>q-1</sub>	-0.002	0.022	-0.035	-0.011	-0.011	<b>-0.261</b>	<b>0.095</b>	<b>0.180</b>	<b>0.082</b>	-0.015	<b>0.512</b>	1	<b>0.191</b>
[13] AbsAbnReturn <sub>q</sub>	0.011	0.008	-0.005	-0.013	-0.018	<b>-0.256</b>	<b>-0.129</b>	<b>0.058</b>	<b>0.116</b>	<b>0.115</b>	<b>0.384</b>	<b>0.185</b>	1

Notes: Size and book-to-market are rank variables; scaled to vary from 0.1 to 1.0. Bold coefficients are significant at less than 5%.

Table 2

This table shows the regression results based on Firm-Year-Quarter average values from 2009 to 2012. The dependent variable is AvgNumPost, which is the quarterly average of the daily log (1 + posts per day) for each firm and year-quarter.

Variable	AvgNumPost	
	Estimate	Estimate
Size <sub>q-1</sub>	0.043 (0.038)	0.054 (0.039)
Analysts <sub>q-1</sub>	0.041 (0.019)	0.041 (0.019)
InstOwnership <sub>q-1</sub>	-0.102 (0.035)	-0.101 (0.035)
Book-to-Market <sub>q-1</sub>	0.049 (0.027)	0.044 (0.027)
AbsReturn <sub>q</sub>	-1.576 (11.892)	-2.521 (11.933)
Turnover <sub>q</sub>	0.198 (0.053)	0.168 (0.061)
Spread <sub>q</sub>		1.015 (1.062)
N	2990	2990
Adjusted R <sup>2</sup>	7.6%	7.5%
Fixed effects	Yr-Qtr	Yr-Qtr

Notes: Quarterly beginning values are used for size, analyst following, institutional ownership, and book-to-market. Quarterly decile ranks are used for size and book-to-market. Quarterly averages are used for absolute return, spread, and turnover. Standard errors are shown in parenthesis. Statistical significance is represented by \*, \*\*, and \*\*\* for  $p < 0.10$ ,  $p < 0.05$ , and  $p < 0.01$ , respectively.

Table 2 reports our estimates of Eq. (1). We find that analyst following is positively associated with average posting behavior. This implies that firms with higher analyst following, i.e., firms that have higher demand for information, tend to disclose more information through their Facebook pages. The negative association between institutional ownership and average number of posts implies that companies disclose more on their Facebook pages as the percent of individual ownership increases, or, equally, as the percent of institutional ownership decreases.<sup>6</sup> The positive association between quarterly average turnover and average number of posts indicates that companies disclose more on their Facebook pages when their trading volume levels are high.<sup>7</sup>

### 5.2. Announcement-period posting

We examine announcement-period posting behavior for 2314 of the previous section's 2990 firm-quarter observations for which we could locate quarterly earnings announcement information. We primarily use quarterly earnings announcement days (RDQ) as reported in IBES. For quarterly earnings announcement dates not available on IBES, we use earnings announcement dates from Capital IQ's Key Development database. We measure the level of abnormal announcement-period posting activity based on differences between firm announcement-period posting levels and firm non-announcement-period posting levels. We measure daily abnormal posting activity as:

<sup>6</sup> Family-run firms are also argued to influence firm disclosure choices (e.g., Ali et al., 2007). In a further robustness analysis, we also controlled for whether a firm was family-owned by including an indicator variable for those firms where family members hold >5% of the firm's shares based on data available from Professor Ron Anderson, Temple University. (<http://www.ronandersonprofessionalpage.net/data-sets.html>). While this variable itself is positive and significant (mirroring the association found for non-institutional ownership level) in this analysis, its inclusion has little impact on the results we report. (In the Table 4 analysis of announcement level activity, it lacks statistical significance.)

<sup>7</sup> In further robustness analysis, available upon request, we find that similar results (arguably weak for analyst following) when we replace the one-quarter lags of analyst following and institutional ownership with their values in the quarter prior to the firm becoming Facebook active. This robustness is consistent with a causal interpretation of the impact of these two variables, as the pre-Facebook levels are, as a matter of structure, not determined by actual Facebook posting activity levels.

$AbnPost_t = \text{Log}(1 + \text{number of posts on day } t) - \text{average of prior and post ten week same weekday as announcement day } t \log(1 + \text{number of posts}).$

Multi-day values for *AbnPost* are constructed as averages of these daily values.

Fig. 2 presents daily values of *AbnPost* for the 61-trading-day period centered on the announcement date (day 0). As expected, there is a noticeable spike in posting activity on the earnings announcement day. This spike is consistent with firms using Facebook posting to amplify their earnings disclosures.

Table 3 reports mean values for *AbnPost* in the immediate pre-announcement (days -5 to -1), announcement (days 0 to +1), and post-announcement (days +2 to +5) periods. There is no evidence of any sort of change in firm posting activity in the pre-announcement period, as average *AbnPost* is indistinguishable from 0 in this period. As expected, the average value for *AbnPost* increases substantially in the immediate announcement period. In days 0 to +1, the observed mean of *AbnPost* is 0.033, which is significant at the 0.001 level. Finally, in the post-announcement period, abnormal posting levels are positive and marginally significant (p value of 0.092), indicating the presence of some lingering posting activity from earnings announcements.

The second line of the table evaluates the abnormal level of non-earnings-related posting activity taking place during the announcement period. We measure this activity by removing announcement-related posts, i.e., posts that explicitly mention earnings news, from our daily posting measure as follows:

$Non-EarnAbnPost_t = \text{Log}(1 + \text{number of posts without EarnPost on day } t) - \text{average of prior and post ten week same weekday as announcement day } t \log(1 + \text{number of posts without EarnPost}).$

*EarnPost* in this expression is the number of “earnings posts” by a firm on day t, which we identify by means of a text search of around 110 earnings- and performance-related text strings. We identified these text



Fig. 2. The average abnormal posting behavior of sample firms around earnings announcements. Day 0 is the earnings announcement day. Abnormal post captures the idiosyncratic posting behavior of companies.  $AbnPost = \text{Log}(1 + \text{Number of posts on a day by a firm}) - (\text{Average of prior and post 10-week same weekday } \text{Log}(1 + \text{number of posts}))$ .

Table 3  
Announcement-period abnormal posting activity.

Measure of posting activity	Days relative to announcement		
	Days -5 to -1	Days 0 to +1	Days +2 to +5
	Mean	Mean	Mean
AbnPost	0.003 (0.004)	0.033*** (0.006)	0.007* (0.004)
Non-EarnAbnPost	NA	0.007 (0.007)	0.008* (0.004)

Notes: Non-earnings abnormal posts per day is calculated based only on the number of posts that do not include any earnings- or performance-related texts.  $Non-EarnAbnPost = \text{Log}(1 + \text{non-earnings posts on a day by a firm}) - (\text{Average of prior and post 10 week same weekday } \text{Log}(1 + \text{number of non-earnings posts}))$ .  $Non-EarnAbnPost[t, t + n] = \text{Average Non-EarnAbnPost from day } t \text{ to day } t + n$ . Standard errors are shown in parenthesis. Statistical significance is represented by \*, \*\*, and \*\*\* for  $p < 0.10$ ,  $p < 0.05$ , and  $p < 0.01$ , respectively.

Table 4  
Firm characteristics and announcement-period posting activity.

Firm variable	Overall abnormal posting Days relative to announcement		Decomposition of announcement period (Days 0 to +1) Posts	
	Days –5 to –1	Days 0 to +1	Non-earnings	Earnings <sup>a</sup>
Size <sub>q-1</sub>	0.030 (0.027)	0.044 (0.027)	0.028 (0.028)	–0.318 (0.375)
Analysts <sub>q-1</sub>	–0.017 (0.012)	–0.043*** (0.013)	–0.044*** (0.013)	–0.264* (0.139)
InstOwnership <sub>q-1</sub>	–0.035 (0.025)	0.014 (0.026)	0.019 (0.026)	–0.140 (0.367)
Book-to-Market <sub>q-1</sub>	–0.020 (0.019)	0.003 (0.021)	0.007 (0.021)	0.425 (0.265)
AbsReturn <sub>q-1</sub>	37.952 (27.072)	–4.656 (17.638)	–3.923 (17.547)	192.618 (313.432)
Spread <sub>q-1</sub>	0.298 (0.828)	–1.773* (0.912)	–1.930** (0.889)	–2.694 (10.398)
Turnover <sub>q-1</sub>	–0.053 (0.046)	0.047 (0.053)	0.036 (0.052)	0.245 (0.510)
FourthQtr	0.000 (0.016)	0.025 (0.017)	0.025 (0.017)	0.107 (0.246)
N	2312	2312	2312	2312
Adjusted R <sup>2</sup> or Psuedo R <sup>2</sup>	0.73%	0.81%	0.94%	2.18%

Notes: All regressions include fixed effects for year-quarter. Cluster-adjusted (by firm) standard errors are in parentheses except for final column, where logistic standard errors are reported. Statistical significance is represented by \*, \*\*, and \*\*\* for  $p < 0.10$ ,  $p < 0.05$ , and  $p < 0.01$ , respectively.

<sup>a</sup>Earnings posts are measured as the presence or absence of any post mentioning earnings-related keywords in the day 0 to +1 window. Hence, the linear equation is estimated using logit regression rather than OLS regression.

strings by reading the Facebook posts of our sample firms around earnings announcements. Illustrative text strings so identified include earnings, exceeded target, financial performance, quarterly revenues, and record progress.<sup>8</sup> *Non-EarnAbnPost* is indistinguishable from 0 in the immediate announcement period (days 0 to +1) and marginally significant ( $p$  value of 0.073) in the post-announcement period (days +2 to +5). Hence, there is no indication in our data that firms, on average, engage in additional non-earnings posting activity as a means of distracting from earnings news.

### 5.2.1. Announcement-period posting and firm characteristics

We examine how firm characteristics affect announcement-period posting activity by estimating equations of the form:

$$\begin{aligned} \text{AbnPost Measure}_{i,t} = & c0 + c1 * \text{Size}_{i,q-1} + c2 * \text{Analysts}_{i,q-1} + c3 * \text{InstOwnership}_{i,q-1} \\ & + c4 * \text{Book-to-Market}_{i,q-1} + c5 * \text{AbsReturn}_{i,q-1} + c6 * \text{Spread}_{i,q-1} \\ & + c7 * \text{Turnover}_{i,q-1} + c8 * \text{FourthQtr} + \text{Fixed Year/Qtr.Effects} + e_{i,t}, \end{aligned} \quad (2)$$

Abnormal Post Measures examined are *AbnPost*, *Non-EarnAbnPost*, and an indicator variable, *Earnings*, for firms that make at least one earnings post. We do not consider the post-announcement (days +2 to +5) period in this portion of our analysis, as the Table 3 results suggest that posting activity during this period is largely unaffected by the earnings event. All independent variables in this analysis are lagged, consistent with our objective of assessing the degree to which they predict heightened announcement-period trading levels.

Table 4 reports our estimations of Eq. (2). In the pre-announcement period, we observe no statistically significant evidence of relations between abnormal posting activity levels and any of the variables considered in

<sup>8</sup> We identified 766 posts, for 283 different firm earnings announcements, in the day 0 to +5 period that contain earnings-related information. These posts are highly concentrated in the day 0 to +1 period with <1% of them falling in the day +2 to +5 period.

Table 5

Abnormal post means News	AFE surprise				SRWFE surprise			
	N	All posts	Non-earn posts	Mean abnormal return	N	All posts	Non-earn posts	Mean abnormal return
<i>Panel A: announcement-period posting activity conditional on earnings news</i>								
Good	1603	<b>0.040</b> <sup>***</sup>	0.011	0.002 <sup>*</sup>	1513	<b>0.039</b> <sup>***</sup>	0.011	0.004 <sup>***</sup>
(Std. Error)		(0.007)	(0.007)	(0.001)		(0.007)	(0.008)	(0.001)
Bad	536	<b>0.028</b> <sup>**</sup>	0.005	−0.004 <sup>*</sup>	728	<b>0.021</b> <sup>**</sup>	−0.001	−0.008 <sup>***</sup>
(Std. Error)		(0.012)	(0.012)	(0.0023)		(0.010)	(0.011)	(0.002)
“Neutral” News	175	−0.016	−0.032	−0.005 <sup>*</sup>	73	0.026	−0.001	0.004
(Std. Error)		(0.020)	(0.020)	(0.003)		(0.019)	(0.035)	(0.004)
Abnormal post means		AFE surprise				SRWFE surprise		
News-return	N	All posts	Non-earn posts		N	All posts	Non-earn posts	
<i>Panel B: Announcement-period posting conditional on market response</i>								
<i>Mean abnormal posting conditional on news and market return direction</i>								
Good News, Pos. Ret.	862	<b>0.038</b> <sup>***</sup>	0.012	0.012	808	<b>0.035</b> <sup>***</sup>	0.009	0.009
(Std. Error)		(0.010)	(0.010)	(0.010)		(0.010)	(0.010)	(0.010)
Good News, Neg. Ret.	741	<b>0.042</b> <sup>***</sup>	0.011	0.011	705	<b>0.043</b> <sup>***</sup>	0.013	0.013
(Std. Error)		(0.011)	(0.011)	(0.011)		(0.011)	(0.011)	(0.011)
Bad News, Pos. Ret.	241	0.001	−0.012	−0.012	330	0.018	0.001	0.001
(Std. Error)		(0.018)	(0.018)	(0.018)		(0.016)	(0.016)	(0.016)
Bad News, Neg. Ret.	295	<b>0.050</b> <sup>***</sup>	0.019	0.019	398	0.023	−0.003	−0.003
(Std. Error)		(0.016)	(0.016)	(0.016)		(0.014)	(0.014)	(0.014)

Notes: Statistical significance is represented by \*, \*\*, and \*\*\* for  $p < 0.10$ ,  $p < 0.05$ , and  $p < 0.01$ , respectively. For all posts and non-earnings posts, the t-statistic is for the hypothesis that the mean is less than or equal to zero. Mean abnormal return shows size-adjusted abnormal return for each category.

Eq. (2). In the announcement period itself, however, both analyst following and average pre-announcement period spread are negatively related to overall posting levels. The analyst relation is consistent with the idea that firms view analyst following as a substitute channel for distributing earnings news to interested external parties.<sup>9</sup> The spread relation is inconsistent with the notion that firms respond to high pre-existent information asymmetry levels by raising their posting activity levels during announcement periods.

### 5.2.2. Posting activity and earnings news

We examine the relation between the directional nature of the earnings news being disclosed and announcement-period posting based on analyst consensus forecast error (AFE) and seasonal random walk forecast error (SRWFE). We classify a forecast error greater (less) than zero, i.e., actual earnings are greater (less) than the consensus forecast or seasonal random walk expectation, as good news (bad news). We identify forecast errors that equal zero, i.e., firms have exactly met earnings expectations, as (nominally) “neutral” news.

Table 5 (Panel A) shows that firms post more frequently during earnings announcements periods when the earnings news is either good or bad. This finding is true for surprises based on both analyst forecast error and seasonal random walk forecast error. However, when we take out earnings-related posts and keep only non-earnings posts, we do not find any evidence of firms increasing their non-earnings posting activity around earnings announcements. These findings suggest that, on average, companies amplify disclosure of both good news and bad news, and there is no evidence that they attempt to distract the market with unrelated information around earnings announcements.

<sup>9</sup> In further robustness analysis, available upon request, when we replace the one-quarter lags of analyst following and institutional ownership with their values in the quarter prior to the firm becoming Facebook active, we continue to find negative relations between analyst following and Facebook earnings posting activity and positive relations between such activity and institutional ownership levels.

In the case of AFE-based neutral news, however, mean abnormal posting levels are negative, albeit not statistically significantly so (at conventional levels). One possible explanation for such lower posting levels is that the earnings news is not surprising. That is, earnings that simply meet expectations are not news, and so the firm opts not to post about it. However, this perspective is inconsistent with the market response evidence provided in the table. The mean abnormal return for the “just meeting the forecast” news group is  $-0.005$ , which, in terms of absolute magnitude, is larger than the estimated mean abnormal returns observed for either the good news ( $+0.002$ ) or bad news ( $-0.004$ ) groups. That is, there is little indication that earnings announcements just meeting forecasts are somehow less informative relative to other announcement types.

Panel B of Table 5 reports how posting behavior varies conditional on the direction of earnings news in conjunction with contemporaneous stock price movements.<sup>10</sup> The categories are as follows:

Good News Positive Return (GNPR); unexpected earnings  $> 0$  and stock return  $> 0$ ,

Good News Negative Return (GNNR); unexpected earnings  $> 0$  and stock return  $< 0$ ,

Bad News Positive Return (BNPR); unexpected earnings  $< 0$  and stock return  $> 0$ , and

Bad News Negative Return (BNNR); unexpected earnings  $< 0$  and stock return  $< 0$ .

The results in Panel B indicate that posting activity increases significantly (at the 0.01 level) for all of the AFE-based surprise categories, except BNPR. Moreover, the highest level of increase occurs for the BNNR category. Not surprisingly, firms reporting good news increase their posting activity irrespective of contemporaneous price movements, but firms experiencing bad (AFE-based) news avoid amplifying such news via posting activity when the contemporaneous market price movement is favorable. These implications are further confirmed in (untabulated) analyses of group mean difference, where we find that the posting activity for BNPR announcements is significantly lower (0.10 level or better) relative to each of the other three announcement categories. These results are consistent with firms avoiding amplifying unfavorable news when it is contrary to the market’s contemporaneous valuation assessments of the firm.

It is less clear, however, that SRWFE-based news is a salient factor in this price movement-conditioned setting. Abnormal posting levels for the GNPR and GNNR categories are positive and significant (at the 0.01 level) and of similar magnitudes, while the BNPR and BNNR categories both lack significance but also are of similar magnitudes. Hence, there is little indication that posting behavior is being conditioned on price. This inference is confirmed in (untabulated) analyses of mean differences between BNPR posting levels and posting levels for the other three categories of announcements. Specifically, there is no indication of any significant differences in SRWFE-based BNPR posting levels and the posting levels for any of the other three categories.

The evidence in Table 5 suggests that AFE-based earnings surprises are a possible determinant of announcement-period posting activity. We formally examine this possibility by incorporating new direction indicator variables into Eq. (2) as follows:

$$\begin{aligned} \text{AbnPost Measure}_{i,t} = & c0 + c1 * \text{GoodNews} + c2 * \text{BadNews} + c3 * \text{Size}_{i,q-1} + c4 * \text{Analysts}_{i,q-1} \\ & + c5 * \text{InstOwnership}_{i,q-1} + c6 * \text{Book-to-Market}_{i,q-1} + c7 * \text{AbsReturn}_{i,q-1} \\ & + c8 * \text{Spread}_{i,q-1} + c9 * \text{Turnover}_{i,q-1} + c10 * \text{AbsEarnSurprise}_{i,q} \\ & + c11 * \text{AbsDiscAccruals}_{i,q} + c12 * \text{AbsAbnReturn}_{i,q} \\ & + c13 * \text{Announcements}_{i,q} + c14 * \text{FourthQtr} + \text{Fixed Year/Qtr. Effects} + e_{i,t}, \end{aligned} \quad (3)$$

The reference category in this specification is neutral (AFE-based) news announcements. Hence, the GoodNews and BadNews coefficients reflect differences in posting levels for these categories relative to the neutral

<sup>10</sup> In additional supplemental analyses, available upon request, we use the signs of unexpected market model and Carhart four factor adjusted returns to classify announcements. These results are substantively identical to the direction of raw returns approach used in our reported analyses.

news category. In terms of overall posting, the GoodNews and BadNews coefficients are each positive and highly significant (at the 0.01 level). Hence, consistent with Table 5, firms are more likely to post about earnings when the news differs from the analyst forecast expectation. When we restrict the examination to non-earnings posting activity, we again observe positive coefficients for both good and bad news. In this case, however, only the GoodNews coefficient is statistically significant at conventional levels. The final rows of the table report our findings of whether there is any difference between the increases in posting behavior for good vs. bad news for each of the models. The results show that increases in posting behavior for earnings announcements are not different between GoodNews and BadNews at conventional levels of significance. Hence, we do not find reliable evidence of differences in announcement-period posting activity conditional on the nominal direction of news.

We next examine posting activity conditional on earnings news and stock return directions. For this analysis, we insert the news-return categories as defined in Table 5, Panel B into Eq. (2) as follows:

$$\begin{aligned} \text{AbnPost Measure}_{i,t} = & c0 + c1 * \text{GoodNews\_PosRet} + c2 * \text{GoodNews\_NegRet} \\ & + c3 * \text{BadNews\_PosRet} + c4 * \text{BadNews\_NegRet} + c5 * \text{Size}_{i,q-1} \\ & + c6 * \text{Analysts}_{i,q-1} + c7 * \text{InstOwnership}_{i,q-1} + c8 * \text{Book-to-Market}_{i,q-1} \\ & + c9 * \text{AbsReturn}_{i,q-1} + c10 * \text{Spread}_{i,q-1} + c11 * \text{Turnover}_{i,q-1} \\ & + c12 * \text{AbsEarnSurprise}_{i,q} + c13 * \text{AbsDiscAccruals}_{i,q} \\ & + c14 * \text{AbsAbnReturn}_{i,q} + c15 * \text{Announcements}_{i,q} \\ & + c16 * \text{FourthQtr} + \text{Fixed Year/Qtr.Effects} + e_{i,t} \end{aligned} \quad (4)$$

The results from this analysis are consistent with the Table 5 evidence. Firms that miss analyst forecasts but see positive associated price movements are less likely to post on Facebook relative to other announcing firms, with the exception of firms that exactly meet forecasts (which, as seen in Table 6, are also less likely than other firms to post during announcement periods). As the reported coefficient test statistics measure relative differences with the “just meet the forecast” baseline group, the relevant statistical test of the BadNews\_x\_Pos.Ret. group is based on an F-test that the BadNews\_x\_Pos.Ret. coefficient differs from the (weighted) average of the other three coefficients. We combine the other three news-return categories (GoodNews-Pos.Ret., GoodNews-Neg.Ret., and BadNews-Neg.Ret.) into one indicator variable, which takes a value of 1 whenever any of these three news-return categories takes a value of 1, and 0 otherwise; in this way, we create a weighted average category for these three groups. Next, we perform tests of coefficient difference between the combined group and the BadNews\_x\_Pos.Ret. group. Our results support our previous finding that firms amplify their earnings news with disclosures on Facebook, except when they miss the consensus forecast but the price reaction stays positive.

We also examine corporate Facebook posting behavior for earnings-related posts around earnings announcements conditional on news-return relations. We use logistic regression to estimate a version of Eq. (4) where the dependent variable is simply an indicator as to whether the firm made an earnings post during the day  $-1$  to  $+1$  announcement period. The results for this estimation are reported in Table 8, and they largely parallel Table 7 findings. In particular, the estimated coefficients for the BadNews\_x\_Pos.Ret. category are smaller than those for the other three non-neutral news categories, and the overall difference between each of them and the collective weighted average across the other three categories is significant at the 0.05 level.

### 5.3. Supplemental analyses

#### 5.3.1. Earnings quality and announcement period posting

Earnings quality has been shown to be related to voluntary disclosures (Francis et al., 2008). For instance, firms with high-quality earnings may be more inclined to post about them. In an untabulated analysis, we explore this possibility by dividing the sample into two separate subsamples based on abnormal accrual-based earnings quality. We then estimate Eq. (4) for each sub-sample. We follow Kothari et al. (2005) to calculate performance-matched discretionary accruals. Observations with absolute discretionary accruals less than the median are grouped into the high-earnings-quality subsample, while the rest are grouped into the

Table 6  
Announcement-period abnormal posting activity by news direction.

	All posts		Non-earnings posts	
	(1)	(2)	(3)	(4)
GoodNews	0.074*** (0.019)	0.072*** (0.019)	0.052** (0.021)	0.054** (0.022)
BadNews	0.070*** (0.021)	0.069*** (0.022)	0.038 (0.023)	0.039 (0.024)
Size <sub>q-1</sub>		0.040 (0.030)		-0.023 (0.033)
Analysts <sub>q-1</sub>		-0.048*** (0.014)		-0.009 (0.016)
InstOwnership <sub>q-1</sub>		0.030 (0.027)		-0.011 (0.029)
Book-to-Market <sub>q-1</sub>		0.010 (0.022)		-0.010 (0.025)
AbsReturn <sub>q-1</sub>		-1.627 (17.446)		23.233 (31.914)
Spread <sub>q-1</sub>		-3.110*** (0.892)		-2.642*** (1.009)
Turnover <sub>q-1</sub>		0.059 (0.053)		0.073 (0.051)
AbsEarnSurprise <sub>q</sub>		0.273 (0.216)		0.222 (0.279)
AbsDiscAccruals <sub>q</sub>		0.029 (0.043)		0.035 (0.034)
AbsAbnReturn <sub>q</sub>		-0.014 (0.171)		-0.124 (0.191)
Announcements <sub>q</sub>		0.005** (0.002)		-0.000 (0.002)
FourthQtr		0.018 (0.017)		-0.023 (0.021)
N	2108	2108	2108	2108
Adjusted R <sup>2</sup>	0.8%	2.08%	1.71%	1.82%
p-value for F-Test of GoodNews vs. BadNews <sup>1</sup>	0.400	0.414	0.165	0.147

Notes: All regressions include fixed effects for year-quarter. Cluster-adjusted (by firm) standard errors are reported in parentheses. Statistical significance is represented by \*, \*\*, and \*\*\* for p < 0.10, p < 0.05, and p < 0.01, respectively.

<sup>1</sup> We perform coefficient difference tests to check whether good news earnings announcements affect companies' posting behavior on Facebook differently than bad news earnings announcements. We report the probabilities (Prob. > F) for tests with a null hypothesis that these coefficients are not different.

low-earnings-quality subsample. While the estimated likelihoods that firms engage in posting activity are higher (generally around 40%) for the higher-quality subsample, these differences lack statistical significance.

### 5.3.2. Announcement-period spread effects

Blankespoor et al. (2014) show that tweeting activities around information events (earnings and non-earnings press releases) reduce information asymmetry for low-visibility technology firms. In an untabulated analysis, we explore whether Facebook posts are related to earnings announcement asymmetry by estimating the following model to examine this relationship:

$$\begin{aligned}
 \text{AbnSpread}_{i,[-1,+1]} = & c_0 + c_1 * \text{Posting Measure} + c_2 * \text{Size}_{i,q} + c_3 * \text{Analysts}_{i,q-1} \\
 & + c_4 * \text{InstOwnership}_{i,q-1} + c_5 * \text{Book-to-Market}_{i,q-1} + c_6 * \text{AbsReturn}_{i,q-1} \\
 & + c_7 * \text{Turnover}_{i,q-1} + c_8 * \text{Spread}_{i,q-1} + \text{Fixed Year/Qtr.Effects} + e_{i,t}
 \end{aligned} \tag{5}$$



Table 7  
Announcement-period abnormal posting activity by news and return direction.

	All posts		Non-earnings posts	
	(1)	(2)	(3)	(4)
GoodNews_x_Pos.Ret.	0.066*** (0.019)	0.063*** (0.020)	0.037* (0.021)	0.037* (0.022)
GoodNews_x_Neg.Ret.	0.081*** (0.020)	0.082*** (0.020)	0.051** (0.022)	0.060*** (0.022)
BadNews_x_Pos.Ret.	0.041* (0.024)	0.036 (0.025)	0.013 (0.026)	0.015 (0.027)
BadNews_x_Neg.Ret.	0.090*** (0.024)	0.092*** (0.024)	0.042* (0.025)	0.044* (0.026)
Size <sub>q-1</sub>		0.037 (0.030)		-0.025 (0.033)
Analysts <sub>q-1</sub>		-0.047*** (0.014)		-0.008 (0.016)
InstOwnership <sub>q-1</sub>		0.028 (0.027)		-0.011 (0.029)
Book-to-Market <sub>q-1</sub>		0.009 (0.022)		-0.011 (0.025)
AbsReturn <sub>q-1</sub>		-1.433 (17.371)		23.547 (31.981)
Spread <sub>q-1</sub>		-3.049*** (0.890)		-2.609*** (1.006)
Turnover <sub>q-1</sub>		0.058 (0.053)		0.071 (0.051)
AbsEarnSurprise <sub>q</sub>		0.261 (0.214)		0.213 (0.277)
AbsDiscAccruals <sub>q</sub>		0.030 (0.044)		0.036 (0.034)
AbsAbnReturn <sub>q</sub>		-0.014 (0.170)		-0.121 (0.190)
Announcements <sub>q</sub>		0.005*** (0.002)		-0.000 (0.002)
FourthQtr		0.019 (0.017)		-0.023 (0.021)
N	2108	2108	2108	2108
Adjusted R <sup>2</sup>	0.98%	2.37%	1.67%	1.84%
p-value for F-test for difference of Avg.(GoodxPos., GoodxNeg. & BadxNeg.) vs. BadxPos. Ret. <sup>2</sup>	0.025	0.007	0.059	0.053

Notes: All regressions include fixed effects for year-quarter. Cluster-adjusted (by firm) standard errors are reported in parentheses. Statistical significance is represented by \*, \*\*, and \*\*\* for  $p < 0.10$ ,  $p < 0.05$ , and  $p < 0.01$ , respectively.

<sup>2</sup> We perform coefficient difference tests to check whether companies' posting behavior on Facebook is different between bad-news-positive-return earnings announcements and a combined group of the other three news-return categories. We report the probabilities (Prob. > F) for tests with a null hypothesis that these coefficients are not different.

We use the announcement-period  $[-1, +1]$  abnormal spread, *AbnSpread*, as the measure for information asymmetry, closely following Blankespoor et al. (2014). We construct *AbnSpread[-1,+1]* as the event-period three-day average spread minus the pre-event-period average spread, where the pre-event-period includes the three-week period, two weeks prior to the earnings announcement date. We examine the influence of Facebook posting activity on information asymmetry with three different posting measures: (i) *AbnPost[-1, +1]*, which is abnormal posting for the three-day period around the earnings announcement, (ii) *AbnPost[0, +1]*, which is abnormal posting on the day of the earnings announcement and the day after, and (iii) *EarningsPost[0, +1]*, which takes a value of 1 if there was at least one post that contained earnings- or performance-related content on the announcement day or the day after.

Table 8  
Announcement-period abnormal posting activity by news and return direction.

	Earnings posts (logit regression)	
	(1)	(2)
GoodNews_x_Pos.Ret.	0.660*	0.575*
	(0.347)	(0.348)
GoodNews_x_Neg.Ret.	0.876**	0.790**
	(0.344)	(0.347)
BadNews_x_Pos.Ret.	0.380	0.218
	(0.410)	(0.414)
BadNews_x_Neg.Ret.	0.717*	0.532
	(0.380)	(0.383)
Size <sub>q-1</sub>		-0.173
		(0.388)
Analysts <sub>q-1</sub>		-0.241
		(0.152)
InstOwnership <sub>q-1</sub>		0.211
		(0.430)
Book-to-Market <sub>q-1</sub>		0.927***
		(0.275)
AbsReturn <sub>q-1</sub>		360.455
		(349.889)
Spread <sub>q-1</sub>		-25.814**
		(10.530)
Turnover <sub>q-1</sub>		0.037
		(0.575)
AbsEarnSurprise <sub>q</sub>		0.615
		(2.242)
AbsDiscAccruals <sub>q</sub>		-0.239
		(0.319)
AbsAbnReturn <sub>q</sub>		4.043**
		(1.955)
Announcements <sub>q</sub>		0.050**
		(0.025)
FourthQtr		0.101
		(0.259)
N	2108	2108
Pseudo R <sup>2</sup>	1.8%	4.2%
P-value for $\chi^2$ test of Avg. (GoodxPos., GoodxNeg. & BadxNeg.) – BadxPos.Ret. <sup>3</sup>	0.046	0.030

Notes: All regressions include fixed effects for year-quarter. Cluster-adjusted (by firm) standard errors are reported in parentheses. Statistical significance is represented by \*, \*\*, and \*\*\* for  $p < 0.10$ ,  $p < 0.05$ , and  $p < 0.01$ , respectively.

<sup>3</sup> We perform coefficient difference tests to check whether companies' posting behavior on Facebook is different between bad-news-positive-return earnings announcements and a combined group of the other three news-return categories. We report the probabilities (Prob. > Chi<sup>2</sup>) for tests with a null hypothesis that these coefficients are not different.

We do not find any statistically significant evidence of event-period Facebook posting activities (*AbnPost* [-1, +1], *AbnPost*[0, +1], and *EarningsPost*[0, +1]) having any significant association with event-period information asymmetry, *AbnSpread*[-1, +1].

## 6. Conclusion

Along with the advent of network-based information dissemination mechanisms, there has arisen a need to understand how such mechanisms are used by corporations to convey information to the public. Facebook is one such rapidly expanding mechanism. In our sample, monthly posts by Facebook-active firms rose from fewer than five per month in early 2009 to over 25 per month by the end of 2012. Moreover, a firm's level of Facebook activity is directly connected to factors associated with equity investor demand for firm-specific information, i.e., trading volume and analyst following. It is also directly connected to individual

investor ownership levels, suggesting that such posting activity is particularly valued by individual investors interested in obtaining firm-specific information.

We also find that firms use Facebook to amplify the disclosure of earnings news. Facebook posting activity increases markedly around earnings announcements, with much of the increase attributable to posts containing earnings news. There are, however, three notable exceptions to this general finding regarding the disclosure-amplifying use of Facebook. First, firms that have high levels of pre-disclosure information asymmetry as reflected by their bid-ask spreads avoid making posts of any type during earnings announcement periods. Arguably, their silence in these periods is an underlying driver of their high asymmetry state. Second, firms reporting unfavorable earnings news avoid posting about earnings on Facebook when the contemporaneous price movement is positive. That is, they avoid calling attention to unfavorable price-contrarian information. Third, firms reporting earnings that precisely equal the analyst forecast consensus also avoid posting about earnings on Facebook. A possible explanation here is that they wish to avoid calling attention to just how close they came to falling short of the forecast. Such attention might be particularly unwelcome if the firm used earnings management to just meet the forecast number, a practice widely documented in the literature.

The latter two exceptions to the general finding that firms use Facebook to amplify earnings news have important implications for the voluntary disclosure literature. This literature, in assessing factors affecting voluntary disclosure choices by firms, generally focuses on rather straightforward motivations such as whether the news that is available for disclosure is unconditionally good or bad. Our findings, however, suggest that factors guiding disclosure choices are more complex. Firms do not avoid amplifying all bad news announcements, only those that are price-contrarian. Consequently, we find little evidence of a general relation between news direction and the disclosure amplification decision. Similarly, just meeting the consensus forecast, which is nominally a good outcome, actually drives firms to actively avoid voluntary actions to bring attention to it.

## Appendix A.

### Variable definitions

Variable	Description	Source
Posts Per Day	Total number of posts on a day by a firm	Facebook pages
NumPost	Log (1 + Posts Per day by a firm)	Facebook pages
AbnPost	[(NumPost on a day) – (Average of prior and post 10 week same weekday NumPost)]	Facebook pages
AbnPost[t, t + n]	Average AbnPost for the window t to t + n	
EarningsPost	1, if the Facebook post contains earnings- or performance-related texts; 0 otherwise	Facebook pages
Non-Earn Posts	Number of Facebook posts that do not contain earnings-related texts on a day by a firm	Facebook pages
AFE	Analyst consensus forecast error. Calculated as (Actual EPS – Median consensus earnings forecast)/Price	IBES
SRWFE	Seasonal random walk forecast error. Calculated as (Actual EPS – Prior year same quarter actual EPS)/Price	IBES
Good News	1, if earnings surprise > 0; 0 otherwise	IBES
Bad News	1, if earnings surprise < 0; 0 otherwise	IBES
Neutral News	1, if earnings surprise = 0; 0 otherwise	IBES
Good News, Pos. Ret.	1, if earnings surprise > 0 and return > 0; 0 otherwise	IBES & CRSP
Good News, Neg. Ret.	1, if earnings surprise > 0 and return < 0; 0 otherwise	IBES & CRSP

Bad News, Pos. Ret.	1, if earnings surprise $< 0$ and return $> 0$ ; 0 otherwise	IBES & CRSP
Bad News, Neg. Ret.	1, if earnings surprise $< 0$ and return $< 0$ ; 0 otherwise	IBES & CRSP
AbsAbnReturn <sub>q</sub>	Absolute value of the difference between the actual stock return (RET) on the earnings announcement day of quarter q for a firm, minus the size-adjusted return, calculated as the average return within each size decile for each quarter	CRSP
AbsEarnSurprise <sub>q</sub>	Absolute value of actual earnings minus the analyst median consensus scaled by price	IBES & CRSP
AbsDiscAccruals <sub>q</sub>	Absolute value of performance matched discretionary accruals as suggested by <a href="#">Kothari et al. (2005)</a>	Compustat
AbsReturn <sub>q</sub>	Quarterly average of the absolute return, where the return is the absolute value of daily return (RET)	CRSP
AbsReturn <sub>q-1</sub>	Previous quarter's average absolute return	
Analysts <sub>q</sub>	Log (1 + number of analysts)	IBES
Analysts <sub>q-1</sub>	Previous quarter's analysts	IBES
Announcements <sub>q</sub>	Quarterly decile rank of number of announcements made by the company on day t	Capital IQ
Book-to-Market <sub>q</sub>	Quarterly decile rank of the book-to-market ratio, scaled to vary from 0.1 to 1. Where Book-to-Market is the book value of equity divided by the market value of shares outstanding; [CEQQ/ (PRCCQ * CSHOQ)]	CRSP- Compustat
Book-to-Market <sub>q-1</sub>	Previous quarter's book-to-market	CRSP- Compustat
FourthQtr	Indicator variable taking the value of 1 for the 4th fiscal quarter	CRSP
InstOwnership <sub>q</sub>	Shares owned by institutional investors scaled by shares outstanding	Thomson Reuters
InstOwnership <sub>q-1</sub>	Previous quarter's InstOwnership	Thomson Reuters
Size <sub>q</sub>	Quarterly decile rank of size for each firm, scaled to vary from 0.1 to 1.0. Where size is Log of Total Assets (ATQ)	CRSP- Compustat
Size <sub>q-1</sub>	Previous quarter's size	CRSP- Compustat
Spread <sub>q</sub>	Quarterly average value of spread. Where spread is (Offer – Bid)/((Offer + Bid)/2)	CRSP
Spread <sub>q-1</sub>	Previous quarter's average spread	CRSP
Turnover <sub>q</sub>	Quarterly average trading volume, scaled by average number of shares outstanding	CRSP
Turnover <sub>q-1</sub>	Previous quarter's average turnover	CRSP

Example of disclosures around earnings announcements

Exhibit 1: ALCOA

Joined Facebook in July 2008. Posts around April 10, 2012 earnings announcement.

story.

02:03 02:36

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April 11, 2012

Here's Jim Cramer's take on Alcoa's 1Q12 earnings. He breaks down Alcoa's global end market growth projections for 2012 and explains how Alcoa is "aluminizing" the world (i.e., lighter, faster, stronger). Where do you use aluminum in your every day life?"

<http://money.msn.com/top-stocks/post.aspx?p=da435cd4-b0d8-4855-9be4-44803e6d5653&ref=bfv&post=555e9cb6-81db-492c-9423-8b51738ed6b9>

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Of all of the principles that have made Warren Buffett arguably

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Alcoa 1Q12 Earnings Presentation. Reminder, tune in at 5pm ET to live earnings webcast. [www.alcoa.com](http://www.alcoa.com) Replay available afterwards.

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**Alcoa**  
April 10, 2012

"Performance rebounded strongly this quarter due to our proactive cash sustainability actions, our relentless focus on profitable growth, and stabilizing markets," said Klaus Kleinfeld, Alcoa Chairman and Chief Executive Officer.

AA earnin... See More



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Alcoa to Host Webcast of First Quarter 2012 Results, April 10, 2012 at 5pm ET.

[http://www.alcoa.com/global/en/news/news\\_detail.asp?pageID=20120404006550en&newsYear=2012](http://www.alcoa.com/global/en/news/news_detail.asp?pageID=20120404006550en&newsYear=2012)

**Q1**  
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Replay of the call will be available from 7:00 p.m. Eastern Time April 10 through April 18.

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\$AA earnings rebound strongly, up \$287m over 4Q11 on strong productivity growth, improved market

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Welcome fans of Alcoa Eaglecam from all around the world! We invite you to suggest names for the three Alcoa Eaglets. Here's what to do:

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2. reply to this pos... See More



ALCOA Alcoa EagleCam at Davenport W

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## Appendix B. Supplementary material

Supplementary data associated with this article can be found, in the online version, at <https://doi.org/10.1016/j.cjar.2019.02.001>.

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