



Online news on Twitter: Newspapers' social media adoption and their online readership

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ABSTRACT

Many news organizations have recognized the potential of social media as a journalistic tool and have used social media marketing to attract online audiences. The aim of this study is to understand the implications of news organizations' adoption of social media sites through (1) an examination of the relationship between news organizations' adoption of social media and their online readership and (2) a comparison of online traffic generated by social media sites with that generated by other online media institutions. Evidence suggests that newspapers' adoption of social media is positively associated with an increase in their online readership, and this association increases in the size of the newspapers' social media networks (e.g., number of Twitter followers). Evidence also suggests that the association between newspapers' social media adoption and their online traffic may differ compared to the association between other online media institutions and the online traffic they generated. A descriptive analysis shows that the online traffic generated by social media sites is less concentrated than that generated by search engines or news aggregators; this can be explained by the fact that social media sites might be less susceptible to information cascades, compared to search engines or news aggregators.

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1. Introduction

Today, the Internet is a major source from which people obtain new information. According to a recent survey conducted by Pew Research (2010), the Internet has surpassed newspapers in terms of popularity as a news platform and ranks just behind television. The Pew Internet survey also summarizes that "peoples' relationship to news is becoming portable and participatory." The survey found that 33% of mobile phone owners read newspapers on their mobile phones, and 37% of Internet users disseminate news content via postings on social media sites such as Facebook and Twitter. In response to the changing business environment and the rapidly growing number of people using

mobile technologies to read news online (Pew Internet, 2010), news organizations will have to increase their use of social media to attract attention online.¹ As can be seen in Table 2, many media organizations have adopted social media to route traffic to their websites (Messner et al., 2011). For instance, *The New York Times* describes its social media marketing as "one of the several essential strategies for disseminating news online" (Emmett, 2009).

Despite the newspaper industry's rapidly growing use of social media, thus far, very few studies have discussed the impact of social media in the context of the online

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¹ Recent evidence implies that people who read newspapers on their mobile phones tend to be more active users of social media sites and read or share news stories more frequently using those sites (Pew Internet, 2009). In fact, Rupert Murdoch—News Corp's chief executive—has referred to mobile technologies as a "game-changer" for news consumption (Reuters, November 12, 2010).

Table 1
Summary statistics.

Variables	Mean	Std. Dev.	Min.	Max.
UV_{it} (log-transformed)	12.0	1.3	4.7	17.1
Direct traffic	17,216	52,603	529	1488,239
Social media traffic	31,664	84,790	726	1469,476
Search traffic	117,376	334,915	955	3728,630
Aggregators' traffic	23,700	59,858	249	787,092
Number of Twitter followers	22,070	228,414	0	3809,821
Number of tweets	12,310	12,531	0	94,198
Number of months since Twitter adoption until January 2011	24	13	0	49

^a Note: "Number of months since Twitter adoption until January 2011" is the maximum value of $adopt_{it}$ in Eq. (1) for each newspaper.

news industry. Only a small number of studies have been conducted research on social media, and from among these, Chi and Yang (2010) present findings pertaining to US politicians' adoption of Twitter at the 111th House of Representatives. They found that the successes of politicians who had already adopted Twitter tended to accelerate Twitter adoption by other politicians. "Success," on Twitter, is defined as having a high number of followers per post. In other words, Chi and Yang's study works on the assumption that politicians' adoption of Twitter and the subsequent increase in their networks vis-à-vis social media are good proxies for the "success" of using Twitter; however, this assumption has yet to be tested.

In this context, an important question is whether, and to what extent, the adoption of social media tools is associated with measurable benefits for the adopters, for instance, the number of online audiences in the online news industry. To the best of my knowledge, previous studies have not examined this seemingly obvious yet important question. Furthermore, previous studies have not shown whether social media sites can have different impacts on the distribution of online traffic, compared to the online traffic generated by other online media institutions such as search engines or news aggregators. There are at least two reasons why the online traffic generated by social media sites differs from that generated by search engines or news aggregators.² (1) Social media sites generally do not *rank* online news stories. However, search engines or news aggregators create information cascades³ because they *rank* information depending on certain measures of "popularity" (Duan et al., 2009); highly ranked information is made more visible to users, assuring an even higher probability of getting online clicks.⁴ (2) Social media sites provide a platform for organizations to *reach out* to their audiences. For example, before the advent of social media tools, news organizations would post their news stories on their websites and depend on search engines or aggregators to direct traffic to them. Now, though, news organizations make use of social media tools to actively disseminate news themselves: these tools ensure that news reaches all the networks⁵ that expressed an interest in the

news, regardless of whether search engines or aggregators are interested in that news. The above two differences suggest that the online traffic generated by social media sites is more egalitarian than that generated by other media institutions.

In this paper, I use the case of the online news industry to present evidence on the associations between the adoption of social media sites and the online readership. The online news industry is of particular interest to this study because online traffic is used as a proxy for the benefits that newspapers obtain through the use of social media; further, online traffic is an important source of revenues for news organizations. To the best of my knowledge, this paper comprises the first empirical evidence on the association between social media adoption and online traffic in the context of the online news industry.

2. Data

The following two empirical analyses were conducted: The first tests the association between news organizations' adoption of Twitter and the subsequent online traffic to those newspapers' sites. The second is a comparison of the online traffic generated by different online media institutions: search engines, news aggregators, and social media. Sections 2.1 and 2.2 explain the construction of the data sets for each empirical analysis. Summary statistics for all variables are listed in Table 1.

2.1. Online traffic

In this study, online traffic is used as a proxy for the benefits obtained by online news sites as a result of their adoption of social media. The number of unique visitors to a news site is used as the measure of online traffic in this study. Monthly online traffic data sets were compiled for 337 daily newspapers, from January 2007 to December 2010. The data for 2007 were obtained from ComScore, Inc., and the data for the later periods were purchased from Compete, Inc.; information from these two sources was then combined.⁶ The studied sample of newspapers (337) includes almost all the major newspapers in the US, except for community newspapers and those without websites.⁷ The earliest adopters

² See Chiou and Tucker (2010) for empirical evidence on the impact of news aggregators on the number of visitors to newspaper sites.

³ An information cascade arises when people who have imperfect information about true product value infer value by observing the choices of others (Banerjee, 1992; Bikhchandani et al., 1992).

⁴ See Salganik et al. (2006) and Tucker and Zhang (2011) for evidence on the impact of popularity information.

⁵ The concepts of "friends" on Facebook and "followers" on Twitter.

⁶ The data sets were obtained from two different sources because I could not obtain 2007 data from Compete, Inc.

⁷ I excluded from the analysis the newspapers for which unique visitor information could not be identified. For example, some newspapers in Michigan were excluded because they share a website (www.mlive.com) and do not maintain individual ones.

Table 2
Newspapers' adoption of social media.

Facebook (%) ^a	Facebook supporters ^b	Twitter (%) ^c	Twitter supporters ^d	Tweets per week ^e
82.6	10,591	84.7	22,070	116

^a Percentage of newspapers with Facebook accounts in January 2011.

^b Average number of people who reported liking the Facebook page as of January 2011.

^c Percentage of newspapers with Twitter accounts in January 2011.

^d Average number of Twitter followers as of January 2011.

^e Average number of tweets posted per week since Twitter adoption as of January 2011.

joined Twitter in March 2007. Therefore, my observation included the time before (from January to March 2007) and after Twitter adoption for all the newspapers in the sample.

On the basis of the sites that people visited prior to visiting the newspaper websites, the monthly online traffic data can be disaggregated into the following five sub-categories: *direct traffic*, *search traffic*, *aggregators' traffic*, *social media traffic*, and *others*. *Direct traffic* refers to online traffic that is not referred by any other websites. For instance, if you directly visit the *New York Times* website by typing www.nytimes.com into the web address bar, then this type of traffic will be classified under *direct traffic*. *Search traffic*, *aggregators' traffic*, and *social network traffic* refer to online traffic that is referred by search engines, news aggregators, and social media websites, respectively. Social media sites with the largest share of traffic include Facebook and Twitter.

When classifying sub-categories, special attention was paid to the *search traffic* and *direct traffic* categories, and some of the *search traffic* data was reclassified as *direct traffic*. For instance, if you type in the name of a newspaper on the Google search bar, even though you will be directed straight to that newspaper's website, this action will be classified under *search traffic*, although, in reality, it is no different from *direct traffic*. Therefore, I collected data on the keywords used by people to search for newspaper websites. If the keywords constituted variants of the name of a newspaper, for example "new york times," "nytimes," or "nyt," this traffic was reclassified from *search traffic* to *direct traffic*.

2.2. Twitter adoption and number of "Followers"

To determine whether newspaper sites' adoption of Twitter was positively associated with their online traffic, a data set for the 337 sample newspapers was compiled, comprising the number of "followers," the number of messages ("tweets") posted on Twitter, and Twitter joining dates. Information on the number of followers and tweets was manually collected from each newspaper's Twitter account during the last week of January 2011; Twitter adoption dates were sourced from an online application: "when did you join Twitter?"⁸

3. Methodology

3.1. Newspapers' social media adoption and their online traffic

The case study of Twitter is used in order to facilitate an understanding of the association between newspapers'

adoption of social media and their online readership. In addition, this study discusses the nature of the above association in terms of its dependence on the size of the newspapers' networks and the number of "tweets" on Twitter.

Twitter⁹ is a particularly interesting networking site because it adopts the "asymmetric model" of relationships (Porter, 2009). Unlike other social media sites like Facebook—where two users can view each other's posts, provided they mutually agree to exchange information—Twitter enables news organizations to maintain an "asymmetric" position by following only a few chosen accounts, all the while being followed by several million users worldwide (Porter, 2009). This asymmetry makes Twitter an attractive tool by which news organizations can disseminate news. Farhi (2009) observes the growing importance of Twitter, noting that "its speed and brevity make it ideal for pushing out scoops and breaking news to Twitter-savvy readers."

As mentioned in Section 2.1, empirical tests were conducted for 337 daily newspapers from January 2007 to December 2010. Specifically, the following regressions were run.

$$UV_{it} = \alpha_0 + \beta_1 adopt_{it} + f(t) + \alpha_i + \epsilon_{ijt} \quad (1)$$

$$UV_{it} = \alpha_0 + \beta_1 adopt_{it} + \beta_2 adopt_{it} followers_i + f(t) + \alpha_i + \epsilon_{ijt} \quad (2)$$

Dependent variable UV_{it} represents the online traffic measured by the log transformed number of unique visitors to newspaper site i . UV_{it} is logarithmically transformed to interpret the estimated coefficients in terms of a percentage change. The variable $adopt_{it}$ represents the number of months since newspaper i adopted Twitter. A linear parametric assumption is imposed on $adopt_{it}$; if the newspaper has not adopted Twitter, $adopt_{it}$ will equal zero, and thus, $adopt_{it}$ will be an integer greater than or equal to zero. The variable $followers_i$ represents the size of networks on Twitter (the number of "Twitter followers"). The newspapers fixed effect is represented by α_i , and a control is included for nonparametric time trend $f(t)$. Coefficient β_1 represents the estimated impact of the adoption of Twitter on the online traffic of newspaper site i , while coefficient β_2 represents the interaction effect between $adopt_{it}$ and $followers_i$. The main effect of $followers_i$ is excluded from the analysis because of the newspapers fixed effect, α_i .

With regard to Eq. (2), the number of posts on Twitter (tweets) was also used in place of the variable $followers$. Although the two variables—number of tweets and follow-

⁸ www.whendidyoujointwitter.com.

⁹ Twitter is a social networking, blogging, and texting platform (Messner et al., 2011) where users can post messages called "tweets", in under 140 characters, to their audience, referred to as their "followers". Twitter users can choose who they want to follow.

ers—are significantly related,¹⁰ there is one important difference: the number of tweets can be controlled by the Twitter account user, whereas the number of followers cannot. In other words, the more significant the association between the number of tweets and online traffic, the greater is that news organization's potential to *reach out* to its audiences online. Having said this, it should also be noted that it is difficult to clearly separate the impacts that these two variables have on online traffic; currently, though, this issue does not lie within the scope of this paper. Instead, this study aims to present descriptive associations between the variables.

3.2. Comparison of online traffic generated by different media institutions

Although previous studies have provided empirical evidence on the adoption of Twitter in the online news industry, they have failed to address one very important question: Is the estimated association any different from the associations between other media institutions and online traffic? In fact, even though some theoretical models (Athey et al., 2011; George and Hogendorn, 2011; Dellarcas et al., 2011; Bar-Isaac et al., 2011) have discussed the impacts of online media institutions such as search engines and news aggregators, they have not answered the above question. Therefore, the second part of this study aims to provide a descriptive evidence with the view to answering this question.

In order to differentiate between the online traffic generated by different online media institutions, it was necessary to obtain data on the total online traffic received by newspapers. Depending on the method of search and the media institutions that directed traffic to the newspaper sites, the online traffic was further disaggregated into *direct traffic*, *search traffic*, *aggregators' traffic*, and *social media traffic*. When comparing online traffic, I used the cross-sectional data set for January 2011 and focused on the concentrations of the different institutions within the online news industry by presenting Lorenz curves of the online traffic generated by each media institution. These details are presented in Fig. 1. Further, the Kolmogorov–Smirnov (K–S) tests were conducted to determine whether the presented Lorenz curves were statistically different; for details, please see Table 4.

4. Results

4.1. Newspapers' social media adoption and their online traffic

Table 3 presents the estimated coefficients of Eqs. (1) and (2). The first column shows the association between newspapers' Twitter adoption and their online readership. As evident, newspapers' adoption of Twitter has a positive association with attracting online readership to their websites. In fact, newspapers' Twitter adoptions were associated with an additional 1% increase, month-

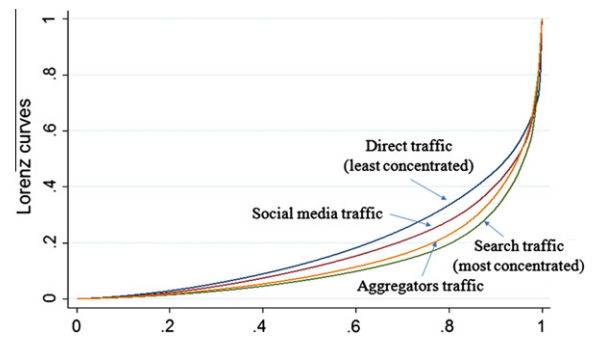


Fig. 1. Lorenz curves of online traffic by online media institutions. *Note:* A Lorenz curve is a graphical representation of the cumulative distribution of empirical probability. Each point on the curve represents a statement such as “the bottom x percent of all newspapers have y percent of the total market shares”. Therefore, the closer the Lorenz curve to a 45° line, the less concentrated is the underlying online traffic.

Table 3

The impact of newspapers' Twitter adoption on their online traffic.

	Dependent variable: UV_{it}			
	(1)	(2)	(3)	(4)
<i>adopt</i>	0.0109** (2.60)	0.0190** (2.26)	−0.0020 (−1.17)	−0.0026 (−0.37)
<i>adopt</i> ²		−0.0002** (−2.19)		
<i>adopt</i> × <i>followers</i>			0.0221** (2.55)	
<i>adopt</i> × <i>tweets</i>				0.0110** (2.01)
<i>Newspaper fixed effect</i>	Yes	Yes	Yes	Yes
<i>Time fixed effect</i>	Yes	Yes	Yes	Yes
<i>N</i>	12,306	12,306	12,306	12,306

^a Unit: followers in millions, tweets in ten thousand.

^b t Statistics in parentheses.

* $p < 0.10$.

** $p < 0.05$.

Table 4

The Kolmogorov–Smirnov (K–S) tests.

Comparison groups	Coefficient D	P -value	Corrected
Social media vs. direct traffic	0.246	0.000	0.000
Social media vs. search traffic	0.431	0.000	0.000
Social media vs. aggregators' traffic	0.310	0.000	0.000

on-month, in online traffic. However, the second column in Table 3 shows that the abovementioned association might not remain constant over time: Although the association between Twitter adoption and online traffic is strongest immediately after the adoption of Twitter, this association weakens over time.

¹⁰ A binary regression between these two variables showed a positive coefficient, significant at the 1% level.

The third column shows whether the association observed in the first column is affected by the size of online networks on Twitter. As seen here, the estimated association between newspapers' adoption of Twitter and their online traffic is near zero (i.e., coefficient β_1 in Eq. (2) is near zero) when the number of followers is assumed to be zero, although the coefficient is not statistically significant. The interaction term between $adopt_{it}$ and the number of followers is positive and statistically significant, suggesting that the association between the two variables increases with the size of online networks on Twitter. Considering the large variation in the number of Twitter followers (seen in Table 1), this evidence suggests that the estimated association between Twitter adoption and online traffic depends heavily on network size.

A similar analysis, shown in column 4, was conducted for the number of tweets. The results were the same as those for the number of followers. Therefore, it can be said that the estimated association is minimal for newspapers with a small number of tweets, while the association is significantly positive for those with a large number of tweets. The similarity of the results for both the number of followers and the number of tweets is not surprising given that these two variables have a significant positive correlation; on average, newspapers with a large number of followers on Twitter post/tweet more frequently than those with a small number of followers.

4.2. Comparison of online traffic generated by different media institutions

I now report the results of the comparisons of online traffic generated by different media institutions (Fig. 1 and Table 3). Fig. 1 shows the Lorenz curves for *direct traffic*, *social media traffic*, *aggregators' traffic*, and *search traffic*. It can be seen that *direct traffic* is the least concentrated, while *search traffic* is the most highly concentrated. *Social media traffic* and *aggregators' traffic* lie somewhere in between, though *social media traffic* is less concentrated than *aggregators' traffic*. Table 4 presents the results of the K–S tests. As seen here, the observed differences in the Lorenz curves are statistically significant.

Direct traffic may be regarded as a proxy for what the total traffic would have been without search engines and news aggregators. *Social media traffic* is less concentrated than *search traffic* or *aggregators' traffic* probably because of the two reasons proposed in Section 1—social media sites generally do not rank information and they provide a platform for news organizations to reach out to their audiences. However, *social media traffic* is still more concentrated than *direct traffic*, suggesting that information within social media sites might, to some extent, still be susceptible to information cascades. For instance, even though you are only following your local, regional newspaper on Twitter, and not *The New York Times*, people whom you follow are more likely to recommend to you an article from *The New York Times* compared to an article from your local newspaper. In this case, even though you are not directly following *The New York Times*, you are likely to click

on the *New York Times* article.¹¹ This process could result in the higher concentration of *social media traffic* compared to *direct traffic*.

5. Conclusion and limitations

This study estimated the association between newspapers' adoption of Twitter and their online traffic. Evidence suggesting a positive association between the two variables has been presented; further, this association increases in the size of online networks created. In view of the large variations in the sizes of online networks (as seen from Table 1) and considering previous evidence (e.g., Schlozman et al., 2012) for a highly concentrated distribution of the sizes of networks among social media adopters, it is reasonable to state that the estimated association depends heavily on the size of online networks. Then, in order to examine whether the online traffic generated by social media sites differs from that generated by other media institutions, the distributions of online traffic generated by social media sites, search engines, and news aggregators were compared. *Social media traffic* was less concentrated compared to the traffic generated by search engines or news aggregators; however, it was more concentrated than *direct traffic*. This is probably because social media traffic, although less susceptible to information cascades compared to search engines or news aggregators, is not entirely protected from these cascades.

It is important to clarify that the observed coefficients in Eqs. (1) and (2) address descriptive associations rather than causal impacts of the adoption of Twitter. For these equations to yield an unbiased and consistent estimate, one strong yet critical assumption has to be made: newspapers' adoption of Twitter should be independent of any idiosyncratic shocks to online traffic. In other words, after controlling for the factors that affect online traffic—such as newspaper quality and time trends—the treatment (i.e., newspapers' adoption of Twitter) must be random across newspapers; that is, the treatment should be uncorrelated with any omitted variables impacting online traffic. A possible omitted variable that might still bias estimates, for example, is the newspapers' adoption of other social media sites. It is highly possible and likely that news organizations will adopt Facebook at the same time at which they adopt Twitter. In this case, the estimated coefficients in Eqs. (1) and (2) may be overestimated, and we should interpret these coefficients as the association between online news traffic and social media adoption, in general, rather than Twitter adoption, in particular.

A limitation with regard to the Lorenz curve analysis should be pointed out. The presented evidence aims to highlight the differences between the online traffic generated by social media sites and that generated by other media institutions. However, although useful, this is a descriptive rather than analytical empirical analysis; therefore, it does not illustrate a clear association between social media adoption and online traffic. For example, the analysis does not estimate the potential substitutions

¹¹ As a result, you are more likely to follow *The New York Times* as well.

among different media institutions. For example, when a newspaper adopts a social media site, this site will direct traffic to that newspaper's site; this is referred to as *social media traffic* in this paper. However, the social media adoptions may also crowd out some *direct traffic* or traffic that is directed by other media institutions.¹² In this sense, it is also possible that newspapers' adoption of social media tools will not have any real impact on their online traffic.

Yet another limitation is that the analysis in this study is based on observations collected when the Internet and social media were still in their "adolescence" (Hindman, 2009). It is important to emphasize that the time periods covered in this study might not be reflective of the full impact of social media, as some studies have pointed out (Schlozman et al., 2010; Bimber, 1998).

Nevertheless, this paper is, to the best of my knowledge, the first empirical study to shed light on (1) the association between social media adoption and online traffic in the online news industry and (2) the varying impacts that different online media institutions may have on the distribution of online traffic. The association is estimated to be positive and to increase depending on the size of online networks created on social media sites. This descriptive evidence suggests that the association between social media adoption and online traffic differs from the association between other online media institutions and online traffic. The analysis has been conducted in the context of the online news industry, in which online traffic represents an important source of revenues; therefore, the results will certainly serve as a good starting point for more serious analysis of the impacts of social media.

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¹² Evidence of substitutions among different online media institutions is rare. However, previous studies have estimated substitutions between online and offline newspapers (Gentzkow, 2007; George, 2008; Filistrucchi, 2005) and between online and offline advertising channels (Goldfarb and Tucker, 2011).