ECONOMIC CONSEQUENCES OF SOCIAL MEDIA ADOPTION BY CEOs AND CFOs

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Corporate executives are becoming increasingly active on social media channels. This paper examines the economic consequences of such behavior and asks whether social media adoption by top executives improves the corresponding firms' information environment and attracts more investors. We look at the personal Twitter activity of S&P 1500 CEOs/CFOs. Personal tweets contain news as well as reports on executives' day-to-day activities, current interests, and mood. Our analysis suggests that personal tweets improve the information environment and widen the retail investor base. The effects are stronger among executives who post more tweets, receive more retweets, or have more followers. In addition, we exploit the Securities and Exchange Commission's embracement of social media to broadcast company-specific news in April 2013 as an exogenous event that leads to a shift in social media use by existing adopters. Our results continue to hold in this subsample analysis and provide evidence for a causal relationship.

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1. Introduction

Corporate executives are becoming increasingly active on social media. Touted benefits for the underlying firms range from improved brand perception to stronger relationships with investors to greater employee satisfaction. For instance, 93% of participants in a recent survey report that "*CEOs who actively participate in social media can build better connections with customers, employees, and investors*;" 75% believe that social media engagement makes a brand seem more honest and trustworthy (BRANDfog 2016). 76% of employees believe it is a good idea for CEOs to be active on social media (Weber Shandwick 2012).

The goal of this study is to assess to what degree these touted benefits manifest themselves in real-world data. We look at the personal Twitter accounts of S&P 1500 CEOs and CFOs and we examine whether the activation of such accounts improves the information environment for investors and helps widen the investor base.

Our analysis begins in April 2008, when the first tweet from a personal S&P 1500 CEO or CFO was sent and it ends in December 2014. In total, our sample includes 156 CEOs and CFOs working for 142 firms who sent a total of 49,713 tweets. As of December 2014, these 142 firms had a combined market capitalization of $3.2 trillion, or 12% of the total market capitalization across all S&P 1500 firms at that time.

Personal tweets include the occasional company news announcement. Most tweets, however, are pertinent to day-to-day activities, personal interests, and mood. Examples include: "*A long week culminates in the #Aetna annual meeting and a great discussion with our board. Lots to feel very good about and lots to do!*" (a tweet sent on 5/18/2012 by Mark Bertolini, CEO of Aetna); or "*More depressed/upset than you've been in years? Try running an airline! – Dave Barger/CEO JetBlue*" (a tweet sent on 12/4/2012 by David Barger, CEO of JetBlue Airways); or "*Very disappointed that there will be no season 9 of 24!*" (a tweet sent on 3/27/2010 by Michael Dell, CEO of Dell).

We conjecture that these tweets provide investors with unique around-the-clock clues of how a company is performing that cannot plausibly be glanced from traditional information sources. Tweets therefore improve the information environment. We further conjecture that investors prefer information-

rich environments. As such, tweets also help attract investors. To test these ideas, we build on extensive arguments in the accounting and finance literature (e.g., Welker 1995; Coller and Yohn 1997; Healy, Hutton, and Palepu 1999; Leuz and Verrecchia 2000; and Lang, Lins, and Maffett 2012) that the richness of an information environments can be captured by the spreads at which investors are willing to buy and sell shares ("bid-ask spreads") and the corresponding trading volume. The intuition is as follows: If an investor wants to sell an equity share in a publicly traded company, she requires a counterparty willing to buy that share to complete the transaction. The bid price is the highest price counterparties are willing to pay for a share. Likewise, if an investor wants to buy a share, she requires a counterparty willing to sell one of her shares. The ask price is the lowest price counterparties are willing to accept to transfer one of their shares. If the information environment is poor and there is greater information asymmetry, counterparties fear being taken advantage of. To protect themselves, counterparties are willing to buy shares only at a very low price (→ very low bid price) and let go of one of their shares only at a very high price (→ very high ask price). Poor information environments thus translate into high bid-ask spreads. High bid-ask spreads increase the cost to investors; high bid-ask spreads therefore discourage trading activity.

Our first inferences regarding the economic consequences of social media adoption by top executives then come from changes in spreads and trading volume when a CEO or CFO starts tweeting, which we hereafter refer to as a personal Twitter account activation event (TAA). Consistent with social media adoption improving the information environment, we find that firms with a TAA experience disproportionate drops of around 30% in their spreads and disproportionate rises of 7.14% in their daily share turnover compared with matched firms.[1] To illustrate the economic significance of our findings, our results suggest that a firm with a TAA experiences a staggering 14.8 million increase in share trading volume after a TAA compared with prior to a TAA. Investors of a firm with a TAA, on average, pay around half a million dollars less in spreads after a TAA compared with prior to a TAA. Our results are even

[1] As discussed in Section 5, to assess the robustness of our findings, we experiment with four variants of spreads. The disproportionate drops vary with the version of spreads that we use.

stronger (both statistically and economically) when the corresponding CEO or CFO posts more tweets, receives more retweets or has more followers.

We also find that when a CEO or CFO starts tweeting, the corresponding firm, on average, attracts 22% more retail investors compared with matched firms. We observe no significant change in the number of institutional investors. Our interpretation of this result is that greater information flow primarily attracts informationally disadvantaged investors, most of which are small retail investors (rather than large professional investors, such as mutual funds or pension funds). Parts of the above increase in the number of retail investors may also come from tweets enhancing retail investor trust and causing retail investors to evaluate firm management more favorably (BRANDfog 2016).

In the end, all of our results are consistent with the notion that greater social media presence by top executives improves the information environment and attracts investors. There is an alternative explanation of our findings, however, which is that TAAs happen to come with shifts in firm strategy or major product launches, which, in turn, trigger increases in retail investor base and stock market liquidity. Under this alternative, TAAs are merely correlated by-products.

To help differentiate between these two views, we examine how our sample firms behave around a recent Securities and Exchange Commission (SEC) ruling. In 2008, the SEC published an interpretive release regarding the use of new media to broadcast company-specific news. The release was criticized by the legal community for being vague and exposing executives using social media to break company-specific news to concerns that they are in violation of fair disclosure rules, also known as "Regulation FD" (e.g., Davis Polk & Wardwell Client Memorandum 2013). On April 2nd 2013, the SEC clarified its position and "*blessed the use of social-media sites to broadcast market-moving corporate news*", meaning that "*executives with itchy Twitter fingers can* [now] *rest easier*" and be less constrained in their Twitter activity (Wall Street Journal, "*SEC Embraces Social Media*", April 2013).

In line with the above, we conjecture that prior to April 2nd 2013, executives were wary about tweeting content that could be construed to be in violation of Regulation FD. As a result, executives

primarily tweeted about their current set of interests and/or their mood. After April 2nd 2013, executives became more comfortable sending tweets pertinent to their firms' operations.

If executives, indeed, became more comfortable sending work-related tweets and if investors prefer work-related tweets over non-work-related tweets, we should observe an improvement in investor base and stock market liquidity around the SEC ruling. Since any shift in executive tweets tied to the SEC ruling is plausibly exogenous to changes in firm strategy and product launches, especially for executives that adopted social media prior to this event, any observed improvement would point to a causal link from personal Twitter activity to stock market liquidity and investor base.

To assess the validity of our conjecture that executives became more comfortable sending work-related tweets after the SEC's clarification, we have each tweet in our sample read by two research assistants and categorized as work-related versus not work-related; a tweet is considered work-related if both research assistants consider the tweet as such. In our first-stage analysis, we find that the fraction of work-related tweets posted by existing social media adopters, indeed, substantially increases after April 2013. In particular, we find that the fraction of tweets considered work-related increases by 13.8% in the three-month period after April 2013 compared with the three-month period prior to April 2013. This jump is substantial given that the overall fraction of tweets considered work-related in our sample is 26.6%. The discontinuous jump in the fraction of work-related tweets does not revert.

In our second-stage analysis, we find that this spike in work-related tweets around the SEC's announcement comes with an incremental decrease in spreads, an incremental increase in trading volume, and an incremental increase in the retail shareholder base among the affected firms. Overall, the results from this additional analysis point to a causal link from Twitter activity to stock market liquidity and investor base, and provide evidence that social media adoption by top executives has important economic consequences for the underlying firms.

Our work addresses two lines of research. Amid the rising popularity of social media, a growing body of work has begun to examine the use of social media in both internal and external corporate settings. Examples of the former include Wattal, Racherla and Mandviwalla (2010) and Huang, Singh and Ghose

(2015) who study employees' blogging behavior in internal enterprise social media. Wu (2013) finds evidence that information-rich networks help improve employees' work performance and job retention. Our study adds to the above work by documenting that social media is increasingly being used not only by "regular employees," but also by the most senior executives of the largest firms in the US economy.

Examples of studies on the use of social media for external corporate purposes include Chen, De, and Hu (2015) who examine how firms use social media to promote their products and services, and Aggarwal and Singh (2013) and Hong, Yu, and Burtch (2017) who analyze how firms use social media to seek venture-capital- or crowd-funding. In this study, we show that the social media phenomenon is evolving and that it is no longer just firms utilizing social media, but that top executives themselves have begun to communicate directly with investors and, by doing so, directly shape their firms' information environment and help widen their investor bases.

Our study also adds to the literature on the role of social media in financial markets. A growing body of work examines whether consumer-generated and investor-generated social media content predicts future firm performance. Luo, Zhang, and Duan (2013) look at customer reviews; Bollen, Mao, and Zeng (2011) look at tweets; Antweiler and Frank (2004) and Park, Konna, Gu, Kumar, and Raghunathan (2013) look at Internet message boards; and Chen, De, Hu, and Hwang (2014) and Jame, Johnston, Markov, and Wolfe (2016) look at crowdsourced equity research. Xu and Zhang (2013) test whether user-generated social media content on Wikipedia affects a firm's "disclosure lag," which is the number of calendar days between a fiscal quarter end and the date when management voluntarily discloses bad news about earnings.

The above literature finds fairly strong evidence that the "crowd" – through social media – predicts firm performance and impacts firm behavior. Our study makes a contribution by providing evidence that the reverse equally holds, namely that firm executives meaningfully impact the crowd.

2. Hypothesis Development

Naaman, Boase, and Lai (2010) suggest that Twitter content can be classified into the following types: conversational (direct address to another user), status ("what are you doing right now?"), pass-along

(endorsing content), news, and phatic (e.g., a greeting to the broader Twitter community, a monologue). A simple glance at executives' tweets reveals that most of their tweets are of the conversational, status, pass-along, or phatic types and resemble a "public diary". Some of these public-diary tweets are work-related (e.g., "*Just met with some amazing startups. Incredible innovation coming to travel industry. Be a part of it. The Concur Connect Platform."*, a tweet sent on March 22, 2011 by Steve Singh, CEO of Concur Technologies). Others are not work-related (e.g, "*On our way to Happy Valley to pick up our daughter and see the Nittany Lions. I hope the referees are nicer to us this weekend.*", a tweet sent on November 16, 2012 by Naren Gursahaney, CEO of ADT Corporation).

In this study, we argue that social media adoption by top executives, in particular, the adoption of Twitter by CEOs and CFOs, can have important economic consequences for the underlying firm. Work-related tweets describing an executive's day-to-day activities provide investors with unique, around-the-clock clues that cannot plausibly be transmitted through other more traditional outlets, such as mandatory SEC filings and corporate earnings announcements, which typically occur once a year or once a quarter.

We conjecture that these "high frequency clues" improve the information flow. Improved information flow becomes reflected in lower bid-ask spreads and increased trading activity (e.g., Kyle 1985; Glosten and Milgrom 1985; Diamond and Verrecchia 1991; Leuz and Verrecchia 2000; Verrecchia 2001; Bushee and Leuz 2005; Blankespoor, Miller and White 2014). Improved information flow should also attract informationally disadvantaged shareholders, most of which are likely to be retail investors.

Even non-work-related tweets may improve the information flow albeit, likely, to a smaller degree than work-related tweets: (1) For CEOs and CFOs, their careers play an important role in their lives and any positive or negative development at work may carry over to their personal lives. Thus, any positive or negative tweet, even if the tweet itself is not directly work-related, may mirror the status of the firm in question. (2) Personal tweets can convey information about a firm due to "strategic" considerations. For example, it likely would be considered unpalatable for an executive to send "happy tweets" about an expensive restaurant when the firm is about to announce a negative earnings surprise. Should an executive

nevertheless send "happy tweets" about an expensive restaurant shortly before an earnings announcement, one may infer that earnings will be good.

From a more behavioral perspective, tweets may enhance retail investor trust and cause retail investors to evaluate firm management more favorably. For instance, BRANDfog (2016) notes in a recent survey that 73% of survey participants perceive CEOs with social media engagement to be more effective leaders. Within an experimental setting, Elliott, Grant, and Hodge (2016) find that investors exhibit higher levels of trust and are more willing to invest in a firm when the firm's CEO broaches negative earnings news through his/her *personal* Twitter account than when the news is transmitted through the firm's website or the firm's official Twitter account.

In light of these considerations, we propose the following hypothesis:

Hypothesis: *Personal Twitter account activation events (TAAs) improve the information environment and, given prior literature, lower bid-ask spreads and increase trading volume.*
TAAs also lead to an increase in the retail investor base.

3. Data

In this section, we describe our Twitter data, our main dependent variables, as well as some of our controls.

3.1 Tweets

Twitter is a social media outlet that allows a user to post short messages of up to 140 characters to his/her network of followers. These short messages are referred to as microblogs or, more commonly, as tweets. Followers can choose to follow or unfollow a public Twitter account without the explicit consent of that user. Twitter was founded in 2006 and has since become the most popular microblogging site in the United States. As of December 2014, the end of our sample period, Twitter had around 284 million active users who posted approximately 500 million tweets each day (https://about.twitter.com/company).

Many public firms have adopted Twitter as a channel to disseminate firm-related news and announcements (Blankespoor, Miller and White 2014; Jung, Naughton, Tahoun, and Wang 2017). Jung, Naughton, Tahoun, and Wang report that, as of 2015, almost half of S&P 1500 firms have firm-managed Twitter accounts to disseminate company-related news. Firm-managed Twitter accounts primarily contain hyperlinks to public press releases and, as such, facilitate the dissemination of existing public news.

Recently, an increasing number of top executives of S&P 1500 firms have begun to create their own personal Twitter accounts and to interact directly with customers and investors. As we describe below, the content of tweets coming out of top executives' personal Twitter accounts is fundamentally different from that of tweets coming out of firm-managed accounts. Further, the results from our study suggest that tweets coming out of top executives' personal Twitter accounts are significantly more impactful than those coming out of firm-managed accounts.

To construct our sample of top executives' personal Twitter accounts, we download a list of all CEOs and CFOs in the Execucomp database between 2008 and 2014. Execucomp covers the S&P 1500 as well as companies that were once part of the S&P 1500 index and that are still trading. We start with the complete list of all CEOs/CFOs in Execucomp and locate users with active Twitter accounts that have the same first and last names as the CEO/CFO in question. We then cross-check the executives' middle names, gender, and company information with user characteristics; we also read tweets to determine whether any account that we find does indeed belong to the executive in question. Through this labor-intensive process, we determine that 156 S&P 1500 CEOs/CFOs have active personal Twitter accounts and work for firms that have the data necessary to conduct our tests.

We exert great effort in separating out Twitter accounts managed by firms. We also eliminate personal tweets that contain hyperlinks to press releases to remove confounding effect arising from firm-managed accounts and err on the side of caution. The information that we collect about each user includes the following items: account identifier ("screen name" in Twitter), personal biography, date of account registration, and number of followers as of December 2014. The information that we collect about each

tweet includes the account identifier, the tweet identifier, date, time, content of the tweet, and number of re-tweets. We make the full list of the 156 CEOs/CFOs in our sample available through our website.

An alternative social media channel through which executives communicate with investors and customers is Facebook. The vast majority of Twitter accounts are set to be public so that anyone who wishes to follow them can do so without the explicit consent of the Twitter account holder. This setting is less common among Facebook account holders, and Facebook posts are generally observable only by "friends". When we sent friend requests to the 72 CEOs and CFOs that we identify as having a Facebook account, only five (6.9%) accepted our friend request. We therefore exclude messages posted on Facebook from our analysis.

3.1.1 Tweets by Relation to Company Operations

Figure 1 presents a few sample tweets. Some tweets can be construed as representing company-related news announcements ("Category 1" tweets). An example of such a tweet is "*Relaunched our Expedia app now with flights and hotel. Beautiful and intuitive: Lmk what you think: http:/t.co/IT15MooF*" (a tweet sent on 11/14/2012 by Dara Khosrowshahi, CEO of Expedia).

The vast majority of tweets, however, is pertinent to an executive's day-to-day activities, current set of interests, or mood. As noted in the hypothesis development section, some of these public-diary tweets are work-related ("Category 2" tweets): "*Earnings call. T-1 hr away. I enjoy taking a step back from the day to day and reflecting on all we have accomplished over the past qtr."* (a tweet sent on 10/29/2009 by John Heyman, CEO of Radiant Systems).

Others are clearly not work-related ("Category 3" tweets): "*Dinner at Hammersley's in Boston—this is still a great restaurant!!*" (a tweet sent on 10/23/2008 by George F. Colony, CEO of Forrester Research), or "*Heading to the @AAarena for the BIG @MiamiHEAT OKC Thunder match-up. Tip is 8pm sharp be there loud & in Black.*" (a tweet sent on 4/4/2012 by Micky Arison, CEO of Carnival).

To filter out tweets that are work-related versus those that are not work-related, we present Figure 1 to research assistants (RAs) and ask them to separate tweets into those that they feel are of Category 1 or

Category 2 (“work-related tweets”) and those that they feel are of Category 3 (“non-work-related tweets”). Each tweet is read by two RAs. We categorize tweets as “work-related” if both RAs agree that the tweet is work related. A total of 26.6% of tweets fall into this category.

3.1.2 Descriptive Statistics Pertaining to Twitter Activity

Table 1 presents descriptive statistics on our final Twitter sample. As shown in Panels A and B, the average number of words used in a tweet is 15.46. In 2008, there were only five tweeting executives who sent a total of 68 tweets. In 2014, 98 tweeting executives sent a total of 12,481 tweets. That is, both the number of executives active on Twitter and the number of tweets sent per executive have increased over time. The number of active executives in a given year does not reach the full 156 figure because some executives send tweets only sporadically.

Panel C separates the number of executives and their tweets by four-digit-Global Industry Classification Standard (GICS) industry. Our sample includes tweets from 24 industries. Much activity comes from the “Software & Services” industry. However, we also observe meaningful activity in the “Consumer Services,” “Media,” “Retailing,” and “Technology Hardware & Equipment” industries. Panels D and E provide additional information. We have 119 CEOs and 37 CFOs. CEOs tend to be more active on Twitter than CFOs, with the former sending an average of 407 tweets and the latter sending an average of 69 tweets. Of the 156 executives, 143 executives are male and 13 executives are female.

3.2 Spread and Turnover

We use intraday trade and quote data from the Trade and Quote (TAQ) database to construct the following liquidity measures: *Bid–Ask Spread* and *Turnover*.

For robustness and in line with prior work, we compute four *Bid–Ask Spread* variants: *Bid–Ask Spread (Equal-weighted)*, *Bid–Ask Spread (Size-weighted)*, *Bid–Ask Spread (Value-weighted)*, and *Bid–Ask Spread (Dollar Spread)*. Specifically, on each day *t* for each firm *i*, we compute, for each quote that is matched with a trade, the *Percentage Spread*, which is the difference between the ask price and the bid

price, divided by the lagged midpoint of the ask price and the bid price, multiplied by 100. We then calculate, for each day *t* and each firm *i*, the weighted average *Percentage Spread* using three sets of weights. The first variant uses equal weights. The weight in *Size-weighted* is *Trade Size*, where *Trade Size* is the number of shares traded in the matched quote. The weight in *Value-weighted* is *Dollar Value*, where *Dollar Value* is the dollar value of the shares traded in the matched quote. To construct *Dollar Spread*, we compute, for each time interval within a given day *t* when the ask price and the bid price stay still, the difference between the ask price and the bid price. *Dollar Spread* is the time-weighted average spread over all time intervals within a given day *t*.

Turnover is the number of shares traded on day *t* divided by the number of shares outstanding on day *t*. In our regression analysis, we multiply *Turnover* by 100 to help interpret the magnitude of the coefficient estimates. *Turnover* essentially computes the fraction of total shares outstanding that are traded on a given day.

3.3 Shareholder Base

We obtain data on the total number of common shareholders from COMPUSTAT and data on the number of institutional shareholders from the Thomson Reuters S34 Master file. We construct the following variables: *#Inst. Investors*, which is the number of institutional investors, and *#Retail Investors*, which is the number of common shareholders minus the number of institutional investors. Institutional investors include banks, insurance companies, mutual funds, pension funds, university endowments and other forms of professional investment advisors. To help interpret the magnitude of the coefficient estimates, the *#Retail Investors* variable is expressed in thousands.

3.4 Other Variables and Descriptive Statistics Pertinent to Firm Characteristics

To assess whether information transmitted through tweets is distinct from news announcements such as product launches or acquisition announcements, we control for news and opinions transmitted through the Dow Jones News Service (DJNS) and Seeking Alpha (SA). According to the Dow Jones company, the

DJNS publishes more than 19,000 daily news items—including items from *The Wall Street Journal*, *Barron's* and *SmartMoney*. We access DJNS articles for the stocks in our sample via the Factiva database. Our *DJNS Articles* variable counts the number of DJNS articles written on firm *i* on day *t*.

SA is a leading social-media platform that provides crowd-sourced equity research articles in the United States. Over our 2008–2014 sample period, SA articles and SA commentaries are written by approximately 6,000 and 180,000 users, respectively, and cover more than 6,000 firms. We download all single-stock opinion articles that were published from 2008 through 2014 on the SA website and all commentaries written in response to those opinion articles. Our *SeekingAlpha Articles* and *SeekingAlpha Comments* variables count the number of SA articles written on firm *i* on day *t* and the number of SA comments posted about firm *i* on day *t*, respectively. We conjecture that any material news about a company, such as a shift in firm strategy or a major product launch, should be covered by DJNS articles or SA articles or commentaries.

We also use earnings data, financial-statement data, and financial-market data from IBES, COMPUSTAT, and CRSP, respectively, to construct controls as described in the analysis section. Table 2 provides descriptive statistics for some of these controls for both tweeting firms and the full Execucomp sample. In particular, we look at *Size*, which is the firm's market capitalization in millions; *Book-to-market*, which is the firm's book value of assets-to-market value of assets; *Monthly Volatility*, which is the standard deviation of the firm's daily stock return; *Institutional Holdings*, which is the firm's fraction of shares held by institutional investors; *Price*, which is the firm's share price; and *Sales/Total Assets*, which is the firm's annual sales scaled by the book value of total assets. The observations are on a firm/year level, whereby we compute the respective firms' characteristics as of December each year.

Table 2 shows that the medians and various percentiles of the above variables of tweeting firms are not materially different from those of firms comprising the full Execucomp sample.

4. Determinants of Twitter Adoption

Before we present our main results, we examine whether an executive's Twitter adoption can be predicted by executive or firm characteristics. To begin, we assemble the population of all S&P 1500 CEOs and CFOs in the Execucomp database from 2008 through 2014. We then include a host of executive- and firm-specific variables available in the Execucomp and COMPUSTAT databases and estimate a linear probability model in an executive/year panel.

The dependent variable is an executive's Twitter adoption status in a year. It takes the value of one if the executive of firm *i* adopted Twitter as of year *t*, and zero otherwise. The independent variables are as follows: (a) *Executive Age*, which is the executive's age. (b) *Male Executive*, which is an indicator that equals one if the executive is male, and zero otherwise. (c) *CEO*, which is an indicator that equals one if the executive is a CEO, and zero otherwise. (d) *Log (Total Compensation)*, which is the natural logarithm of the executive's total compensation. (e) *Size*, which is the corresponding firm's market capitalization in millions. (f) *Book-to-market*, which is the corresponding firm's book value of assets-to-market value of assets, measured as of the most recent fiscal-quarter end and calculated within COMPUSTAT as *ATQ/(ATQ – CEQQ + (#Shares Outstanding[in millions]*Price))*. (g) *Cash Flow*, which captures how much cash at hand the corresponding firm has and is calculated as *([OIBDP – XINT – TXT – CAPX] / AT)*. (h) *ROA*, which measures the accounting profitability of the firm and is calculated as (*OIBDP / AT*). (i) *Leverage*, which measures how much debt the firm has on its books and is calculated as *([DLC + DLTT] / AT)*. (j) *Dividend*, which measures how much of the profits the firm decides to pay out to its investors and is calculated as *(DVPSP_F / PRCC_F)*. (k) *Capital Expenditures*, which measures how much the firm invests in physical assets and is calculated as *(CAPEX/AT)*. (l) *R&D*, which measures how much the firm invests in research and development and is calculated as *(XRD/AT)*. (m) *Sales/Total Assets*, which is the annual sales scaled by the book value of total assets. (n) *Sales Growth*, which is calculated as $(REVT / REVT_{t-1})$. (o) *Loss*, which is an indicator that equals one if a firm has negative net income in a given year, and zero otherwise. (p) *Tax*, which is the effective tax rate and is calculated as *(TXT/EBIT)*. And (q) *Log(Firm Age)*, which is the natural logarithm of the cumulative number of years the firm has been publicly traded. To

control for time-invariant firm characteristics and time effects such as the increasing popularity of social media over time, we include firm- and year-fixed effects. We measure all of our variables at the end of year *t*-1 to investigate whether they have predictive power of an executive having a personal Twitter account as of year *t*.

The results of our regression model are reported in Table 3. Surprisingly, the only variable with predictive power is the *CEO* variable implying that CEOs are more likely to adopt Twitter than CFOs. This is consistent with our observation that there are more tweeting CEOs than tweeting CFOs in our sample (while the total number of CEOs should be roughly the same as the total number of CFOs in the Execucomp database). No gender effect is observed, although there are more male Twitter adopters than female adopters in our sample. This can be explained by the fact that there are fewer female CEOs or CFOs at S&P 1500 firms. The lack of statistically and economically significant predictors suggests that executives' Twitter adoption choice is either random or driven by unobservable factors.

5. Twitter Activity and its Effect on Liquidity and Shareholder Base

Our first inferences regarding the economic consequences of executives' Twitter activity are drawn from changes in daily spreads and changes in daily turnover around the time a given firm's CEO or CFO starts tweeting. In particular, consider an executive employed by *Treated Firm i* who begins tweeting on day *t*. For each *Treated Firm i*, we look at the daily spread and daily turnover over the one-year period prior to the TAA and compare it with the daily spread and daily turnover over the one-year period following the TAA. We exclude executives who activate a personal Twitter account either before they assume the CEO or CFO role or after they leave the corresponding role.

To better tie changes in our liquidity measures to executives' Twitter adoption, we conduct a difference-in-differences analysis within a regression framework. Specifically, we find for each treated firm a matched firm that is comparable to the treated firm in terms of stock market liquidity. In particular, *Matched firm i* is defined as a stock that (1) is in the same four-digit-GICS industry as *Treated Firm i,* (2) is in the same size-quintile as *Treated Firm i,* (3) is in the same daily share turnover-quintile as *Treated*

Firm i, (4) trades on the NYSE/AMEX (NASDAQ) if *Treated Firm i* trades on the NYSE/AMEX (NASDAQ), and (5) has no tweeting CEO or CFO. If multiple stocks satisfy the aforementioned criteria, we rank stocks based on the absolute difference in the average daily bid–ask spread in the month prior to the TAA and we choose the firm with the smallest difference compared with *Treated Firm i*.

We generally succeed in finding a good match: In the month prior to the TAA, the average size, book-to-market ratio, daily turnover, and equal-weighted bid–ask spreads for the treated firms are 15.66 billion, 0.57, 0.77%, and 0.09%, respectively. The corresponding numbers for the matched firms are 15.68 billion, 0.69, 0.76%, and 0.10%, respectively.

To minimize the effect of confounding factors, we skip the day of the TAA (or the ensuing day if the TAA occurs on a non-trading day) as well as the trading day before and after the TAA. To be conservative and further minimize the effect of confounding factors, we also eliminate TAAs whose three-day window overlaps with the activation of an official, firm-managed Twitter account, or whose firm is discussed/mentioned in the DJNS or SA, or whose firm issues an earnings announcement. In untabulated analyses, we extend the three-day window to longer periods and we find that our results are similar (results available upon request). After imposing all these restrictions and finding matched firms, our final sample includes 112 TAAs (224 firms in total) and 85,816 firm/day observations, half of which represent treatment-firm observations and half of which represent matched-firm observations. Our results are very similar without the above restrictions.

Our difference-in-differences regression equation is similar to that of Gormley and Matsa (2011):

$$Y_{i,t} = \alpha_i + \alpha_t + \beta I\left(Creation\ of\ Personal\ Twitter\ Account_{i,t}\right) + \gamma X + \varepsilon_{i,t}\ . \qquad (1)$$

The dependent variable is either firm *i*'s average bid-ask spread on day *t* or firm *i*'s turnover on day *t*. α_i and α_t are firm and year/month/day fixed effects. Firm-fixed effects control for fixed differences between treated firms and matched firms. Time-fixed effects control for aggregate fluctuations. *I(Creation of Personal Twitter Account$_{i,t}$)* is an indicator that equals one if the CEO/CFO of firm *i* has been tweeting as of day *t* and zero otherwise. The coefficient estimate for *I(Creation of Personal Twitter Account$_{i,t}$)* provides our estimate for the effect of sending personal tweets for the underlying firm.

X contains the following controls: *I(Creation of Company Twitter Account*$_{i,t}$*)*, *#CompanyTweets*$_{i,t}$, *#DJNS Articles*$_{i,t}$, *#Seeking Alpha Articles*$_{i,t}$, *#Seeking Alpha Comments*$_{i,t}$, *Earnings Announcement*$_{i,t}$, *Size*$_{i,t-1}$, *Book-to-market*$_{i,t-1}$, *Monthly Volatility*$_{i,t-1}$, *Institutional Holdings*$_{i,t-1}$, *Log(Price*$_{i,t-1}$*)*, and *Log(#Shareholders*$_{i,t-1}$*)*. *T*-statistics are computed using standard errors clustered by both time and firm and are reported in parentheses.

As reported in Columns (1) to (4) of Table 4, the regressions produce strong negative slopes on *I(Creation of Personal Twitter Account)* when the dependent variables are measures of a firm's bid–ask spread. That is, even after accounting for time and firm fixed effects as well as differences in time-varying firm characteristics, our regression reveals that a TAA is associated with an incremental improvement in liquidity. Our estimates imply that a firm whose executive starts tweeting experiences a disproportionate drop of 0.032% (*t*-statistic = -5.91) in its equal-weighted spread, a disproportionate drop of 0.035% (*t*-statistic = -5.88) in its size-weighted spread, a disproportionate drop of 0.034% (*t*-statistic = -5.87) in its value-weighted spread, and a disproportionate drop of 0.193% (*t*-statistic = -3.68) in its dollar spread. In the month prior to the TAA, the average equal-, size-, and value-weighted, and dollar spreads are 0.09%, 0.11%, 0.11%, and 1.18% respectively. Considering these averages, our results suggest that TAAs disproportionately drop spreads by 35.56% (= -0.035%/0.09%), 31.82%, 30.91% and 16.36%, respectively. The percentage drops are very similar when comparing the observed disproportionate drops with average spreads in the full period prior to the TAA (as opposed to average spreads in the month prior to the TAA).

The daily turnover of tweeting firms also increases notably on a relative basis (Column 5 of Table 4). The coefficient estimate for *I(Creation of Personal Twitter Account)* equals 0.055 (*t*-statistic = 3.55), implying that the daily turnover of firms whose top executive starts tweeting increases disproportionately by 0.055%. Again, compared with the average daily turnover of 0.77%, this disproportionate increase is substantial.

Columns (6) and (7) of Table 4 report results when re-estimating regression equation (1), but replacing the liquidity-based dependent variables with *Ln[#Retail Investors]* and *Ln[#Inst. Investors]*. Since these variables can be captured only at the annual frequency, we now look at the annual number of

shareholders over the two-year period prior to the TAA and compare it with the annual number of shareholders over the two-year period following the TAA. Our control variables are now also at the annual frequency and we no longer control for *Institutional Holdings* and *Log(#Shareholders)*. Since we have only a limited number of clusters, we can no longer cluster standard errors by year (Petersen 2009). However, we can still cluster our standard errors by firm to account for heteroskedasticity and serial correlation. Our final sample includes 112 TAAs (224 firms in total) and 760 firm/year observations.

Table 4 shows that a firm whose top executive starts tweeting experiences a disproportionate increase of 0.220 (*t*-statistic = 2.60) in the natural logarithm of the number of retail investors. Put differently, firms with TAAs disproportionately grow their retail investor bases by 22.0%; for reference, the average number of retail shareholders in our sample is 17,600. We observe no association between TAAs and the number of institutional investors (the coefficient estimate for *I(Creation of Personal Twitter Account)* turns to -0.023 (*t*-statistic = -0.74)).

Table 4 also reports the coefficient estimates for *I(Creation of Company Twitter Account)* and other control variables. As noted above, tweets sent from company Twitter accounts primarily contain hyperlinks to public press releases and, as such, facilitate the dissemination of existing news. Consistent with Blankespoor, Miller and White (2014), we find that the creation of a company-Twitter account comes with lower spreads, higher trading activity and an increase in the retail shareholder base. Compared with the coefficient estimates for *I(Creation of Personal Twitter Account)*, however, the coefficient estimates for *I(Creation of Company Twitter Account)* are generally less reliable and much smaller in magnitude. The stronger results for top executives' personal Twitter accounts are consistent with the experimental results of Elliott, Grant and Hodge (2016) that investor react more strongly to tweets from the CEO's *personal* Twitter account than to tweets from the firm's investor relations Twitter account.

Adopting Twitter is only the first step. How executives actually use this social media channel should play an important role in determining its ultimate economic consequences. To explore how actual social media usage affects stock market liquidity and shareholder base, Table 5 examines whether our basic patterns are stronger for executives who send more tweets, as well as for executives who receive more

retweets and have a larger follower base. We expect Twitter activity to produce a greater incremental drop in spreads, a greater incremental rise in trading activity, and a greater incremental rise in retail shareholder base for firms in which (a) the executive sends more tweets, (b) the executive's tweets are re-tweeted more often, and (c) the executive's Twitter account has more followers.

To test this conjecture, we re-estimate regression equation (1), but now interact *I(Creation of Personal Twitter Account)* with *More # Tweets*, *More # Re-tweets* and *More # Followers*. *More # Tweets* is an indicator that equals one if the CEO/CFO working for firm *i* has a personal Twitter account as of day *t* and the CEO/CFO's average number of tweets per year is above the sample median, and zero otherwise. Similarly, *More # Re-tweets* is an indicator that equals one if the CEO/CFO's average number of re-tweets per year is above the sample median, and zero otherwise. *More # Followers* is an indicator that equals one if the CEO/CFO's total number of followers at the end of our sample period is above the sample median, and zero otherwise.[2] For brevity, for our spread-based analysis, we only report results for equal-weighted bid-ask spreads. The results are very similar when we use size-weighted, value-weighted, and dollar spreads (results are available upon request).

As reported in Table 5, in every regression specification, the results are stronger for firms in which (a) the CEO/CFO sends more tweets, (b) tweets are re-tweeted more often, and (c) the Twitter account of the CEO/CFO has more followers. For instance, the coefficient estimate for the interaction term based on the number of tweets is -0.016 (*t*-statistic = -2.49) when the dependent variable is *Bid-Ask Spread*, 0.110 (*t*-statistic = 5.29) when the dependent variable is *Turnover*, and 1.144 (*t*-statistic = 2.82) when the dependent variable is *Ln[#Retail Investors]*.

[2] Specifically, for the regressions based on *Bid–Ask Spread* and *Turnover*, for which we look at the one-year period around the TAA, we look at the number of tweets (re-tweets) in the one-year period after the TAA and we compare it with the number of tweets (re-tweets) of other CEO/CFO Twitter accounts over the same window. For the regression based on *# Investors*, for which we look at the two-year period around the TAA, we look at the average number of tweets (re-tweets) per year in the two-year period after the TAA and we compare it with the average number of tweets (re-tweets) per year of other CEO/CFO Twitter accounts over the same window.

6. The Effect of the SEC's "Embracement of Social Media"

All of our results up to this point are strongly consistent with the notion that social media adoption by top executives improves the corresponding firm's information environment and attracts investors. One possible alternative explanation is that TAAs come with significant corporate events, such as a corporate reorganization or an important product launch that, for some reason, are not covered by the media outlets and, as a result, are not captured by our controls based on DJNS and SA. These events could, in turn, affect a company's stock market liquidity and investor base. Furthermore, the moderating relationships in Table 5 might suffer from reverse causality concerns. For example, after observing improved market liquidity or larger investor base, executives may become more active on Twitter and send out more tweets. Similarly, new retail investors may voluntarily seek to engage with top executives by retweeting their tweets or following them on Twitter.

To address these endogeneity concerns, we utilize an exogenous event, the SEC's "embracement of social media" on April 2nd 2013. Until April 2nd 2013, it was unclear whether posting company-related information on social media accounts was in line with Regulation FD. On July 5th 2012, Reed Hastings, the CEO of Netflix, posted on his Facebook account that Netflix customers were viewing more than 1 billion hours of video content a month. The Facebook post was widely discussed in the media and accompanied by a 10% stock price increase. The information that Netflix customers were viewing more than 1 billion hours of video content a month was neither disclosed in a press release nor reported in a SEC filing, prompting the SEC to issue "Well Notices," investigating whether the executive was in violation of Regulation FD. On April 2nd 2013, the SEC announced that it will not press charges against Hastings. The SEC also noted that, going forward, companies and executives may announce company news through social media as long as the social media outlet is not restricted and as long as investors are aware that news may be transmitted via social media.

We conjecture that after the SEC's clarification, executives are more comfortable transmitting work-related information through their personal Twitter accounts. To test this hypothesis, we look at firms with a TAA prior to April 2013. We utilize the manually coded data of whether a tweet is work-related or

not work-related. For each year-month around the SEC's clarification, we compute the fraction of tweets that are work-related. To remove seasonality in tweet-type (e.g., there are fewer work-related tweets in the summer), we also calculate, on our full sample, the average fraction of work-related tweets for each of the twelve months, which we hereafter refer to as "seasonal fraction." The abnormal fraction of work-related tweets in a given year-month is the fraction of work-related tweets in that year-month minus the corresponding seasonal fraction.

Consistent with our hypothesis, Figure 2, which plots the abnormal fraction of work-related tweets around the SEC's announcement in April 2013, shows that the fraction of work-related tweets increases abnormally and substantially after April 2013. Specifically, the fraction of tweets considered work-related increases by 12.9% in May 2013 compared with March 2013. The fraction of tweets considered work-related increases by 13.8% in the three-month period after April 2013 compared with the three-month period prior to April 2013. The discontinuous jump in the fraction of work-related tweets does not revert. The average monthly fraction of tweets considered work-related is 18.9% higher in the post-April 2013 sample period than in the pre-April 2013 sample period.

The spike in the work-relevance of tweets following the SEC's embracement of social media is plausibly exogenous to shifts in corporate strategy or major product launches. If investors prefer work-related tweets over non-work-related tweets and if there is a causal link from personal Twitter activity to our outcome variables, firms with tweeting top executives should experience an incremental drop in their spreads, an incremental rise in their trading volume and an incremental widening of their shareholder base around April 2013.

To test these predictions, we estimate a variant of regression equation (1) on a sample of 84 firms with a TAA prior to April 2013 (=treated firms) and their matched firms; matched firms are constructed as in Section 5:

$$Y_{i,t} = \alpha_i + \alpha_t + \beta I(Post\ SEC\ Embracement_t) + \gamma X + \varepsilon_{i,t}\ . \qquad (2)$$

The dependent variable is either firm *i*'s average bid-ask spread on day *t*, firm *i*'s turnover on day *t* or firm *i*'s number of retail- or institutional investors in year *t*. *I(Post SEC Embracement$_t$)* is an indicator that equals

one if the observation belongs to a treated firm and if the observation falls after 2nd April 2013, and zero otherwise. We again include firm- and year/month/day-fixed effects along with the same set of controls as in regression equation (1).

For the spread- and the turnover analyses, which are conducted at the daily frequency, we include observations in the one-year period before and after 2nd April 2013 (i.e., we cover the period from April 2012 through March 2014). For the shareholder analysis, which is conducted at the annual frequency, we include observations in the two-year period before and after 2nd April 2013 (i.e., we cover the period from 2011 through 2015).

Columns (1)-(5) of Table 6 show that the coefficient estimates for *I(Post SEC Embracement)* are negative when the dependent variables are measures of spreads, and positive when the dependent variable is turnover. That is, firms with tweeting top executives experience an incremental drop in their spreads and an incremental rise in their trading volume after the SEC's clarification. For the price-scaled bid-ask spread analysis, the estimate for *I(Post SEC Embracement)* ranges from -0.029 to -0.030 and it is always significant at the 1% level; for the dollar spread, the estimate is -0.145 (*t*-statistic of -3.42); for the turnover analysis, the estimate is 0.026 (*t*-statistic = 1.73). The results in Column (6) of Table 6 indicate that firms with tweeting top executives also experience an incremental increase in the number of retail investors. The estimate is 0.895 (*t*-statistic = 2.33). We continue to see insignificant results when the dependent variable is the number of institutional investors.

In sum, our subsample analysis on existing adopters around an exogenous event yields results that are similar to those produced by our previous analysis and serves as evidence for a causal relationship between social media adoption by top executives and improved information environment and wider shareholder base for the underlying firms.

7. Conclusion

Our study is the first to document and describe how executives have begun to use social media to communicate directly with investors and customers. We examine the potential economic consequences of

such behavior for the underlying firm. Our evidence suggests that having social executives can lead to lower spreads, greater trading activity, and a greater retail shareholder base. The SEC's embracement of social media in April 2013 clarifies how firms can utilize social media as a new and emerging channel to disclose material information and interact with investors and customers. Together, our results point to the growing significance of social media in financial markets and show that social media activity can have important consequences for firms that engage in it.

Our study has important managerial implications. The corporate use of social media now goes beyond traditional purposes such as product promotions and customer relationship management. Our evidence suggests that corporate executives proactively utilize social media channels to reach out to and serve a broader set of stakeholders such as investors. Our analysis also indicates that personal tweets by top executives have a much more significant effect on improving the information environment of the underlying firms than tweets posted by firm-managed Twitter accounts. This result underscores the importance of having social media savvy top executives. Such executives may be able to discover new benefits and opportunities and transform their firms as social media continues to evolve.

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Figure 1 Sample Tweets by Relation to Company's Operations

Tweet	Tweet Date	Screen Name	Executive Name	Industry	Company Name	Category
Very excited about the prospects of the Sirius XM Satellite Radio App due to come out for iPhone users soon!	4/28/2009	MelKarmazin	Mel Karmazin	Media	SIRIUS XM RADIO	
Western Union launches solution to deliver financial inclusion to millions in #India.: prepaid cards.	10/23/2012	WesternUnionCEO	Hikmet Ersek	Software & Services	WESTERN UNION	
Relaunched our Expedia app now with flights and hotel. Beautiful and intuitive. Lmk what you think. http:/t.co/IT15MooF	11/14/2012	dkhos	Dara Khosrowshahi	Retailing	EXPEDIA	
Just finished a meeting with a lot of good ideas about behavioral mapping ideas	5/7/2009	jmclaughlin173	John P. McLaughlin	Pharma, Biotech & Life Sciences	P D L BIOPHARMA INC	
Earnings call. T- 1 hr away. I enjoy taking a step back from the day to day and reflecting on all we have accomplished over the past qtr.	10/29/2009	johnheyman	John Heyman	Software & Services	RADIAN SYSTEMS	
More depressed/upset than you've been in years? Try running an airline! –Dave Barger/CEO JetBlue	12/4/2012	DavidJBarger	David Barger	Transportation	JETBLUE	
Dinner at Hammersley's in Boston—this is still a great restaurant!!	10/23/2008	gcolony	George F. Colony	Software & Services	FORRESTER RESEARCH	
Very disappointed that there will be no season 9 of 24!	3/27/2010	MichaelDell	Michael S. Dell	Technology Hardware & Equipment	DELL	
Heading to the @AAarena for the BIG @MiamiHEAT OKC Thunder match-up. Tip is 8pm sharp be there loud & in Black.	4/4/2012	MickyArison	Micky M. Arison	Consumer Services	CARNIVAL CORP	

Figure 2 **Monthly Abnormal Fraction of Work-Related Tweets around the "SEC's Embracement of Social Media"**

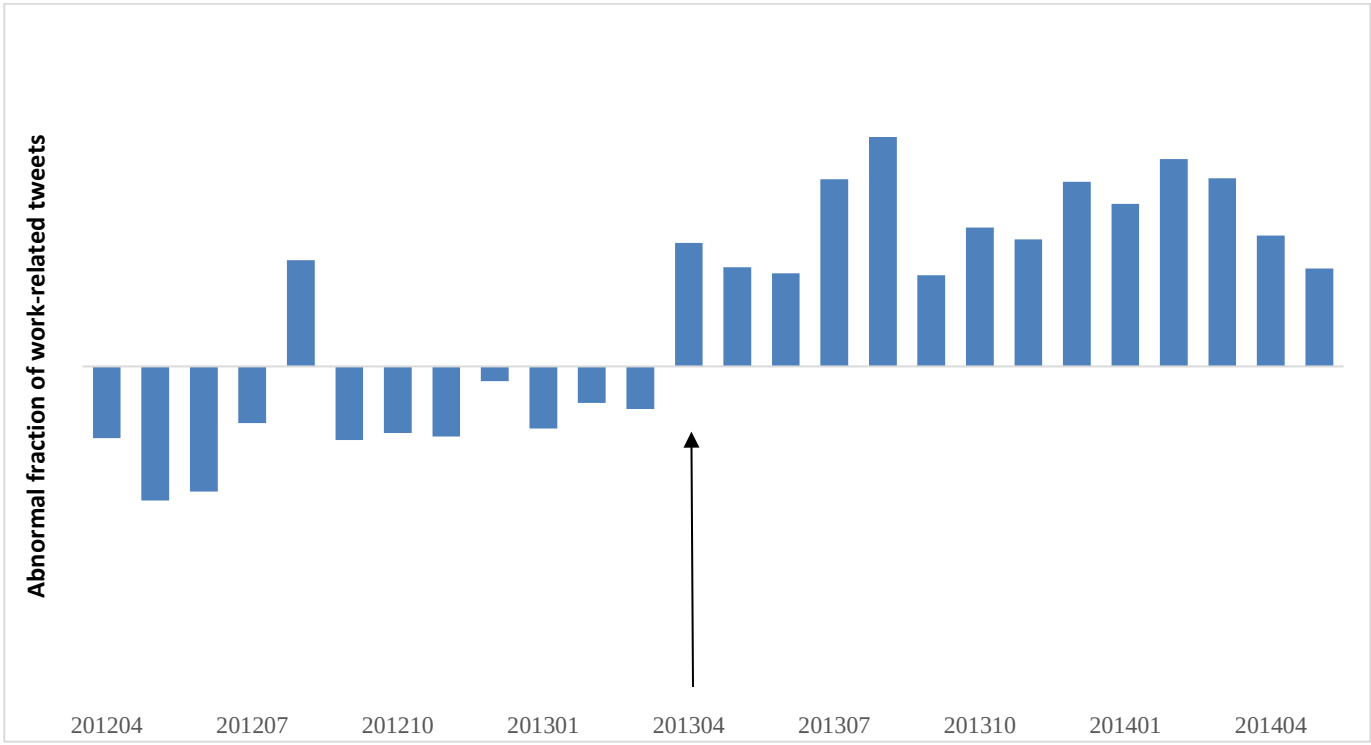

Table 1 Descriptive Statistics on Tweets

	Total #Executives	Total #Firms	Total #Tweets	Total #Tweets per Firm
Panel A: Full Sample				
ALL	156	142	49,713	350.09
Panel B: Calendar Year				
2008	5	5	68	13.60
2009	43	41	2,450	59.76
2010	45	43	3,266	72.95
2011	65	64	7,538	117.78
2012	80	76	12,916	169.95
2013	90	87	10,982	126.23
2014	98	92	12,481	135.66

Table 1. Continued.

	Total #Executives	Total #Firms	Total #Tweets	Total #Tweets per Firm
Panel C: GICS Industry				
Automobiles and Components	1	1	260	260.00
Banks	3	3	345	115.00
Capital Goods	5	4	1,882	470.50
Commercial & Professional Services	7	6	2,191	365.17
Consumer Durables and Apparel	1	1	2,582	2582.00
Consumer Services	10	10	9,866	986.60
Diversified Financials	4	4	655	163.75
Energy	3	3	91	30.33
Food & Staples Retailing	2	2	334	167.00
Food, Beverage & Tobacco	6	5	1,706	341.20
Health Care Equipment & Services	7	7	2,801	400.14
Household & Personal Products	2	2	2,237	1118.50
Insurance	2	2	34	17.00
Materials	4	4	103	25.75
Media	10	9	2,176	241.78
Pharma, Biotech & Life Sciences	2	2	765	382.50
Real Estate	1	1	30	30.00
Retailing	10	9	2,419	268.78
Semiconductors	6	6	516	86.00
Software & Services	46	38	11,098	292.05
Technology Hardware & Equipment	12	12	5,394	449.50
Telecommunication	5	4	318	79.50
Transportation	2	2	1,567	783.50
Utilities	5	5	343	68.60

Table 1. Continued.

	Total #Executives	Total #Firms	Total #Tweets	Total #Tweets per Firm
Panel D: Executive Type				
CEO	119	116	47,178	406.71
CFO	37	37	2,535	68.51
Panel E: Executive Gender				
Male	143	130	47,827	344.02
Female	13	12	1,886	157.17

Table 2 Descriptive Statistics – Firm/Year Level

	N	Mean	Std. Dev	25th Pctl	50th Pctl	75th Pctl
Panel A: "Tweeting" Firms						
Size$_{i,t-1}$	1,016	15,822	52,238	556	1,424	5,815
Book-to-market$_{i,t-1}$	1,016	0.89	2.86	0.27	0.49	0.82
Monthly Volatility$_{i,t-1}$	1,016	2.50%	16.07%	0.10%	0.40%	1.37%
Institutional Holding$_{i,t-1}$	1,016	0.76	0.23	0.65	0.81	0.94
Price$_{i,t-1}$	1,016	296.13	5041.22	11.69	22.92	37.49
Sales/Total Assets $_{i,t-1}$	1,016	1.04	1.05	0.49	0.78	1.27
#Retail Shareholders$_{i,t}$ *(thousands)*	1,016	18.25	72.71	0.08	1.37	8.71
#Institutional Shareholders$_{i,t}$	1,016	281	327	115	168	323
Panel B: Full Execucomp Sample						
Size$_{i,t-1}$	11,405	7,963	24,742	635	1,723	5,135
Book-to-market$_{i,t-1}$	11,405	0.88	3.45	0.33	0.56	0.90
Monthly Volatility$_{i,t-1}$	11,405	1.91%	15.51%	0.07%	0.31%	1.14%
Institutional Holding$_{i,t-1}$	11,405	0.78	0.20	0.69	0.83	0.93
Price$_{i,t-1}$	11,405	52.64	1,330.08	13.56	25.91	43.53
Sales/Total Assets $_{i,t-1}$	11,405	0.92	0.78	0.39	0.75	1.25
#Retail Shareholders$_{i,t}$ *(thousands)*	11,405	22.84	111.27	0.16	1.77	10.14
#Institutional Shareholders$_{i,t}$	11,405	261	243	122	179	315

Table 3 Determinants of Top Executives' Twitter Adoption

	Twitter Adoption
Executive Age$_{i,t-1}$	-0.000
	(-1.23)
Male Executive$_{i,t-1}$	0.004
	(0.42)
CEO$_{i,t-1}$	0.029***
	(4.00)
Log (Total Compensation)$_{i,t-1}$	-0.003
	(-0.54)
Size$_{i,t-1}$	0.004
	(0.60)
Book-to-market$_{i,t-1}$	-0.000
	(0.55)
Cash Flow$_{i,t-1}$	-0.004
	(-0.22)
ROA$_{i,t-1}$	-0.001
	(-0.06)
Leverage$_{i,t-1}$	-0.004
	(-0.21)
Dividend$_{i,t-1}$	-0.133
	(-0.55)
Capital Expenditures$_{i,t-1}$	0.000
	(0.81)
R&D$_{i,t}$	0.006
	(0.27)
Sales/Total Assets $_{i,t-1}$	0.000
	(1.04)
Sales Growth$_{i,t-1}$	0.001
	(1.09)
Loss$_{i,t-1}$	0.006
	(1.49)
Tax$_{i,t-1}$	-0.000
	(-0.88)
Log(Firm Age)$_{i,t-1}$	-0.006
	(-0.49)
# Executives	3,265
# Obs.	12,211
Adj. R^2	0.283

Notes: (1) firm and year fixed effects are included in the regression; (2) t-statistics are computed using standard errors clustered by both firm and year and are reported in parentheses; and (3) statistical significance at the 10%, 5%, and 1% levels is denoted by *, **, and ***, respectively.

Table 4 The Effects of the Creation of a Personal Twitter Account on Liquidity and Shareholder Base

	Bid-Ask Spread Equal-weighted [%]	Bid-Ask Spread Size-weighted [%]	Bid-Ask Spread Value-weighted [%]	Bid-Ask Spread Dollar-Spread [%]	Turnover [%]	Ln [#Retail Investors]	Ln [#Inst. Investors]
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
I(Creation of Personal Twitter Account$_{i,t}$)	-0.032***	-0.035***	-0.034***	-0.193***	0.055***	0.220**	-0.023
	(-5.91)	(-5.88)	(-5.87)	(-3.68)	(3.55)	(2.60)	(-0.74)
I(Creation of Company Twitter Account$_{i,t}$)	-0.004	-0.002	-0.002	-0.121**	0.008	0.409	-0.081*
	(-0.48)	(-0.20)	(-0.19)	(-2.48)	(0.25)	(1.56)	(-1.66)
#Company Tweets$_{i,t}$	-0.000	-0.000	-0.000	-0.000	0.001	0.000	0.000
	(-0.37)	(-0.17)	(-0.19)	(-0.02)	(1.57)	(1.71)	(1.00)
#DJNS Articles$_{i,t}$	0.002	0.003	0.003	0.033	0.143**	0.019*	0.001
	(0.45)	(0.42)	(0.42)	(0.20)	(2.25)	(1.67)	(0.18)
#Seeking Alpha Articles$_{i,t}$	-0.006	-0.019*	-0.019*	-0.253	-0.304***	-0.005	-0.004
	(-0.62)	(-1.89)	(-1.89)	(-0.77)	(-3.98)	(-0.17)	(-0.37)
#Seeking Alpha Comments$_{i,t}$	0.010	0.027**	0.027**	-0.144	0.350***	0.005	0.011
	(1.29)	(2.41)	(2.40)	(-0.35)	(3.98)	(0.13)	(0.94)
Earnings Announcement$_{i,t}$	0.011*	0.027***	0.026***	0.160**	0.671***		
	(1.75)	(3.50)	(3.45)	(2.21)	(22.65)		
Size$_{i,t-1}$	-0.183***	-0.178***	-0.178***	-0.761***	0.077	-0.361	0.484***
	(-4.43)	(-4.51)	(-4.53)	(-2.46)	(0.76)	(-1.10)	(12.49)
Book-to-market$_{i,t-1}$	0.001	0.003*	0.003*	0.014**	0.006*	-0.016	-0.007**
	(1.02)	(1.92)	(1.93)	(1.99)	(1.71)	(-0.96)	(-2.51)
Volatility$_{i,t-1}$	-0.506	-0.597*	-0.598*	-2.035	5.861***	-0.955	0.315
	(-1.50)	(-1.87)	(-1.88)	(-0.99)	(6.81)	(-0.31)	(0.57)
Institutional Holding$_{i,t-1}$	-0.009	-0.003	-0.002	-0.017	0.647***		
	(-0.22)	(-0.06)	(-0.04)	(-0.05)	(6.26)		
Log(Price)$_{i,t-1}$	0.058	0.038	0.038	0.966***	-0.027	0.057	-0.200***
	(1.30)	(0.90)	(0.90)	(3.28)	(-0.25)	(0.21)	(-3.30)
Log(# of Shareholders.)$_{i,t-1}$	-0.111***	-0.103***	-0.103***	-0.274	-0.020		
	(-5.39)	(-4.79)	(-4.79)	(-1.61)	(-0.73)		
# Obs.	85,816	85,816	85,816	85,816	85,816	760	760
Adj. R^2	0.554	0.446	0.446	0.534	0.530	0.919	0.951

Notes: (1) firm and time fixed effects are included in the regressions; (2) in Columns (1)-(5), *t*-statistics are computed using standard errors clustered by both firm and time and are reported in parentheses; (3) in Columns (6)-(7), *t*-statistics are computed using standard errors clustered by firm only; and (4) statistical significance at the 10%, 5%, and 1% levels is denoted by *, **, and ***, respectively.

Table 5 The Effects of Twitter Adoption on Liquidity and Shareholder Base: Account Characteristics as a Moderator

	Bid-Ask Spread Equal-weighted [%]			Turnover [%]			Ln [#Retail Investors]			Ln [#Inst. Investors]		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
I(Creation of Personal Twitter Account$_{i,t}$)	-0.024***	-0.032***	-0.015***	0.002	0.066***	0.003	0.023	-0.106	0.271	-0.098	-0.072	-0.089
	(-4.48)	(-4.91)	(-2.96)	(0.13)	(3.47)	(0.13)	(0.08)	(-0.45)	(0.58)	(-1.62)	(-0.89)	(-0.92)
*I(Creation of Personal Twitter Account$_{i,t}$) * More # Tweets*	-0.016***			0.110***			1.144***			0.129**		
	(-2.49)			(5.29)			(2.82)			(1.97)		
*I(Creation of Personal Twitter Account$_{i,t}$) * More # Re-tweets*		-0.008*			0.029**			1.194***			0.073	
		(-1.71)			(2.27)			(4.46)			(0.84)	
*I(Creation of Personal Twitter Account$_{i,t}$) * More # Followers*			-0.025***			0.076***			0.555**			0.090
			(-5.02)			(3.15)			(2.11)			(0.89)
Controls?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
# Obs.	85,816	85,816	85,816	85,816	85,816	85,816	760	760	760	760	760	760
Adj. R^2	0.555	0.554	0.555	0.531	0.530	0.530	0.819	0.819	0.815	0.960	0.960	0.960

Notes: (1) firm and time fixed effects are included in the regressions; (2) in Columns (1)-(6), *t*-statistics are computed using standard errors clustered by both firm and time and are reported in parentheses; (3) in Columns (7)-(12), *t*-statistics are computed using standard errors clustered by firm only; and (4) statistical significance at the 10%, 5%, and 1% levels is denoted by *, **, and ***, respectively.

Table 6 SEC's Embracement of Social Media

	Bid-Ask Spread Equal-weighted [%]	Bid-Ask Spread Size-weighted [%]	Bid-Ask Spread Dollar-weighted [%]	Bid-Ask Spread Dollar-Spread [%]	Turnover	Ln [#Retail Investors]	Ln [#Inst. Investors]
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
I(Post SEC Embracement$_{i,t}$)	-0.029***	-0.030***	-0.029***	-0.145***	0.026*	0.895**	-0.115
	(-6.76)	(-4.61)	(-4.59)	(-3.42)	(1.73)	(2.33)	(-0.96)
Controls?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
# Obs.	22,520	22,520	22,520	22,520	22,520	256	256
Adj. R^2	0.628	0.512	0.512	0.559	0.480	0.813	0.821

Notes: (1) firm and time fixed effects are included in the regressions; (2) in Columns (1)-(5), *t*-statistics are computed using standard errors clustered by both firm and time and are reported in parentheses; (3) in Columns (6)-(7), *t*-statistics are computed using standard errors clustered by firm only; and (4) statistical significance at the 10%, 5%, and 1% levels is denoted by *, **, and ***, respectively.