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**Twitter Twitter Tell Me Truly: Examining the Association between
Twitter Activities and Earnings Management**

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ABSTRACT

This paper explores whether there exists an association between firms' social media activities and their tendency to manage earnings. We are keen to investigate whether social media activities prompt firms to be more transparent to the stakeholders or whether social media provide firms with a channel to hide their misconduct. We conduct a large scale analysis of firms listed in the COMPUSTAT North America database and create a unique dataset for those firms along with their aggregate Twitter postings and followers for the years 2011-2015. We find that firms with a higher number of Twitter postings and a larger follower base have lesser tendency to manipulate earnings. We also observe that there is a substitutive effect between tweeting activities and follower base suggesting that the negative impact of tweeting on earnings management is less pronounced for firms with a large follower base. Additionally, apart from accrual based earnings management, we conduct a number of robustness checks using real activities earnings management, alternative computation of discretionary accruals, propensity score matching (PSM) and difference-in-difference (DID) analysis, and find the results to be consistent. Our research has implications for academics, practitioners, and policy makers. Our results signify that the use of social media decreases the likelihood of earnings management, and hence decision makers should encourage firms to use social media as an important channel to engage with users. The findings provide a signal to the investors that firms that are active on social media are less likely to manage their earnings.

Keywords: Disclosures, Discretionary accruals, Earnings management, Real earnings management, Social media, Tweets, Twitter.

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1. Introduction

In 2012, Reed Hastings, CEO of Netflix, stated in his personal Facebook page that for the first time the monthly viewing of Netflix has surpassed one billion hours. Netflix's stock price rose from US\$ 70.45 prior to the Facebook post, to US\$ 81.72 at the end of the following trading day. Netflix did not specify this information to investors through official press release or Form-8K filing. An investigation was conducted and the Securities and Exchange Commission (SEC) specified that it was "ok" to make announcements on social media to alert investors in compliance with Regulation Fair Disclosure¹ as long as the investors were alerted which social media channel would be used for dissemination. The advent of the social media platforms has made it easy for companies to announce accomplishments and other firm related news in a consolidated format. Social media sites have offered firms the opportunity to communicate with their investors on a frequent and real-time basis (Blankespoor et al. 2014). Twitter is often termed as 'push technology' as it has allowed firms to directly disseminate information to users (or investors) across the globe rather than investors having to search and gather (i.e., pull) desired information through various information intermediaries (Mazboudi and Khalil 2017). Apart from tweeting non-financial customer engaging tweets, firms have often posted tweets that have directed followers to press releases, interviews, news reports, links to conference calls etc. The tweets have often focused on the latest incidents concerning the company and other company specific information. Many firms have also live tweeted company events such as shareholder meetings (Alexander and Gentry 2014). The social media have been used by firms to voluntarily disclose various types of information (Zhou et al. 2015). In fact, organizations have often

¹ <https://www.sec.gov/news/press-release/2013-2013-51.htm>

integrated investor relations with public relations and marketing departments to create engaging content such as interactive annual reports, webcasts, etc. (Alexander and Gentry 2014). According to Luo et al. (2013), social media content is updated rapidly and can spread at an unprecedented speed often providing first-hand information to investors ahead of many other sources. The authors have argued that investors are more likely to respond to news posted on social media platforms owing to its high visibility and accessibility (Luo et al. 2013).

Twitter communication has differed from traditional media coverage as the communication is two-way and the firm cannot control it (Trinkle et al. 2015). The firm has disseminated information through tweets, and at the same time individual investors have expressed their views to the world about the firm through comments, tweets, or retweets. The investors have often leveraged Twitter to discuss the market conditions with one another by making use of these features. Some of the most prominent financial analysts and investment advisors have actively used Twitter to publish their analyses, and rebroadcast important news and events². Prior research has shown that institutional investors have often analyzed social media content when analyzing and recommending investments (Alexander and Gentry 2014). In fact, investment professionals have been able to monitor what is being said by a firm on social media using Bloomberg terminals. For many investors and traders, using Twitter has become a routine activity just like observing Bloomberg or Reuters terminals³. Jia et al. (2017) have suggested that compared to traditional media, social media platforms have offered an enhanced way to aggregate individual wisdom that has accelerated the process of information discovery. This is often referred to as the crowd wisdom role of social media platforms. Current scholarship has supported the notion that investors have listened to what other users have communicated on social media platforms. Thus, social media have enabled scrutiny of the firms and have served as an informal monitoring platform (Lyon and Montgomery 2013). Institutional investors and government regulators have

² <http://www.businessinsider.in/The-125-most-important-finance-people-you-have-to-follow-on-Twitter/Ray-Dalio/slideshow/59489091.cms>

³ <https://www.ft.com/content/c464d944-ee75-11e4-98f9-00144feab7de>

often tracked the Internet message boards where investors have raised appropriate issues with the management, and hence these individual shareholders or investors have become bona fide monitors (Wu et al. 2016).

The financial disasters of Enron and WorldCom have underscored the importance of detecting fraud in its early stage (Kaplan et al. 2007; Ravisankar et al. 2011). These scandals have raised doubts about the reliability of reported earnings. A high-quality earnings report is expected to do three things: (i) reflect the current operating performance, (ii) serve as a good indicator of future operating performance, and (iii) annuitize the intrinsic value of the firm (Dechow and Schrand 2004). Hence, it is crucial for firms to report their actual earnings. According to Healy and Wahlen (1999), “*Earnings management occurs when managers use judgment in financial reporting and in structuring transactions to alter financial reports to either mislead some stakeholders about the underlying economic performance of the company or to influence contractual outcomes that depend on reported accounting numbers*”. Earnings management has covered a broad spectrum of activities and financial fraud is the extreme form of earnings management. Existing research has highlighted that fraudulent firms are more likely to have managed earnings in prior years (Perols and Lougee 2011). In this study, we examine if there is any association between the firm’s Twitter activities and its likelihood to manage earnings.

We are keen to investigate whether social media activities have prompted firms to become more transparent to the stakeholders or whether social media have provided firms with a channel to hide their misconduct by putting up a positive image in front of investors. It is difficult to predict the direction of the association between social media activity and earnings management upfront, and this warrants an empirical enquiry. We specifically examine the impact of number of postings and number of followers on Twitter on measures of earnings management. Prior research has highlighted that Twitter has become the most frequently used social media platform for Fortune 500 firms (Culnan et al. 2010). Researchers have also reported that Twitter has become the most preferred social media platform for corporate communication and investor relations (Jung et al.

2017). This has led to our choice of Twitter as a social media platform for analyzing the relationship between social media activities and earnings management.

Extant research has investigated the impact of social media on capital markets (Luo et al. 2013; Yu et al. 2013; Blankespoor et al. 2014; Prokofieva 2014; Lee et al. 2015; Jung et al. 2017). Researchers have examined how use of corporate social media has impacted the consequences of firms' disclosures in the event of consumer product calls and have reported that corporate social media in general have attenuated the negative price reaction to announcements of product recall (Lee et al. 2015). Jung et al. (2017) have studied firms that strategically disseminate quarterly earnings news on Twitter, and have found that firm-initiated social media dissemination has improved a firm's information environment. Researchers have suggested that dissemination of news through Twitter has reduced information asymmetry (Blankespoor et al. 2014; Prokofieva 2014). We would like to examine whether firms are less inclined to manage earnings in this environment with reduced information asymmetry. To the best of our knowledge this is the first paper that attempts to analyze whether firms' Twitter activities have any impact on their tendency to manage earnings.

From our research enquiry, we show that firms with increased Twitter postings and follower presence have lower tendency to manage earnings. We also observe that there is a substitutive effect between tweeting activities and the follower base suggesting that the negative impact of tweeting on earnings management is less pronounced for firms with a larger follower base. Furthermore, we find that the negative impact of tweeting activities on earnings management is more pronounced for manufacturing firms than for firms belonging to the services sector that tweet less than the median number of tweets that are posted by firms in the respective industries. We contribute to the literature in the following way: we unearth the association between Twitter activities and firm's earnings management which to the best of our knowledge has not been studied yet. We create a unique dataset for firm's aggregate Twitter postings and followers at year-end for five years (2011-2015) and report these results for all firms listed in the

COMPUSTAT North America database. Our research has several implications for policy makers. The results from this study show that use of Twitter can reduce earnings management. This implies that, the SEC may urge organizations to adopt Twitter and disseminate news on this platform as it signals lower tendency to manage earnings. The SEC is resource-constrained and it is not always feasible for it to spot firms that aggressively manage earnings (Dechow et al. 2010). The use of social media can promote informal monitoring for identifying corporate misconduct, which can benefit the SEC and the entire investor community. For investors and other stakeholders, the use of Twitter by firms can act as a bridge for communication by facilitating information sharing and minimizing earnings management related activities. Additionally, by using robustness checks such as use of real activities management, alternative computation of discretionary accruals, PSM and DID, we find the results to be consistent under different conditions and this strengthens the validity of the results.

The paper is organized as follows: Section 2 provides a focused literature review of earnings management followed by a discussion of the studies that examine social media communication of firms. In section 3 we provide the theoretical motivation and document the hypotheses. Section 4 delineates the research method. Section 5 presents the results and the associated robustness checks. Section 6 provides the discussion of results along with details of research implications, limitations, and directions for future research. The conclusion is presented in Section 7.

2. Literature Review

Literature on earnings management is vast and spans across disciplines. In this section we discuss the drivers of earnings management for firms. Next, we shift our focus to the use of social media as a corporate communication channel, and delineate the research gap addressed in this study. The past two decades have seen an unprecedented growth in research on earnings quality and earnings management. However, there is limited literature that integrates the stream of research on earnings management with that on information systems. It is imperative for researchers to look

into this inter-disciplinary area as information systems can play a dual role. It can either provide a handle to a manager to increase the likelihood of earnings management, or it can promote transparency and reduce the tendency to manage earnings.

Prior research has revealed various factors that may incite firms to manage their earnings. First, capital market incentives may encourage firms to manipulate earnings. A common reason for earnings management is the desire to issue securities at a higher price or to profit from insider trading (Dechow and Schrand 2004). Firms can sometimes portray a very optimistic picture of their earnings and future potential before going to the capital markets to raise external funds. In fact, research has shown that firms that have presence on social media are more highly valued and have a better financial performance (Du and Jiang 2015). The second motivation for earnings management can be to meet the expectations of analysts and investors. Managers may themselves be responsible for creating such a problem by ‘guiding’ analysts about future results and creating unrealistic expectations. Third, there can be contractual incentives such as manipulating earnings to increase the size of earnings-based bonus. Regulatory contracts, executive compensation contracts, political or tax incentives may also be drivers for firms to indulge in earnings management.

Research on voluntary information disclosure on social media is nascent and emerging. Zhang (2015) have analyzed 60 firms in the manufacturing and services sectors to understand the use of social media for voluntary disclosures. Using a sample of 1500 firms, Du and Jiang (2015) have found that firms that have adopted social media are more highly valued in the market and have better financial performance. Owing to the emergence of social media platforms, firms can now take an active role by engaging in a dialogue with the stakeholders, disseminating relevant information, or responding actively to the concerns of the users (Saxton 2012). Social media enable firms to undertake such a relationship building strategy. In recent research, Blankespoor et al. (2014) have used a sample of technology firms and have highlighted that the use of Twitter has reduced information asymmetry. Similarly, Prokofieva (2014) has shown that dissemination

of corporate announcements through Twitter has helped firms attract investor attention and decrease information asymmetry. Mazboudi and Khalil (2017) have reported that large acquirers who have announced their acquisitions on Twitter are able to attenuate the anticipated negative market reaction of the announcements related to acquisition. They have stressed that Twitter has become an important investor channel for announcement of major corporate events. Jung et al. (2017) have studied the impact of dissemination of quarterly earnings news through social media on capital markets for S&P 1500 firms. They have found that there exists some opportunism to tweet good news. Huang et al. (2015) have studied the association between green disclosures or green tweets⁴ and discretionary earnings quality for a sample of 362 observations, and have found that the relationship is negative.

We relate social media and transparency of earnings and highlight that the reach of information can be a driving factor for managers to produce high-quality financial reports. Prior research has shown that ethical motives can be a defining explanation for socially responsible firms to produce high-quality financial information (Kim et al. 2012). Here, we posit that the fear of getting caught and consequently facing massive damage of reputation owing to the advent of social media can be a deterrent for firms to manage earnings. This research is an attempt to contribute to the vast body of literature on earnings management that has broadly overlooked the association between firms' social media activities and quality of earnings reports.

3. Hypothesis Development

3.1. Social Media as an Informal Monitoring Platform

The negative impact of unethical accounting practices is manifold. They tarnish the image of the firm, lead to loss of support from the investors and other associated stakeholders, increase surveillance by regulatory bodies, and impose financing constraints (Rodriguez-Ariza et al. 2016;

⁴ Tweets that disclose firm's environmental strategies. Green tweets are operationalized as tweets that contain any of the following words "ecosystem", "ecology", "ecological", "environment", "environmental", "green", "sustainable", and "sustainability."

Katmon and Farooque 2017). Firms that want to uphold their reputation should be deterred from engaging in this short-term opportunistic behavior for minimizing the risk of ruining their reputation and foregoing gains from future transactions (Afuah 2013). Although social media do not play a formal role in supplying quality financial statements, we hypothesize that social media can serve as an informal monitoring platform for firms and can deter them from indulging in earnings management related practices. Scholars have discussed the role of the board of directors, auditors, and institutional shareholders as monitors of earnings quality. In the extant literature, it has also been reported that traditional press have often acted as a watchdog and have questioned the company's accounting practices prior to the firm's public disclosure (Miller 2006). We believe social media can act in a similar way by integrating a multitude of voices across the globe such as those of analysts, general public, firms, and their competitors. In fact, unlike traditional press that are inclined to cover highly visible firms because of the 'sensational' aspect of the news related to them, social media provide a strong platform for information dissemination even for firms that are not so visible (Blankespoor et al. 2014). On social media platforms, the level of user engagement is high as users are not just recipients of information (Kaplan and Haenlein 2010) but can engage in a dialogue with other users, auditors, and firms. We believe that the informal monitoring has increased with the emergence of social media, and this may deter firms from misreporting earnings. It is unlikely that the misconduct of the firm can be kept under wraps. The connectedness of the social media platform makes the news available to all interested parties within a short period of time.

The 'co-ordinated effects' by the connected mass on social media help in both disclosing responsible behavior and locating improper ones (Lee et al. 2013). Social media provide a platform where individuals from various backgrounds and areas of expertise can share their knowledge without any geographical constraints (Fieseler and Fleck 2013). The stakeholders on social media are highly informed and connected and the platform gives them the power to act on any misinformation or manipulation (Lee et al. 2013). Interestingly, the Big 4 audit firms (i.e.,

KPMG, PWC, EY, and Deloitte) are using social media platforms like Facebook and Twitter for knowledge sharing with other users (Eschenbrenner et al. 2015). It is now difficult for unfair companies to hide behind fake posts with the emergence of social media platforms as the coordinated actions of online users disclose improper behavior (Lee et al. 2013). Thus, social media plays the role of an informal monitoring platform. Figure 1 shows how a firm communicates over social media. The firm interacts with the connected mass using its account and the users (i.e., analysts, investors, etc.) communicate among themselves (shown as dotted lines between the nodes in Figure 1) as well as with the firm, and often provide feedback to the firm.

Existing research points out that Wikipedia serves a governance function by diminishing the information advantage of corporate insiders and large institutional investors (Wu et al. 2014). Wikipedia provides aggregated information about firms, information about its products, management structure, operations and marketing and sales, product launches, store openings, among others. We argue that for firms that maintain their social media presence on Twitter, similar availability of information regarding company specific events are available in a consolidated fashion. However, there are some additional advantages that can be obtained when information is disseminated on Twitter by firms. First, the content is updated frequently and the followers get updates on new information posted on their walls. Second, this information is provided by the company itself and has more credibility. Third, there are about millions of Twitter users around the globe and it is extremely visible and popular among the investors. Schipper (1989) has argued that in an environment where there is asymmetric information, managers have the incentive to manage earnings. Social media reduce information asymmetry and can deter earnings management by firms.

We analyze the extent of social media activities and their impact on earnings quality. We believe firms that are available on this communication platform will face a greater backlash if they try to manage their earnings. The severity of backlash can magnify as bad news spreads like a wildfire

on social media due to the connectedness of the platform. In fact, it has been found that a negativity bias prevails for electronic word-of-mouth, i.e., the diffusion of negative news is more pronounced (Hornik et al. 2015) and so the spread of wrongdoings by firms will diffuse faster among the entire community. In fact, Lyon and Montgomery (2013) have reported that firms that have negatively impacted the environment have faced strong backlash from consumers on social media when they tried to make any sustainability-related claims. Thus, the authors have proposed that firms who have done something controversial are less likely to use the social media to communicate their performance. Alternatively, for the airlines sector it has been reported that firms that engaged in value-enhancing corporate social responsibility related activities, have received more positive word-of-mouth on Twitter (Vo et al. 2017). Firms that have an elaborate social media presence in terms of social media activities and followers are more visible and open to public scrutiny. We further believe that firms that maintain social media presence by expending time and effort are likely to have superior earnings quality by furnishing more reliable and transparent financial information. The more the number of followers, the more are the watchful eyes monitoring the firm directly and so the chances of getting caught by engaging in unethical practices becomes high.

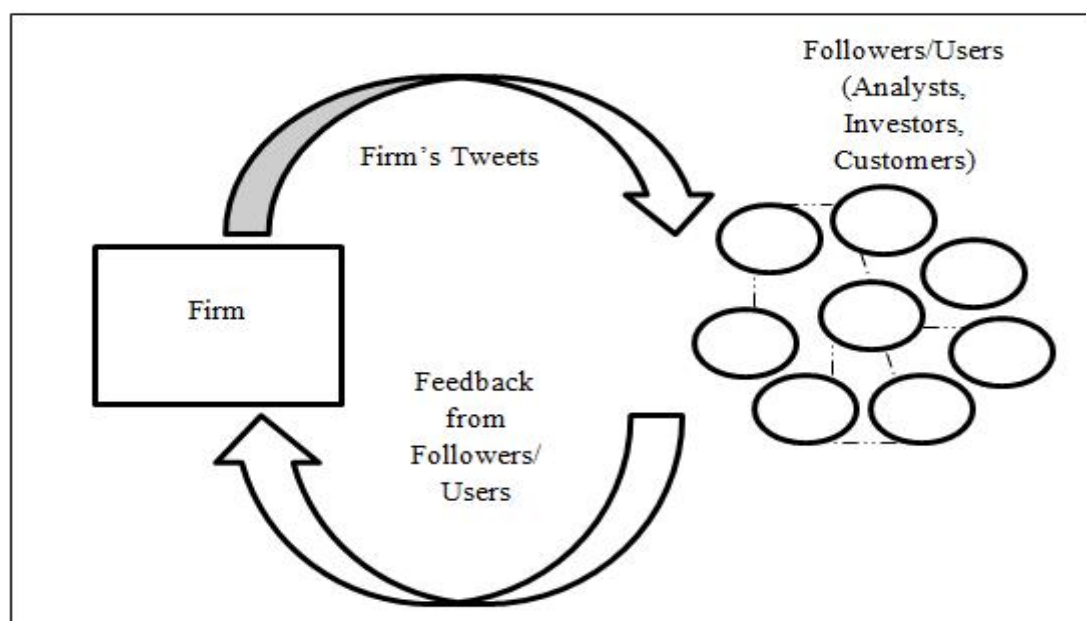


Fig 1. Interactive social media communication by firms.

3.2 Tweets

We consider the overall impact of firms' Twitter related activities regardless of the content to ascertain its association with earnings management. Bhagwat and Burch (2014) have termed this as the general attention channel. Tweets increase the firm's visibility and keep the firm in the forefront of the investors' mind (Bhagwat and Burch 2014). The investors may tune in or seek out earnings news about the particular firm from various sources and eventually consider trading. We extend this argument and posit that, a higher number of postings on Twitter will improve the visibility of the firm and the firm may not want to indulge in earnings management as their activities are monitored by the investors. We further believe that firms who maintain social media presence by expending time and effort will have superior earnings quality as they will furnish reliable and transparent financial information. Additionally, prior research has shown that disclosure and earnings management has a negative association. In fact, for a sample of seasoned equity offerings, it has been found that disclosure frequency is inversely related to the likelihood of earnings management (Jo and Kim 2007). Greater information disclosure has improved the information environment and has helped investors detect earnings management (Jo and Kim 2007). It has also been observed that firms that have tweeted more are followed by a greater number of analysts (Kovacs et al. 2017; Wang et al. 2016) leading to an enhanced monitoring environment while curbing earnings manipulation (Yu 2008). Thus, we postulate:

H1: *The higher is the number of postings of firms on Twitter the lower is the likelihood of the firm to manage earnings.*

3.3 Followers

A large follower base will indicate that if the firm carries out any unethical practice, or manipulates its earnings then the backlash will be extremely high. The firm may not want to jeopardize the reputation it enjoys. Additionally, it is reported by Jung et al. (2017) that the

absolute market reactions are higher for firms with a large number of social media followers. This is so because, social media followers include analysts, investors, and other market participants who can demand information from firms and informally monitor the platform. Furthermore, according to prior research, firms that use Twitter have higher analyst coverage (Jung et al. 2017). According to Yu (2008), there are certain characteristics that have made analysts effective monitors against earnings management. First, unlike internal governance devices which are designed to protect only the interests of current shareholders, the analysts are expected to provide information for the benefit of both current and prospective shareholders. Second, analysts monitor the firms on a regular basis while scrutinizing management behaviors and financial reporting irregularities. Often formal gatekeepers like the staff of the SEC and board members are resource constrained and can monitor only a fraction of the reports. In fact, analysts performed a more effective monitoring role in these situations. Past literature on the role of information intermediaries like financial analysts and their impact on corporate governance have revealed that firms that have a higher number of analysts following them have a better earnings quality (Yu 2008). We extend this argument in the context of social media and posit that in this environment where analysts and investors are strongly connected and the analysts can effectively publish their analysis for others to read, the tendency to manage earnings will be less for firms due to close monitoring. Additionally, Bushee et al. (2010) have shown that the extent of press coverage on firms has reduced the information asymmetry implying that news that spread to multiple news sources and to a larger number of people reduces information asymmetry. Thus, we argue that firms that have a large follower base on social media will have a low information asymmetry and the incentive to manage earnings will be less. The above discussion highlight that the number of followers of a firm is likely to have a negative impact on the likelihood of earnings management likelihood.

H2: *The higher is the number of followers of a firm on Twitter the lesser is the likelihood of the firm to manage earnings.*

3.4 Manufacturing vis-à-vis Services Firms

We argue that the relationship between social media activities and earnings management is not identical across all firms, and differ by the type of the industry. Based on their industry structure, firms can have disparate social media strategies (Lyon and Montgomery 2013). Generally, the firms in the services industry publish far more tweets than firms in the manufacturing industry. A prior study has highlighted that firms belonging to the manufacturing sector have tweeted significantly less than the firms that belonged to the services sector (Mao et al. 2012). If manufacturing firms have tweeted, it is indicative that they are making a conscious effort to reduce information asymmetry. Furthermore, Zhang (2015) has found that 38% of the firms in the manufacturing industry have used Twitter for financial disclosure as compared to 9% of firms in the information industry (part of the services industry). Additionally, 75% of firms from the information industry have used Twitter for non-financial dissemination. For manufacturing firms, this figure is only 20%. Thus, manufacturing firms are less inclined to publish customer engaging tweets but are keen to publish company-related news. Firms that have used Twitter for financial disclosures should ideally have a more negative association with earnings management as they are more transparent about their current financial state. Therefore, we posit that higher financial disclosures for manufacturing industries will have a more negative association with earnings management. The disclosure of financial information suggests that the firms are more open about letting followers discuss and raise questions about their actions. It also leads to an environment of reduced information asymmetry (Blankespoor et al. 2014; Prokofieva 2014) and in such a case the incentive to manage earnings lessens. We hypothesize that the negative association between Twitter activities and earnings management will be stronger for firms belonging to the manufacturing industry.

H3: *The negative impact of tweeting activities on earnings management is more pronounced for manufacturing firms than for firms belonging to the services sector.*

4. Research Method

4.1 Data

We analyze the Twitter platform to understand a firm's social media activities. We consider all firms that are listed on the COMPUSTAT North America database. We have chosen the North American database because the familiarity with the Twitter platform is strong in this region as the most active Twitter users are part of this geography⁵. We collect data from each firm's official Twitter account. To ensure that the account is maintained by the firm itself and not by any other user community we first visit the company's website and choose the Twitter account that is listed there. If the company does not list its Twitter account on its website, we look for the Twitter account from Twitter search and ensure that the company website is listed in the account. Additionally, it is possible for a company to have multiple Twitter accounts for separate functional domains. In those cases, we choose the account that discusses the firm as an aggregate entity or an account that discloses company related news. We create a unique dataset that contains the total number of postings by a firm and the number of followers of the firm on Twitter at the end of every year for the years 2011-2015. In prior literature (Jung et al. 2017) the variable Twitter follower has been measured only as a static variable (time-invariant). However, we collect a time-variant measure of the Twitter follower variable for the firms. To the best of our knowledge, barring one paper (Zhou et al. 2015) where the authors have analyzed firms listed on COMPUSTAT to report their adoption status and use of Facebook and Twitter for corporate disclosures, such a large-scale analysis of social media activity has not been conducted to date. To determine earnings management of firms, we collect firm-level data from the COMPUSTAT North America database. Following extant research (Gunny 2010; Stubben 2010; Kim et al. 2012), we eliminate firms belonging to utility industries (SIC codes between 4400 and 5000) and financial industries (SIC codes between 6000 and 6999) as these firms operate in highly regulated industries with accounting rules that are different from those for other industries. There are 8486

⁵ <https://www.statista.com/statistics/242606/number-of-active-twitter-users-in-selected-countries/>

firms in our sample and of these 3130 firms have adopted Twitter. After aggregating data for Twitter related variables, computing the measures for earnings management from the COMPUSTAT data and listing the values of the control variables, we obtain the final dataset. The final dataset is an unbalanced panel dataset.⁶

Table 1 Description of variables used in the study.

Variables	Description
Abnormal discretionary accruals (<i>Abs_DiscAccr</i>)	Abnormal discretionary accruals computed from the residual of the modified Jones model.
Abnormal cash flow from operations (<i>Abn_Cash</i>)	First measure of real activities manipulation computed using the Roychowdhury model.
Abnormal production costs (<i>Abn_Prod</i>)	Second measure of real activities manipulation computed using the Roychowdhury model.
Abnormal discretionary expenses (<i>Abn_DisExp</i>)	Third measure of real activities manipulation computed using the Roychowdhury model.
Combined measure of real earnings manipulation (<i>RealEarn</i>)	Combined real activities manipulation computed from the three measures using the Roychowdhury model. (<i>Abn_Prod</i>) - (<i>Abn_Cash</i>) - (<i>Abn_DisExp</i>)
<i>Tweets_Act</i>	Total number of postings on Twitter by the firm during a year scaled by lagged total assets of the firm.
<i>Follow_Act</i>	Total number of followers of the firm on Twitter during a year scaled by lagged total assets.
Leverage (<i>Lev</i>)	Long-term debt scaled by total assets.
Big 4 auditor dummy (<i>Big4</i>)	A dummy variable that takes a value 1 if the firm is audited by a Big 4 auditor and is 0 otherwise.
Market to book ratio (<i>MB</i>)	Measured as MVE/BVE, where MVE is the market value of equity and BVE is the book value of equity of the firm.
Return on assets (<i>ROA</i>)	This is measured as income before extraordinary items, scaled by lagged total assets of the firm.
Company size (<i>Size</i>)	Natural logarithm of total assets of the firm.
Research and development intensity (<i>RD_Int</i>)	R&D expense / net sales.
<i>Tweets_Act X Follow_Act</i>	Product of <i>Tweets_Act</i> and <i>Follow_Act</i> .
Manufacturing_dummy (<i>Manu_Dummy</i>)	A dummy variable to indicate a manufacturing firm or a service firm where 1 denotes manufacturing and 0 denotes service.

Table 2 Descriptive statistics of the variables under consideration.

	Mean	Median	SD	25th	75th
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⁶ Firms have adopted Twitter at different times and so data for some of the prior years are missing. Furthermore, the sample size has reduced due to the data requirements of the variables calculated using COMPUSTAT data (e.g., discretionary accruals, real earnings management).

				Percentile	Percentile
<i>Abs_DiscAccr</i>	0.702	0.108	8.787	0.037	0.302
<i>RealEarn</i>	-0.935	-0.318	15.310	-0.842	0.015
<i>Tweets_Act</i>	0.109	0.003	1.973	0.0003	0.016
<i>Follow_Act</i>	0.953	0.005	24.183	0.0008	0.029
<i>Lev</i>	0.182	0.066	0.757	0.000	0.227
<i>MB</i>	-0.801	2.534	297.934	1.384	4.538
<i>ROA</i>	-2.450	0.036	56.400	-0.093	0.084
<i>Size</i>	6.150	6.113	2.740	4.449	7.981
<i>Big4</i>	0.732	1.000	0.443	0.000	1.000
<i>RD_Int</i>	1.288	0.064	29.715	0.007	0.170

Table 3 Correlations between variables of interest.

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]
[1] <i>Abs_DiscAccr</i>	1.000									
[2] <i>RealEarn</i>	-0.084	1.000								
[3] <i>Tweets_Act</i>	0.212	-0.738	1.000							
[4] <i>Follow_Act</i>	0.346	-0.123	0.703	1.000						
[5] <i>Lev</i>	0.120	-0.051	0.351	0.416	1.000					
[6] <i>MB</i>	0.001	-0.001	-0.055	-0.002	0.003	1.000				
[7] <i>ROA</i>	-0.079	0.020	-0.042	-0.041	-0.029	-0.001	1.000			
[8] <i>Size</i>	-0.082	0.102	-0.152	-0.108	-0.074	0.039	0.088	1.000		
[9] <i>Big4</i>	-0.049	0.044	-0.077	-0.060	-0.058	0.027	0.049	0.566	1.000	
[10] <i>RD_Int</i>	0.006	-0.001	0.002	0.000	-0.001	0.000	-0.006	-0.036	-0.041	1.000

4.2 Measurement of Earnings Management

Earnings management is often performed by manipulation of the accruals. Accruals give a manager the freedom to make forecasts, estimates, and judgments. As the degree of discretion increases in an accrual, the opportunity for earnings management rises (Dechow and Schrand 2004). To examine the association between social media activities and earnings management, we use discretionary accruals as a proxy for earnings management. This requires a model that is able

to estimate the discretionary component of the reported income (Dechow et al. 1995). It is acceptable to capture the notion of discretion (Dechow et al. 2010) where the total accruals is decomposed into expected (or non-discretionary accruals) and abnormal (or discretionary) accruals. In this research we compute discretionary accruals by using a cross-sectional form of the modified Jones Model. The details of the model are provided in Appendix A. We compute the discretionary accruals as the residuals of the cross-sectional regression model based on year and the 2-digit SIC code (Kothari et al. 2005; Kim et al. 2012). Following prior studies (Chen et al. 2015; Yu 2008), we remove observations that have less than 15 data points in any two-digit SIC code in any year. We also consider the absolute value of the discretionary accruals (*Abs_DiscAccr*), as earnings management can involve either income-decreasing or income-increasing accruals (Kim et al. 2012).

4.3 Other Measures

Large firms are more likely to use Twitter to disseminate earnings-related news (Jung et al. 2017). Prior studies have reported that larger firms are more likely to tweet (Al Guindy 2016; Kovacs et al. 2017). Following prior research we use scaled total number of postings and total number of followers on Twitter as measures of control (Al Guindy 2016). To control for the difference in size, the total number of postings on Twitter posted by the firm in a year is scaled by the lagged total assets of the firm and shown as *Tweets_Act* and the total number of followers of the firm on Twitter in a year is scaled by the lagged total assets of the firm and is shown as *Follow_Act*. We also control for the years in our model. Following prior research on earnings management (e.g., Kim et al. 2012; Zang 2012), we use control variables such as company size (*Size*), market to book ratio (*MB*), return on assets (*ROA*), leverage (*Lev*), research & development intensity (*RD_Int*) and, audited by the Big 4 dummy (*Big4*). Table 1 provides the description of the variables. Table 2 and Table 3 provide descriptive statistics and the correlations between the variables under consideration.

4.4 Research Model

We have set up a panel for the dataset with the firm GVKEY (unique firm ID) and year. The Hausman test shows a significant p value rejecting the null hypothesis that the coefficient estimates of the fixed effect model and the random effect model are consistent. Thus, we use the fixed effect model in the panel-based regression. We also control for the years in the model. We use data from 2011-2015 for the computation of the models. We run a panel data regression individually for Models 1, 2, and 3 for testing hypotheses H1, H2, and H3 respectively. When running Model 1, we control for the effect of real earnings management (details provided in Appendix B), where $Abs_DiscAccr$ is the dependent variable. Similarly, we run the panel data regression for Model 2 and Model 3. To examine H3, we introduce the dummy variable $Manu_Dummy$.

Model 1: Examining the association between number of postings on Twitter and earnings management (H1)

$$Abs_DiscAccr_t = \alpha_0 + \alpha_1 Tweets_Act_t + \alpha_2 RealEarn_t + \alpha_3 Lev_{t-1} + \alpha_4 MB_{t-1} + \alpha_5 ROA_{t-1} + \alpha_6 Size_{t-1} + \alpha_7 Big4_t + \alpha_8 RD_Int_t + \varepsilon_{it}$$

Model 2: Examining the association between number of followers on Twitter and earnings management (H2)

$$Abs_DiscAccr_t = \alpha_0 + \alpha_1 Follow_Act_t + \alpha_2 RealEarn_t + \alpha_3 Lev_{t-1} + \alpha_4 MB_{t-1} + \alpha_5 ROA_{t-1} + \alpha_6 Size_{t-1} + \alpha_7 Big4_t + \alpha_8 RD_Int_t + \varepsilon_{it}$$

Model 3: Examining the association between number of postings on Twitter and earnings management for manufacturing and services firms (H3)

$$Abs_DiscAccr_t = \alpha_0 + \alpha_1 Tweets_Act_t + \alpha_2 Manu_Dummy * Tweets_Act_t + \alpha_3 RealEarn_t + \alpha_4 Lev_{t-1} + \alpha_5 MB_{t-1} + \alpha_6 ROA_{t-1} + \alpha_7 Size_{t-1} + \alpha_8 Big4_t + \alpha_9 RD_Int_t +$$

ε_{it}

5. Results

Table 4 presents the results of the three hypotheses. In Table 4, Model 1 shows the result of the association between the tweeting behavior of firms and their accrual based earnings management. The coefficient of firm's number of postings on Twitter is found to be negative and significant (coefficient = -5.193, $p < 0.01$). Thus, we find support for H1. Furthermore, from Model 2 it is evident that the association between the number of Twitter followers of the firm and the likelihood of managing earnings is negative and significant (coefficient = -0.235, $p < 0.01$). It shows support for H2. However, for Model 3 we find the interaction term of manufacturing dummy and number of postings on Twitter to be insignificant (the insignificant result is not shown in Table 4). Therefore, we do not find support for H3 that posits that the association between number of postings on Twitter and earnings management is stronger for firms belonging to the manufacturing industry as compared to those belonging to the services industry. Furthermore, we find a negative and significant association between accrual based earnings management and real earnings management ($p < 0.01$) for all models, that is consistent with prior studies (Cohen et al. 2008; Kim et al. 2012). Similar to prior studies (Kim et al. 2012; Doukakis 2014), we also find that the absolute value of the discretionary accrual and size has a negative and significant association indicating that larger firms are less likely to manage accrual based earnings.

Table 4 Association between number of postings on Twitter, number of followers on Twitter, type of industry and earnings management.

	Model 1	Model 2	Model 3⁺	Model 4⁺⁺
<i>Tweets_Act</i>	- 5.193*** (0.126)		-2.247*** (0.278)	-13.378*** (0.231)
<i>Follow_Act</i>		-0.235*** (0.010)		-0.351*** (0.026)
<i>Tweets_Act</i> × <i>Follow_Act</i>				0.009*** (0.000)

<i>Manu_Dummy</i> × <i>Tweets_Act</i>			-1.367*** (0.408)	
<i>RealEarn</i>	-0.487*** (0.014)	-0.049*** (0.010)	-0.205*** (0.027)	-1.160*** (0.020)
<i>Lev</i>	1.538*** (0.294)	-0.639* (0.347)	0.389*** (0.084)	0.104 (0.220)
<i>MB</i>	-0.001 (0.003)	0.000 (0.0004)	-0.001 (0.001)	-0.004 (0.002)
<i>ROA</i>	0.006*** (0.002)	0.004 (0.002)	0.017* (0.010)	0.008*** (0.001)
<i>Size</i>	-0.654* (0.375)	-0.985** (0.434)	-0.213** (0.098)	-0.612** (0.275)
<i>Big4</i>	0.209 (0.684)	0.056 (0.793)	0.026 (0.236)	0.363 (0.501)
<i>RD_Int</i>	-0.0001 (0.004)	-0.007 (0.005)	0.000 (0.001)	-0.005 (0.003)
<i>Constant</i>	4.515** (2.298)	6.865** (0.466)	1.527*** (0.487)	4.932*** (1.685)
<i>Year Dummies</i>	Included	Included	Included	Included
<i>Overall R²</i>	0.039	0.079	0.009	0.127
<i>N</i>	4136	4136	1296	3930

*, **, and *** indicate statistical significance at the 0.10, 0.05, and 0.01 levels. Standard Errors are provided in the parentheses. ⁺Model 3, ⁺⁺Model 4 contains results generated from the additional analysis section that is described next.

5.1 Additional Analysis

In order to dig deeper and understand the insignificant result generated from Model 3 (i.e., H3), we conduct a sub-sample analysis. Prior research has stated that firms that have an exceptionally large social media presence are less likely to use Twitter for releasing earnings-related news. They mostly use Twitter for retail purposes as most of their followers are customers rather than investors (Jung et al. 2017). We believe that the strong impact of tweeting behavior of manufacturing firms on earnings management vis-à-vis firms in services industries will be visible for firms that do not tweet excessively. These firms are more targeted in their communication and

do not use Twitter for excessive retailing activities. Thus, for the additional analysis we consider firms from the manufacturing and services industries whose number of postings on Twitter remains less than the median number of postings on Twitter by firms belonging to the respective industries and find the result to be significant. Column 3 of Table 4 provides the result. We find that the interaction term of manufacturing dummy and number of postings on Twitter is negative and significant (coefficient = -1.367, $p < 0.01$) for firms whose number of postings on Twitter is less than the median value of number of postings on Twitter in the respective industries. Thus, the association between number of postings on Twitter and earnings management for firms in the manufacturing industry is found to be more negative than the ones that belong to the services industry for a sub-sample. Therefore, we can say that hypothesis H3 is partially supported. Table 5 provides the summary of findings.

We also attempt to examine the interaction of the number of followers of the firm on Twitter and their posting behavior on the likelihood of earnings management. We argue that there is a substitutive effect between tweeting and the size of the follower base on earnings management. As highlighted in the previous section, a large follower base of a firm on Twitter can deter firms from engaging in earnings management as it helps to spread news to a large number of people and reduces information asymmetry. Thus, the size of the follower base can act as an alternative mechanism to curb earnings management even when the firm does not actively tweet. Therefore, the interaction between the number of postings on Twitter and the number of followers on Twitter of a firm is likely to be substitutive. The negative impact of firm's disclosure activities on the likelihood of earnings management is likely to be less pronounced for firms that have a larger follower base than for firms that do not have that. To address this, we run the following regression (Model 4). We introduce the interaction term $Tweets_Act \times Follow_Act$ apart from the main effects.

Model 4: Examining the association between number of postings on Twitter and number of followers on Twitter and earnings management

$$Abs_DiscAccr_t = \alpha_0 + \alpha_1 Tweets_Act_t + \alpha_2 Follow_Act_t + \alpha_3 Tweets_Act_t * Follow_Act_t + \alpha_4 RealEarn_t + \alpha_5 Lev_{t-1} + \alpha_6 MB_{t-1} + \alpha_7 ROA_{t-1} + \alpha_8 Size_{t-1} + \alpha_9 Big4_t + \alpha_{10} RD_Int_t + \varepsilon_{it}$$

From the results obtained using Model 4 we observe that individually the association between accrual based earnings management and the number of postings on Twitter and the number of followers on Twitter is negative and significant but the interaction of number of postings on Twitter and number of followers on Twitter is positive and significant (coefficient = 0.009, $p < 0.01$).⁷ Therefore the impact of tweeting activities and the size of the follower base on Twitter is substitutive in nature. The effect of tweeting activities on earnings management diminishes as the size of the follower base on Twitter increases.

Table 5 Summary of findings.

Hypotheses	Results
H1: The higher is the number of postings of firms on Twitter the lower is the likelihood of the firm to manage earnings.	Supported
H2: The higher is the number of followers of firms on Twitter the lesser is the likelihood of the firm to manage earnings.	Supported
H3: The negative impact of tweeting activities on earnings management is more pronounced for manufacturing firms than for firms belonging to the services sector.	Partially supported

5.2 Robustness Checks

We conduct a number of robustness checks in our study. First, apart from accrual based earnings management, managers can also manipulate earnings with real earnings management. Real earnings management entails manipulation by changing the timing or structuring of actual operating, investing and financing activities (Roychowdhury 2006). Existing literature has highlighted that managers have increased the use of real earnings management and have decreased the use of accrual estimation after the passage of the Sarbanes-Oxley Act (2002)

⁷ We find qualitatively similar results if we represent the follower base with a dummy variable with high and low values (the top quartile suggesting high level of followers and for other values, low level of followers). The interaction term of tweeting activities and high level of followers is found to be positive and significant.

(Cohen et al. 2008). Thus, we test our hypotheses using the real earnings management model apart from the accrual based earnings management model. Real earnings manipulations are departures from the normal operational practices due to an opportunistic motivation to mislead the stakeholders. Managers engage in various forms of real activities manipulation. These may include reduction in R&D expenditures, providing limited time discounts to increase sales and thereafter building up excess inventory to lower reported cost of goods sold (COGS), among others. Roychowdhury (2006) has focused on three manipulation methods and these are: (a) sales manipulation, i.e., accelerating the timing of sales or generating unsustainable sales through increased price discounts or more lenient credit options; (b) increasing production levels to report lower COGS, and (c) reduction in discretionary expenses. Extant literature on financial accounting has employed three measures to compute real earnings management. They are (i) abnormal cash flow from operations (*Abn_Cash*), (ii) abnormal production costs (*Abn_Prod*) (iii) abnormal discretionary expenses (*Abn_DisExp*). These variables are computed using the residuals from the corresponding regression models estimated by the combination of year and the 2-digit SIC code. The regression equations are provided in Appendix B. Following prior studies (Cohen et al. 2008; Kim et al. 2012; Xue et al. 2014), the combined measure, *RealEarn*, is calculated as $Abn_Prod - Abn_Cash - Abn_DisExp$ and is used as the proxy of real earnings management. A high value of *RealEarn* suggests higher levels of real activity manipulation. We examine the two supported hypotheses H1 and H2 and seek to understand if higher number of postings on Twitter and a larger number of followers on Twitter also curb real earnings management.

Model R1: Examining the association between the number of postings on Twitter and real earnings management

$$RealEarn_t = \alpha_0 + \alpha_1 Abs_DiscAccr_t + \alpha_2 Tweets_Act_t + \alpha_3 Lev_{t-1} + \alpha_4 MB_{t-1} + \alpha_5 ROA_{t-1} + \alpha_6 Size_{t-1} + \alpha_7 Big4_t + \alpha_8 RD_Int_t + \varepsilon_{it}$$

Model R2: Examining the association between the number of followers on Twitter and real earnings management

$$RealEarn_t = \alpha_0 + \alpha_1 Follow_Act_t + \alpha_2 Size_{t-1} + \alpha_3 Mb_{t-1} + \alpha_4 Roa_{t-1} + \alpha_5 Lev_{t-1} + \alpha_6 Rd_Int_t + \alpha_7 Big4_t + \alpha_8 Abs_DiscAccr_t + \varepsilon_{it}$$

We conduct the robustness checks for hypothesis H1 and H2 that were fully supported in the prior section. Table 6 provides the results obtained by using models R1 and R2. From model R1 we find that the higher the number of postings by firms on Twitter the lower is the likelihood of the firm to engage in real earnings management (coefficient = -8.403, $p < 0.01$). Model R2 shows that the higher is the number of followers of the firm on Twitter the lesser is the likelihood of the firm to take part in real earnings manipulation (coefficient = -0.160, $p < 0.01$).

Table 6 Association between number of postings on Twitter and number of followers on Twitter and real earnings management.

	Model R1	Model R2
<i>Tweets_Act</i>	-8.403*** (0.092)	
<i>Follow_Act</i>		-0.160*** (0.190)
<i>Abs_DiscAccr</i>	-0.664*** (0.019)	-0.208*** (0.033)
<i>Lev</i>	8.411*** (0.302)	1.839** (0.142)
<i>MB</i>	-0.004 (0.004)	-0.008 (0.001)
<i>ROA</i>	-0.002 (0.002)	-0.043 (0.001)
<i>Size</i>	3.816*** (0.431)	15.380*** (0.138)
<i>Big4</i>	-0.069 (0.799)	-2.156 (0.255)
<i>RD_Int</i>	0.004 (0.005)	0.004 (0.001)
<i>Constant</i>	-22.884*** (2.647)	-89.049*** (5.204)
<i>Year Dummies</i>	Included	Included
<i>Overall R²</i>	0.388	0.013
<i>N</i>	3930	3930

*, **, and *** indicate statistical significance at the 0.10, 0.05, and 0.01 levels. Standard Errors are provided in the parentheses.

Second, as an alternative to the computation of discretionary accruals by using the modified Jones model, we have also computed the discretionary value of earnings management by adopting Kothari's approach (Kothari et al. 2005) and augmenting the modified Jones model by including ROA_{t-1} . We found the results to be similar to those obtained using the modified Jones model. The results are shown in Table A1 in Appendix C.

Third, to control for the self-selection bias and to establish a causal link we have used PSM in conjunction with DID. A key challenge is to show that the use of Twitter impacts earnings management but the reverse situation that firms in order to impact their earnings management adopt and use Twitter does not hold. Following the methodology used in prior literature (Rishika et al. 2013; Kim et al. 2016), we use PSM and a DID research design to understand how earnings management measures are impacted for firms that have adopted Twitter vis-à-vis firms that have not adopted it. We acknowledge that although the instrumental variable approach is more commonly used for correction of selection bias, finding a good instrument for social media participation is difficult (Rishika et al. 2013), and in such cases PSM and DID are more suitable (Rishika et al. 2013; Kim et al. 2016).

In this research design, we create two distinct groups: a treatment group consisting of firms that have adopted Twitter as a social media platform, and a control group consisting of firms that have not adopted Twitter. The objective of the PSM is to select firms in the treatment and the control groups that are similar to each other on every aspect apart from the fact that the treatment group has adopted the Twitter platform (Rosenbaum and Rubin 1983). We also perform balancing tests to ensure that firms in the treatment and control group are not statistically different from each other prior to the treatment (Kim et al. 2016). We match the firms using a list of characteristics such as likelihood of earnings management, size, leverage, return on assets, market to book ratio, advertisement intensity, research and development intensity, and industry to ensure that the matched firm and the control firm are similar. Next, we use a nearest neighbor with one-one matching to ensure that the treated firm is highly similar to the control firm. Following this

procedure we are able to match successfully 190 treatment and control firms based on the aforementioned characteristics. Next, we use the DID estimation on the matched treatment and control groups to analyse the impact of Twitter adoption two years before and two years after adoption and find that firms that have adopted Twitter show a reduced likelihood of earnings management compared to the ones that have not. The difference between the pre and post earnings management tendencies of firms that adopt Twitter will not give us accurate results owing to the inclusion of extraneous factors. Thus, a more concrete research design involves comparing the earnings management tendencies of firms that have adopted and that have not adopted in the pre and post participation periods to control the influence of extraneous factors (Rishika et al. 2013). The difference in likelihood of earnings management between the two groups can then be attributed to adoption of Twitter. The results are shown in Table A2 in Appendix C where $Time \times TreatmentGroup$ is our interest variable and it has a negative and significant coefficient (coefficient = -0.287, $p < 0.05$). This suggests that firms that have adopted Twitter have a reduced tendency to engage in earnings management post adoption.

6. Discussion

Prior research on a firm's use of social media use has looked into the impact on financial market, but we have attempted to uncover if there is any association between a firm's use of social media and its tendency to manage earnings. We find that social media act as an informal monitoring tool and encourage firms to be more transparent. The results obtained in this paper highlight that increased postings on Twitter reduce the likelihood of firms to manage both accrual based earnings and real activities manipulation. Thus, firms who are more actively disclosing on Twitter have lower levels of earnings management. There also exists a negative association between the number of followers of firms on Twitter and their likelihood to manage earnings for both accrual and real activities based earnings. However, there is a substitutive effect between the impact of number of postings on Twitter and the number of followers on Twitter and earnings management.

Finally, the results further reflect that the impact of tweeting activities on earnings management is stronger for firms belonging to the manufacturing sector vis-à-vis firms belonging to the services sector, if their number of postings on Twitter is below the median number of postings on Twitter for firms belonging to the same sector. Prior research documents that the use of Twitter by corporates reduces information asymmetry (Blankespoor et al. 2014) and we join this conversation and document that firms that are active on Twitter display reduced tendency to manipulate earnings. In an environment where there is less information asymmetry the incentive to manipulate earnings is also reduced.

6.1 Implications

Recent research on technology firms (Blankespoor et al. 2014) has highlighted that the use of Twitter reduces information asymmetry. Similarly, prior research (Prokofieva 2014) has shown that dissemination of corporate announcements through Twitter has helped firms attract investor's attention and decrease information asymmetry. Furthermore, Richardson (2000) has shown that earnings management increases in an environment where there is information asymmetry. The reduction in information asymmetry due to the use of Twitter urges firms to decrease their tendency to manage earnings. A firm whose information environment is more developed has lesser opportunities to manipulate earnings. Thus, we find that firms who engage in social media activities are more transparent and are deterred from managing earnings. Our findings are consistent with that of Huang et al. (2015) where the authors have studied the association between green disclosures or green tweets and discretionary earnings quality for a sample of 362 observations and have found that a firm's incentives for improving earnings quality and disclosing social responsibilities is compatible and they do not use Twitter for green washing. Previously, Lee et al. (2013) have noted that the stakeholders on social media are highly informed and connected and it gives them the power to act on any misinformation or manipulation. Thus, we highlight the role of social media as an informal monitoring tool that prevents firms from indulging in earnings related manipulation.

There is a considerable overlap between research on quality of earnings and the interest of the policy makers (DeFond 2010) and these results are valuable for policy making as well. Prior studies by academic researchers on earnings management have been used by the policy makers. A report on audit quality by the US Department of the Treasury (2008) has cited extant academic research. Moreover, the Sarbanes-Oxley Act has referenced several academic articles like the research conducted by DeFond et al. (2002). Our results signify that the use of social media decreases the likelihood of earnings management, and hence policy makers should encourage firms to use social media as an important channel to engage with users. It also provides a signal to the investors that firms who are active on social media are more transparent. Furthermore, our research has implications for firms and it urges them to be more active on Twitter. Thus, our findings not only contribute to the academic literature and help the industry practitioners, but it provides useful guideline to policy makers as well.

6.2 Limitations and Future Research

The paper is not without its limitations. First, we conduct a volume based analysis to understand the association between social media activities of the firms and their tendency to manage earnings. Although the focus of this research is on the use of Twitter as a platform, future research can look into the information content of the tweets and its relationship with earnings management. Second, although existing scholarship suggests that Twitter is the most preferred platform for corporate communication, in future the role of Facebook as an information dissemination channel can be studied and the findings from both the platforms can be compared. Third, the study can be extended to other geographies as use of social media may not be similar everywhere. Fourth, in this paper we demonstrate an association between Twitter based activities and earnings management but do not show causality. Future research can try to establish causal relationship that increased activity on Twitter leads to curbing of earnings management.

7. Conclusion

The emergence of social media platforms enables users and investors to discuss various issues related to the financial market with one another and, the actions of the firms are now closely monitored on these platforms. Moreover, the connectedness of the platform permits any news to travel fast and the backlash from negative news has increased in this environment. Thus, the firms present on this platform may be deterred from engaging in earnings manipulation. Prior research has also shown that information dissemination on social media reduces information asymmetry. In an environment where there is reduced information asymmetry the incentives for managers to engage in earnings manipulation is low. To the best of our knowledge, this is the first empirical study that attempts to understand the association between a firm's postings on Twitter and its tendency to manage earnings. We create a unique dataset of Twitter activities of all firms listed on the COMPUSTAT North America database for the years 2011-2015. We find that firms who tweet more show a negative association with earnings management. Additionally, there is a negative association between the number of followers of a firm on Twitter and their likelihood to manage earnings. Furthermore, we find that the negative association between number of postings on Twitter and earnings manipulation is stronger for firms belonging to the manufacturing sector whose number of postings on Twitter is below the median value of number of postings on Twitter in that sector. Thus, social media can act as an informal and external monitoring platform. Our findings suggest that firms active on Twitter are more transparent and are less likely to be involved in earnings manipulation.

Appendix A

We estimate the following regression equation and use residuals as a measure of a firm's discretionary accruals.

$$TA_{it}/A_{it-1} = \alpha_0 \left(1/A_{it-1}\right) + \alpha_1 \left(\Delta REV_{it} - \Delta REC_{it}/A_{it-1}\right) + \alpha_2 \left(PPE_{it}/A_{it-1}\right) + \varepsilon_{it}$$

Where, TA_{it} = total accruals for a firm i in year t ; ΔREV_{it} =

change in net revenues between year t and $t - 1$; ΔREC_{it} =

change in net receivables between year t and $t - 1$; $PPE_{it} =$

gross property, plant and equipment in year t ; $A_{it-1} =$ lagged total assets;

We have computed the discretionary accruals as the residuals of the cross sectional regression model based on year and the 2-digit SIC code. Following a prior study (Kim et al. 2012) we consider the absolute value of the discretionary accruals ($Abs_DiscAccr$) as a measure of earnings management.

Appendix B

A measure of real activity manipulation is abnormal cash flow from operations. To estimate the real activities manipulation, we run the following cross-sectional regression for every industry and year:

$$CFO_{it}/A_{it-1} = \alpha_0 + \alpha_1 \left(1/A_{it-1}\right) + \beta_1 \left(S_{it}/A_{it-1}\right) + \beta_2 \left(\Delta S_{it}/A_{it-1}\right) + \varepsilon_{it},$$

For every firm-year, abnormal cash flow from operations (Abn_Cash) is the residual from the model.

CFO_{it} = cash flow from operations for firm i in year t ;

S = net sales;

$$\Delta S_{it} = S_{it} - S_{it-1}.$$

The second measure for real activities manipulation is abnormal production costs.

$$COGS_{it}/A_{it-1} = \alpha_0 + \alpha_1 \left(1/A_{it-1}\right) + \beta \left(S_{it}/A_{it-1}\right) + \varepsilon_{it}$$

$COGS_{it}$ = cost of goods sold in year for firm i in year t .

$$\Delta INV_{it}/A_{it-1} = \alpha_0 + \alpha_1 \left(1/A_{it-1}\right) + \beta_1 \left(\Delta S_{it}/A_{it-1}\right) + \beta_2 \left(\Delta S_{it-1}/A_{it-1}\right) + \varepsilon_{it}$$

ΔINV_{it} = change in inventory for firm i in year t .

Now, $PROD_{it} = COGS_{it} + \Delta INV_{it}$

Using the equations for COGS and change in inventory, we estimate the normal production costs and the residual gives us the abnormal production costs (Abn_Prod).

$$PROD_{it}/A_{it-1} = \alpha_0 + \alpha_1 \left(1/A_{it-1}\right) + \beta_1 \left(S_{it}/A_{it-1}\right) + \beta_2 \left(\Delta S_{it}/A_{it-1}\right) + \beta_3 \left(\Delta S_{it-1}/A_{it-1}\right) + \varepsilon_{it}$$

The third measure for real activities manipulation according to the model is the abnormal discretionary expenses. The normal level of discretionary expenses is measured in the following way:

$$DISEXP_{it}/A_{it-1} = \alpha_0 + \alpha_1 \left(1/A_{it-1}\right) + \beta \left(S_{it-1}/A_{it-1}\right) + \varepsilon_{it}$$

where, $DISEXP_{it}$ is the discretionary expense for firm i in year t , defined as the sum of R&D, advertising, and selling, general and administrative expenses. For every firm-year, abnormal discretionary expenditure (Abn_DisExp) is the residual from the model.

Following prior studies (Cohen et al. 2008; Kim et al. 2012; Xue et al. 2014), the combined measure, $RealEarn$, is calculated as $Abn_Prod - Abn_Cash - Abn_DisExp$.

Appendix C

$$TA_{it}/A_{it-1} = \alpha_0 \left(1/A_{it-1}\right) + \alpha_1 \left(\Delta REV_{it} - \Delta REC_{it}/A_{it-1}\right) + \alpha_2 \left(PPE_{it}/A_{it-1}\right) + \alpha_3 \left(IBXI_{it-1}/A_{it-1}\right) + \varepsilon_{it}$$

Where, $IBXI_{it-1}$ = income before extraordinary items at year $t - 1$;

Following extant research (Kothari et al. 2005; Kim et al. 2012) the residuals of the above annual cross-sectional industry regression model is used as an alternate method for accrual based earnings management. These estimates ($Abs_DiscAccr_tROA$) serve as the dependent variable for robustness checks of H1 and H2.

Model R4: Examining the association between the number of postings on Twitter and earnings management computed by augmenting the modified Jones model by including ROA_{t-1}

$$Abs_DiscAccr_tROA = \alpha_0 + \alpha_1 Tweets_Act_t + \alpha_2 RealEarn_t + \alpha_3 Lev_{t-1} + \alpha_4 MB_{t-1} + \alpha_5 ROA_{t-1} + \alpha_6 Size_{t-1} + \alpha_7 Big4_t + \alpha_8 RD_Int_t + \varepsilon_{it}$$

Model R5: Examining the association between the number of followers on Twitter and earnings management computed by augmenting the modified Jones model by including ROA_{t-1}

$$Abs_DiscAccr_tROA = Abs_DiscAccr_t = \alpha_0 + \alpha_1 Follow_Act_t + \alpha_2 RealEarn_t + \alpha_3 Lev_{t-1} + \alpha_4 MB_{t-1} + \alpha_5 ROA_{t-1} + \alpha_6 Size_{t-1} + \alpha_7 Big4_t + \alpha_8 RD_Int_t + \varepsilon_{it}$$

Table A1 Association between number of postings on Twitter, number of followers of Twitter, and absolute value of discretionary accruals computed by augmenting the modified Jones model by including ROA_{t-1}

	Model R4	Model R5
<i>Tweets_Act</i>	-3.815*** (0.144)	
<i>Follow_Act</i>		-0.137*** (0.010)
<i>RealEarn</i>	-0.356*** (0.016)	-0.030*** (0.010)
<i>Lev</i>	2.331*** (0.335)	-0.148 (0.373)
<i>MB</i>	0.000 (0.004)	0.001 (0.004)
<i>ROA</i>	0.012*** (0.002)	0.010*** (0.003)
<i>Size</i>	-0.674 (0.428)	-0.956** (0.467)
<i>Big4</i>	0.290 (0.782)	0.148 (0.853)
<i>RD_Int</i>	0.000 (0.005)	-0.004 (0.005)
<i>Constant</i>	4.207 (2.625)	6.302*** (2.864)
<i>Year Dummies</i>	Included	Included
<i>Overall R²</i>	0.033	0.063
<i>N</i>	3930	3930

The dependent variable in Models R4 and R5 has been computed by augmenting the modified Jones model by including ROA_{t-1} . *, **, and *** indicate statistical significance at the 0.10, 0.05, and 0.01 levels. Standard Errors are provided in the parentheses.

Model R6: Difference-In-Difference regression model

$$Abs_DiscAccr_t = \alpha_0 + \alpha_1 Time + \alpha_2 TreatmentGroup + \alpha_3 Time * TreatmentGroup + \alpha_4 RealEarn_t + \alpha_5 Lev_{t-1} + \alpha_6 MB_{t-1} + \alpha_7 ROA_{t-1} + \alpha_8 Size_{t-1} + \alpha_9 Big4_t + \alpha_{10} RD_Int_t +$$

ε_{it}

Table A2 Difference-In-Difference Estimation Results

	Model R6
<i>Time</i>	0.313** (0.126)
<i>TreatmentGroup</i>	0.099 (0.103)

<i>Time × TreatmentGroup</i>	-0.287** (0.129)
<i>RealEarn</i>	0.167*** (0.035)
<i>Lev</i>	0.035 (0.083)
<i>MB</i>	-0.001 (0.003)
<i>ROA</i>	-0.0085 (0.055)
<i>Size</i>	-0.021 (0.021)
<i>Big4</i>	0.087 (0.095)
<i>RD_Int</i>	-0.024* (0.055)
<i>Constant</i>	0.232 (1.026)
<i>Year Dummies</i>	Included
<i>R²</i>	0.219
<i>N</i>	1372

Time: A dummy variable that takes a value of 1 in the post adoption period and 0 otherwise.

TreatmentGroup: A dummy variable that takes a value of 1 for firms that have adopted Twitter and 0 otherwise.

Time X TreatmentGroup: The variable of interest. A negative and significant coefficient for this variable suggests that firms that adopted Twitter have reduced likelihood to manage earnings in the post adoption period.

*, **, and *** indicate statistical significance at the 0.10, 0.05, and 0.01 levels. Standard Errors are provided in the parentheses.

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