

Supplemental Information for Paper Submissions

1) Paper title: New Dimensions to Firm-Stakeholder Relationships through Social Media: An Examination of U.S. Electric Power Companies' Twitter Accounts

2) Filename: Kim 1.pdf

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6) Topic (10 words or less): Social media, Firm-Stakeholder relationships, Symbolic management, Firm performance

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New Dimensions to Firm-Stakeholder Relationships through Social Media: An Examination of U.S. Electric Power Companies' Twitter Accounts

Abstract

Social media has been gaining popularity; not only individuals but large organizations have started to increasingly use social media. In this paper, we explore how the new dimensions that social media tools have added in the relationships between firms and external stakeholders—less formal and more frequent interactions—change the dynamics of the relationships and how the changes in turn may affect firm performance. We find that firms use Twitter to build rapport with external stakeholders among other purposes, and this in turn has positive implications for firm performance. We also find that useful tweets as judged by stakeholders have positive consequences for firm performance. In addition, firms with higher emissions tweet more about their CSR-related activities, and firms with weak CSR performance tweet more about their environmental sustainability-related activities.

Growing number of firms have been adopting social media, such as Twitter and Facebook. Firms use social media for various purposes, for example, to manage their core business functions, to promote their products, to expand distribution channels, or to manage customer service on a continuous basis. Firms also use social media to publicize their corporate social responsibility (CSR) and environmental sustainability-related activities. In addition to facilitating business operations and publicizing the efforts mentioned above, social media has brought about important changes to the ways in which firms interact with their stakeholders.

Most noticeably, such communication channels allow firms to interact with their external stakeholders in greater frequency compared to traditional ways of interactions, such as through shareholder meetings or annual reports. More frequent interactions with stakeholders have potential benefits both for external stakeholders and for firms. First, the immediacy inherent in social media facilitates the delivery of timely information. For investors, timely information means reduced information asymmetries and thus lower transaction costs, without having to incur the cost of obtaining private information (King, Pownall, and Waymire, 1990; Botosan and Harris, 2000). For firms, lower transaction costs mean lower costs of capital. Frequent disclosure of information also promotes increased transparency, reducing incentives to manage earnings (Jo and Kim, 2007). Second, frequent interactions between a firm and its stakeholders may help build a greater sense of relatedness (Doney and Cannon, 1997). Frequent communication allows resolution of issues as they arise, avoiding the accumulation of grudges (Nelson, 1989). Frequent contact also facilitates more informal interactions. Less conflict and more informal exchanges are likely to lead to higher levels of trust (Dwyer, Schurr and Oh 1987; Morgan and Hunt 1994). Stakeholders are more likely to do business with an organization when the affective bonds of liking, trust, and respect have been established (Morris & Feldman, 1996), and this may in turn enhance firm competitiveness (Noordewier, John and Nevin 1990; Doney & Cannon, 1997).

Despite potential usefulness of social media in managing core business functions and managing stakeholder relationships, not all firms have adopted social media, and firms differ widely in the extent and scope of their usage of social media. This paper examines why and how social media usage is

different across firms and what the implications of the differences are for firm performance. In doing so, this paper explores the possibility that social media may be used as a symbolic management tool. Decoupling of organizations' formal structures and actual work activities (Meyer and Rowan, 1977) are explicitly explored in the literature on symbolic management (Pfeffer, 1981; Elsbach and Sutton, 1992; Westphal and Zajac, 1998; Zajac and Westphal, 2004). The main point of the argument is that despite decoupling, conformity to institutional pressures may be viewed positively by external stakeholders and hence bring about positive outcomes. Although fascinating, the prior literature has so far examined the phenomenon of symbolic management as it is present in formal channels such as proxy statements (Westphal and Zajac, 1998) or participation in voluntary programs (Delmas and Montes-Sancho, 2010) and as revealed by annual data (Zajac and Westphal, 2004), and has devoted little attention to how less formal and more frequent interactions with stakeholders affect the nature of symbolic management and whether this has any financial implications. By examining firms' use of social media and its contents, we are able to bring the concept of informal interactions and frequency of interactions to the literature on symbolic management.

This paper proceeds in three steps. We start by studying variations in the adoption of social media. Based on the prior literature on institutional theory, we expect institutional pressures as demonstrated by increasing use of social media over time, to play an important role in firms' adoption of social media. Yet, we also posit that less certain external environment in terms of financial returns along with greater presence of investors and customers foster the use of social media. Second, we examine the contents of social media. In particular, we explore whether there is any information content, what kinds of information are conveyed, and whose concerns are addressed by firms, for example, investors, customers, local communities, activist groups, or employees. This provides insights into various ways in which firms use social media, including the possibility of symbolic management. Third, we study the implications on firm performance. This allows us to identify under what circumstances social media usage affects firm performance. While prior literature has demonstrated that symbolic management influences stock price (Westphal and Zajac, 1998; Zajac and Westphal, 2004), we still know little about how the new

dimensions that social media tools have added in the relationships between firms and external stakeholders--less formal and more frequent interactions—change the dynamics of the relationships and the nature of symbolic management, and how these changes in turn may affect the consequences symbolic management.

The context in which we examine these issues is Twitter use by large electric power holding companies such as American Electric Power and Duke Energy. For two reasons, this empirical setting provides an appropriate context to examine how social media may bring changes to traditional ways of firm-stakeholder relationships. First, electricity can be thought of as a commodity, and thus the use of social media in the electric power industry is geared more toward managing their various stakeholders, less towards marketing their products. Second, the electric power industry has recently undergone deregulation movement in some states. By making use of variations in the status of deregulation, a natural experiment, we can examine how changes in the external environment affect the use of social media and its potential consequences. Among several social media channels, we focus on Twitter use since Twitter is the most widely adopted social media in the electric power industry. Below we begin by providing a brief background on Twitter.

Background: Twitter

Twitter was created and launched in 2006 by Dorsey, et al., in San Francisco, and gained popularity in 2007 (Soho and Jones, 2009). Twitter is a “real-time information network that connects you to the latest stories, ideas, opinions and news about what you find interesting.”¹ More specifically, it is an online platform for social networking and micro-blogging where those with a Twitter account can post messages. Such posts are referred to as “tweets”, and although it is limited to 140 characters in length, it goes beyond the limited characters as the posts can provide links to other websites, pictures, and videos, such that the entire message that a tweet incorporates can be quite comprehensive. In some cases, “tweets” can be considered as “titles” for the message that the account user is trying to convey.

¹www.twitter.com/about

Twitter is a social networking media in that not only can the account user subscribe to other accounts in order to receive their tweets (i.e., considered as “following” the accounts), but also as other users can subscribe to one’s own account (i.e., “followers”), although such relationships are not necessarily reciprocal. Also, among various functions, users can send direct messages to each other, in which case they need to be following each other’s accounts, carry conversations on the accounts by replying to a tweet, favorite a tweet, and repost (i.e., “retweet”) the messages. Given such convenient functions of establishing and maintaining relationships and the low cost of using Twitter, we are interested in examining why firms differ in their adoption of Twitter and its usage, specifically in regards to the content and frequency of the postings, and how this might relate to the extent to which firms engage in symbolic management. Below we develop our hypotheses.

HYPOTHESES DEVELOPMENT

Adoption of Twitter

We are interested in understanding the motivations for adopting Twitter since we observe wide variations in its adoption by large electric power holding companies. Among potential factors, we start with changes in the electricity market conditions brought about by deregulation, which are likely to influence the firms’ relationships with their retail consumers and investors.

Retail electricity markets were not open to competition until the late 1990s when state-level retail deregulation began. Under retail deregulation, customers are allowed to choose their own electricity suppliers instead of having default suppliers. The first retail deregulation programs began operating in Massachusetts, Rhode Island, and California in early 1998 (Joskow, 2005). As of 2000, twenty four states and the District of Columbia issued regulatory orders or passed legislation to promote retail competition (EIA, 2000). The California electricity crisis of 2000-2001, however, slowed down these initiatives (Griffin and Puller, 2005; Wolfram, 2005). With strong concerns that the California electricity crisis was fundamentally a regulatory crisis rather than an economic one (Wolak, 2005),² many states suspended

² Market manipulation by Enron might also have been facilitated by deregulation. See, for example, [‘After Enron, Deregulation Is Looking Less Sexy,’](#) *The New York Times* (02/10/2002).

efforts to deregulate their retail electricity markets. As of 2009, retail deregulation remained active in only about fifteen states (See Figure 1).

Thus, with deregulation, retail consumers with default electricity providers in a previously regulated market are left with the choice of electricity providers. In such cases, not only do firms have to be concerned about maintaining their current customers, but also, they need to vie for new customers. Thus, secondary stakeholders and audiences with the potential of becoming their customers will be of greater importance to the firm than before, and firms will put more value in the channels through which they are able to easily interact with external stakeholders.

Such changes in the market conditions are also expected to influence the firms' relationship with investors. Under regulation, electric power companies was allowed to charge one single price for electricity generation, transmission and distribution, which allowed firms to recover their costs and to earn a fair rate of return on the capital invested as long as they made prudent investments. With deregulation, however, a fair rate of return is no longer guaranteed, and investors would be naturally uncertain of profitable returns on their investments.

Given such uneasiness resulting from new market conditions, electric power companies would be faced with increased pressures in retaining their current investors and attracting new investors. Under the circumstances, firms may be keen to use social media such as Twitter, in which they can easily disclose their positive financial and operational news in a timely fashion and build strong relationships with current and potential investors. Thus, we expect changes in the regulatory environment and strong customer and investor bases have positive impacts on the adoption of Twitter accounts.

Hypothesis 1: Firms in a deregulated market is more likely to adopt Twitter accounts.

Hypothesis 2: Firms with a greater number of residential or commercial customers are more likely to adopt Twitter accounts.

Hypothesis 3: Firms with a greater market value are more likely to adopt Twitter accounts.

Twitter contents

Among the firms that have adopted Twitter, we are interested in examining how Twitter is used. That is, to what extent and for what purposes the electric power companies use Twitter?

We examine this question based on insights from the literature on information asymmetry and on relationship-building. The literature on information asymmetry has generally argued for positive consequences of information disclosure and disclosure frequency. Frequent information disclosure increases transparency and decreases the need to acquire information through costly means which will lead to a decrease in transaction costs and information asymmetry (Jo and Kim, 2007; Botosan and Harris, 2000). In light of such arguments, past research has found a negative association between disclosure frequency and earnings management as increased transparency enables investors to easily monitor earnings management (Jo and Kim, 2007). This line of reasoning leads to expectations that firms that tweet more frequently are likely to disclose more information regarding various aspects of their operations and performance to external stakeholders, leaving less room for symbolic management. At the same time, however, we recognize that the kinds of information firms choose to reveal to external stakeholders through social media may include more positive information than negative information. This suggests that frequent information disclosure via Twitter may not necessarily reduce information asymmetry between firms and external stakeholders.

The literature on relationship-building suggests that frequent interactions between a firm and its stakeholders may help build a greater sense of relatedness (Doney and Cannon, 1997). Frequent communication allows resolution of issues as they arise, avoiding the accumulation of grudges (Nelson, 1989). Frequent contact also facilitates more informal interactions. Less conflict and more informal exchanges are likely to lead to higher levels of trust (Dwyer, Schurr and Oh 1987; Morgan and Hunt 1994). To the extent that social media is used to build and maintain relationships, in which case the purpose may be to earn the trust of external stakeholders, we posit that firms use social media to resolve any issues stakeholders might have, for example, consumer complaints, or just to build rapport that may not have much information content, for example, informal greetings that make firms look more personal.

Hypothesis 4: A greater tendency to use Twitter accounts to resolve consumer complaints in a timely manner is associated with higher intensity of Twitter use, controlling for other usage.

Hypothesis 5: A greater tendency to use Twitter accounts for building rapport is associated with higher intensity of Twitter use, controlling for other usage.

Firms also use social media to publicize their corporate social responsibility (CSR) and environmental sustainability-related activities. The previous literature on the link between voluntary environmental information disclosure and environmental performance shows mixed results. Patten (2002) finds a negative association between the extent of discretionary disclosures and environmental performance, and argues that the mixed results of earlier studies may have to do with omitted variable and sample selection biases. The main point of the argument is that firms that had negative environmental incidences in the past have a greater incentive to disclose more about their environmental sustainability-related activities to make up for past behavior and build legitimacy. In contrast, Clarkson, et al. (2008) find a positive association between disclosures and environmental performance, and argue that earlier studies were not careful enough in restricting themselves to purely voluntary disclosures. The idea here is that the more the firms engage in environmentally sustainable activities, there are more information to disclose. Accordingly, we posit that there are alternative possibilities, and this may apply to CSR-related activities as well.

Hypothesis 6a: Firms with higher level of environmental pollutions tweet their corporate responsibility-related activities to a greater extent.

Hypothesis 6b: Firms with lower level of environmental pollutions tweet their corporate responsibility-related activities to a greater extent.

Hypothesis 7a: Firms with higher level of CSR concerns tweet their corporate responsibility-related activities to a greater extent.

Hypothesis 7b: Firms with higher level of CSR strengths tweet their corporate responsibility-related activities to a greater extent.

Firm performance

Do Twitter usage has any implications on firm performance? We suggest that when the potential benefits of social media is fully utilized, Twitter usage may positively affect firm performance. We discuss two such circumstances in turn. First, the literature on relationship-building suggests that stakeholders are more likely to do business with an organization when the affective bonds of liking, trust, and respect have been established (Morris & Feldman, 1996), and this may in turn enhance firm competitiveness (Noordewier, John and Nevin 1990; Doney & Cannon, 1997).

As discussed earlier, relationship-building via social media may be facilitated by attempting to resolve any issues stakeholders might have in a timely fashion, for example, prompt response to consumer complaints, or just by trying to build rapport without providing much information content, for example, frequent informal greetings that make firms look more personal. Resolving conflicts, however, may not significantly affect firm performance, although not doing so may negatively affect firm performance. Efforts to build rapport, however, may influence performance.

The literature on symbolic management proposes that despite decoupling of organizations' formal structures and actual work activities (Meyer and Rowan, 1977), conformity to institutional pressures may be viewed positively by external stakeholders and hence bring about positive outcomes (Pfeffer, 1981; Elsbach and Sutton, 1992; Westphal and Zajac, 1998; Zajac and Westphal, 2004).

In the context of social media, symbolic management may be demonstrated by the extent to which firms use social media to build rapport without providing much new information. Recent studies find that social media users put a greater value on tweets that provides new information than on tweets that are intended to just build and maintain relationships such as informal greetings (André, Bernstein, and Luther, 2012). Accordingly, we argue that adopting social media and use it for the purpose of building rapport mostly, without providing information content, can be thought of as a form of symbolic management in the social media space. To the extent that the prior literature has demonstrated that symbolic management positively influences stock price (Westphal and Zajac, 1998; Zajac and Westphal, 2004), we posit that building rapport through social media may favorably affect firm performance.

At the same time, the extent to which firms provide information thought to be useful by social media users may positively affect stock performance. Usefulness of information as judged by social media users, may indeed indicate the potential efficiency benefits of social media. The immediacy inherent in social media facilitates the delivery of timely information. Timely information means reduced information asymmetries and lower transaction costs, which may in turn lower costs of capital (King, Pownall, and Waymire, 1990; Botosan and Harris, 2000). To the extent that lower transaction costs mean lower costs of capital for firms, we expect useful tweets to positively affect firm performance.

Hypothesis 8: A greater tendency to use Twitter accounts for building rapports leads to higher firm performance.

Hypothesis 9: A greater response to companies' tweets by Twitter users leads to higher firm performance.

DATA & METHODS

We examine the proposed hypotheses through the Twitter accounts of U.S. electric power companies. Here, we limit the companies to those that appear on the Standard and Poor's (S&P) 500 list at least once during the time period of 2005 to 2012. We start from 2005 as Twitter was created in 2006, and this resulted in 39 companies where 27 had corporate-level Twitter accounts as of July 2012. We identified their official corporate-level Twitter accounts either through company websites or by directly contacting the company, and manually compiled the tweets from the first available one up till those posted on June 30th, 2012 (refer to the Appendix for a list of the identified Twitter accounts).

Table 1 and 2 display the heterogeneity across companies in regards to their adoption and usage of Twitter accounts. Among the 27 companies that have Twitter accounts, 12 had the first available tweet in 2009, six had the first available tweet in 2010, five in 2011, and three companies had their first tweet in 2012. Moreover, the companies vary greatly in the usage of Twitter as reflected in the total number of tweets. The mean number of total tweets is 995 with a standard deviation of 1,006. Also, while the company with the minimum number of total tweets has 74 tweets (Sempra Energy), the company with the greatest number of tweets has 3,566 tweets (DTE Energy).

Insert Table 1 about here

Insert Table 2 about here

Among the 39 electric power companies that we identified, we examine different subsets for the various hypotheses. We examine the adoption of Twitter by firms in company-year units (hypotheses 1 to 3), where 2009 is the earliest year when companies in our sample pool started tweeting. Hence, we limit

the starting year of our analysis to 2008 where we ultimately examine 38 companies as Keyspan Energy was acquired by National Grid in 2007³.

In regards to the remaining hypotheses that focus on Twitter contents, we limit our analysis to 2011. We chose 2011 for the current analysis as it is the most recent year with complete data for an entire year. There are 23 companies with Twitter accounts in 2011, and among those we examined the tweets of 12 companies⁴. This resulted in a total of 2,697 individual tweets, where we manually went over each tweet in order to capture the subtle nuances that certain tweets convey and in order to categorize the tweets as closely as possible to the categories necessary for testing our hypotheses. Such process required much time and we plan to analyze the remaining companies' tweets in the near future. Moreover, we aggregated the tweets by company-month in order to capture a trend without too much random noise, and in order to be able to examine in detail the extremely rich frequency data due to the short time distances between tweets. Hence, the unit of analysis is in company-month units in examining hypotheses 4 to 9.

Content analysis of tweets

We conducted content analysis for the 2,697 tweets according to the coding classifications as displayed in Table 3. A research assistant compiled the contents and date of the tweets, in addition to the number of retweets and the number of favorites that the tweets received.

Insert Table 3 about here

The authors conducted content analyses of the tweets through extensive discussions regarding the categorization, where the coding scheme was developed both through deductive and inductive processes. We first started from categories that were theoretically important, such as the categories for “Core” and “Noncore”, and as we went over the tweet contents we further specified which subcategories will fall

³ We included National Grid even though it does not appear on the S&P 500 list during 2005 to 2012, as it acquired Keyspan.

⁴ The 12 companies included in the analysis are Ameren Corp., American Electric Power, Consolidated Edison Inc., Constellation Energy Group, Duke Energy Corp., FirstEnergy Corp., ONEOK Inc., Sempra Energy, Southern Co., TECO Energy Inc., Wisconsin Energy Corp., and Xcel Energy Inc. The remaining 11 companies are DTE Energy Co., Edison Intl., Entergy Corp., NextEra Energy Inc. (FPL Group Inc.), Integrys Energy Group Inc., National Grid (Keyspan), Northeast Utilities, NRG Energy, PPL Corp., Progress Energy Inc., and Public Service Enterprise Group.

under the theoretically driven classifications. The main concern was distinguishing between contents that are related to the core-business of the company and those that are related to the non-core business of the companies, specifically, those related to corporate responsibility issues and those, although they do not hold concrete information regarding the focal company, that have the potential to build relationships with external stakeholder.

Thus, in the first step, we classified tweets between “Core” and “Noncore” categories. The “Core” category includes three issues; “Customer”, “Investor”, and “Employment”. “Customer” includes issues that have substantive impact on customers such as those related to payments, energy saving tips, and reliability and safety issues (e.g., billing information, weather related power outages, and warning against power lines). “Investor” includes issues that would be of primarily interest to investors. It includes issues regarding the firm’s businesses and operations (e.g., announcements on acquisitions, earnings results, and appointment of a new CEO), and contents that reinforce and legitimizes the firm’s businesses and operations (i.e., those that fall under public relations, such as CEO’s interview or appearance in the media on business related issues). “Employment” includes tweets with information regarding firm’s job postings and firm’s participation in college job fairs.

“Non-core” category is further divided into corporate responsibility (CR) and “Rapport” categories. CR includes issues on “Community”, “Diversity”, “Employee”, and “Environment”. “Community” includes various cases, including firms’ interactions with community members and participation in regional development activities. For example, this category include tweets on community volunteering work conducted by firm employees, donations and grants provided by the firm to institutions within the community, and school programs funded by the firm. “Diversity” pertains to diversity issues of employees within the firm. “Employee” pertains to issues, such as employee safety, lifestyle, benefits and unionizations. Finally, “Environment” includes issues such as renewable energy and related technologies.

“Rapport” includes tweets, although not substantial in content, have the potential to build relationships with external stakeholders. It includes a variety of tweets, such as greetings, mundane information sharing, and responses to conversations. Also, it includes tweets through which companies

share information, such as industry trends, which are information that do not directly disclose that of the company. It essentially includes all tweets that have the potential to make the firm more personable to external stakeholders.

Variables

Dependent variables

Table 4 displays the list of variables and their descriptions. There are six variables that are used solely as dependent variables (*Adoption of Twitter*, *Existence of Twitter*, “*Intensity*” of *Tweets*”, *Total market return*, *CSR Tweet*, and *ENV Tweet*) and one additional variable that are used as both a dependent and independent variable (*CR Tweet*).

Insert Table 4 about here

Adoption of Twitter and Existence of Twitter

In order to test the hypotheses examining Twitter adoption, we conducted both survival analysis and probit regressions. *Adoption of Twitter* is the dependent variable for survival analysis, which is a binary variable. More specifically, *Adoption of Twitter* is 0 for the company-years until a company adopts Twitter, which then becomes 1 and the company falls out of the sample pool. We also test the hypotheses using probit regression models where the company-year observations remain in the analyses even after the adoption of Twitter. Thus, in this case, the dependent variable, *Existence of Twitter* is 0 for the years that a company does not have a Twitter account and becomes and continues to be 1 following the adoption of Twitter.

“Intensity” of tweets

In order to test hypotheses 4 and 5, we constructed the dependent variable, “*Intensity*” of *Tweets*, which reflects both the frequency and extent of Twitter usage. More specifically, it incorporates how frequently a company posts tweets and the amount of postings within a company-month period. We operationalize frequency as the average of the distances between tweets in terms of days within a company-month period. In this case, the more days a company posts tweets (i.e., more “frequent”), the

average of the distances between tweets will be smaller. Hence, we reversed the number so that higher number indicates greater frequency. We weighted this number by multiplying the total number of tweets for the corresponding month. As the dependent variable is a continuous variable, we tested hypothesis 4 and 5 through ordinary least squares (OLS) models.

CR, CSR, and ENV Tweet (ratio)

The set of hypotheses for 6 and 7 examine Twitter-related variables as the dependent variables, which touch on different subsets of the non-core category. *CR Tweet (ratio)* is the total number of CR tweets over the total number of tweets in a given company-month. As described in Table 3, this category includes community, diversity, employee, and environment-related issues. Moreover, as we seek to examine how a company's environmental and social performance potentially influences the contents of the tweets, we re-classified the sub-categories under *Non-core* into CSR and environmental issues. Thus, environment-related issues are regarded as a separate category (*ENV Tweet*) and *CSR Tweet* includes community, diversity, employee and rapport. In this case, we used the ratio of CSR tweets and ENV tweets over the total number of tweets in a given company-month, respectively. In this case as well and for the following hypotheses, we tested the hypotheses through OLS regression models.

Total market return

Finally, for the hypotheses examining firm performance through various dimensions of Twitter usage (hypothesis 8 and 9) we operationalized firm performance through companies' monthly total market return of the company, which was compiled through Compustat.

Independent variables

Descriptions of the independent variables are provided in Table 4, and this section discusses variables that merit more detailed information. *Weighted deregulation* is constructed in order to capture the potential influence of deregulation on company behavior. It was constructed by first identifying subsidiaries of the focal firm, and whether or not the state that the subsidiary operates in is a deregulated electricity market or not (coded as 1 when it is deregulated and 0 otherwise). The dummy variable is multiplied by the proportion of the subsidiary's revenue over the total revenue of the company, and the

numbers are ultimately aggregated by company-year. Hence, a greater number of weighted deregulation reflect greater influence of deregulation, and is lagged by one year.

Residential revenue ratio is the ratio of the residential revenue over the total revenue per company-year. We constructed this variable in order to capture how deregulation has the potential to change the dynamics in the relationship between residential customers and the company, as residential customers has the choice of choosing between electricity providers with market deregulation. This variable is also lagged by one year.

In regards to the tweet-related variables, we also included two variables for the tweets that are initiated by third-parties as take on a different nature from the tweets posted by the companies themselves (*Neg. Tweet* and *Retweet*). First, *Neg. Tweet* refer to postings by third-parties that give negative impressions of the company, such as complaints about their services and high bills. Although there are other categories of third-party postings, such as compliments, questions, and factual postings, such negative postings greatly contradict with how companies tend to use their Twitter accounts as they generally convey appealing and positive information and announcements regarding the company. As such postings could influence the perception of how others view the company we included such tweets in the analyses. There were 305 such negative tweets, which is approximately 11% of the total tweets that we analyzed.

In addition we constructed a variable that reflects how many times the companies' tweets were re-posted by others (*Retweet*), which can be seen as indications of popularity or usefulness of the information contained in such tweets. From our observations, they mostly pertained to tweets that contain concrete and useful information. We had initially constructed an additional variable for the number of "Favorites" that tweets receive but due to significantly high correlation with *Retweet*, we did not include the variable in the analysis. Table 5 and 6 provide descriptive statistics and correlation matrix for the company-year data and company-month data.

Insert Table 5 about here

Insert Table 6 about here

RESULTS

Table 7 presents the influence of deregulation, extent of residential or commercial customer, and firm's market value on the adoption of Twitter accounts (tests of hypotheses 1 to 3). Model 1 and 2a estimate the influences of the primary independent variables on Twitter adoption, using survival analysis and probit regression models respectively. In Model 2b, we additionally include year dummy variables. The results overall do not show support for hypothesis 1 and 2, as *weighted deregulation* and *residential revenue ratio* are insignificant in all three models. In regards to hypothesis 2, the ratio of residential revenue over a company's total revenue was highly correlated with that of commercial revenue, and as the regression results using either variable were similar in regards to the significance of the primary independent variables, we only display the results using residential revenue. Finally, we do not find support for hypothesis 3 as the price variable was not significant in the models.

However, the results in Model 2b suggest alternative explanations for why some firms adopt Twitter accounts. Not only do we observe that the estimated coefficients of the year dummy variables are positive and significant, but also that they increase with time. As awareness and popularity of Twitter increases with time, it is likely that more firms will adopt the new communication channel. Thus, the increasing estimated coefficients of the year dummy variables seem to suggest that institutional pressures, especially mimetic pressures, are strong determinants for firms in adopting Twitter.

Insert Table 7 about here

Insert Table 8 about here

Table 8 represents the results of OLS regression models testing hypotheses 4 and 5. In testing the hypotheses, we analyzed the tweet-related variables, first, in terms of the number of tweets falling each category (models 1a to 6a), and, second, in terms of their ratio over the total number of tweets (models 1b

to 6b) per company-month. In hypothesis 4, we argued that firm's purpose to quickly respond to and solve consumer complaints through Twitter is associated with higher intensity of Twitter usage. Hypothesis 4 is supported as the estimated coefficients for *Neg. Tweet* were significant in both model 6a and 6b. More specifically, when the number of negative posting by third parties increases by 10 tweets within a company-month, the "Intensity" of tweets is expected to increase by approximately 67 units, even after controlling for other types of tweets. The influence becomes much larger when we estimate the model using the ratio of negative tweets over all tweets (Model 6b).

Moreover, we find support for hypothesis 5 when we estimate intensity of Twitter usage with the count measure of *Rapport Tweets*. That is, the greater the numbers of *Rapport* tweets, the more intense firms are in using their Twitter accounts. This result is consistent through models 1a to 6a. However, when we analyze the model with *Rapport Tweets* in terms of the ratio measure, the significant estimated coefficients have opposite directions (models 1b, 4b, 5b, and 6b). We need to conduct further analyses to examine the mixed results, where the ratio measure could be reflecting the importance of the portfolio of firms' tweet categories and how certain categories could work to enhance or depress the impact of each other when included simultaneously in the firm's portfolio of tweets. Although we have touched on this issue by including different types of tweets as controls, it would be interesting to delve more into this issue in future analyses.

Insert Table 9 about here

Table 9 presents the OLS regression models testing the set of hypotheses for hypothesis 6 and 7. It is interesting to note that while the level of environmental pollutions (as operationalized by total emissions) and the level of CSR concerns and strength (operationalized by KLD concern and strength) are insignificant on the level of *CR Tweet (ratio)* as shown in the results for models 1a to 1c, there are cases when they become significant when we more narrowly and clearly categorize the dependent variables into CSR (*CSR Tweet*) and environmental sustainability related issues (*ENV Tweet*). More specifically, we find that firms with higher levels of total greenhouse gas emissions tend to have greater proportions of

CSR Tweets (Model 2a). Also, firms with greater CSR concerns tend to have greater proportions of environmental sustainability related tweets (Model 3c).

Insert Table 10 about here

Finally, table 10 presents the results for testing the hypotheses in regards to firm performance. Hypothesis 8 is partially supported as the estimated positive coefficients of *Rapport Tweet* are significant for models 1a, 2a, and 4a, but are not significant in the remaining models that use count measures of the tweet-related variables. The positive influence of *Rapport Tweets* on firm's total market return tend to be more consistent and significant when the measure is in ratios than in the counts. Hypothesis 9 is strongly supported as the estimated coefficient for *Retweet* is positive and significant across all models.

DISCUSSION AND CONCLUSION

We have examined how large electric power companies in the U.S. use Twitter, a popular social media channel. We find that Twitter adoption is mainly driven by institutional pressures, in particular, mimetic pressures. With increasing popularity of social media, a greater number of electric power companies have adopted Twitter over time. Not all firms we examined, however, have a Twitter account. Despite low costs of opening and maintaining a Twitter account, some firms choose not to engage with their stakeholders through Twitter. This appears to suggest that institutional pressures may not provide a whole story. Indeed, recent research suggests potential risks of using social media. Some firms are concerned about how social media allows any kinds of postings to their social media spaces, for example, inappropriate posts or false representation that could cause a PR crisis (Giamanco and Gregoire, 2012).

Regarding the content of Twitter usage, we find that oftentimes firms use Twitter to build rapports with external stakeholders among other purposes. This is particularly interesting since the data we examined are large firms' Twitter usage, not individuals' Twitter usage. One might expect large firms to use social media to provide new hard information to its various stakeholders. On the contrary, trying to build rapports by exchanging informal greetings accounts for a large portion of firms' tweets. To the

extent that external stakeholders value information content, this may represent a form of symbolic management in the social media space. Firms also use social media to publicize their corporate social responsibility (CSR) and environmental sustainability-related activities. We find that firms with higher level of environmental pollutions tweet their CSR activities to a greater extent, and firms with higher CSR concerns tweet their environmental sustainability related activities to a greater extent. This is consistent with a prior research stream that argues that firms that had negative environmental incidences in the past have a greater incentive to disclose more about their environmental sustainability-related activities to make up for past behavior and build legitimacy.

Certain Twitter usage has positive implications for firm performance. Building rapport and tweeting messages that external stakeholders value highly increase firm value. The former suggests that symbolic management in a social media space may be viewed positively by investors. The latter indicates that more substantive use of the social media—providing tweets that are judged useful by their stakeholders—also has positive consequences for firm performance. These findings—seemingly contradictory circumstances under which firm values are positively associated with social media usage—appear to suggest that at the minimum, the link between social media usage and firm performance is difficult to generalize.

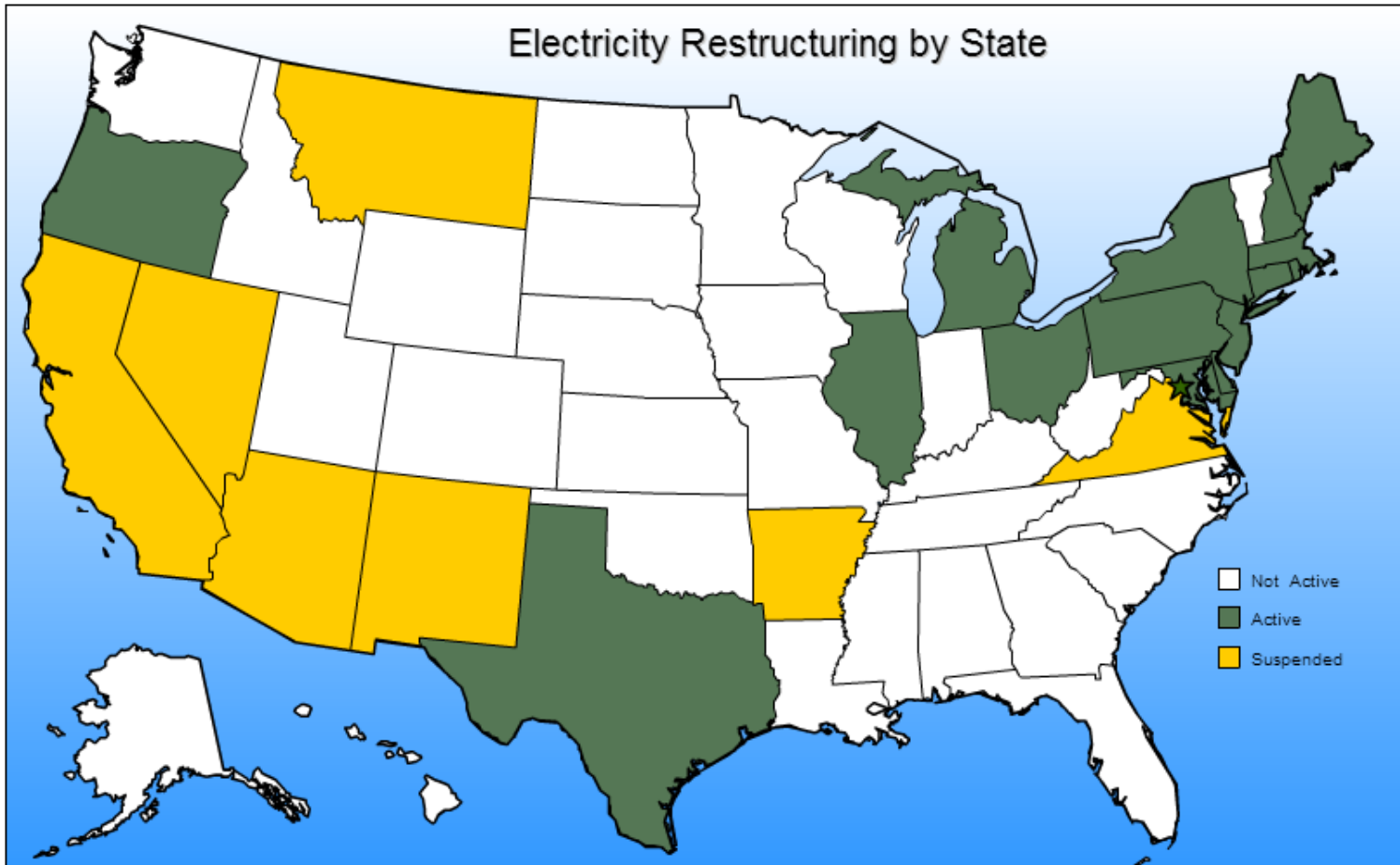
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TABLES AND GRAPHS

Figure 1. Status of electricity restructuring by state (data as of Sep. 2010)



Source: Energy Information Administration (http://www.eia.gov/cneaf/electricity/page/restructuring/restructure_elect.html)

Table 1. List of companies in the sample pool and the year of Twitter adoption

Companies without Twitter accounts	Companies with twitter accounts and the year of Twitter adoption			
	2009	2010	2011	2012
AES Corp	American Electric Power	Ameren Corp.	DTE Energy Co.	Centerpoint Energy
Allegheny Energy ¹	Consolidated Edison	Entergy Corp.	FirstEnergy Corp.	Dominion Resources
CMS Energy Corp	Constellation Energy	Integrus Energy Group	National Grid	PG&E Corp.
Dynegy	Duke Energy Corp.	PPL Corp.	Public Service Enterprise Group	
EQT Corporation	Edison Intl.	TECO Energy Inc.	Wisconsin Energy	
Exelon Corp ²	FPL Group ³	Xcel Energy		
Keyspan Energy	Northeast Utilities			
NICOR Inc.	NRG Energy			
Nisource Inc.	ONEOK Inc.			
Pepco Holdings Inc	Progress Energy Inc.			
Pinnacle West Capital	Sempra Energy			
SCANA Corp	Southern Co.			
12	12	6	5	3

¹ Allegheny Energy merged with FirstEnergy Corp. in 2011. However, since they were separate entities with the potential of adopting Twitter before Twitter was founded in 2006, we considered them as separate entities with the potential to of adopting Twitter.

² Constellation Energy Group and Exelon Corp. merged in 2012.

³ FPL Group changed its name to Nextera in 2009.

Table 2. Number of tweets per company-year

(Shaded areas indicate the years we observe tweets for each company. The numbers within the cells are the total number of tweets in the given year.)

	Company Name	2009	2010	2011	2012	TOTAL
1	Ameren Corp		226	370	180	776
2	American Electric Power	51	202	457	299	1009
3	Centerpoint Energy Inc.				400	400
4	Consolidated Edison Inc.	6	86	85	105	282
5	Constellation Energy Group	338	588	317	468	1711
6	Dominion Resources Inc.				77	77
7	DTE Energy			2368	1200	3566
8	Duke Energy Corp.	84	258	207	129	678
9	Edison Intl.	165	457	1172	429	2223
10	Entergy Corp.		70	369	261	700
11	FirstEnergy Corp.			18	82	100
12	FPL Group Inc. *	101	230	289	140	760
13	NextEra Energy Inc. *		267	209	90	565
14	Integrus Energy Group Inc.		279	451	491	1221
15	National Grid (Keyspan)			910	1962	2872
16	Northeast Utilities	4	56	231	97	388
17	NRG Energy	7	50	474	365	896
18	ONEOK Inc.	2	17	113	77	209
19	PG&E Corp.				262	262
20	PPL Corp.		528	2073	552	3153
21	Progress Energy Inc.	428	621	1026	318	2393
22	Public Service Enterprise Group			212	161	373
23	Sempra Energy	15	16	12	31	74
24	Southern Co.	17	197	358	261	833
25	TECO Energy Inc.		31	23	23	77
26	Wisconsin Energy Corp.			35	48	83
27	Xcel Energy Inc.		89	702	397	1188

* Although FPL Group Inc. changed its name to NextEra in 2009, separate Twitter account exists for both entities.

Table 3. Coding classification for the tweets

	Category	Description
Core	Customer	The classification includes the following issues: a) Bills: Contents related to service bills, and savings on payments. b) Energy saving: Contents related to how consumers can save energy. c) Both Bills & Energy saving: Contents that include both billing and energy saving issues. d) Reliability & Safety: Contents related to the reliability of services and safety issues, such as power outages from weather conditions and precautions regarding.
	Employment	Announcements of positions, internships, and participation in college fairs.
	Investor	Includes various issues that would be of interest to investors (e.g., announcement of financial statements, investor meetings, acquisition of firms, opening of new business, and appointment of top managers). It also includes tweets related to public relations and 3 rd party validation (described in detail below). <ul style="list-style-type: none"> • Public relations: Tweets of opinions or news that directly support and legitimize firm’s operations, missions, values, etc. • 3rd party validation: News of when the firm receives validation from 3rd parties through awards, being part of a prestigious list, etc. As there were various topics, we further classified this category into CSR, Sustainability, and Rapport (i.e., tweets that directly relate to shareholders such as being listed as the “Top Dividend Stock of the Dow Utilities” (AEP Tweet on 2011/11/1).
Non-core	Corporate Responsibility:	
	(a) Community	Content in which firm’s action is directed towards the community.
	(b) Diversity	Tweets that specifically mention employee diversity issues within the firm.
	(c) Employee	Contents related to employees, such as employee well-being and educational support for their children.
	(d) Environment	Tweets that contain contents on environment conservation/preservation, wildlife protection, renewable energy, and environment-related technologies (e.g., electric vehicles).
	Rapport	Tweets that build rapport with audiences through greetings, mundane information sharing, or announcement of industry trends.

Table 4. Variable list and definitions

Variable	Definition
DEPENDENT VARIABLES	
<i>Adoption of Twitter</i>	0 until a company adopts Twitter (which becomes 1) (company-year)
<i>Existence of Twitter</i>	1 if a Twitter account exists in a given year and 0 otherwise (company-year)
<i>"Intensity" of Tweets</i>	Average frequency of tweets weighted by the number of tweets (company-month)
<i>Total market return²</i>	Monthly total market return (company-month)
<i>CR Tweet (ratio)</i>	Corporate responsibility-related tweets/total number of tweets (company-month)
<i>CSR Tweet (ratio)</i>	Number of CSR-related tweets/total number of tweets
<i>ENV Tweet (ratio)</i>	Environment-related tweets/total number of tweets (company-month)
INDEPENDENT VARIABLES	
<i>Weighted deregulation¹</i>	Enactment of deregulation weighted by state sales per company-year (Yearly data. Lagged by one year)
<i>Residential revenue ratio¹</i>	Residential revenue/total revenue ratio per company-year (Yearly data. Lagged by one year)
Firm size variables²:	
<i>Firm size: employee (yearly)</i>	Logged term of the number of employees per company-year. Number of employees in thousands (Yearly data. Lagged by one year).
<i>Firm size: assets (quarterly)</i>	Total assets per company-quarter (Quarterly data. Lagged by one quarter).
Investor-related variables²:	
<i>Investor: price (yearly)</i>	Firm price (Yearly data. Lagged by one year)
<i>Investor: price (monthly)</i>	Firm price (Monthly data. Lagged by one month)
Tweet-related variables (count & ratio):	
<i>Core:</i>	
<i>Customer Tweet (count)</i>	Number of customer-related tweets (company-month)
<i>Customer Tweet (ratio)</i>	Customer-related tweets/total number of tweets (company-month)
<i>Employee Tweet (count)</i>	Number of employee-related tweets (company-month)
<i>Employee Tweet (ratio)</i>	Employee-related tweets/total number of Tweets (company-month)
<i>Investor Tweet (count)</i>	Number of investor-related tweets (company-month)
<i>Investor Tweet (ratio)</i>	Investor-related tweets/total number of tweets (company-month)
<i>Non-core:</i>	
<i>CR Tweet (count)</i>	Number of corporate responsibility-related tweets (company-month)
<i>CR Tweet (ratio)</i>	Corporate responsibility-related Tweets/total number of tweets (company-month)
<i>CSR Tweet (count)</i>	Number of corporate social responsibility-related tweets. This includes tweets related to community, diversity, employee, environment, and rapport (company-month)
<i>CSR Tweet (ratio)</i>	Number of CSR-related tweets/total number of tweets
<i>ENV Tweet (count)</i>	Number of environment-related tweets (company-month)
<i>ENV Tweet (ratio)</i>	Environment-related tweets/total number of tweets (company-month)
<i>Rapport Tweet (count)</i>	Number of rapport-related tweets (company-month)
<i>Rapport Tweet (ratio)</i>	Rapport-related tweets/total number of tweets (company-month)
<i>3rd-party:</i>	
<i>Neg. Tweet (count)</i>	Number of negative tweets posted by a 3rd-party (company-month)
<i>Neg. Tweet (ratio)</i>	Negative Tweets by a 3rd-party/total number of tweets (company-month)
<i>Retweet (count)</i>	Number of retweets of the company's tweets (company-month)
<i>Retweet (ratio)</i>	Retweets of the company's tweets/total number of tweets (company-month)
Environmental and social performance indicators:	
<i>Total emissions³</i>	Total amount of greenhouse gas emissions (Yearly data. Lagged by one year)
<i>KLD strength⁴</i>	Includes community, diversity, employee relations, and environment categories (Yearly data. Lagged by one year)
<i>KLD concern⁴</i>	Includes community, diversity, employee relations, environment, and nuclear power categories (Yearly data. Lagged by one year)
Year dummy variables:	
<i>Year dummy 2010</i>	Dummy variable indicating 1 for the year 2010
<i>Year dummy 2011</i>	Dummy variable indicating 1 for the year 2011
<i>Year dummy 2012</i>	Dummy variable indicating 1 for the year 2012

¹ Source: DSIRE & EIA ; ² Source: Compustat ; ³ Carbon Disclosure Project; ⁴ KLD social rating compiled through WRDS

Table 5. Descriptive statistics and correlation matrix for company-year data (hypothesis 1 – 3)

COMPANY-YEAR DATA:											
Company-year data for hypothesis 1-3 (survival analysis model)											
	Variable	Mean	SD	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(1)	Adoption of Twitter	0.22	0.42	1							
(2)	Weighted deregulation	0.45	0.43	-0.03	1						
(3)	Residential revenue ratio	0.44	0.09	-0.10	0.25	1					
(4)	Firm size: employee (yearly)	2.35	0.56	0.07	-0.10	0.02	1				
(5)	Investor: price (yearly)	38.44	20.25	-0.05	-0.01	0.11	0.2	1			
(6)	Year dummy 2010	0.20	0.40	0.10	0.07	0.04	-0.05	-0.08	1		
(7)	Year dummy 2011	0.13	0.34	0.10	0.06	0.17	0.01	-0.08	-0.19	1	
(8)	Year dummy 2012	0.09	0.28	0.06	-0.03	0.11	0.00	-0.09	-0.15	-0.12	1
Company-year data for hypothesis 1-3 (probit models)											
	Variable	Mean	SD	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(1)	Existence of Twitter account	0.45	0.50	1							
(2)	Weighted deregulation	0.44	0.41	-0.05	1						
(3)	Residential revenue ratio	0.44	0.10	-0.02	0.24	1					
(4)	Firm size: employee (yearly)	2.38	0.56	0.10	-0.17	0.05	1				
(5)	Investor: price (yearly)	38.55	18.64	-0.02	-0.04	0.01	0.22	1			
(6)	Year dummy 2010	0.20	0.40	0.06	0.01	-0.04	-0.01	-0.10	1		
(7)	Year dummy 2011	0.20	0.40	0.23	0.03	0.06	0.01	-0.08	-0.25	1	
(8)	Year dummy 2012	0.19	0.39	0.31	0.01	0.17	0.03	0.02	-0.24	-0.24	1

Table 6. Descriptive statistics and correlation matrix for company-month data (hypothesis 4 – 9)

COMPANY-MONTH DATA:																				
Company-month data for tweet-related independent variables in counts																				
Variable	Mean	SD	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
(1) "Intensity" of Tweets	14.07	16.68	1																	
(2) Total market return (monthly)	1.16	4.69	-0.02	1																
(3) Weighted deregulation	0.32	0.31	0.41	-0.14	1															
(4) Firm size: assets (quarterly)	30648.46	16930.97	0.10	-0.04	-0.18	1														
(5) Investor: price (monthly)	33.43	12.62	-0.36	0.15	-0.13	-0.16	1													
(6) Residential revenue ratio	0.42	0.08	-0.36	0.06	-0.58	0.16	-0.25	1												
(7) Rapport Tweet (count)	3.61	4.68	0.76	0.03	0.22	0.23	-0.33	-0.33	1											
(8) Customer Tweet (count)	6.24	9.91	0.86	-0.06	0.42	-0.04	-0.37	-0.22	0.54	1										
(9) Employee Tweet (count)	0.19	0.76	0.12	-0.03	0.12	-0.01	-0.04	0.14	0.05	0.09	1									
(10) Investor Tweet (count)	6.18	6.42	0.11	0.04	-0.07	0.56	-0.06	0.03	0.09	-0.21	0.04	1								
(11) CR Tweet (count)	2.13	2.93	0.08	0.00	0.37	-0.09	0.04	0.00	-0.04	0.01	0.32	0.10	1							
(12) CSR Tweet (count)	5.64	5.38	0.70	0.02	0.39	0.14	-0.26	-0.30	0.84	0.48	0.21	0.13	0.50	1						
(13) ENV Tweet (count)	0.09	0.34	-0.01	0.00	-0.11	0.18	-0.10	0.19	0.03	-0.08	0.25	0.14	0.17	0.05	1					
(14) Neg. Tweet (count)	0.39	1.06	0.67	0.00	0.20	0.07	-0.17	-0.31	0.41	0.51	-0.05	-0.03	-0.11	0.30	-0.08	1				
(15) Retweet (count)	23.62	39.14	0.14	0.16	0.17	0.23	-0.10	-0.25	0.14	0.00	-0.02	0.30	0.15	0.21	-0.03	0.02	1			
(16) Total emissions	5.78	2.89	0.29	0.00	0.14	0.40	-0.28	0.08	0.37	0.36	0.17	-0.15	0.06	0.33	0.21	0.07	0.01	1		
(17) KLD strength	6.42	3.52	0.39	-0.09	0.36	0.46	-0.17	-0.43	0.35	0.33	-0.02	0.19	-0.12	0.23	0.09	0.33	0.12	0.21	1	
(18) KLD concern	3.71	2.89	0.19	-0.10	0.23	0.72	-0.45	0.34	0.16	0.18	0.16	0.38	0.15	0.21	0.24	0.03	0.13	0.44	0.56	1
Company-month data for tweet-related independent variables in ratios																				
Variable	Mean	SD	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
(1) "Intensity" of Tweets	14.07	16.68	1																	
(2) Total market return (monthly)	1.16	4.69	-0.02	1																
(3) Weighted deregulation	0.32	0.31	0.41	-0.14	1															
(4) Firm size: assets (quarterly)	30648.46	16930.97	0.10	-0.04	-0.18	1														
(5) Investor: price (monthly)	33.43	12.62	-0.36	0.15	-0.13	-0.16	1													
(6) Residential revenue ratio	0.42	0.08	-0.36	0.06	-0.58	0.16	-0.25	1												
(7) Rapport Tweet (ratio)	0.14	0.17	0.13	0.06	-0.08	0.36	-0.06	-0.14	1											
(8) Customer Tweet (ratio)	0.18	0.26	0.51	-0.11	0.37	0.01	-0.28	-0.05	-0.10	1										
(9) Employee Tweet (ratio)	0.01	0.07	-0.03	0.00	-0.01	0.00	0.06	0.02	0.33	-0.29	1									
(10) Investor Tweet (ratio)	0.41	0.32	-0.51	0.07	-0.47	-0.09	0.04	0.38	-0.39	-0.59	-0.10	1								
(11) CR Tweet (ratio)	0.12	0.16	-0.24	0.01	0.17	-0.30	0.28	-0.04	-0.19	-0.12	-0.05	-0.26	1							
(12) CSR Tweet (ratio)	0.26	0.21	-0.06	0.05	0.07	0.06	0.16	-0.16	0.68	-0.16	0.24	-0.52	0.57	1						
(13) ENV Tweet (ratio)	0.01	0.03	-0.08	0.05	-0.11	0.04	0.02	0.09	0.05	-0.09	-0.01	0.01	0.21	0.04	1					
(14) Neg. Tweet (ratio)	0.01	0.02	0.56	0.03	0.15	0.16	-0.11	-0.28	0.00	0.20	-0.05	-0.30	-0.22	-0.16	-0.07	1				
(15) Retweet (ratio)	1.13	2.83	-0.08	0.17	0.16	0.07	-0.04	-0.21	-0.07	-0.08	-0.04	-0.06	0.21	0.11	-0.03	-0.05	1			
(16) Total emissions	5.78	2.89	0.29	0.00	0.14	0.40	-0.28	0.08	0.44	0.36	0.08	-0.49	-0.05	0.33	0.10	0.00	-0.01	1		
(17) KLD strength	6.42	3.52	0.39	-0.09	0.36	0.46	-0.17	-0.43	0.30	0.23	0.02	-0.32	-0.25	0.04	0.08	0.35	0.04	0.21	1	
(18) KLD concern	3.71	2.89	0.19	-0.10	0.23	0.72	-0.45	0.34	0.15	0.26	0.00	-0.16	-0.17	-0.02	0.07	0.07	0.04	0.44	0.56	1

Table 7. Regression models estimating the adoption and existence of Twitter accounts

Variables	Dependent variable: Adoption of Twitter		Dependent variable: Existence of Twitter	
	Survival analysis		Probit regression	
	Model 1	Model 2a	Model 2a	Model 2b
Intercept		-0.45 (1.00)	-0.55 (1.13)	
Weighted deregulation	0.35 (0.57)	-0.08 (0.47)	-0.04 (0.51)	
Residential revenue ratio	-5.30** (2.44)	-0.37 (1.69)	-1.73 (1.91]	
Firm size: employee (yearly)	0.31 (0.45)	0.15 (0.35)	0.19 (0.39)	
Investor: price (yearly)	0.016 (0.01)	0.01 (0.01)	0.01 (0.01)	
<i>Year dummy variables (base year of 2009):</i>				
Year dummy 2010			0.58*** (0.22)	
Year dummy 2011			1.08*** (0.28)	
Year dummy 2012			1.26*** (0.34)	
Observations	76	124	124	
Wald chi ² (Probit regression models)	----	2.19	24.01	
Pseudo R ² (Probit regression models)	----	0.03	0.12	
Log-likelihood (Survival analysis models)	-87.34	----	----	
Number "failed" (Survial analysis models)	24	----	----	

Robust standard errors (clustered by company) are reported in parenthesis. * p<0.10; ** p<0.05; *** p<0.01.

Table 8. OLS regression models estimating "Intensity" of tweets

Variables	Dependent variable: "Intensity" of tweets											
	Models using tweet-related variables in counts						Models using tweet-related variables in ratios					
	Model 1a	Model 2a	Model 3a	Model 4a	Model 5a	Model 6a	Model 1b	Model 2b	Model 3b	Model 4b	Model 5b	Model 6b
Intercept	13.68** (4.33)	13.89 (23.95)	-3.53 (19.66)	1.46 (19.31)	16.59 (25.82)	1.17 (19.85)	78.03* (41.17)	54.64 (48.52)	42.76 (41.74)	56.26* (29.07)	79.81** (31.97)	61.65* (29.62)
Weighted deregulation	-2.4 (2.02)	10.78 (7.75)	12.85 (7.86)	10.23 (6.69)	10.57 (7.59)	10.26 (6.71)	-4.45 (11.15)	12.67 (12.40)	11.38 (11.49)	2.21 (7.91)	-2.13 (9.28)	1.62 (8.20)
Residential revenue ratio	-27.05*** (7.69)	-12.28 (41.42)	19.01 (33.52)	10.73 (33.03)	-16.37 (44.92)	11.26 (34.06)	-77.14 (58.65)	-70.57 (80.48)	-50.59 (71.69)	-37.01 (41.08)	-70.76 (44.49)	-47.94 (43.22)
Firm size: assets (quarterly)	-0.00** (0.00)	-0.00 (0.00)	-0.00 (0.00)	-0.00 (0.00)	-0.00 (0.00)	-0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	-0.00 (0.00)	0.00 (0.00)	-0.00 (0.00)
Investor: price (monthly)	-0.05* (0.00)	-0.19 (0.00)	-0.09 (0.00)	-0.12 (0.00)	-0.2 (0.00)	-0.11 (0.00)	-0.58* (0.00)	-0.47 (0.00)	-0.48 (0.00)	-0.40* (0.00)	-0.49* (0.00)	-0.44* (0.00)
Rapport (Independent variable of interest. Subset of non-core)												
Rapport Tweet (count)	1.18*** (0.12)	2.36*** (0.49)	1.97*** (0.38)	1.94*** (0.42)	2.34*** (0.50)	1.94*** (0.41)						
Rapport Tweet (ratio)							-17.93** (7.13)	1.64 (11.74)	6.79 (11.63)	-11.40* (6.07)	-24.03*** (6.55)	-13.41** (5.79)
Core classifications:												
Customer Tweet (count)	1.20*** (0.07)											
Employee Tweet (count)	1.19* (0.54)			1.23 (1.02)	1.34 (1.48)	1.23 (1.03)						
Employee Tweet (ratio)							1.58 (5.48)			-4.11 (6.24)	-0.94 (5.42)	-2.55 (5.77)
Investor Tweet (count)	0.72*** (0.10)			0.36* (0.17)	0.28 (0.24)	0.36* (0.17)						
Investor Tweet (ratio)							-26.75** (11.00)			-24.66** (9.27)	-31.32** (11.19)	-24.34** (9.22)
Non-core classification:												
CR Tweet (count)		0.23 (0.80)		0.24 (0.54)	0.02 (0.77)	0.24 (0.55)						
CR Tweet (ratio)								-22.89 (16.06)		-29.52** (13.12)	-32.41** (13.14)	-24.58* (11.72)
Third-party classifications:												
Neg. Tweet (count)			6.52*** (1.48)	6.73*** (1.56)		6.74*** (1.59)						
Neg. Tweet (ratio)									354.73** (114.91)	240.27** (90.17)		227.44** (91.07)
Retweet (count)			0.02 (0.02)		-0.02 (0.02)	0.00 (0.01)						
Retweet (ratio)									-0.87 (0.57)		-0.84* (0.45)	-0.67* (0.37)
Observations	108	108	108	108	108	108	108	108	108	108	108	108
R-squared	0.93	0.64	0.78	0.8	0.65	0.8	0.48	0.37	0.53	0.61	0.58	0.62

Robust standard errors (clustered by company) are reported in parenthesis. * p<0.10; ** p<0.05; *** p<0.01.

Table 9. OLS reg. models estimating CR, CSR, and ENV tweets (in ratios) depending on company's environmental and social performance

Variables	Dependent variable: CR Tweet (ratio)			Dependent variable: CSR Tweet (ratio)			Dependent variable: ENV Tweet (ratio)		
	Model 1a	Model 1b	Model 1c	Model 2a	Model 2b	Model 2c	Model 3a	Model 3b	Model 3c
Intercept	-0.21 (0.16)	-0.19 (0.15)	-0.03 (0.17)	0.16 (0.20)	0.23 (0.28)	0.23 (0.25)	-0.01 (0.02)	-0.03 (0.03)	0.07 (0.04)
Weighted deregulation	0.14** (0.05)	0.14** (0.05)	0.04 (0.06)	-0.05 (0.08)	0.04 (0.11)	0.03 (0.15)	-0.02 (0.01)	-0.01 (0.01)	-0.06* (0.03)
Residential revenue ratio	0.45 (0.27)	0.44* (0.24)	0.1 (0.31)	-0.51 (0.37)	-0.31 (0.45)	-0.31 (0.53)	0.01 (0.04)	0.06 (0.04)	-0.13 (0.07)
Firm size: assets (quarterly)	-0.00** (0.00)	-0.00* (0.00)	-0.00** (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	-0.00 (0.00)	-0.00 (0.00)	-0.00* (0.00)
Investor: price (monthly)	0.00** (0.00)	0.00** (0.00)	0.00** (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
Environmental and social performance indicators:									
Total emissions	0.00 (0.01)			0.03*** (0.01)			0.00 (0.00)		
KLD strength		-0.00 (0.01)			-0.00 (0.01)			0.00 (0.00)	
KLD concern			0.02 (0.01)			0.00 (0.03)			0.01* (0.00)
Observations	96	108	108	96	108	108	96	108	108
R-squared	0.14	0.16	0.17	0.21	0.06	0.06	0.04	0.04	0.06

Robust standard errors (clustered by company) are reported in parenthesis. * p<0.10; ** p<0.05; *** p<0.01.

Table 10. OLS regression models estimating monthly total market return

Variables	Dependent variable: Monthly total market return											
	Models using tweet-related variables in counts						Models using tweet-related variables in ratios					
	Model 1a	Model 2a	Model 3a	Model 4a	Model 5a	Model 6a	Model 1b	Model 2b	Model 3b	Model 4b	Model 5b	Model 6b
Intercept	1.18 (1.73)	1.77 (1.53)	-0.13 (2.53)	1.34 (1.87)	-0.24 (3.12)	-0.4 (3.22)	1.05 (1.95)	1.55 (1.40)	-1.22 (2.22)	-0.75 (2.45)	-0.18 (2.73)	-2.39 (3.27)
Weighted deregulation	-1.94** (0.64)	-2.40*** (0.74)	-2.51** (0.95)	-2.28** (0.82)	-2.26* (1.09)	-2.30* (1.12)	-1.45 (1.28)	-1.80** (0.77)	-1.96** (0.75)	-1.09 (1.25)	-1.61 (1.47)	-1.18 (1.46)
Residential revenue ratio	0.71 (3.83)	-0.98 (3.06)	3.67 (5.27)	0.26 (4.03)	4.09 (6.77)	4.46 (7.01)	-0.52 (3.31)	-0.66 (2.40)	5.5 (4.31)	1.5 (3.69)	3.53 (5.02)	6.31 (5.63)
Firm size: assets (quarterly)	-0.00 (0.00)	-0.00 (0.00)	-0.00 (0.00)	-0.00 (0.00)	-0.00 (0.00)	-0.00 (0.00)	-0.00 (0.00)	-0.00 (0.00)	-0.00 (0.00)	-0.00 (0.00)	-0.00 (0.00)	-0.00 (0.00)
Rapport (Independent variable of interest. Subset of non-core)												
Rapport Tweet (count)	0.12* (0.06)	0.09* (0.05)	0.09 (0.08)	0.10* (0.05)	0.1 (0.08)	0.09 (0.08)						
Rapport Tweet (ratio)							3.31* (1.80)	2.47* (1.29)	4.08** (1.75)	4.57* (2.15)	4.08* (2.12)	5.62* (2.54)
Core classifications:												
Customer Tweet (count)	-0.02 (0.02)											
Employee Tweet (count)	-0.09 (0.21)			-0.11 (0.21)	-0.05 (0.20)	-0.05 (0.21)						
Employee Tweet (ratio)							-2.07 (1.42)			-2.1 (1.44)	-2.5 (1.84)	-2.58 (1.84)
Investor Tweet (count)	0.06 (0.06)			0.07 (0.06)	0.03 (0.06)	0.04 (0.06)						
Investor Tweet (ratio)							0.63 (1.48)			1.55 (1.37)	0.27 (1.22)	1.33 (1.32)
Non-core classification:												
CR Tweet (count)		0.05 (0.11)		0.03 (0.11)	-0.04 (0.13)	-0.04 (0.13)						
CR Tweet (ratio)								0.01 (3.33)		1.55 (3.14)	-2.43 (3.63)	-1.03 (3.52)
Third-party classifications:												
Neg. Tweet (count)			0.14 (0.24)	0.06 (0.23)		0.14 (0.26)						
Neg. Tweet (ratio)									29.68* (13.73)	27.66 (17.16)		34.19* (18.68)
Retweet (count)			0.03*** (0.01)		0.03*** (0.01)	0.03*** (0.01)						
Retweet (ratio)									0.40***		0.40***	0.42***
Observations	108	108	108	108	108	108	108	108	108	108	108	108
R-squared	0.03	0.02	0.08	0.03	0.08	0.08	0.03	0.02	0.1	0.04	0.09	0.1

Robust standard errors (clustered by company) are reported in parenthesis. * p<0.10; ** p<0.05; *** p<0.01.