Images that Matter:
Online Protests and the Mobilizing Role of Pictures†

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Paper prepared for the 2016 MPSA Conference

Do images shared online increase rates of protest mobilization? If so, how? In this paper we study the spread of Twitter support for Black Lives Matter and for Shutdown April 14, a specific Black Lives Matter protest, from April 13 to April 20, 2015. As predicted by the literature on images and social movements, we find that, all else equal, an increase in the percentage of tweets with images contributes to an increase in subsequent tweets about the movement. Similarly, an increase in the percentage of tweets with images contributes to a increase in the number of new users tweeting about the protest. We then consider which types of images contribute most to increases in online protest support. This allows us to adjudicate between theories that claim different mechanisms for why new imaging technology should facilitate political mobilization. Images might a) act as an emotional trigger; b) reduce information costs; c) increase expectations of success; or d) generate collective identity. Our paper thus provides empirical evidence supporting the broad argument that image-sharing increases the likelihood of a protest to diffuse while also teasing out the narrow mechanisms at play in a new media environment.

† Acknowledgements: Thanks are due to our two research assistants, Tyler Pichette and Trevor Joireman, and to the many readers of earlier paper drafts, including Lance Bennett, Megan Francis, Benajmin Mako Hill, James Long, Christopher Parker and Rebecca Thorpe. This research was made possible by a University of Washington Camden Hall Research Grant.

Introduction

Do images shared online increase rates of protest diffusion? If so, how? Anecdotal evidence from recent protests around the world suggests that the answer to the first question is a resounding "yes": for examples, one need look no farther than the 2013 Gezi Park protests in Turkey, where images of the "woman in red" being sprayed in the face with tear gas were shared online via social media and arguably contributed to an increase in support for the movement. In the United States, images of police actions against both the 2011 Occupy Wall Street (OWS) movement and the journalists who covered OWS galvanized support for the protesters. In Tunisia, images of Mohamed Bouazizi, the fruit vendor who set himself on fire in response to government mistreatment, spread rapidly on social media and have been described as catalyzing the late 2010-2011 Arab Spring uprisings throughout the Middle East. Video clips and still frames of Eric Garner's 2014 arrest and death in New York City expanded the reach of the Black Lives Matter movement.

However, despite compelling narratives along the lines described above, very little research has attempted to isolate the role of images in the spread of protests online (though some general explorations have begun, see for example Kharroub and Bas 2015). Highlighting only those cases where powerful images spread via social media ignores the many social movements whose images never "go viral." Beyond case selection concerns, researchers must contend with overlap between images and other variables of interest: perhaps the effect of the images in the protest movements above was less about the images themselves and more about the interaction of those images with other, more important factors such as the presence of material support and key protest organizers. Addressing both a gap in the literature and these methodological concerns, our paper makes two contributions to the discussion of images and the spread of protests online. First, we show a strong image effect in the expansion of an April 14, 2015 Black Lives Matter protest on Twitter, even after controlling for other factors that might mitigate the image effect, such as the differential influence of various Twitter users. Second, we tease out which types of images were the most impactful in spreading the protest online in order to test specific hypotheses put forward by prior scholars as to why images might matter in online social movement mobilization.

On April 14 2015, a coalition of activist groups, including the Stop Mass Incarceration Network and Hands Up United, organized a protest against police brutality in the United States. The protest took place at the national level with numerous demonstrations in cities such as New York, Los Angeles, Seattle, Baltimore, Oakland, and Ferguson. The demonstrations were a reaction to a set of highly salient episodes where police officers acted violently, and in some cases killed, African American citizens. Some of the most salient cases were the deaths of Trayvon Martin (February 26, 2012), Eric Garner (July 17, 2014), Michael Brown (August 9, 2014), Tamir Rice (November 23, 2014), Walter Scott (April 4, 2015), and Freddie Gray (April 12, 2015). As a part of the protest, the organizing groups not only called for a mobilization on the streets but also coordinated an online social media campaign in order to recruit new participants and to spread information about their cause. To promote the movement, organizing materials asked people to share messages about the protest and its goals by using specific hashtags and keywords such as #shutdownA14, #A14, #policebrutality, and #murderbypolice. In addition, organizing materials and tweets about the protest often included #blacklivesmatter, highlighting the crossover between the April 14 protest and the broader Black Lives Matter movement currently active throughout the United States.

In this paper we study the spread of online Twitter messages related to the protest to see if those messages that contained images played a special role in mobilizing supporters. We divide the general concept of social movement mobilization into two subcategories: attention and diffusion. In short, we are interested in whether and which Twitter images lead to variation in the number of tweets and the number of new Twitter users for the movement.

First, we consider attention to the movement. We measure this by examining the number of people tweeting about Black Lives Matter from April 13 to April 20Ẇe care about attention, or the sharing of information about the movement, for reasons both practical and theoretical. On the

practical side, gaining attention is often a goal of social movements themselves. Attention is, one might argue, a necessary condition for a movement to exist or to succeed at framing and setting policy agendas (Baumgartner and Jones 1993; Kingdon 1984; Baumgartner et al 2008). On the theoretical side, many studies of how social movements function within a new media environment stress the importance of how social media has changed information flows (Castells 2009; Earl and Kimport 2011).

Second, we consider the diffusion of the specific protest to new members. Diffusion here is therefore conceptually equivalent to recruitment into the movement. Given the narrow timeframe of our data collection, we are unable to analyse the number of new recruits to Black Lives Matter, as individuals may have been active online in the movement long before April 14. Therefore we focus our diffusion analysis on the April 14 protest, counting the number of new people tweeting about #ShutdownA14 over the course of the event.

Arguing that more scholarship should focus on images in the mobilization of protests online requires us to stake out two broad positions within the literature on social movement activism: first, that online activity and diffusion matter for social movements and, second, that images matter within that framework. We address these literatures in the next section of the paper. We then turn to our specific hypotheses, proposing types of images that might be more likely to increase online protest support. Our hypotheses are fourfold. Images might a) act as emotional trigger (Ansolabere and Iyengar 1995; Brader 2005; Valentino et al. 2011), b) reduce information costs (e.g. Gazzaniga 1998; Barry 2002), c) increase expectation of success (e.g. Raiford 2007), and/or d) promote inclusive collective identities (e.g. Kharroub and Bas 2015). After discussing both the broad and specific literature of relevance, we then present the April 14 data and some preliminary analyses. Finally, we discuss the limitations of the current study and how we are planning to address them in future iterations of the project.

Protests in the Twenty-First Century

Individuals today have greater access to information communication technologies (ICTs) than ever before (e.g mobile-phones, tablets, laptops, smart-watches, etc.). Connectivity is increased even more by Internet access. ICTs have transformed the way people perform a large number of tasks and, in particular, the way people protest. If we take a quick look at some of the most salient protests that had taken place in the last few years, we immediately see that ICTs have played a relevant role in the organization and diffusion of social mobilizations such as the Anti-Iraq War demonstrations, Occupy Wall Street and the Arab Spring (e.g. Bennett et al. 2008; Castells 2009; Howard 2010; Gonzalez-Bailon et al. 2011; Kharroub and Bas 2015). However, how do ICTs specifically affect the way people protest? Are they really all that special? .

Scholars studying social movements and the diffusion of protest theorize that ICTs help facilitate political mobilization as a result of (1) reducing information, coordination and participation costs, (2) decreasing the relevance of strong central organizations, and (3) partially solving the free-rider problem by allowing a more personalized participation (e.g. Bimber 2005; Garret 2006; Earl and Kimport 2011; Walgrave et al. 2011; Bennett and Segerberg 2013).

First, ICTs have decreased coordination, communication, and participation costs associated with social mobilizations (Garret 2006). In the past, coordination between groups with scarce resources was very costly and ineffective. It was difficult for an organization to know what other organizations or individuals 'out there' supported similar causes and it was also hard to coordinate strategies with them all by post-mail or phone. However, the technological innovations of the last decades have facilitated the creation of both transnational and regional advocacy networks (Keck and Sikkink 1998). For example, Bimber (2005) and Bennett and Segerberg (2013) highlight the role that ICTs have played in the organization of multiple anti-globalization protests since the 'Battle of Seattle" in 1999; without email, webpages, video calls, or social media, those macro coordinated protests would not had been possible.

ICTs have also decreased the communication costs associated with protests. In order to recruit new participants and spread the message of a protest, social movements need to spend time and resources communicating their messages. In the past, communication tasks were costly, time-consuming, and did not have an immediate impact. The communication strategy of the National Association for the Advancement of Colored People (NAACP) during the first half of the 20th century is a good example of this. The NAACP principally communicated its message through an in-house publication (*The Crisis*) and issue-based pamphlets (Francis 2014). The costs of printing and distribution those publication were extremely high compared to the costs of maintaining the current NAACP website (http://www.naacp.org/). Moreover, it takes longer for printed and manually-distributed material to get to a larger number of people and to achieve the desired impact.

New digital media have also contributed to decrease participation costs: supporting a political cause is less costly today than it was in the past (e.g. Walgrave et al. 2011). Instead of helping a movement in spreading the word by talking to friends one-by-one, people can share a message via social media and immediately reach multiple friends at once; or instead of physically going to sign a petition, people can sign it online from home and in a fraction of time. Some scholars are highly sceptical about the political impact of those online activities or 'slacktivism' (e.g. Morozov 2011). However, other scholars such as Gonzalez-Bailon et al. (2011) and Barbera et al. (2015) show that the diffusion of protests online are relevant when explaining the success of on-street mobilizations such as the *Indignados* movement in Spain in 2011, the Occupy movement in the United States in 2011, and the Taksim Square protests in 2013. Moreover, there are also numerous online petitions that end up achieving their goals. For example, in response to multiple actions including an online petition,[1] the California legislature recently passed a bill (SB277) forbidding parents to opt out of immunizing their children for personal beliefs if they go to day care or public and private schools.

Second, social movements today are less dependent of strong formal organizations thanks to new ICTs. According to traditional theories of collective action (Hardin 1968; Olson 1965), resourceful organizations play a key role in solving communication and coordination problems. However, as scholars such as Bimber (2005), Castells (2009), and Bennett and Segerberg (2013) point out, because ICTs have drastically decreased communication and coordination costs, small groups of individuals can coordinate actions by building a "self-organizing network" (Bennett and Segerberg 2013) without the need of a strong central organization such as unions and macro NGOs. The *Indingados* protest in Spain in 2011 is a good example of this phenomenon; a group of about 400 small and recently-created organizations used digital media to coordinate the initial demonstration and occupation of Madrid's main square (*Plaza del Sol*) without the support of any union or political party (Bennett and Segerberg 2013; Anduiza et al. 2014).

Finally, Bimber (2005) also notes that ICTs have changed the notion of free-riding. Traditional theories of collective action (e.g. Olson 1965) pay special attention to the discretionary decision that individuals make about getting involved or not in a collective action. However, as Bimber (2005:372) points out, "individuals can now contribute to information repositories with no or only partially knowledge of contributing to communal information with public goods properties." Webb Williams (2015) similarly notes that the spread of ICTs has enabled the rise of "protest observation" as a distinct and important level of protest involvement – a desire to take and share a picture from a protest might not represent participation in that protest, but posting the image online might still help the movement grow. On the one hand, the change in the free-rider phenomenon is the result of a decrease of participation costs; on the other hand, this also happens because ICTs allow individuals to engage with a social movement in a more personalized and emotional way (Bennett and Segerberg 2013). Individuals can choose to contribute to a social movement's debate with their own words, a picture of a protest taken from the sidelines, or by engaging with a specific frame or sub-debate. Although sometimes social movements sacrifice clarity

[1] https://www.change.org/p/california-governor-eliminate-the-personal-belief-vaccine-exemption-that-s-putting-sick-california-kids-at-risk#petition-letter

of discourse and media impact when doing so, this does not have to be the case. For example, Casas et al. (*forthcoming*) show that the *Indignados* movement in Spain was capable of accurately transmitting its message to the mainstream media despite having a highly fragmented discourse.

Scholars have also debated whether the mechanics of ICT-enabled activism are really all that special, or whether they simply represent an acceleration of processes that are already well understood (e.g. how reduction in costs might increase participation). Are ICTs a newly powerful democratizing force, or business as usual at a slightly faster pace? Right after the emergence of the Internet, some scholars (e.g. Schwarts 1996; Bryan 1998; Dahlgreen 2000) saw such technological innovation as an instrument and opportunity to reverse negative social patterns in Western democracies such as unequal political participation (Verba and Nie 1992), unequal political influence (Verba et al. 1995), a decrease in social capital and civic culture (Putnam 2000), and the marginalization and under-representation of certain target populations (Schneider and Ingram 1993; Cameron et al. 1996; Lerman and Weaver 2010). However, subsequent scholars were more cyber-skeptic (Norris 2000, Morozov 2011). For example, Davis and Owen (1998), Golding (2000) and Norris (2000) argued that the Internet would exacerbate the unequal power that the affluent have in politics because access to Internet was expensive and only those with resources would benefit from having more information available, better ways to connect with others, and new instruments to participate in politics. Others such as Sunstein (2001) also argued that digital media would worsen political polarization and create more "echo-chambers." Finally, some have noted the rise of innovative social media-enabled repression under authoritarian regimes that could swamp any possible ICT democratizing effect (Pearce 2014, 2015).

However, there are still some reasons to believe that ICTs, and 'online image-sharing' in particular, can contribute to the spread of more equal voice to all citizens. These technologies and behaviors give more power to smaller organizations and social movements so that they might recruit participants, spread their messages and, ultimately, influence the political agenda and the decision-making process. There is evidence today that undermines some of the cyber-skeptical arguments: ICTs are cheaper than ever (e.g. Internet, phones, smart-phones, tables...) and their prices keep decreasing; and some academic works suggests that "previous studies may have overestimated the degree of mass political polarization" in social media (Barbera et al. 2015). Moreover, images and 'online image-sharing' allow social movements to have more control over their own discourse. Mainstream media (e.g. newspapers, radio, TV, and mass media companies in general) traditionally had enormous power in deciding what social movements were worth paying attention to and how those social movements were framed to and by the public (Gitlin 1980; Gamson and Modigliani 1989; Oliver and Maney 2000; Smith et al. 2001; Raiford 2007). However, when photographic cameras became available to the mass public, social movements increased their capacity to give more salience to the movement and to decide how the movement was framed. For example, Raiford (2007:1131-1132) highlights that photography played a key 'democratizing' role in the 1960s during the Civil Rights Movement:

> "When network television or dominant newspapers did report on movement activities, they tended to provide accounts of events involving white or well-known African American participants [...] In contrast, photography proved a more accessible, contemplative, and democratic medium than television. [...] Cheaper and more readily available, still cameras enabled activists themselves to frame the movement as they shaped and experience it. [...] Photography constituted a democratic practice that strove for the fullest representation possible. Photography offered, literally, what historian Charles Payne has called 'a view from the trenches'."

These words from Raiford perfectly exemplify the potential of images, ICTs, and 'online image-sharing' to enhance online social movement mobilization. The capacity of taking images and sharing them with other in pamphlets or in-house newspapers (Francis 2014) helped the Civil Rights Movement to frame and give more salience to the cause. With the emergence of ICTs this power has increased exponentially. During the Civil Rights Movement organizations such as the NAACP or SNCC needed semi-professional photographers on the streets in order to capture im-

ages they could later include in their publications and share with others. Today small or emerging social movements such as Black Lives Matter can rely on thousands of participants to take pictures "from the trenches" (Payne 1998) and immediately share them with everybody. Recent academic works point to 'online image-sharing' as a specific ICT-enabled activity that may increase the likelihood of protests to diffuse (Kharroub and Bas 2015). We take these insight as inspiration to focus on the sharing of images via online social media.

The goal of this paper is not to argue that online activism is the only activism that matters in the 21st century. Black Lives Matter holds on-street protest as well as on-line activities: organizations today use hybrid offline and online tactics to achieve their goals (Chadwick 2007). Instead, the main goal of this paper is to better understand which types of online activism via image sharing are more likely to be successful in promoting attention to and diffusion of a movement. We turn next to these specific elements of online mobilization.

Online Image-Sharing and Mechanisms of Protest Diffusion

There are multiple reasons to believe that ICTs facilitate the spread protests online, but how do different ICT-enabled activities contribute to this diffusion process? Recent academic works point out to 'online image-sharing' as a relevant diffusion instrument. Scholars such as Howard and Hussain (2011), Aday et al. (2012), Bennett and Segerberg (2013) and Kharroub and Bas (2015) argue that visual content such as images and videos played a key role in the spread of revolutions during the Arab Spring and the Occupy movements around the globe. Although there is still little systematic evidence showing such an effect, broader literature suggests that images have great potential as instruments of diffusion because they: a) act as emotional triggers, b) reduce information costs, c) generate expectations of success, d) promote inclusive collective identities.

Emotional Trigger

Political psychologists working on political participation argue that a wide range of emotions explain different levels of participation in collective political processes such as elections (e.g. Valentino et al. 2011) and protests (Jasper 1998). Questions remain as to which emotions play a role (Valentino et al. 2011). Jaspers (1998:405-406) argues that a large set of affective and reactive emotions "help lead people into social movements, keep them there, and drive them away": hate, love, solidarity, suspicion, trust, anger, grief, outrage, shame, sympathy, cynicism, defiance, enthusiasm, resentment, fear, hope, and resignation. Jaspers is not very clear about under which condition we should expect these emotions to encourage or discourage social mobilization, some of these emotions are closely related. For example, emotions such as enthusiasm and hope are highly correlated and distinguishing between them when modeling protest diffusion may be impossible in practice. Because of this high correlation between emotions, in the past scholars have often aggregated different emotions into only two categories: positive and negative (e.g. Abelson et al 1982; Marcus and MacKuen 1993). However, as Valentino et al. (2011) point out, by aggregating all emotions into two groups, researchers may be missing relevant variation and including into the same category emotions that one can theoretically expect to have an opposing effect (e.g. anger and fear). Hence, in order to model and estimate the role that emotions play in protest diffusion it is necessary to find the right balance between taking into consideration all possible emotions and considering too few.

Valentino et al. (2011) argue that three main emotions have the potential to increase political participation: anger, enthusiasm, and fear; and that, out of the three, anger has the most potential to mobilize. *Anger* "emerges in situations when people are threatened or find obstacles blocking their path to reward" (Huddy et al. 2013:179) and it motivates individuals to mobilize in order to find a solution to the threat or to remove the existing obstacle (Valentino et al. 2011; Huddy et al. 2013). Individuals experience *enthusiasm* "when the system receives positive feedback about a pursuit, namely when rewards appear within reach, are getting closer, or have been attained" (Huddy et al. 2013:175). Similar to anger, enthusiasm also might boost participation

because there is a desire to achieve certain goals. However, Valentino et al. (2011) argue that since in the case of enthusiasm the goals are close to being attained, a free-rider dynamic may emerge and that is why they theorize mobilization to be higher in cases of anger than in situations where enthusiasm is present. Finally, fear (or anxiety)[2] "is a product of an emotional system that monitors the environment for potential threats and adapts behavior accordingly" (Huddy et al. 2013:178). The mobilizing effect of fear is less clear than anger or enthusiasm. On the one hand, when we fear something we have the desire to change it in order to end that potential threat; on the other hand, individuals may deal with fear or anxiety "indirectly through emotion-focused avoidance behavior rather than attacking the problem at hand" (Valentino et al. 2011:159). As a result of these contradictory effects, Valentino et al. (2011) argue that fear would boost participation only when the costs are very small. Building on this existing literature on political psychology and participation, we have the following expectations about the effect that different type of images shared online will have on the spread of a protest:

$\mathbf{H}_1$ (*Anger*) Hypothesis: Images that generate anger and that are associated with a protest increase the likelihood of that protest to diffuse.

$\mathbf{H}_2$ (*Enthusiasm*) Hypothesis: Images that generate enthusiasm and that are associated with a protest increase the likelihood of that protest to diffuse; but the diffusion power of enthusiastic images is smaller than the power of anger images.

$\mathbf{H}_3$ (*Fear*) Hypothesis: Images that generate fear and that are associated with a protest increase the likelihood of that protest to diffuse; but the diffusion power of fearful images is smaller than the power of anger- or enthusiasm-inciting images.

In our labeling of the protest images, we also measured the amount of sadness and disgust generated by each image. While we did not approach the research with strong prior hypotheses about how these two emotions would affect protest mobilization, we included them as prior literature asserted the primacy of these emotions (cf Schmidt and Stock 2009). It is also important to note that an image could certainly incite a cluster of emotions (e.g. anger and disgust; sadness and fear). Given the relatively small number of images that have currently been tagged, this preliminary analyses does not consider these interactions. Instead we analyze each emotion in isolation, holding the other variables at their means.

Images have an enormous potential to unleash and trigger emotions (e.g. Ansolabehere and Iyengar 1995; Brader 2005) but emotions are subjective; which may complicate studying the specific effect than an image has on different individuals. However, although the same image does not always generate the same emotion to all observers, existing studies show that on average survey respondents do use the same emotion to tag the same image (Schmidt and Stock 2009).

Reduction of Information Costs

Images may also increase the likelihood of an online protest to diffuse because they lower the costs of obtaining information. ICTs in general decrease information costs by making information about protests more available in multiple technological devices in our hands; but images may contribute even more to lower those costs because they facilitate information-processing for multiple reasons. First, images can briefly summarize the key points of a protest by showing the motto of the protest or a set of banners. Second, some neurology scholars (e.g. Gazzaniga 1998) also argue that we learn more efficiently through visual communication because it involves a more passive comprehensive process than reading or engaging in a conversation; and finally, some other scholars (e.g. Barry 2002) argue that people do a better job at processing visual information (TV news or images in newspapers) because it is easier for humans to relate to reality the information

[2] Although fear and anxiety can be theoretically distinguished (Ohman and Mineka 2001), empirical evidence show that they are highly correlated and difficult to distinguish in practice (Marcus et al. 2000; Brader 2005). For this reason in this paper we use Valentino et al.'s (2011) approach and we treat fear and anxiety interchangeably.

they perceive visually: humans principally learn about their world and their environment through personal experience and such personal experiences principally involve visual communication. In sum, this set of literature indicates that 'online image-sharing' may also increase the diffusion of protests as a result of lowering the information costs for potential participants.

$\mathbf{H}_4$ (*General Image Effect*) Hypothesis: In general all images related to a protest increase the likelihood of that protest to diffuse.

$\mathbf{H}_5$ (*Information*) Hypothesis: Images related to a protest that include a motto and/or banners increase the likelihood of that protest to diffuse.

Expectations of Success

Existing literature suggest that expectation of success explains in part why individuals participate in political protests. Classic rational-choice models (e.g. Downs 1957; Olson 1965) predict that people with a material interest in joining a collective action are more likely do so if their action is needed and worth it. Some social movements scholars (e.g. Klandermans 1984; Oberschall 1994; Kuran 1997; Finkel and Muller 1998; Kharroub and Bas 2015) apply this logic to argue that joining a small social movement may not be rational when the movement is perceived as having only a small likelihood of success. On the contrary, as the number of participants increases past some threshold, individuals have a larger incentive to join the protest because the likelihood of success increases and the participation of one extra person represents a relevant contribution to the movement. However, if at a certain point the movement end ups achieving a large participation, it becomes irrational again to join the protest because of a free-rider problem. In sum, rational choice approaches predict an inverse U-shape relation between expectation of success and willingness to participate. Nevertheless, in the early stages of a protest, images showing protesters on the streets may help social movements to increase people's perception about the movement's potential for success and to recruit more participants. For example, in a recent study of the 2011 Egyptian revolution Kharroub and Bas (2015) show that some of the most tweeted images during the revolts contained crowds of people on the streets. Images during the Civil Rights Movement in the 1960s had similar effects. For example, Raiford (2007) describes how a picture (by Danny Lyon) with a line of African American demonstrators waiting to get into a pool with a sign "Private Pool. Members Only" and anxious white men hiding behind the sign encouraged others to join the movement because they way other already invovled (see image in Appendix A).

$\mathbf{H}_6$ (*Success Expectations*) Hypothesis: Images related to a protest that include larger numbers of people will increase the likelihood of that protest to diffuse.

Generate Identity

A collective identity is relevant for a social movement for several reasons (Polleta and Jasper 2001) but particularly because it creates motivations for individuals to join the movement. As Melucci (1996) points out, collective action is in part an expression of a set of purposes: "a purposive orientation constructed by means of social relationships within a system of opportunities and constraints" (Melucci 1995:43). In constructing and connecting purposes, and thus in building motives for others to join the movement, symbols may play a very important role. For example, Eyerman and Jamison (1998) argue that music has played a key role in the formation of collective identities of social movements and in bringing together individuals with similar but still too distinct purposes. Images, because of their strong emotional and symbolic component, are capable of building common meaning between people with similar but different purposes; bringing them together. For example, Kharroub and Bas (2015) argue that images of symbols such as the Egyptian flag and religious symbols (e.g. the Muslim Crescent and the Christian Cross) facilitated the 2011 revolts "by making salient the collective inclusive identity and hence increase identification with the movement and efficacy beliefs, where efficacy increases the likelihood to participate in

the movement" (Kharroub and Bas 2015:7).

$\mathbf{H}_7$ (*Symbol*) Hypothesis: Images related to a protest that include symbols (such as flags or logos) increase the likelihood of that protest to diffuse.

Data and Measurement

To test the hypothesis that 'online image-sharing' increases the protest mobilization, we study Twitter messages related to the Black Lives Matter (BLM) movement and to the Shutdown April 14 protest, a specific BLM action that took place in multiple cities in the United States on April 14, 2015. We use the hashtags promoted by the groups organizing the demonstrations and a similar set of keywords to identify which messages where about the protest. We collected the hashtags and keywords by observing the websites of the main organizing groups Stop Mass Incarceration Network and Hand Up United in the weeks prior to the protest. Then, from April 13 to April 20, we collected all Twitter messages containing the hashtags and keywords in Table 1 using the Twitter Streaming API.

Table 1: List of Hashtags and Keywords used to collect the Tweets related to the Protests

A14	BLM	
#shutdownA14	murder by police	mass incarceration
shutdownA14	killer cops	police murder
#A14	stop business as usual	stolenlives
	massincarceration	stolen lives
	#policebrutality	#stolenlives
	#blacklivesmatter	black lives

We look at this particular case and both BLM and ShutdownA14 messages because it allows us to test the effect that images have on two dynamics that are crucial for social activism: attention and diffusion. Social movements aiming to set the media and political agenda need to recruit as many new first-time supporters as possible (diffuse the movement) but they also need to keep their supporters engaged and talking about the movement's claims (attention). The Twitter activity related to the overall BLM began in 2012 and particularly after Tamir Rice's death on November 23, 2014. However, social media activity related to the ShutdownA14 action started right before the demonstration took place on April 14, 2015. Thus we use the volume of messages related to both BLM and ShutdownA14 to study the attention to BLM in social media, and only the messages related to ShutdownA14 to study the diffusion of a protest in Twitter. In this social media context, we define *attention* as the number of messages that contain one of the hashtags we identified as belonging to BLM and/or ShutdownA14, and we define *diffusion* as the number of users that start using a ShutdownA14 hashtag for the first time.

As a result of the data-collection process we obtained a data set with 150,324 tweets sent by 67,484 unique users. About 43.2% of the messages had an image and 26.8% of the messages (40,409 sent by 22,950 unique users) were related to the A14 protest. The week after the protest and right after collecting the tweets, we wrote a computer script to gather all the images that were present in the messages. The Twitter Streaming API provides a link to the tweeted images. Some tweets had the same image so before studying them we first had to find a way to identify which images were the same. We did that in three different steps. First we looked for which messages shared an image stored in the same URL. Second we wrote a computer program to identify what images were very similar.[3] As a result we obtained a list of images that were the same but also a list of images that were potentially the same. In the third step two annotators manually revised the second group and indicated which were exactly the same. During this last step we found some

[3] A computer program written in `python` that uses some functions of the `Python Imaging Library` module

images that were pictures of the same scene but from different angles or at slightly different times. We decided to code those as unique images. After collecting all the pictures and matching the ones that were the same, we ended up with a dataset of 10,244 unique images.

To address our specific hypotheses, we have begun labeling the 10,244 unique images with a number of relevant tags to build a database of image qualities. Each image will be labeled by a minimum of two individuals to verify accuracy. To date, two labelers have completed roughly 300 images – these preliminary data are used in the analyses below. For a the labeling methodology, including two sample images from the dataset with their tags, see Appendix B. Variables of interest include both measures of what is in the images (e.g., number of individuals present, slogans on visible signs, etc.) and measures of viewer responses to the images (e.g. whether the image incites anger, disgust, etc.).

Results

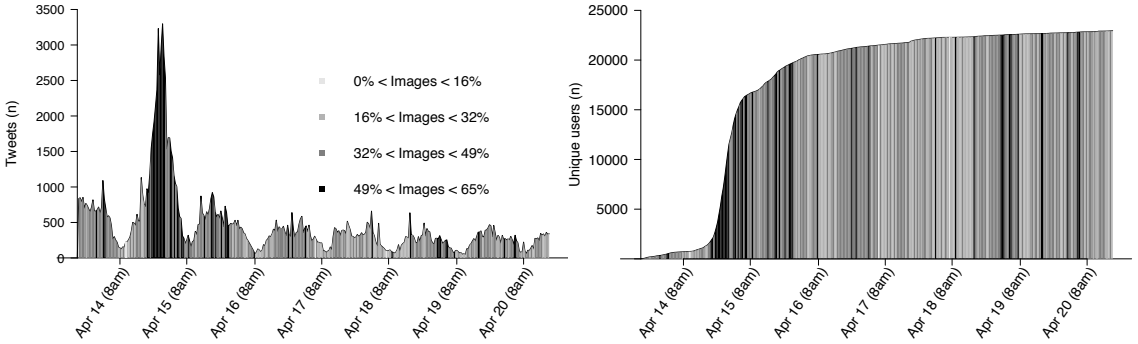
To model the data and test our hypotheses we divide the messages in periods of 30 minutes and then use the information from the messages in each of these 30-minutes breaks to build a set of variables. In order to leverage out time-series data we need to split the data set into time periods. We chose a 30-minutes cutoff because we think messages sent at any point in time should particularly have an effect in the following 30 minutes. However, to make sure the results of our analysis do not depend on this particular cutoff, we include lags of the key explanatory variable in our models and we replicate the main models using a 10-minutes cutoff.

The dependent variables of the analysis are the *attention* to the BLM movement and the *diffusion* of a particular BLM action: the Shutdown A14 protest. We measure *attention* using the number of tweets that mentioned one of the BLM or A14 hashtags sent during each 30-minute period . We measure *diffusion* using the number of new unique users that started using an A14 hashtag in each 30-minutes period. Our explanatory variable of interest is the percentage of the total messages for each 30-minutes period that had an image (*pimage*). Then we also control for other plausible explanations. Previous research shows that users with larger number of followers are more influential than others and these could also explain an increase on attention and a faster diffusion (Gonzalez-Bailon et al. 2011). To control for that, we measure the sum of the number of followers of the unique users tweeting in each 30-minutes period (*followers*), and also a lag of this same variable (*followers1lag*). Since the number of people talking about the BLM movement or joining the A14 action in any given time period depends in part on the people who talked about the movement and joined the action in the recent past, we need to control as well for lags of the two dependent variables. Partial autocorrelation functions (PACF) indicate that the dependent variable *attention* is correlated with its own two previous values and the dependent variable *diffusion* with one (see Appendix C). For this reason we control for two lags of the dependent variable in models predicting attention and one lag for models predicting diffusion.

A first glance to the bivariate relationship between the two dependent variables (*attention* and *diffusion*) and the independent variable of interest (*pimages*: percentage of the total tweets that have an image) indicate a potential strong relationship. Darker colors in Figure 1 indicate moments where a larger percentage of the total messages had an image. Lighter colors indicate the opposite. We observe that the *attention* to the BLM movement and the *diffusion* of the A14 action particularly increased when people shared images in a larger percentage of their tweets. Attention appears to decrease when a smaller percentage of the messages had an image.

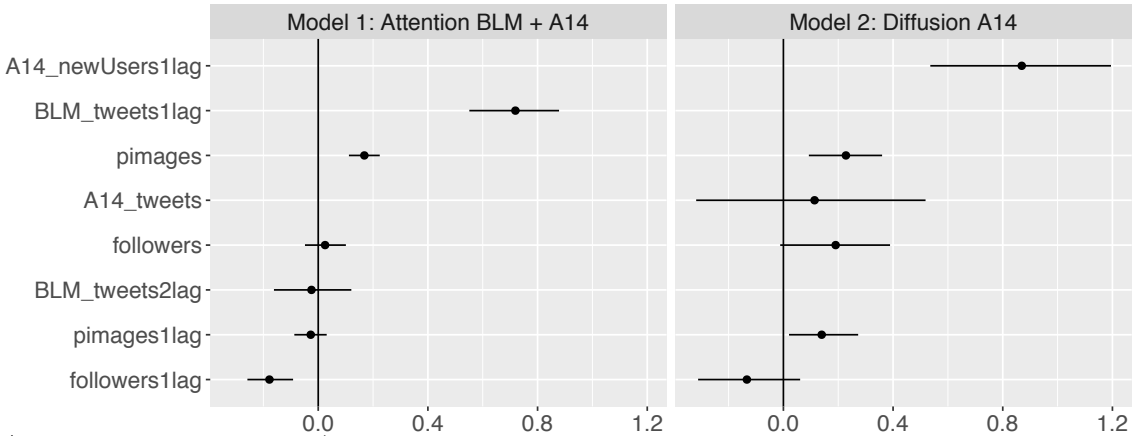
Figure 1: Bivariate relationship between the key variable of interest (% of messages with images) and the two dependent variables: *attention* and *diffusion*

(a) Relation: % of tweets w. images and *attention* (b) Relation: % of tweets w. images and *diffusion*



Do these initial results persist after controlling for other factors? To assess that we test two multivariate models. These are negative binomial models predicting the Twitter *attention* to the overall BLM movement (Model 1) and the *diffusion* of the A14 action (Model 2). In both models the independent variable of interest is *pimages* (% of the total messages that have an image). In Model 1 we control for two lags of the dependent variable, so for the number of tweets sent in the two previous 30-minutes breaks (*BLM_tweets1lag* and *BLM_tweets2lag*), for a lag of the explanatory variable of interest (*pimages1lag*), and for the average number of followers of the users tweeting during that and the previous time period (*followers* and *followers1lag*). In Model 2 we also control for the variables *followers*, *followers1lag*, and *pimages1lag*. However, since in this case we are predicting the diffusion of the A14 protest only (and not the diffusion of the overall BLM movement), in Model 2 we do not control for *BLM_tweets1lag* or *BLM_tweets2lag*. Nevertheless, we add a control for this second model: the number of tweets containing an A14 hashtag in each period of time (*A14_newUsers1lag*).

Figure 2: Predicting Twitter attention to the BLM movement and the diffusion of the Shutdown A14 action (Negative Binomial Models)*



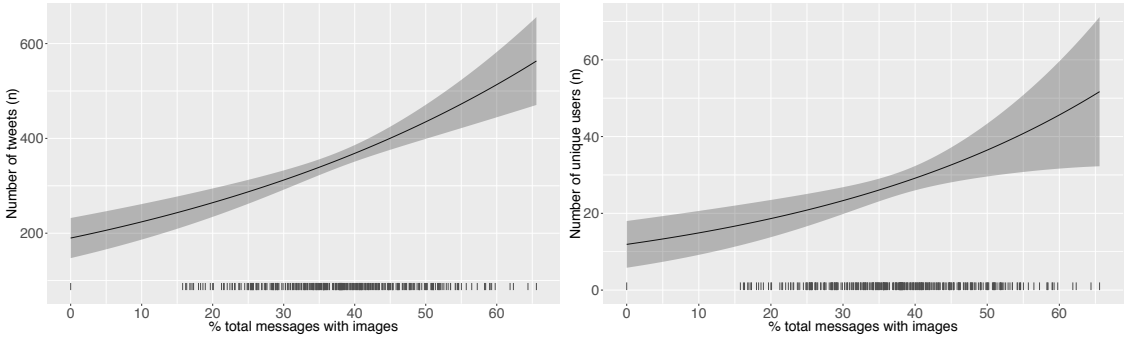
**Standardized coefficients (the effect of a variable moving from its mean to 1 standard deviation above)*

The models' coefficients in Figure 2 show that the first lag of the dependent variables (*BLM_tweets1lag* and *A14_newUsers1lag*) are the strongest predictors of increasing *attention* and *diffusion*. This means that the likelihood of a protest to get more attention and diffuse increases as the number of messages and unique users talking about the protest also increases. In both cases the second most relevant variable in terms of effect size is our variable of interest: the percentage

of messages that contain an image (*pimages*). It is hard to interpret the substantive effect of this variable by only looking at the coefficients in Figure 2. In Figure 3 we use the coefficients of Models 1 and 2 to plot predicted values of the dependent variables: we keep all the covariates at their mean and only change the key variable of interest. Figure 3a shows that when none of the tweets have an image, the expected number of tweets for that time period is around 200. However, if for example 40% of the messages have an image (the mean value of *pimages* in our dataset is around 38%), then the expected number of tweets for that time period is around 365; which represents a 82.5% increase. Similarly, in the same time period we would expect only around 12 unique users using A14 hashtags if 0% of the messages had an image, but we would predict the number to raise up to 29 if 40% of the tweets had a picture (a 41.3% increase in the number of users).

Figure 3: Predicting values of attention to the BLM movement and diffusion of the Shutdown A14 action using the coefficients of Models 1 and 2.

(a) Predicted values of attention to BLM (b) Predicted values of diffusion of the A14 action



The results of the bivariate (Figure 1) and multivaraite analyses (Models 1 and 2 in 2) are consistent with our *General Image Effect* hypothesis (H_4): the likelihood of a protest to diffuse and get more attention increases as a larger percentage of the messages related to the protest contain images. However, this evidence still says little about the reasons why this is the case. The next step is then to test to what extent the mechanisms we presented in the previous section may actually explain why images related to a protest increase its likelihood to get more attention and diffuse. To do that, we elaborated a coding protocol to identify the presence of each of the mechanisms and two annotators went through the images and manually labeled them accordingly. To get to the *expectation of success* mechanism (H_6), the annotators indicated the number of people they thought was present in the image. To get to the *information* mechanism (H_5), they indicated if a sign and/or slogan was present. To test the *symbol* hypothesis (H_7), they checked if a symbol such as a flag or a logo was in the image; and finally, to test the hypotheses on emotions ($H_{1,2,3}$), they indicated on a ten points scale to what extent the picture incited them: anger, fear, disgust, sadness, and enthusiasm.

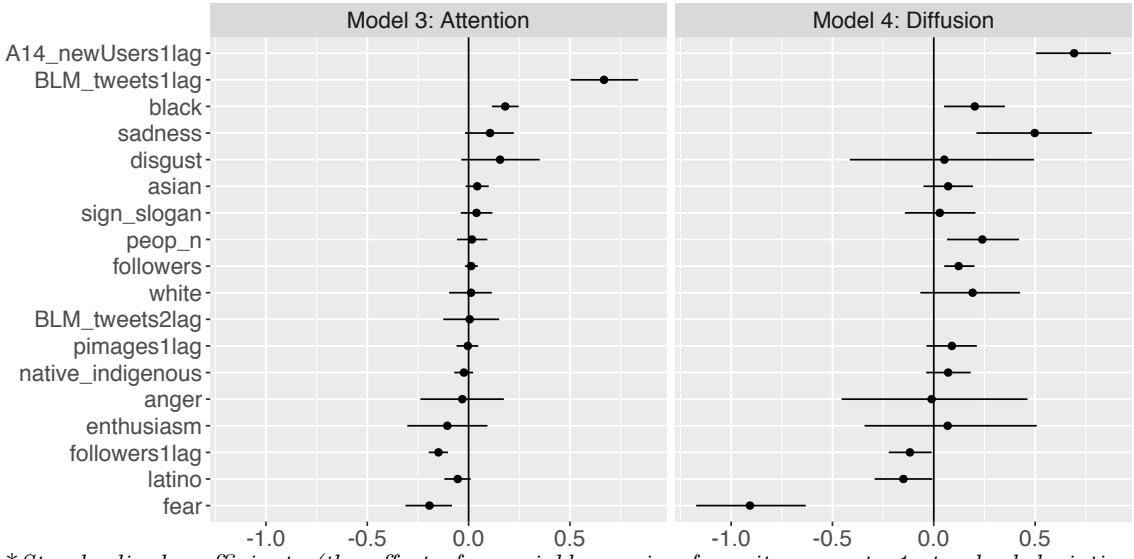
For this draft the two annotators were able to code the top 300 unique pictures, which represents about 47.4% of the messages with images. Once the annotators finished the labeling, we matched each unique image to all the messages containing that picture and we constructed 13 new variables. *Peop_n* represents the average number of people in images sent in each 30-minutes period. *Sign_slogan* represents the percentage of all the images sent in each time period that have a protest sign and/or slogan. The variable *symbol* is the percentage of all the images sent in each time period that contain a symbol. The variables *anger, fear, disgust, sadness*, and *enthusiasm* are the average score {0-10} for each particular emotion and time period. Since the percentage of the total messages with images is not the same across time periods, and neither the percentage of the total images that have been labeled, we weight these variables for the percentage of the total messages sent in each time period that contain an image that has been labeled.

In addition to the variables above, we have also begun to label the images with additional

descriptions of what is in the image – for example, whether or not a police officer is present, whether the image is a picture of someone killed by police, etc. What is in the image, beyond the size of the crowd or the presence of a slogan, is a component that should not be overlooked in evaluating the image effect (e.g. – what exactly does the slogan say?). These analyses are beyond the scope of our current paper, but research in these areas is ongoing. For our preliminary analyses, we include only one descriptor of what is in the image: the races/ethnicities of individuals visible in the picture. The variables *black, white, latino, asian,* and *native* are the percentage of all the images sent in each time period that have a person from that race or ethnicity. Just as in the labeling of emotions, labeling the races of individuals can be subjective. However, we think this is an important first step in bringing more details of image content into our analysis, and we are encouraged that our annotators generally agree in labeling this aspect of the images.

To study the effect that these image mechanisms have on the two dependent variables, we estimate two new negative binomial models. In them we substitute the independent variable of interest *pimages* for all these mechanisms while still keeping *pimages1lag* in the models. The results in Figure 4 are supportive of some of the theories about why images are important for social mobilization. First, we find that some emotions explain an important portion of the variation. In particular, we observe that when a larger percentage of the messages contained images that inspire *sadness*, the attention to the BLM movement and the diffusion of the A14 action increased. The effect is statistically significant at the .001 level for the diffusion model (Model 4). However, contrary to our expectations in H_3, we find that in periods when larger percentage of the messages had images inspiring fear, both attention and diffusion decreased. These findings are statistically significant at the 0.001 in both models. We do not find images inspiring other emotions such as *anger*, *enthusiasm*, and *disgust* to be related to variations in attention and diffusion.

Figure 4: Predicting attention and diffusion using the Image Mechanisms (Negative Binomial Models)*



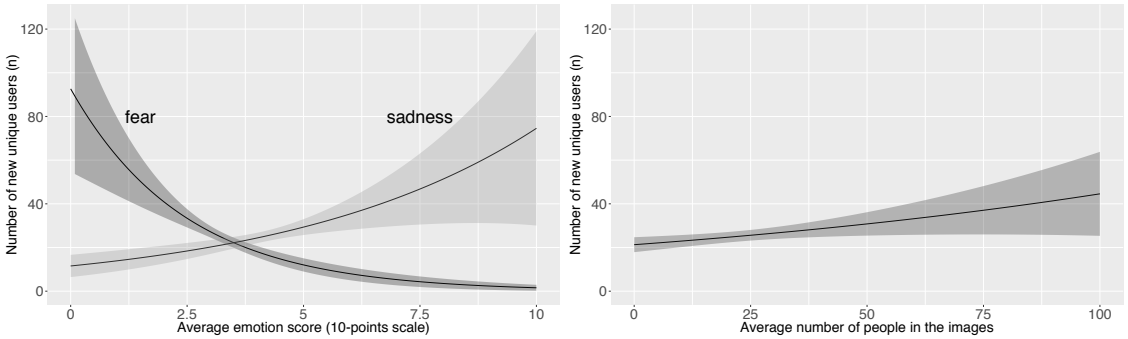
**Standardized coefficients (the effect of a variable moving from its mean to 1 standard deviation above)*

Second, the results of the models in Figure 4 are also supportive of the *Success Expectation* hypothesis (H_6). When users tweeted images with more people in them, the BLM movement received larger social media attention and the ShutdownA14 action diffused faster. The findings are statistically significant at the .001 for the diffusion model (Model 4). Finally, we also find that in periods when a larger percentage of the messages had images containing African-American people, the protest also received more attention and diffused faster. In Figure 5 we present the substantive effect of the covariates that are statistically significant in Model 4. We report predicted

values of diffusion given different average levels of *fear* and *sadness*, and different average number of people in the images. To calculate the predicted values we kept all the other variable at their mean and we simulated a time period in which 10% of the messages had images that had already been labeled. Figure 5a shows that, under this scenario, if the messages with images incited an average *sadness* of 2 (in a 10-point scale), we would predict that 18 new unique users would start using an A14 hashtag. However, if the average *sadness* was 8, we would predict that about 55 new users would do so. We observe an opposite effect of about the same magnitude for *fear*. Figure 5b shows that in the same scenario, if the average number of people in the images is around 10, we would predict that about 20 new users would "join" the A14 protest. However, if the average number of people is around 90, we would predict 40 new users to start messaging about the A14 protest.

Figure 5: Predicting values of diffusion of the A14 action using the coefficients of Model 4.

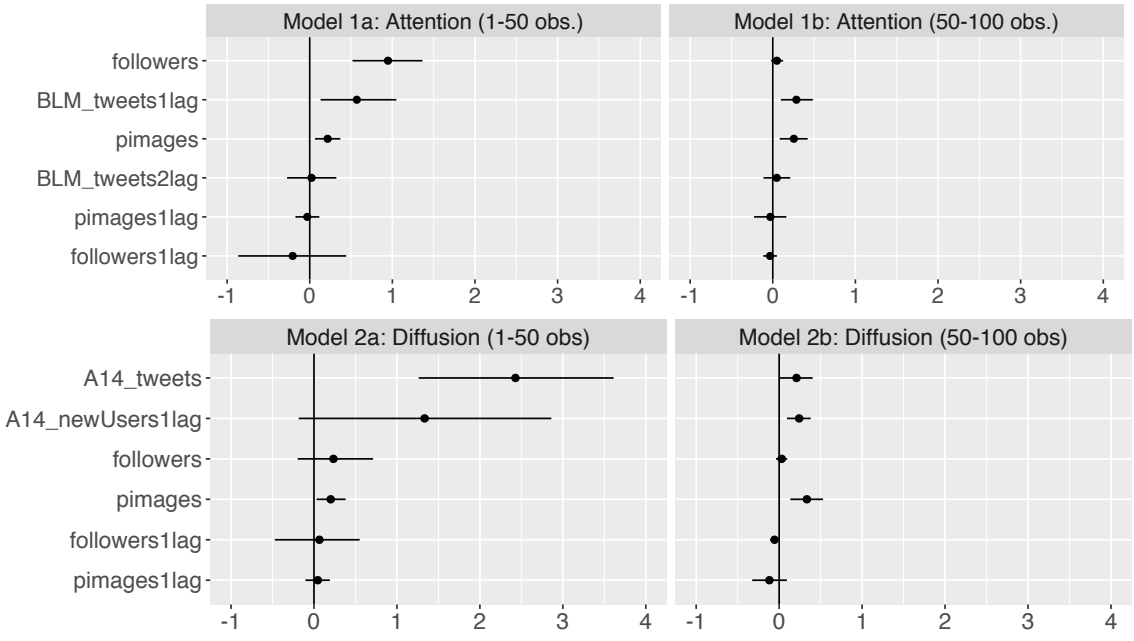
(a) Emotion variables (b) Number of People in the image (*peop_n*)



Robustness Checks

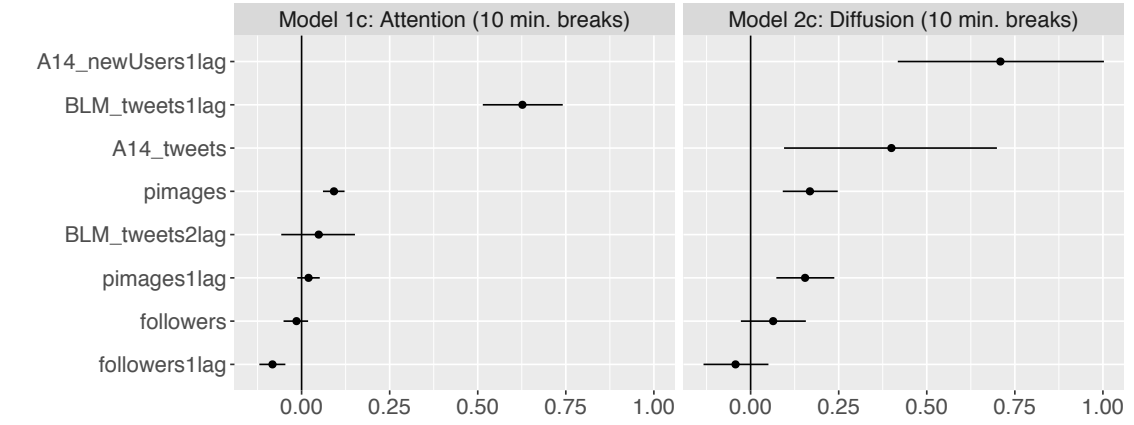
In this section we present two types of tests to illustrate the robustness of the key finding of the paper: images shared online increase rates of protest attention and diffusion. First, we estimate Models 1 and 2 (from Figure 2) using two different samples: the first 50 and the second 50 observations in our data set. Observations 1 to 50 go from the afternoon of April 13 to the afternoon of April 14, 2015. Observations 51 to 100 go until the afternoon-evening of April 15. The goal of this robustness check is to show that the "image effect" is not just capturing the mobilizing effect of a particular event or accident that took place during the protest. The organizations behind the Shutdown A14 action demonstrated on the streets on April 14. However, no protest or mobilization happened on April 15. If we still observe the key variable *pimages* to have a significant effect when using the second sample to estimate the models (observations 51 to 100), then we would find evidence suggesting the mobilizing effect of images is not dependent of a very particular event or accident that could had happened during the protest. In Figure 6 we show that this is actually the case when predicting both *attention* and *diffusion*. We estimate models 1a and 2b using data from after the on-street protest. However, we still find the key variable *pimages* to be significant and to have a very similar substantive effect.

Figure 6: Predicting attention and diffusion using two different samples (Negative Binomial Models)*



Finally, we also run two other negative binomial models to show that the key findings are not dependent on the 30-minutes cutoff we use to transform the data into a time-series. These two models also replicate models 1 and 2 in Figure 2 but in this case we split the data into time periods of 10 minutes. Figure 7 shows that even when using the 10-minutes cutoff, we still find that *pimages* has a positive and significant effect on the amount of messages related to the BLM movement and the number of new unique users talking about the Shutdown A14 protest.

Figure 7: Replication of models 1 and 2 using 10-minutes periods as observations (Negative Binomial Models)*



Discussion and Conclusion

Our paper provides an initial empirical test of a theoretical claim: that images shared online should increase the rate of social movement mobilization. In line with the theoretical prediction, we find that an increase in images sent over Twitter is associated with higher rates of both protest diffusion and social movement attention. The image effect persists even when controlling for the the number of previous tweets, the differential influence of Twitter users, and lags of our dependent variables.

The second stage of empirical analysis evaluates specific hypotheses as to why images would be expected to have an effect on the diffusion and attention to a protest. We consider four mechanisms: emotional triggers, reduction of information costs, expectations of success, and the generation of collective identity. While the analyses presented here are preliminary, the initial results are intriguing. We find support for and reasons to be skeptical of multiple mechanisms. Pictures with more individuals in them have a larger effect on diffusion (the recruitment of Twitter users into the protest) than images with few individuals – this expectation of success effect does not hold when we look at attention paid to the movement. Pictures that inspire fear lower both diffusion and attention, while sadness increases diffusion and has no significant effect on attention. Visible signs or slogans had no significant effects.

In addition, we expect to conduct a number of additional robustness checks. It is possible that outlier images or outlier time periods are driving our results – cross-validation robustness checks will show whether systematically excluding single images from the analysis changes our results. Future work on the project will entail continued labeling of the ShutdownA14 images – to ensure the accuracy of labels, we hope to have each image collected from Twitter labeled by at least two annotators. Accurate labels will also help us to bring in more detail from the content of images into the analysis.

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Appendix A

Appendix B: Questions used to manually label the images.

Variable	Question	Options
sign_slogan	Is there a protest sign or slogan in the picture? (e.g. Black Lives Matter; Hands Up, Don't Shoot!)	[0,1]
symbol	Is there any symbol in the picture? (e.g. flags, logos)	[0,1]
anger	How much anger does the image incite in you? If none, select 0.	[0, 1, ..., 10]
fear	How much anger does the image incite in you? If none, select 0.	[0, 1, ..., 10]
disgust	How much anger disgust the image incite in you? If none, select 0.	[0, 1, ..., 10]
sadness	How much sadness does the image incite in you? If none, select 0.	[0, 1, ..., 10]
enthusiasm	How much enthusiasm does the image incite in you? If none, select 0.	[0, 1, ..., 10]
peop_n	By your guess, how many people are in the picture? Leave blank if no people.	[number]
black	Check the box if this race/ethnicity is represented in the picture: Black	[0,1]
white	Check the box if this race/ethnicity is represented in the picture: White, non-Hispanic	[0,1]
latino	Check the box if this race/ethnicity is represented in the picture: Latino, Hispanic	[0,1]
asian	Check the box if this race/ethnicity is represented in the picture: Asian	[0,1]
native	Check the box if this race/ethnicity is represented in the picture: Native/Indigenous	[0,1]

(a) The Most Tweeted Image During the April 14 Protest

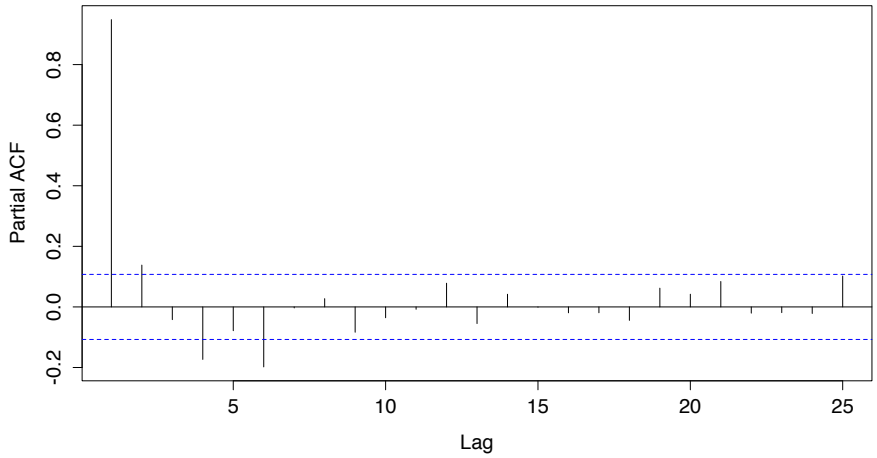
Research staff labeled this image as having 7 people (on average), no signs or slogans, and no symbols. On the emotions, the average scores were: anger: 2, fear: 1, disgust: 2, sadness: 3, enthusiasm: 1. Races/ethnicities identified were Black and White (non-Hispanic)

(a) The Fifth Most Tweeted Image During the April 14 Protest

Research staff labeled this image as having 45 people (on average) and protest signs, but no slogans or symbols. On the emotions, the average scores were: anger: 2, fear: 1.5, disgust: 1, sadness: 1, enthusiasm: 2.5. Races/ethnicities identified were Black, White (non-Hispanic) and White (Hispanic).

Appendix C

(a) Partial Autocorrelation Function plot for the dependent variable *Attention* (Number of messages with a BLM and/or A14 hashtag)



(b) Partial Autocorrelation Function plot for the dependent variable *Diffusion* (Number of new unique users tweeting about a particular BLM protest: Shutdown A14)