Protest in the Internet Age:

Public Attention, Social Media, and the Spread of

"Occupy" Protests in the United States*

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Abstract

We explore the role of new communication tools such as Internet searches and social media activities in the diffusion of the "Occupy Wall Street" movement, one of the fastest and widest spreading protests in recent U.S. history. The results from event history analyses suggest that public attention via Internet searches, even after controlling for community characteristics such as political orientation and organizational resources, has a direct influence on the emergence of online activism, as well as an indirect influence on the spread of offline protests. Moreover, online activities on Facebook and Twitter positively affect the spread of offline protests and their effect increases over time. In addition, online activism increases the effects of spatial proximity to existing occupations. The results show that the Internet and social media activity create new communication channels among potential sites of contention and facilitate the diffusion of contentious collective actions.

Introduction

On 17 September 2011 a few hundred people gathered in lower Manhattan to protest against financial institutions and to "Occupy Wall Street." The occupation ofNew York City's Zuccotti Parkignited a movement that would spread around the United States and the world. Benefiting from intense mediation through Facebook, Twitter, and other online forums, protesters gathered in central city locations for days, weeks and months on end. The successful diffusion of the movement took many by surprise and was celebrated by some as "the moment when resistance to the inequalities of capitalism finally emerged: a tipping point in which the unfairness of bank bailouts juxtaposed against rising personal poverty triggered a moment of clarity of the absurdity of the current economic and political system." (Pickerill and Krinsky 2012: 279). While the spread of protests gradually slowed down and the Occupy movement has gradually disappeared from the public by 2012 , the protests popularized the long-term occupation of a public space as a social movement repertoire and created a public debate around the topic of rising socio-economic inequality –or, as one author put it, helping to "turn the climate –at least a bit– against the impunity of the wealthy." (Gitlin 2012: 48)

The Occupy Wall Street movement is often discussed in the scholarly literature as an example of activism during the age of the Internet and online social networking. Scholars have argued that social networking sites have played a crucial role in linking potential supporters and making possible the sharing of information and stories (Gaby and Caren 2012). Yet, as Pickerill and Krinsky (2012: 285) note, "there remains an interesting tension between the utility of online social networks for protest and the place-based utility of personal ties. […] There is still a need to move beyond the superficial celebration of digital mediation and unpack the implications of this use of mixed media." Because the Internet played a crucial role for the spread of the Occupy

movement, we can use it to advance social movement and diffusion theories about the role of communication technologies for the spread of contention.

Most social movement scholars agree that the Internet and social networking sites allow movements to disseminate information and engage with very large audiences without the filter of mass media (Earl 2010; Earl and Kimport 2010, 2011; Gaby and Caren 2012; Rane and Salem 2012). However, the literature on this subject is at an early stage and has a number of limitations. First, we do not know if online searches for information about a movement can predict movement diffusion. Data available from Internet search engines has made possible the exploration of topics such as the prediction of consumer behavior (Goel et al. 2010), the spread of diseases (Eysenbach 2006; Ginsberg et al. 2008), the identification of changes in individuals' diurnal and seasonal mood (Golder and Macy 2011), and the measurement of public mood or public attention (Koehler-Derrick and Goldstein 2011; Ripberger 2011; Scheitle 2011). These studies have demonstrated that analyzing Internet searches is valuable for understanding individual-level processes such as what people pay attention to, what they buy, or how they feel.

Information about Internet searches could be valuable for understanding the spread of protests and other forms of contentious collective actions. Social scientists have shown that contentious collective actions spread from sites of origin to other sites through activists' interpersonal contacts, mass media, or third parties who connect previously unconnected sites (McAdam and Rucht 1993; Strang and Meyer 1993; Strang and Soule 1998; Myers 2000; Andrews and Biggs 2006; Vasi and Strang 2009; Givan, Roberts, and Soule 2010). Studies have demonstrated that the spread of riots, protests, and other types of contentious collective behaviors is shaped by the characteristics of the communication channels between individuals in different locations and by the socio-demographic profile of the communities in which individuals

are located. While these studies have improved our understanding of the spread of contention, they are limited by the fact that they focus on the role of conventional information transmitters −change agents− and communication channels −mass media−, ignoring the role of online activities by information receivers in communities that have not yet experienced protests. Researchers have recognized that actions performed by information receivers shape the diffusion of innovative technologies and collective actions (Rogers 2003), but have had no practical means for studying how information receivers' online actions influence the spread of innovations over an extensive area.

This is now changing because of data available from Internet search engines such as Google. Internet searches may contribute to the spread of contention by allowing individuals to rapidly obtain information about protest events in distant locations, which may be difficult to obtain from traditional mass media. We argue that Internet searches are valuable measures of public attention, or "the scarce resources –time and others− that citizens willingly dedicate towards thinking about publicly debated issues" (Newig 2004: 153). Public attention is important for the spread of contention because it shows what the public is thinking about at a given moment. In contrast to public opinion, public attention changes quickly and documents subtle fluctuations in social, political, and economic realities associated with a movement. By examining the role of public attention for both online and offline protest activities, we move beyond studying public opinion's influence on social movements (Burnstein 1998; Soule and Olzak 2004), thus substantially advancing our understanding of social movements.

Another limitation is that scholars have not thoroughly considered the interactive and temporal effects of social media for the spread of social movements. Online activities such as creating Twitter and Facebook accounts or websites for specific communities may contribute to

the spread of contention by creating new communication channels among potential social movement participants; these communication channels, in turn, allow activists to organize and coordinate collective actions. Researchers have recently begun mapping various forms of Internet activism such as the transmission of information over the Internet, the online facilitation of offline protests, or online participation and organizing (Earl 2010; Earl and Kimport 2010; Rane and Salem 2012). Some studies have shown that Internet enabled technologies change the scale of activism and make social movement participation easier, faster and more effective. For example, studies have shown that websites and email lists have helped the Zapatista movement broadcast its message across borders (Martinez-Torres 2001), that Twitter acted as a news sharing system during crises such as the recent Egyptian revolution (Papacharissi and Oliveira 2012), or that conversations about liberty and democracy on blogs and on Twitter often immediately preceded mass protests in Egypt and Tunisia (Howard and Hussain 2011). In the case of the Occupy movement, researchers have shown that Facebook was a more prominent social networking site than Twitter (Gaby and Caren 2012).

Other studies have argued that these new technologies do not simply "supersize" activism –they also change how it takes place. According to Earl and Kimport (2011), existing theoretical models are not well equipped to address questions such as who organizes and how organization takes place in the age of Internet activism. For example, social movement scholars have pointed out that protests that spread through brokerage –when the transfer of information occurs between previously unconnected social sites through an intermediary– normally spread more widely than protests that spread through direct diffusion –when information is transferred along established lines of interaction (McAdam 2003; Tarrow 2005). While some studies show that brokerage is an important mechanism for the spread of contention because it can transcend the fragmentation

which characterizes modern society, they assume that the broker is either a social movement organization or a governmental agency (Vasi 2011). We argue that existing research has failed to recognize that Internet enabled technologies such as Facebook or Twitter can substitute organizations and become "cyber-brokers", or technologies that transfer information between previously unconnected actors. Moreover, research has not systematically examined whether online activities are useful predictors for the spread of offline protests, nor has it examined how these activities' influence changes over time and interacts with direct diffusion processes.

We identify the social media tools used the most by organizers and examine how they contribute to the spread of offline protests. Since Facebook, Twitter, and other social media platforms are widely used by activists and ordinary citizens nowadays, two scenarios are possible. On the one hand, if these tools are used primarily by activists committed to organizing and participating in actual protests, the use of social media tools could accurately predict the emergence of offline protests. In this case social movement scholars could use information about online activities to anticipate offline activism in the same way in which, for example, seismologists use tremors to anticipate volcanic eruptions. On the other hand, if these tools are used mainly by individuals who want a low-cost substitute for offline activism, information about online activities will be superfluous for understanding the diffusion of offline activities. Given how easy it is to create a Facebook or Twitter account dedicated to almost any cause, it is conceivable that social media usage is not a reliable indicator of impending offline protests – although it may predict what Earl and Kimport (2011) call "e-movements", or movements that unfold entirely online. We examine which of these theoretical possibilities is supported by the empirical evidence. Moreover, we advance diffusion research by investigating if the effect of

online activities on offline protests remains constant or changes over time, and if online activities interact with other direct diffusion factors such as proximity to previous sites of contention.

Using event history analysis, we investigate how Internet searches and social media activities shape the diffusion of the Occupy Wall Street movement in the United States. Based on existing research on the spread of contention, we explore the effects of various community characteristics on the spread of occupy protests –or occupations, terms we use synonymously throughout– among U.S. cities. We also develop hypotheses about the effects of public attention on online and offline activism, and about the effect of online activities on offline activism in order to understand the rapid diffusion of the movement at the end of 2011.

The Origins and the Diffusion of the Occupy Wall Street Movement

Protests against financial institutions –also known as "Wall Street" – can be traced to the beginning of the 20th century. During the Great Depression, various groups including organized workers and unemployed workers held strikes and protested against both financial and government institutions (Zieger and Gall 2002). As the world economy became increasingly interdependent, most protests against financial institutions were directed at global, not domestic, monetary organizations. The global justice movement of late 1990s and early 2000s targeted the World Trade Organization, the World Bank, and the International Monetary Fund.

The contemporary Occupy Wall Street movement emerged in a historical context characterized by growing income inequality and an increasingly large financial system. The main grievance for the contemporary Occupy Wall Street movement is the financial crisis of 2008, triggered by growing income inequality and an increasingly large financial system. Income

inequality has gradually increased since the 1970s. For example, U.S. Census Bureau data shows that the Gini ratio −one of the most commonly used indices of social inequality which uses a scale from zero (absolute equality) to one (absolute inequality)− has increased from 0.4 in the early 1970s to over 4.8 in 2010. In addition, the size of the U.S. financial industry has risen steadily since the 1950s. Indeed, the financial industry's share of domestic GDP has grown considerably, from about 15 to about 22 percent between 1970 and 2010.[1] Not surprisingly, a November 2011 public opinion poll found that approximately 6 in 10 Americans said that they supported government efforts to reduce disparities in wealth (Gitlin 2012: 37).

The financial crisis started as a result of the bursting of the housing bubble in 2008. The burst led to a high default rate for subprime mortgages, which in turn resulted in the larger-scale crisis of massive financial institutions that held high volumes of toxic mortgages. The US Treasury took over institutions such as Fannie Mae (Federal National Mortgage Association) and Freddie Mac (Federal Home Loan Mortgage Corporation), and investment banks such as Bear Stearns and Lehman Brothers were forced to file for bankruptcy. To keep the economy from an even more serious depression, the federal government moved to use about 1.2 trillion dollars through the Federal Reserve to bail out banks and corporations in crisis. In addition, as the financial crisis was arguably caused by the failure to effectively regulate the financial market, the government sought to impose a new series of financial regulations and obligations.

An important consequence of the 2008 economic crisis was the significant drop in the level of trust in financial institutions. Data from the General Social Survey, which asks respondents about the degree to which they have confidence in the people who run institutions

[1] This measure is based on Bureau of Economic Analysis data, which measures GDP share of financial industry as finance, insurance real estate, rental, and leasing. See: *http://www.bea.gov/itable/index.cfm*

such as financial institutions, shows that in 2010 the overall level of trust in financial institutions has dropped to the lowest level since 2000. While distrust of political institutions in the United States has been previously documented (Levi and Stoker 2000; Pharr and Putnam 2000), it is noteworthy that in 2010 trust in financial institutions was lower than trust in the federal government.

The financial crisis and growing distrust of financial institutions eventually led to the emergence of the Occupy Wall Street movement. On July 13, 2011, Canadian activists associated with the Adbusters magazine proposed an occupation of America's financial center; the occupation began on September 17, 2011. Social media such as Facebook and Twitter provided a public space in which people share opinions and disseminate information about the movement (Gerbaudo 2012). The movement spread fast to many cities in the U.S. and around the world and had a significant impact on society. As one author observed, the Occupy movement "seized attention, won friends, enlivened the demoralized, stirred up theater, engaged wits, penetrated the media as a big cultural and political fact, influenced some people, antagonized others […], and prompted intense conversation not only about the financial crisis and about causes of and remedies for the deep economic affliction, and about larger, chronic injustices, but about what ought to be done not only by political leaders but by everyone within earshot." (Gitlin 2012: 52).

The Occupy movement has two unique characteristics. First, it has no formal governing bodies. Although the NYC General Assembly has been the coordinating body of the initial protests held in New York City, neither prominent leaders nor a centralized structure exist anywhere within the movement. When the protests diffused to other places, each place created and maintained its own independent coordinating bodies and goals. This amorphous structure

enabled the movement to spread rapidly and effectively mobilize heterogeneous groups of occupiers. Second, the movement popularized a distinct, non-violent repertoire: the occupation. People began to occupy Zuccotti Park – also known as Liberty Park – because of its peculiar nature as a privately owned public space open to the public 24 hours a day. The coordinators also provided legal advice to the occupiers when marches and demonstrations were held in the streets. During the protests held within various local communities, the act of occupying certain places such as parks, squares, buildings, and campuses aimed to share experiences and to organize "using a non-binding consensus based collective decision making tool known as a 'people's assembly'".[2] Additionally, because it is a "product of an online age of 24/7 interaction and rampant social networks" (Pickerill and Krinsky 2012: 285), the movement allows us to advance theories about the role of the Internet and social networking sites for the spread of contention.

Theories of Diffusion of Contention, Public Attention, and Social Media

Research on the spread of contentious politics shows that information is transferred along established lines of interaction between social movements in three different ways. Some studies focus on relational diffusion, or on the direct interaction between prior and potential sites of contention (Hedström 1994, 2000; Davis and Greve 1997). The interpersonal interaction via social networks is the primary mechanism for relational diffusion since the adoption of a new idea or behavioral practice depends on some form of communication between innovators and adopters (McAdam, Tarrow, and Tilly 2001).

[2] See the OccupyWallStreet website, accessed in April 2012 at http://occupywallst.org/about/.

Other studies focus on mediated diffusion. This type of diffusion assumes that, even though they are not in direct communication, social movement actors are connected through a mediator or translator (Han 2009; Vasi 2011). The main mechanism of mediated diffusion is brokerage, which is defined as "the linking of two or more previously unconnected social sites by a unit that mediates their relations with one another and/or with yet other site" (McAdam, Tarrow, and Tilly 2001: 26).

Still other studies focus on non-relational diffusion, arguing that contentious politics may spread even in the absence of direct communication between social movement actors if individuals in potentially contentious sites belong to a similar social category to or define themselves as similar to transmitters (McAdam and Rucht 1993; Strang and Meyer 1993; Chaves 1996; Soule 1997; Soule and Zylan 1997). The essential mechanism for non-relational diffusion is theorization, which is "a kind of 'folk theory' that defines some thing or activity in abstract terms and locates it within a cause-effect or functional scheme" (Tarrow 2005: 104). Mass media plays an important role for non-relational diffusion because it creates communication channels between prior and potential sites of activism in the absence of interpersonal networks (Myers 1997, 2000; Oliver and Myers 2003).

While the literature on the diffusion of contention is theoretically and empirically sophisticated, it remains somewhat limited due to its narrow focus on the conventional communication channels between prior and potential sites of contention. Thus, although we know that diffusion is shaped by agitators' social networks (Hedström 1994, 2000; Han 2009) or the mass media context (Myers 1997, 2000; Oliver and Myers 2003), we do not know how the online activities of those in potentially contentious communities create new communication channels among local people and influence the emergence of protests. This knowledge gap is

significant because, in the current period when access to the Internet is widespread, the transfer of information between prior and potential sites of contention does not depend only on activists' social networks or on mass media's coverage of contention: it also depends on online activities related to contention, or the degree to which local publics search the Internet for information about contentious events and communicate with each other through social media.

We seek to fill this lacuna by examining how public attention to a social movement influences the spread of online and offline activism associated with the movement. Public attention is a scarce resource, predominantly time, that individuals dedicate towards thinking about current public issues (Newig 2004). As Newig (2004: 154) points out, "in contrast to public opinion, public attention does not indicate what people think, but what they think about, and it expresses the extent to which they dedicate their resources towards a given subject." While public opinion is relatively stable in the absence of a radical external shock, public attention changes rather quickly and can map the ebbs and flows of social, political, and economic realities without requiring changes in public belief structures or value systems (Newig 2004; Ripberger 2011). Public attention is a scarce resource because many issues, matters and subjects are competing for it. Thus, public attention is best measured as a "relative intensity (resource employment per unit time) or as a ratio (resource employment dedicated to one issue as compared to another issue competing for attention)." (Ripberger 2011: 240).

Another important issue that has received relatively little attention from scholars is the relationship between online and offline activism. Social movement scholars have identified a number of categories of Internet activism (Earl and Kimport 2010; Rane and Salem 2012). The Internet may be used simply as an information transmission medium, similarly to other broadcast media –for example, websites are created to disseminate information about a movement

campaign. The Internet may also be used to facilitate offline protests, as in the case when it provides information about specific protest events. Thus, Internet enabled technologies change the scale of activism and make social movement participation easier, faster and more effective. Studies have shown, for example, that the Zapatista and global justice movements relied heavily on the Internet to broadcast their message globally (Martinez-Torres 2001; Bennett 2003), that Twitter acted as a news sharing system during crises such as the Tunisian and Egyptian revolutions (Howard and Hussain 2011; Papacharissi and Oliveira 2012), and that Facebook was widely used in the Occupy movement (Gaby and Caren 2012). However, no studies have systematically examined the influence of online activism on the spread of offline protests.

Following Earl and Kimport (2011), we argue that existing theoretical models are not well equipped to address questions such as who organizes and how organization takes place in the age of Internet activism. Social movement studies have argued that protests spread faster when they spread through brokerage than when they spread through direct diffusion. This is because brokers make possible the transfer of information between previously unconnected social sites −thus, transcending the fragmentation which characterizes modern society (McAdam 2003; Tarrow 2005; Vasi 2011). However, existing research fails to recognize that Internet enabled technologies such as Facebook or Twitter can act as "cyber-brokers" and substitute traditional brokers such as social movement organizations or governmental agencies. Therefore, we examine whether cyber-brokers such as Facebook and Twitter accounts created to organize local protests can influence the spread of offline protests, and whether their influences changes over time.

Finally, the spatial structure of diffusion has increasingly been of interest to research on diffusion. Previous studies on diffusion have shown that protests in potential sites are influenced

by existing protests in neighboring sites; spatial diffusion occurs because events are not only more visible to people in neighboring communities, but also more likely to spread through interpersonal networks embedded between adjacent localities (Conell and Cohn 1995; Givan, Roberts, and Soule 2011; Gould 1991; Hedström 1994; Myers 1997; Vasi and Strang 2009). However, we do not know whether the effect of spatial proximity has diminished in contemporary times when online communication technologies are increasingly being utilized in coordinating protests. Therefore, research has yet to examine whether protests still spread to geographically adjacent communities and whether online activism is more easily translated into offline protests by the presence of protests in spatially proximate cities. We address these shortcomings by studying how online activism interacts with geographical contagion processes.

Hypotheses

Public Attention. We argue that the spread of occupy protests to new locations is influenced by the overall level of public attention to the movement in those locations. A high level of public attention to the occupy movement in a city or region indicates that citizens in that city or region are aware of the movement and want to find out more about it. Moreover, the search for information about the occupy movement is likely to be driven by the desire to support and/or participate in it. Although it is impossible to know the exact motivation behind the search for information, a widespread and well-established body of literature has shown that people search for information that confirms what they already believe in, rather than evidence that seeks to contradict what they believe in –a strong tendency termed "confirmation bias" (Baron 2004; Plous 1993; Taber and Lodge 2006). We recognize the theoretical possibility that a spike in

public attention to the occupy movement in a particular region is caused in part by searches conducted by people who have no intention of supporting the movement –and may even oppose it. However, we expect that the spike is most likely to be caused by people with an interest in joining the online conversation and/or the offline protests. Formally, we hypothesize:

> *Hypothesis 1a:* Communities with high levels of public attention to the movement will experience online activism associated with the occupy movement.
>
> *Hypothesis 1b:* Communities with high levels of public attention to the movement will experience offline activism –or actual occupations.

Social Media. We examine whether online activism precedes offline activism. Following researchers who have argued that Internet activities can be used to facilitate the organization of offline protests (Earl and Kimport 2010, 2011; Rane and Salem 2012), we argue that the Internet is an essential organizing tool for activists. In contrast to the early days of the Internet age, when activists could use only websites or email lists to broadcast information about a movement, nowadays activists can use Twitter and Facebook both for rapidly disseminating information about grievances and for organizing offline events. Indeed, the use of social media tools has increased dramatically over the last few years: by 2011 Facebook was used by approximately 75 percent of all U.S. Internet users, and Twitter was used by approximately 13 percent of all U.S. Internet users.[3] We explore which tools are used the most by organizers and analyze the effect of

[3] For information about Internet usage, see: http://www.internetworldstats.com/am/us.htm. For information about Facebook usage, see: *http://techcrunch.com/2011/12/29/2011facebookmarketsaturationus/*. For information about Twitter usage, see: *http://pewinternet.org/Reports/2011/Twitter-Update-2011/Main-Report.aspx*.

online activism on offline protests. Given that more internet users use Facebook than other social networking tools, we anticipate that Facebook activism will have a stronger effect than activism on other social media platforms.[4]

We also examine if the effect of online activism on offline protests change over time. We anticipate that the effect of online activism will increase over time because early protests likely to be organized in communities with numerous experienced activists who know each other through direct personal ties and, therefore, less dependent on social media. As time passes and protests spread to communities with fewer experienced activists, protests are likely to require more planning and online social networking is likely to increase in importance. Thus, we hypothesize:

> *Hypothesis 2a:* Communities that experience online activism will experience actual occupations.
>
> *Hypothesis 2b:* The effect of Facebook will be stronger than the effect of other social media platforms.
>
> *Hypothesis 2c:* The effect of online activism on actual occupations will increase over time.

Inter-municipal contagion. Finally, we examine the diffusion structure of occupy protests across municipalities. Previous research has shown that inter-municipal contagion is a spatial phenomenon because events that occur in nearby communities are visible and influential

[4] Anecdotal evidence supports this argument; for example, Gaby and Caren (2012: 369) note that the Facebook page for Occupy Boston had over 28,000 likes, while less than 18,000 people subscribed to the Occupy Boston Twitter feed.

(Hedström 1994; Conell and Cohn 1995; Myers 1997; Vasi and Strang 2009). Research on the diffusion of sit-ins through the American South in 1960, for example, has found that cities were more likely to experience sit-ins if they were spatially proximate to cities that already experienced them –yet, the effect of prior contention elsewhere diminished with distance between cities (Andrews and Biggs 2006). We examine the degree to which spatial proximity to sites of contention still matters in for the diffusion of contemporary social movements. While older social movements depended on local mass media for conveying information about protests elsewhere, recent movements are less dependent on local media coverage of contention because people can find information from various online sources: blogs, YouTube, social media platforms, etc. We also examine the interaction between social media platforms and the diffusion of protests: more specifically, we expect that online protests are more likely to develop into offline protests if protests have already emerged in neighboring cities. Therefore:

> *Hypothesis 3a:* Communities that are spatially proximate to actual occupations will experience actual occupations.
>
> *Hypothesis 3b:* The effect of online activism on actual occupation will increase if neighboring communities have already experienced offline protests.

Data and Methods

Dependent variables. We collected data on over 1,300 U.S. cities that had more than 25,000 people in 2010, for two reasons. First, because we consider that cities below this threshold are relatively unlikely to establish an occupation, in particular an occupation that involves a

significant number of people, receives media coverage, and has a starting date that can be clearly recorded. Second, because we could obtain data for all measures of interest only for cities above this threshold. The data was organized for event history analysis: the time period starts at September 16th 2011 because this is the day before the first Occupy protest occurred in New York City. The time period ends after 60 days, on November 15th –after this day very few new occupations emerged.[5] Indeed, the colder weather at the beginning of winter and the evictions enforced by municipal governments have made occupations unfeasible after this date –we found that no new cities joined the occupy protests in December 2011.

We used a discrete-time data in which there is an observation for each city for each day in the time period. We organized the data in four different data sets. In the first one, the dependent variable is the time until the first occupy protest emerges. Each city is given a 0 for each day that it does not experience an occupation and a 1 for the day in which it does. Once a city experiences an occupy protest, it is dropped from the analysis for the remaining days. In the second one the dependent variable is the time until a Facebook account to organize local protests is opened. Each city is given a 0 for each day that it does not open a Facebook account and a 1 for the day in which it does. Once a city opened a Facebook account, it is dropped from the analysis for the remaining days. A similar strategy is used for the two other datasets, in which the dependent variable is either the time until a Twitter account is opened, or the time until a website is created.

We identified occupy protests using information about the date when an OWS protest was first organized in a city using the following two-step strategy. First, we searched the *Occupy Together* website (*occupytogether.org*), which collects information about all protests associated

[5] As an alternative we extended the observation period to November 30th –the main results did not change.

with the Occupy movement in the United States are around the world. As a supplementary source, we used the interactive data that *The Guardian* collected about Occupy protest activities (*http://www.guardian.co.uk/news/datablog/2011/oct/17/occupy-protests-world-list-map*). Second, we conducted a Lexis Nexis search of all U.S. newspapers during this period as well as a Google search, including the terms "occupy" and the name of the city that was listed on the *Occupy Together* and *The Guardian* websites. In cases when a city experienced protests on multiple days, we recorded the first day of protest.

We identified the day when a Facebook account that contained the term Occupy and the name of a city was created using information from Facebook. We considered that the first day a Facebook user posted anything related to the Occupy protests on Facebook was the account opening date. We identified the day when a Twitter account that contained the term Occupy and the name of a city was created using information from Twitter. In identifying the account opening date of Twitter, we rely on a web service named whendidyoujointwitter (*http://www.whendidyoujointwitter.com*). We identified the day when a website was created using information from DSNstuff by searching for domain names that contained the term occupy and the name of a city (for example, "occupyChicago.org"); we used the WHOIS lookup tool available at: *http://www.dnsstuff.com/tools/*

Main predictors. We measured *public attention* to the Occupy movement using data from Google Insights for Search, a research tool which provides data on the relative frequency of search terms entered by Google users across time and geographic units. The search engine data obtained from Google's Insights for Search provides a valuable alternative to public opinion polls for measuring the salience of different issues within the population –or the public's

attention or mood. Public attention data obtained from Google Insights corresponds relatively closely with existing measures of issue salience such as opinion polls or mass media (Scheitle 2011).

We use Google Insight to measure daily public attention to Occupy Wall Street protests. We searched Google Insights for the term "occupy".[6] We searched the most detailed geographic level available −Metro areas− between September 16th and November 15th 2011. Google Insights data is normalized by dividing the term's frequency to the total number of searches for a particular case. Google fixes a certain "low-interest threshold" –thus, only searches involving a level of interest above this threshold are presented and the rest are excluded as missing data. Results are presented on a scale from 0 to 100. To arrive at this final number, Google takes the normalized data and assigns the number 100 to the case that presents the highest overall search interest (for time series this case will be the day in which the search term received the highest level of attention), and scales the rest of the cases proportionally.

Google Insights allows for comparisons between searches of a maximum of five different geographical locations at a time. To make search trends comparable between locations, Google selects from these locations the one receiving the most interest in any particular day during the time frame selected and leaves it unchanged. It then scales the searches from the rest of the locations to make possible the comparison between them. In order to search for all the metro areas that can be compared, we selected a metro area as a benchmark and then retrieved data

[6] In addition to this broad term we included a narrower term, "occupy Wall Street". We found that the effects of this alternative measure were similar, but less significant. This is probably due to the fact that individuals interested in joining local protests are more likely to search for information about local occupations than about the New York City occupation (for example, citizens for from Oakland are likely to search for "occupy" *and* "Oakland" rather than "Occupy Wall Street"). We do not include these results for simplicity in presentation.

keeping the benchmark as a reference. We selected as a benchmark Burlington, Vermont, because this metro area received the most attention for this particular search during the period of the study. Since Google sometimes updates the Google Insights taxonomy retroactively, we collected data on one day only -December 7th, 2011.

In the first data set, when the dependent variable is the time until the emergence of the first occupy protest, we also used as predictors the opening of Facebook and Twitter accounts or of websites. In this case the variables *Facebook*, *Twitter*, and *website* had a value 0 if no account or website was created in a day and 1 for the day when an account or a website was created and all following days.

In addition, we calculated spatial proximity to occupations by using information about latitudes and longitudes for each city in the data set. We developed a special program to calculate the total number of occupations within a certain radius around each city for each day. We experimented with various distances but, for simplicity in presentation, we show results from the following: 30 miles, 45 miles, 60 miles, and 100 miles radius.[7]

Covariates. We include a number of control variables: *city population*, since larger cities are more diverse and more likely to experience protests; *income change*, since cities where personal income declines rapidly are more likely to experience protests; *Internet speed*, since access to Internet may determine the level of online activism. We added as a control the *type of local government* –since cities that have a mayor/council form of government may have a higher frequency of protests (Eisinger 1973; Snow, Soule, and Cress 2005). The variable city population

[7] The program for calculating distances for each city was written in R (version 2.15.2). All statistical analyses were performed in STATA (version 11.0).

was measured using data from the U.S. Census Bureau for the year 2010 -we used the natural logarithm to stabilize skew in the variable population. The variable income change was measured using data from the American Community Survey. This variable was measured as decrease in income between 2006 and 2000, the most recent years for which city-level statistics were available. The variable access to the Internet was coded using data from the National Broadband Map at the lowest possible level of measurement −the county. We used the common measure of combined download speed greater than 3 megabits per second and upload speed greater than 768 kilobits per second. The variable Mayor-Council was measured using data from the U.S. Census Bureau about the form of local government.[8]

The spread of Occupy protests is likely to be influenced by the political orientation of the community. While many of the occupy protesters claimed to be non-partisan,[9] the movement is aligned primarily with the political left. Indeed, the movement's most popular slogan –"we are the 99 percent"– draws attention to rising socio-economic inequalities and the gap between the very rich and the rest. Not surprisingly, a survey of over 5000 participants in the movement found that about three quarters of respondents voted for Barack Obama in the 2008 presidential

[8] In results not shown we used alternative control measures to check for robustness of findings. We used data from the 2000 and 2004 presidential elections and different measures of internet access –for example, download speeds greater than 10 and 25 megabits per second. We also used as controls level of education and poverty rate (at the county level, for the most recent year available, 2004). We disaggregated the index of progressive activism into three separate variables, which corresponded to living wage, civil liberties and peace activism. These alternative measures did not change the effects of variables of interest –for simplicity in presentation we do not show these results.

[9] According to an online survey on the occupywallst.org website visitors, 70.2% of the occupiers answered that they are politically independent, while 27.4% marked their partisanship as Democrats. Only 2.4% of the occupiers noted that they are Republicans. The survey was conducted on October 21-22 by Harrison Schultz and Hector R. Cordero-Guzman (*http://www.fastcompany.com/1792056/occupy-wall-street-demographics-infographic*, retrieved as of April 4, 2012).

elections.[10] Therefore, we measure the left-of-center political orientation of the community as the *percent of voters* for Barack Obama during the 2008 election. We coded this variable using data from David Leip's Atlas of U.S. Presidential Elections.

Organizational resources are also likely to important for the spread of the movement. Following a long tradition of anarchist organizers, the movement used a horizontal organizing structure. However, despite its horizontal organizing structure, the movement is likely to have benefited from pre-existing mobilizing structures.[11] Formal organizations and informal networks associated with other, "miscible" (Vasi and Strang 2009) movements are likely to contribute to the spread of occupy protests. Indeed, a survey of movement participants has found that almost 60 percent of respondents have previously been involved in other social movements and a similar number of respondents belong to non-profit organizations.[12] We measured organizational resources in a number of ways. First, we created the variable *labor unions*, since unions have expressed their support for the occupy protests. Second, we created the variable *civic and social associations*, since these associations may provide organizational resources for protesters. The variables labor unions and civic and social associations were coded using data from the 2010 U.S. Bureau of Labor Statistics Quarterly Census of Employment and Wages –we standardized these variables per 10,000. Third, we created the variable *number of universities* because student

[10] See: Preliminary Findings: Occupy Research Demographic and Political Participation Survey, accessed online in March 2012 at: *http://www.occupyresearch.net/2012/03/23/preliminary-findings-occupy-research-demographic-and-political-participation-survey/*

[11] Mobilizing structures are "collective vehicles, informal as well as formal, through which people mobilize and engage in collective action" (McAdam, McCarthy, and Zald 1999)

[12] See: Preliminary Findings: Occupy Research Demographic and Political Participation Survey, accessed online in March 2012 at: *http://www.occupyresearch.net/2012/03/23/preliminary-findings-occupy-research-demographic-and-political-participation-survey/*

debt has been one of occupy protesters' main grievances and many protest participants were students. This variable was coded using data from the Higher Education General Information Survey -we standardized the number of universities variable per 10,000 people.

Finally, we created a variable that captures the recent *history of activism* on progressive issues in a community because these communities are likely to have experienced activists who may initiate occupations. We collected data about three major campaigns that spread widely and resulted in the adoption of local resolutions during the last 15 years: living wage, civil liberties, and anti-war. We obtained data about living wage ordinances from the Association of Community Organizations for Reform Now (ACORN); we obtained data about the passage of civil liberties from the Bill of Rights Defense Committee (BORDC); we obtained data about the passage of peace resolutions from the Institute for Policy Studies.[13] The progressive ordinances index was calculated by summing the number of ordinances adopted by each city –the three items covaried somewhat strongly, with a Cronbach's alpha of .63. Table 1 shows descriptive statistics and correlations for all of the independent variables.

[Table 1 about here]

[13] Activism on living wage issues started in the mid-1990s, as a response to the failure of federal and state minimum wage laws to keep pace with inflation and to enable the lowest-paid workers to live above the poverty line. We obtained data about living wage resolutions from the Association of Community Organizations for Reform Now (ACORN), (*http://www.livingwagecampaign.org/index.php?id=1961*) in January 2010. Activism to protect civil liberties by adopting Bill of Rights resolutions emerged after the USA PATRIOT Act was signed into law in 2001. We obtained data about civil liberty resolutions from the Bill of Rights Defense Committee (*http://www.bordc.org/about/index.php*) in January 2010. Activism against the war started in 2002, in anticipation of the war with Iraq –we obtained data about peace resolutions from the Institute for Policy Studies (*http://www.ips-dc.org/about*) in January 2010. Of the total number of cities with a population above 25,000, 77 cities passed living wage laws, 135 cities passed Bill of Rights resolutions, and 66 cities passed anti-war resolutions by 2010.

Estimation. Because the dependent variables are the day when the first Occupy event occurred in a city, and the day when a Facebook or Twitter account or a website was created, hazard models are appropriate for estimating our model (Bennett 1999; Box-Steffensmeier and Jones 1997, 2004). We use Cox proportional hazards model with exact marginal likelihood because of ties in our data.[14] The hazard rate for the Cox distribution is:

$$h_i(t) = h_0(t) \cdot \exp(\beta' x) = h_0(t) \cdot \exp(\beta_1 x_{1i} + \beta_2 x_{2i} + \ldots \beta_k x_{ki})$$

where $h_0(t)$ is the baseline hazard function, β is regression coefficients, and x is covariates (Box-Steffensmeier and Jones 2004). Estimation of proportional hazards models when hazards are nonproportional can result in biased estimates, incorrect standard errors, and faulty inferences about independent variables' impacts (Box-Steffensmeier and Jones 2004). We use the Grambsch and Therneau tests for non-proportional hazards and we find that a number of variables have non-proportional hazards. We address the violations of proportionality by estimating standard Cox models with the addition of interaction effects between offending

[14] The Cox proportional hazards model is widely used in social science research as an alternative to parametric models. These models are appropriate for answering the following question: given that a city has not experienced a protest or used social media and websites by the day under observation, what is the probability that it will do so during that day? They are also well suited for dealing with right-censored data, since the time period ends before all potential events have a chance to occur. The main advantages of hazard models –compared to models such as probit or logit– are that they allow changes in the independent variables over time to affect the probability of experiencing the event, and that they allow the effect of a unit change in the level of an independent variable on the probability of adopting a policy to vary, depending on when changes occur in the time period. Cox model with exact marginal likelihood are used with tied data –i.e. when many cases have equivalently recorded event times –see Box-Steffensmeier and Jones (2004).

covariates and a function of time (Kalbfleisch and Prentice 1980; Box-Steffensmeier and Zorn 2001; Box-Steffensmeier and Jones 2004).[15]

Results

Results are presented in Tables 2-7. Results in Table 2 show the effects of public attention to the movement on online activities associated with the Occupy movement.[16] The effect of public attention is statistically significant ($p<.001$) for activism on Facebook and Twitter; for websites, however, the effect of Google searches is not significant. Since we lagged Web searches by one day, we rule out the possibility of reverse causality, namely that the number of Web searches increased after Facebook and Twitter accounts were created or after the Occupy protests occurred in a city. Thus, these results partially support hypothesis 1a: communities with high levels of public attention to the movement will experience Facebook and Twitter activism, but not website activism.

[Table 2 about here]

[15] While various functions of time are possible (time, natural logarithm of time, time X time, etc), we choose the simplest one because it is easiest to interpret. Alternative functional forms were explored but are not reported because results were substantially similar. Unlike in traditional tests of interaction effects, this method for address the violations of proportionality requires that time is not included as a covariate when it is interacted with other covariates in the Cox model (Box-Steffensmeier, Reiter and Zorn 2003).

[16] We tested for non-proportional hazards and we found that all variables of interest from these models have proportional hazards.

Results in this table also show that larger cities are more likely to create a social media account or a website dedicate to the movement, and that the higher the number of Democratic Party supporters in a community, the more likely that community is to create an Occupy account using Facebook and Twitter or a website. The effect for Democratic Party support is substantial: an increase of one in the percent of votes for Barack Obama during the 2008 elections corresponds to an increase of almost 1 on the log-odds of a city experiencing online activism associated with the Occupy movement.

Results in Table 2 also show that, while organizational resources matter for the spread of online protest activities, they do not matter in the same way. Communities with a high number of civic and social associations are significantly ($p<.001$) more likely to open an occupy account on Facebook and Twitter. Yet, civic and social associations do not have an effect on the creation of a website associated with the occupy movement. In contrast, the variable labor unions has a significant ($p<.01$) effect on the creation of an occupy website, but not on the opening of a Facebook and Twitter account. This important difference suggests that websites are a tool used more by labor groups, while Facebook and Twitter are used more by various civic and social associations loosely associated with the occupy movement.

In addition, results in Table 2 show that universities have a significant ($p<.001$) effect on online protest activities. The largest effect of universities is on the creation of Twitter and Facebook accounts: an increase of one in the number of universities per 10,000 people corresponds to an increase of almost 36 on the log-odds of a city opening an Occupy account on Twitter, and to an increase of almost 25 on the log-odds of a city opening an Occupy account on Facebook. This could be interpreted as a consequence of the fact that Facebook and Twitter are very popular among college students. Similarly to universities, the history of progressive

activism index has a significant effect on the opening of Facebook and Twitter accounts, and on the creation of websites. Thus, communities with a high number of activists involved in past campaigns on progressive issues are more likely to experience online protest activities.

Table 3 shows the effect of public attention and social media on the spread of offline activism. Model 2 shows that public attention to the movement has a significant effect on the emergence of offline activism; however, when social media variables are added in models 3-6, the effect of public attention becomes non-significant. It is important to point out that, despite these results, we cannot reject hypothesis 1b –which states that communities with high levels of public attention to the movement will experience actual occupations. This is because, while we do not find evidence of a direct effect of public attention on the emergence of occupations, we find evidence of indirect effects. Public attention to the movement increases the likelihood of opening a Facebook or Twitter account, which in turn increases the likelihood of an actual occupation –see the results below.

Models 3-5 add the effects of social media variables. All of these variables have significant effects, but the largest effects are those of Facebook: opening an Occupy account on Facebook increases the log odds of a city experiencing an actual protest by almost 41, while opening a Twitter account and a website increases the log odds of a city by approximately 19, respectively 6. Model 6 adds the effects of Facebook, Twitter, and websites –in this case, only Facebook and Twitter have significant effects. In addition, we find that variables population, universities, and progressive index have significant and robust effects; more specifically, larger cities, with one or more universities, and with a tradition of progressive activism are more likely to experience actual occupations than other cities.

[Table 3 about here]

Figure 1 shows that the use of social media and websites generally precedes the emergence of protests −but important differences exist between different types of social media. In general, Facebook accounts are opened earlier than Twitter accounts, which are opened earlier than websites. The median starting date of occupy protests is October 15th, while the median opening dates of Occupy accounts in Facebook and Twitter, and of websites for specific communities are, October 3rd, October 5th and October 6th. When comparing the overall levels of usage of social media and the Internet to organize protests, we find that Facebook was used more often than Twitter and websites, and Twitter was used more often than websites. Facebook was used in 364 cities, Twitter was used in 281 cities, and websites were used in 200 cities. These results are consistent with the fact that creating a website is a more complex enterprise than creating a Facebook or Twitter account for a particular location. The results are also consistent with the fact that more Americans used Facebook than Twitter in 2011. Taken together, Table 3 and Figure 1 support hypotheses 2a and 2b: communities that experience online activism are likely to experience actual occupations, but the effect of Facebook is stronger than the effect of other social media platforms.

[Figure 1 about here]

We test for non-proportional hazards –results are displayed in Table 4. These results show that the variables Facebook account, population, and progressive index –from model 3, Table 3− have nonproportional hazards. Similarly, variables Twitter account, population, and

Democratic Party –from model 4, Table 3− have nonproportional hazards; also variables website, population, and Democratic Party –from model 5, Table 3− have nonproportional hazards. We address the violations of proportionality by adding interaction effects between offending covariates and a function of time –results are presented in Table 5. In accordance with our theoretical expectations (hypothesis 2c), results from this table show that the effects of Facebook, Twitter and websites increase over time.

[Tables 4 and 5 about here]

To compare the effect of Facebook with and without time interactions, Figure 2 plots the estimated odds ratio for model 1 in Table 5 and model 3 in Table 3. This plot shows that the effect of Facebook increases exponentially in the second half of the period (after day 30). Model 3 in table 3 –which assumes a proportional effect for opening a Facebook account– would suggest that creating a Facebook account increases the hazard ratio by a factor of 6.E+17 [exp(40.9)] for all days. In contrast, model 1 in table 5 shows that this effect is relatively small in the first days but increases gradually such that, by day 34 creating a Facebook account increases the hazard ratio by a factor of 7.E+18 [=exp(0.228+1.198*(time)]. Therefore, Figure 2 illustrates how a model that assumes proportional hazards produces misleading inferences about the effect of non-proportional measures. This figure shows that cities that experience "Facebook occupations" are significantly more likely to experience occupations, but this effect increases exponentially with time.

[Figure 2 about here]

Finally, we present results from tests of inter-municipal diffusion in Tables 6 and 7. We find that spatial proximity to occupations matters: more specifically, we find that cities that are within 30 to 45 miles from cities with occupations are more likely to experience occupations at a later time. However, cities that are over 60 miles from cities with occupations are not significantly more likely to experience occupations. Thus, even in the age of Internet activism, when contention could –in theory– spread fast across vast areas and geographical distances should matter little, we find that spatial proximity to previous sites of contention matters. Interestingly, however, the effect of spatial proximity is greatly enhanced by the presence of online activism. Results in Table 7 show that cities that already opened an Occupy account on Facebook *and* are proximate to existing occupations are likely to experience occupations in the future. The interaction effects decrease with distance – the log-odds of a city experiencing an occupation increase by a factor of 2.2 for cities within 30 miles of existing occupations, but only by 1.5 for cities within 60 miles and by 1.3 for cities within 100 miles. These effects are similar −but slightly less substantive− for Twitter and websites; we do not show these results for simplicity in presentation. Therefore, these results show that hypotheses 3a and 3b are supported: communities that are spatially proximate to actual occupations will experience actual occupations, and the effect of spatial proximity to actual occupations will increase if communities also experience online activism.

[Tables 6 and 7 about here]

Discussion

The occupy protests are some of the fastest and widest spreading protests in U.S. history. The protests popularized an uncommon social movement repertoire –the long-term occupation of a public space– and created a significant debate around an important topic: rising socio-economic inequality. What do we learn about the spread of contentious collective actions from the case of the occupy movement?

This study contributes to the literature on diffusion and social movements by advancing a "theory 2.0" (Earl and Kimport 2011) of the use of Internet-enabled technologies, which argues that these technologies change the actual process of organizing. We highlight three specific contributions. First, we show that public attention to a social movement is a useful predictor for the spread of the movement. Public opinion surveys have been the only tool available for measuring public perceptions of movements in potentially contentious sites, but cost limitations have prevented surveys from capturing significant regional or temporal variation in attitudes toward movements. Thus, social movement scholars may have known how people in a particular region and moment in time were feeling about a movement, but not how people from a specific metropolitan area were feeling about a movement on a daily basis. By using data from Internet searches for "occupy" we were able to measure public attention toward the occupy movement in unprecedented detail and to show that public attention shapes the spread of actual protests.

An interesting finding is that public attention had a direct effect on the emergence of online activities associated with the occupy movement such as the creation of Facebook and Twitter accounts, but not on websites. We argue that this is because websites were often created later than Facebook or Twitter accounts, when public attention to the movement has decreased. Equally interesting, however, is the finding that, although public attention does not have a direct

effect on the emergence of offline activism, it has an indirect effect. More specifically, public attention contributes to the spread of occupations by influencing the creation of Facebook and Twitter accounts, which in turn contribute to the spread of protests.

We acknowledge that these findings may be limited by the fact that the public attention measure uses information about web searches from one search engine: Google. However, we believe that this is not a major limitation because Google is the most popular search engine –it accounted for approximately 75 percent of the U.S. search engine market during the period of this study. We also acknowledge another potential limitation: information about the intention behind the search is missing. While we do not know the motivation behind the search for information about Occupy protests, we do not consider this a critical shortcoming, for a number of reasons.

One reason is that most people seek confirming evidence –either in logical problem solving tasks, job interviews, or news search–, a predisposition known as "confirmation bias" (Baron 2004; Plous 1993; Taber and Lodge 2006). Numerous studies have shown that people search for information that confirms what they already believe, rather than evidence that seeks to contradict what they believe –for a review of the psychological literature, see Nickerson (1998). For example, in an experiment which allowed people to select the source of their information about gun control or affirmative action, Taber and Lodge (2006) found that supporters of gun control or affirmative action were significantly more likely to search out the arguments of "their" issue groups. As the authors conclude: "To the extent one's attitude reflects considerable prior thought, it may well be more trustworthy than new information, especially if -as is so often the case in the political realm- that new information reflects the strategic behavior of political opponents. Simply put, if one thinks (more pointedly, feels) that the veracity of the evidence is

dubious, the opposition is wrong, or the media hostile, then why pay them heed?" (Taber and Lodge 2006: 767) Therefore, growing public attention to the occupy movement is likely to be the consequence of search for information from people who believe that "something is rotten in the state of Wall Street" and sympathize with the movement.[17]

Another reason is that existing research suggests that Google-based search measures of public attention are consistent with other measures of public attention. Comparing results from Google searches and issue coverage in the New York Times, Ripberger (2011) found that the trend for searches on health care, global warming and terrorism tract closely the trends for media coverage of those issues. Using vector autoregression, correlation analysis, and visual inspection, Ripberger (2011: 250) concludes that "the search volume measure and the media coverage measure are indeed similar to one another […], which furthers confidence in search-based measures of public opinion." Similarly, Scheitle (2011) finds that Google searches for terms such as "unemployment", "immigration" or "terrorism" are highly correlated with results from public opinion polls about the most important issues facing the country. Moreover, he finds that searches for terms such as "Catholic church" correlate strongly with actual Catholic service attendance by region. Thus, research suggests that Google searches are valid measures of public attention to the movement –and ones that are much more practical than other measures such as newspaper coverage or surveys.

[17] The paraphrase "Something Is Rotten In The State Of Wall Street" was used in 2009 by Robert Lenzner, the National Editor of Forbes magazine. According to Lenzner, "It's time to fix an appalling compensation system that lavishly rewards the losers who got into trouble and shafts the savior." See Forbes.com, accessed online in March 2012 at: *http://www.forbes.com/2009/08/07/citigroup-goldman-sachs-personal-finance-investing-ideas-bank-america.html*

An additional reason comes from studies which show that public attention to a specific problem increases primarily because of people who need to find a solution to that problem. In a recent influential study, Ginsberg et al (2008) find that Google searches for influenza-like symptoms can be used to predict outpatient visits to physicians in the United States. Similarly, Eisenberg (2006) finds a very high correlation between Google searches for influenza-related terms and epidemiological data from Canada. These studies dramatically illustrate the predictive power of Internet searches. For example, these studies show that Google searches estimate consistently the percentage of influenza-like-illnesses at least one week ahead of physician-registered flu cases. We argue that most searches for the occupy movement were generated by people preoccupied by growing social inequality and other social problems addressed by this movement –but we recognize that some searches were probably conducted by people with no interest in these problems.

A second important contribution of this study is to show that social media is a crucial tool for modern activists. Previous studies have argued that online activities can facilitate offline protests (e.g. Earl and Kimport 2010, 2011; Rane and Salem 2012), but no studies have rigorously tested this assumption. Our findings show that information about Facebook and Twitter activities is valuable for predicting the spread of occupy protests. Facebook has provided an essential platform for activists interested in organizing general assemblies and planning offline protests. Twitter accounts have usually been opened a few days later than Facebook accounts and were generally used to recruit additional participants. Adding information about the date when occupy Facebook accounts were opened for different cities improves the accuracy of traditional models of diffusion of contentious collective actions by the largest margin, but so does information about Twitter accounts. A related, equally important finding is that the effect of

online activism on offline protests increases over time. We argue that this is because early protests are likely to be organized in communities with activists who know each other through direct personal ties and, therefore, are less dependent on social media usage. As protests spread to communities with fewer experienced activists, protests require more planning and online social networking increases in importance.

A third contribution of this research is to reveals that spatial structures of diffusion matter even for protests organized in the age of the Internet. Our results show that emergence of new occupations is influenced by existing occupations in neighboring communities. But existing occupations are more likely to be influential on spatially proximate cities if these cities already experience online activism. Remarkably, the presence of online activism increases the geographical influence of existing occupations: thus, even cities that are more than 60 miles away from existing occupations are significantly more likely to experience protests if they already have a Facebook or Twitter account, or a website dedicated to the occupy movement – even though the effect becomes rather weak for occupations over 100 miles away. These results show that inter-municipal contagion is an enduring phenomenon, which shapes the spread of contagion even for contemporary social movements that use the Internet and social media as their primary communication channels and mobilizing tools; however, Internet enabled technologies have the ability to enhance the effect of contagion between communities.

Finally, our study shows that organizational resources such as direct still matter for the spread of contention in the Internet age. Despite the movement's anarchist roots and horizontal organizing structure, the movement benefited from proximity to universities and civic and social associations, which provided organizational resources such as meeting space and informal networks between activists. The importance of informal networks of activists is highlighted by

the fact that the history of activism on progressive issues has a relatively large effect on the emergence of both online and offline activism associated with the occupy movement. This argument is consistent with the fact that a majority of the participants surveyed have previously been involved in another social movement. In short, our findings are consistent with research on social movement diffusion (e.g. Andrews and Biggs 2006; Vasi and Strang 2009), demonstrating that organizational resources matter even for movements that claim to be decentralized and rely heavily on cyber-brokerage to connect activists. In short, our study suggests that, despite the uncontested utility of online social networks for protest, the place-based utility of personal ties remains relevant and we should not "superficially celebrate digital mediation" (Pickerill and Krinsky 2012: 285).

Data available from social media tools such as Twitter and Facebook and search engines such as Google has the potential to significantly improve our understanding of the spread of contention. As social media and the Internet are used more and more in the world, these new technologies are likely to become indispensable organizing tools for activists. We identify a few promising directions for future research on the role of the Internet and social media for contention: for example, examining how social media and online activities contribute to social movement participation and recruitment, the emergence of fractions within movements, or the formation of alliances between different movements.

Table 1. Means, standard deviations and correlations of variables

		Mean	S.D.	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
(1)	Offline protests	.01	.05	1									
(2)	Population (ln)	10.97	.66	.08	1								
(3)	Income	-4.18	4.84	.01	.08	1							
(4)	Internet speed	.97	.10	.00	.00	-.12	1						
(5)	Democratic Party	56.70	12.52	-.01	-.09	.01	.13	1					
(6)	Labor unions	4.98	4.58	.00	-.12	-.23	.06	.34	1				
(7)	Civic/social assoc.	14.49	9.81	.01	-.1	-.04	-.04	.06	.40	1			
(8)	Universities	.04	.10	.04	-.01	.10	-.06	-.03	-.02	.13	1		
(9)	Prog. activism index	.17	.53	.06	.25	.06	.06	.18	.13	.15	.25	1	
(10)	Google Searches	3.62	3.80	.03	-.07	-.01	-.01	.21	.03	.01	-.06	.02	1

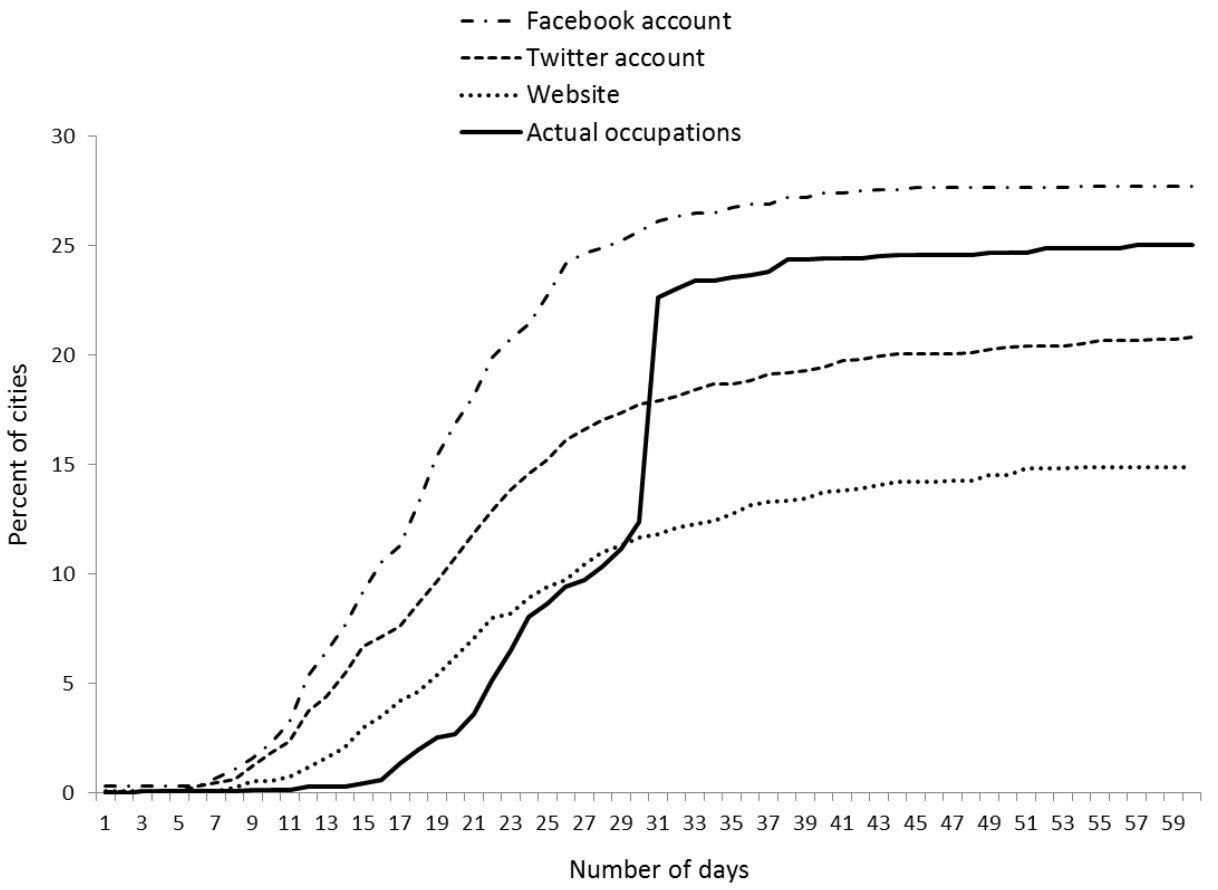

Figure 1. Social media and the spread of "Occupy Wall Street" contention.

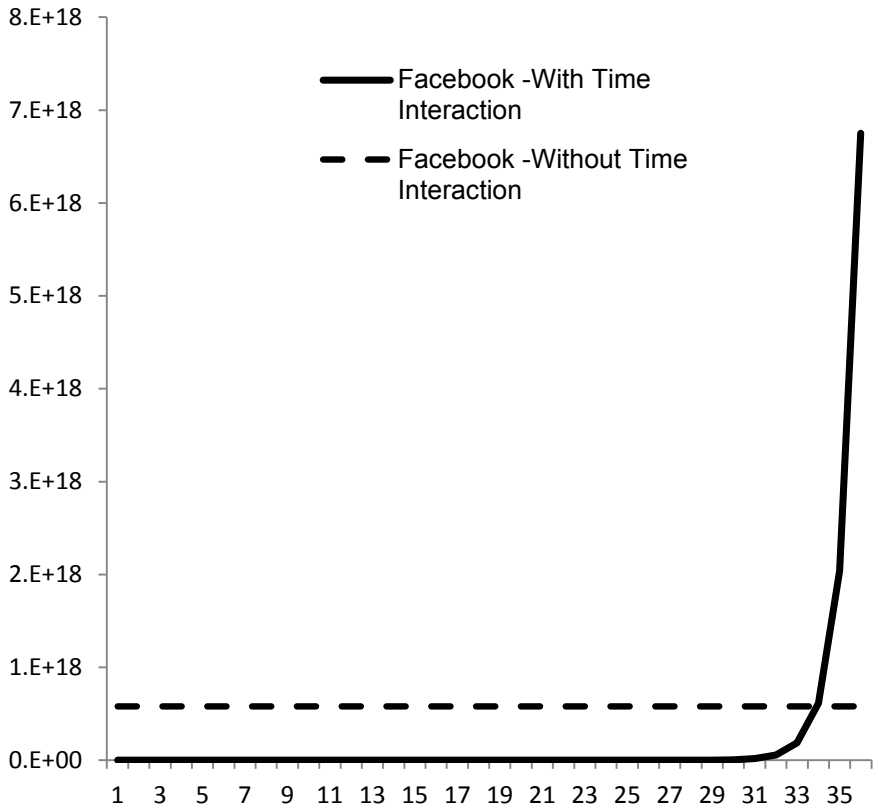

Figure 2. Odds ratio by duration for the Facebook variable; estimated odds ratio for model 1, Table 2 –with time interaction- and for model 3, Table 1 –without time interaction.

Table 2. Public attention and the spread of online activities between September 16th and November 15th 2011 (Cox regression –exact marginal likelihood)

	Facebook	***Twitter***	***Websites***
Public attention			
Google Searches	.825***	.846***	.941
	(.033)	(.042)	(.037)
Controls			
Population (ln)	3.353***	5.326***	2.802***
	(.280)	(.927)	(.229)
Mayor-Council	1.263	1.298	1.471
	(.223)	(.378)	(.331)
Income change	1.011	1.022	1.044
	(.020)	(.030)	(.027)
Internet speed	1.066	1.004	.712
	(.673)	(1.198)	(.546)
Democratic Party	.971***	.955***	.958***
	(.006)	(.011)	(.008)
Labor unions	1.025	1.004	1.069***
	(.013)	(.032)	(.021)
Civic assoc.	1.025***	1.021*	1.009
	(.007)	(.011)	(.009)
Universities	25.104***	36.776***	17.980***
	(9.459)	(16.121)	(9.117)
Progressive index	1.328**	2.676***	1.871***
	(.138)	(.459)	(.224)
Number of obs.	46352	42577	49856
Chi-square	394.95***	186.06***	290.46***

Note: * $p < .05$; ** $p < .01$; *** $p < .001$

Table 3. Public attention, social media and the spread of offline activism between September 16th and November 15th 2011 (Cox regression –exact marginal likelihood)

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Public Attention						
Google searches		.942**	.981	.961	.941**	.980
		(.020)	(.019)	(.021)	(.021)	(.021)
Social Media						
Facebook account			40.901***	_	_	25.790***
			(9.733)			(7.307)
Twitter account				18.865***	_	2.330***
				(4.105)		(.563)
Website					5.745***	1.184
					(1.242)	(.250)
Controls						
Population (ln)	3.781***	3.754***	1.610***	1.908***	2.698***	1.522***
	(.327)	(.328)	(.157)	(.199)	(.273)	(.168)
Mayor-Council	1.098	1.107	.775	.746	.784	.658*
	(.185)	(.188)	(.134)	(.130)	(.136)	(.126)
Income change	1.035	1.035	1.047*	1.023	1.028	1.050*
	(.019)	(.019)	(.021)	(.020)	(.019)	(.023)
Internet speed	.620	.567	.503	.698	.616	.459
	(.360)	(.321)	(.298)	(.421)	(.381)	(.300)
Democratic Party	.973***	.978***	1.001	.988	.980**	1.001
	(.006)	(.006)	(.006)	(.007)	(.006)	(.007)
Labor unions	1.019	1.017	.999	1.012	1.007	.999
	(.016)	(.016)	(.016)	(.016)	(.015)	(.017)
Civic assoc.	1.025***	1.025***	1.010	1.016*	1.024***	1.010
	(.007)	(.007)	(.007)	(.008)	(.007)	(.008)
Universities	21.422***	20.350***	5.446***	5.195**	17.316***	3.555*
	(7.582)	(7.111)	(2.865)	(2.952)	(6.350)	(2.137)
Progressive index	1.624***	1.675***	1.351**	1.227*	1.431***	1.305*
	(.153)	(.161)	(.140)	(.125)	(.146)	(.150)
Number of obs.	48056	48056	48056	48056	48056	48056
Chi-square	410.02***	417.56***	720.86***	621.53***	481.14***	759.05***

Note: * $p < .05$; ** $p < .01$; *** $p < .001$

Table 4. Non-proportional hazard diagnostics (Grambsch and Therneau tests; the tests correspond to models 3-5 in Table 1).

	$\rho \mid \chi^2$	$\rho \mid \chi^2$	$\rho \mid \chi^2$
Google searches	-0.07	-0.03	-0.08
	1.16	0.26	1.94
Facebook account	0.30		
	29.89***		
Twitter account		0.15	
		7.65**	
Website			0.15
			7.14**
Population (ln)	-0.27	-0.14	-0.14
	17.50***	4.78*	4.87*
Mayor-Council	0.04	0.01	-0.01
	0.36	0.00	0.08
Income change	-0.01	-0.04	0.00
	0.01	0.39	0.00
Internet speed	0.05	-0.01	0.04
	0.43	0.01	0.31
Democratic Party	-0.08	-0.18	-0.20
	1.23	5.90**	6.95**
Labor unions	0.01	0.02	0.05
	0.01	0.13	0.91
Civic assoc.	-0.11	-0.07	-0.11
	2.51	1.16	2.91
Universities	-0.18	-0.11	-0.06
	5.71*	2.16	0.42
Progressive index	0.04	-0.04	-0.00
	0.45	0.36	0.00
Global Test	46.07***	28.79**	24.00*

Note: * $p < .05$; ** $p < .01$; *** $p < .001$

Table 5. Social media and the spread of offline activism between September 16th and November 15th 2011 –time interactions for non-proportionality (Cox regression –exact marginal likelihood)

	Model 1	**Model 2**	**Model 3**
Time Interactions			
Facebook X Time	1.198***	_	_
	(.038)		
Twitter X Time	_	1.084**	_
		(.031)	
Website X Time	_	_	1.133***
			(.040)
Population X Time	.953***	.987	.979
	(.012)	(.012)	(.012)
Universities X Time	.850*	_	_
	(.055)		
Democratic X Time	_	.996***	.996***
		(.001)	(.001)
Controls			
Google searches	.982	.975	.945*
	(.021)	(.022)	(.021)
Facebook	.228	_	_
	(.212)		
Twitter	_	1.892	_
		(1.643)	
Website	_	_	.205
			(.201)
Population (ln)	6.335***	2.763**	4.855***
	(2.303)	(.971)	(1.753)
Mayor-Council	.740	.743	.720
	(.137)	(.130)	(.129)
Income change	1.054*	1.017	1.023
	(.023)	(.020)	(.019)
Internet speed	.501	.627	.542
	(.348)	(.390)	(.340)
Democratic Party	1.002	1.097***	1.070**
	(.007)	(.028)	(.027)
Labor unions	.995	1.003	1.003
	(.017)	(.015)	(.015)
Civic assoc.	1.016*	1.017*	1.024***
	(.008)	(.008)	(.007)
Universities	421.462***	5.154**	18.219***
	(725.177)	(3.024)	(6.829)
Progressive index	1.421**	1.169*	1.378**
	(.159)	(.119)	(.144)
Number of obs.	48056	48056	48056
Chi-square	778.59***	645.06***	503.06***

Note: * $p < .05$; ** $p < .01$; *** $p < .001$

Table 6. Inter-municipal contagion and the spread of occupations between September 16th and November 15th 2011 (Cox regression –exact marginal likelihood)

	Model 1	**Model 2**	**Model 3**	**Model 4**
Spatial proximity to occupations				
30 miles	.776*	_	_	_
	(.097)			
45 miles		.825*	_	_
		(.073)		
60 miles			.919	_
			(.059)	
100 miles				.894
				(.044)
Controls				
Google searches	.984	.982	.980	.984
	(.021)	(.021)	(.021)	(.021)
Facebook account	22.115***	21.682***	23.355***	21.915***
	(6.365)	(6.275)	(6.779)	(6.310)
Twitter account	2.220***	2.220	2.275***	2.341***
	(.539)	(.538)	(.552)	(.568)
Website	1.138	1.132	1.174	1.157
	(.244)	(.243)	(.251)	(.248)
Population (ln)	1.538***	1.541***	1.514***	1.493***
	(.173)	(.173)	(.169)	(.166)
Mayor-Council	.613*	.615*	.629*	.612*
	(.119)	(.119)	(.122)	(.119)
Income change	1.052*	1.053*	1.051*	1.057*
	(.023)	(.023)	(.023)	(.023)
Internet speed	.456	.467	.452	.407
	(.299)	(.307)	(.296)	(.267)
Democratic Party	1.006	1.006	1.003	1.005
	(.007)	(.007)	(.007)	(.007)
Labor unions	.998	.997	.998	1.000
	(.017)	(.017)	(.017)	(.017)
Civic assoc.	1.008	1.008	1.009	1.009
	(.008)	(.008)	(.008)	(.008)
Universities	3.306*	3.784*	3.588*	4.016*
	(1.958)	(2.330)	(2.193)	(2.441)
Progressive index	1.283*	1.278*	1.296*	1.301*
	(.149)	(.148)	(.150)	(.150)
Number of obs.	47252	47252	47252	47252
Chi-square	754.58***	755.45***	751.99***	754.51***

Note: * $p < .05$; ** $p < .01$; *** $p < .001$

Table 7. Inter-municipal contagion and the spread of occupations between September 16th and November 15th 2011 (Cox regression –exact marginal likelihood)

	Model 1	**Model 2**	**Model 3**	**Model 4**
Interactions				
Facebook X 30 miles	2.248*** (.578)	–	–	–
Facebook X 45 miles		1.819*** (.342)	–	–
Facebook X 60 miles			1.508** (.199)	–
Facebook X 100 miles				1.312** (.121)
30 miles	.495*** (.108)	–	–	–
45 miles		.582*** (.097)	–	–
60 miles			.721** (.084)	–
100 miles				.770*** (.060)
Google searches	.983 (.021)	.981 (.021)	.977 (.021)	.979 (.022)
Facebook account	12.509*** (4.016)	11.855*** (3.868)	12.529*** (4.170)	11.108*** (3.896)
Twitter account	2.428*** (.601)	2.397*** (.593)	2.446*** (.605)	2.366*** (.579)
Website	1.210 (.263)	1.192 (.259)	1.215 (.262)	1.164 (.252)
Population (ln)	1.526*** (.170)	1.550*** (.174)	1.552*** (.174)	1.557*** (.176)
Mayor-Council	.627* (.122)	.618* (.120)	.626* (.121)	.629* (.123)
Income change	1.054* (.023)	1.057* (.023)	1.057* (.023)	1.058* (.023)
Internet speed	.479 (.312)	.478 (.310)	.454 (.297)	.405 (.268)
Democratic Party	1.006 (.007)	1.006 (.007)	1.004 (.007)	1.007 (.007)
Labor unions	1.001 (.017)	1.001 (.017)	1.001 (.017)	.998 (.017)
Civic assoc.	1.009 (.008)	1.008 (.008)	1.009 (.008)	1.009 (.008)
Universities	2.954 (1.799)	3.368 (2.183)	3.517* (2.249)	3.397 (2.178)
Progressive index	1.276* (.149)	1.288* (.150)	1.302* (.152)	1.307* (.153)
Number of obs.	47251	47251	47251	47251
Chi-square	765.65***	767.29***	762.91***	764.87***

Note: * $p < .05$; ** $p < .01$; *** $p < .001$

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