The Role of Social Media in the 2011 Egyptian Revolution

Shingo Hamanaka[1]

Abstract

The Egyptian uprising in January 2011, widely known as the January 25 Revolution, was initially claimed to have been caused by the Internet. However, the relationship between social media and participation in the anti-regime demonstrations is contested and opaque. This paper explores this relationship through both a theoretical and empirical approach. More concretely, by using two survey data sets, we examine a hypothesis derived from a diffusion model of information and social movement theory. The two key findings are: (1) vanguards of the demonstrations were more active on social media than followers during the revolution, and (2) active bloggers tended to participate in demonstrations against the Mubarak regime. These findings contradict previous findings of social media's limited effect and indicate that social media diminishes the collective action problem in anti-government protests. They also indicate that the concept of political opportunity structure is useful for understanding the revolution.

Keywords: Arab Spring, social media revolution, diffusion model, social movement

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1. Introduction

Beginning on January 25 and ending on February 11, with the resignation of President Mubarak, the Egyptian uprising of 2011 has been termed the "Facebook Revolution" or "Web 2.0 Revolution," on the assumption that social media platforms such as Facebook and Twitter played a significant role. Having initially been cast as a revolution brought about by the Internet, [2] this interpretation faded as Middle East researchers and political scholars investigated its essential causes and clearly discussed the causal processes triggering such political turmoil. However, the potential linkage between information diffusion via the Internet and the anti-government demonstrations, leading so quickly to the collapse of an authoritarian political system, should not be denied without academic exploration.

Prior literature regards the impact of social media on the January 25 Revolution to have been limited. According to Ezzeddine Abdelmoula, "The Arab spring has been and will

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[2] A couple of typical examples are: first, Egyptian activist Wael Ghonim identifying the Egypt Revolution as the "Web 2.0 Revolution" in his TED talk "Inside the Egyptian revolution" on March 4, 2011; and, second, the title of the NHK, Japan Broadcasting Corporation, Special Program, "Network caused the revolution: The offence and defense of youth in the Middle East," broadcast on February 20, 2011.

be remembered for so long as the event in which the media played a central role. By changing the Arab media landscape, Al Jazeera has certainly contributed to the current political changes. Its coverage should be seen as one of the main factors of success of the Tunisian, Egyptian, Libyan and Yemeni revolutions" (Abdelmoula, 2012: 263). Kato and Iwasaki (2013: 273), while acknowledging the Internet's importance by introducing the trend in its utilization ratio in Arab countries, emphasize the contribution to information communication of satellite broadcasting in Arabic, based on the results of a public opinion poll. Furthermore, Wilson and Dunn (2011: 1252-1253), who conducted a face-to-face survey of participants in the Tahrir Square demonstrations, found that the communication of information about the revolution depended far more on satellite broadcasting and oral communication than on social media. Therefore, prior studies have generally concluded that the contribution of social media was limited and certainly not as important as proclaimed at the beginning of the revolution (Lynch, 2011; Lynch et al., 2017).

Discussions in the above studies are based on various news reports, the results of a public opinion survey, and interviews with concerned individuals about local situations around the time of the revolution. However, such discussions fundamentally rely on information relating to media usage frequency, and the interactive mechanism between social media and people's participation in anti-government demonstrations seemingly remains opaque. Elucidating the mechanism requires the elaboration of theoretical and empirical research. In

this context, using available data from an original public opinion survey, this study employs statistical analysis to test hypotheses, clarifying an explicit mechanism derived from information diffusion theory.

2. Social movement, regime change, and social media

This study investigates social media's role in the gathering of people for anti-government demonstrations against Mubarak's undemocratic regime. Comparative political scientists have led theoretical and empirical studies on the collapse of political regimes. The key element to solve the problem of the collapse is thought to be the motivation for participating in anti-government demonstrations, with the risk of losing one's freedom and jeopardizing one's safety or even life. Consequently, collective action, or Olson's problem, is associated with the gathering of people to participate in anti-government demonstrations. On this basis, a hypothesis could be formed that social media provides a tool to overcome the collective action problem and promote the gathering of people.

Empirical approaches before the Arab Spring sought to use cross-section analyses to demonstrate a correlation between the widespread use of digital media and democratization (Groshek, 2009; Kedizie, 2002; Milner, 2006; Norris, 2001). Groshek (2009) followed Lerner

(1958) in contending that the spread of mass media is a prerequisite for social changes and democratization processes, arguing also that the Internet is a powerful agent for democratization. Moreover, Howard (2010) indicated that the popularization of digital media would change Muslim politics and cultures. As justifications for this assertion, he pointed to the formation of the locations of debates on such issues as gender politics, international security, and interpretations of the Koran, and a correlation between the development of information and communications technology (ICT) and the degree of democratization in Muslim countries. However, the above arguments do not explicitly consider the collective action problem associated with democratization. Thus, these studies only address macro processes, without exploring the explicit micro foundations of endogenous democratization.

Both Wolfsfeld et al. (2013) and Howard and Hussain (2013) conducted empirical analyses of the Arab Spring through cross-national comparative studies. Wolfsfeld et al. associated an individual's frustrations and grievances with protest activities, focusing on social media as a tool for reducing the collective action problem. However, because they observed the phenomenon at the national level, their empirical analysis was disconnected from their hypothesis explaining individual-level behaviors. Howard and Hussain (2013) argued that civil societies, as self-generated, self-supporting communities not controlled by a state, have been facilitated by the development of ICT, and that such civil societies, in turn, caused the Arab Spring. They substantiated this hypothesis using qualitative comparative analysis (QCA). It is

an innovative approach for investigating an area or a hypothesis for which the generation of statistically reliable quantitative data is difficult. As we can use quantitative data, including those collected through a public opinion survey, to investigate whether social media reduces the collective action problem, not there is need to employ QCA in this study.

Only three prior studies have used individual-level data to investigate the role of social media in Egypt's 2011 revolutionary demonstrations: Tufekci and Wilson (2012), Brym et al. (2014), and Hassanpour (2014).[3] Tufekci and Wilson used the Tahrir Data Set, the product of interviews conducted with participants in the anti-government demonstrations between February 24 and March 1, 2011, beginning two weeks after the end of the January 25 Revolution. Their study found that those who participated from the first day of the demonstrations had more proactively used Facebook than those who joined the protests later.

Brym et al. (2014) utilized data from the Gallup poll conducted immediately after the Egyptian January 25 revolution. They constructed an econometric model based on social movement theory, through which they found that, compared to those who merely supported the anti-government demonstrations, the demonstrators tended to more frequently use short message service (SMS) messaging and have higher trust in new media. The data analyzed by

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[3] Focusing on the period after the Egyptian revolution, Lynch et al. (2017) use individual-level data to reveal that one role of social media is clustering, reinforcing in-group solidarity and out-group demonization. This clustering destabilized the democratic transition until July 2013. Individual survey data were also used by Breuer (2016) in analyzing events in Tunisia during the Arab Spring.

Tufekci and Wilson were only gathered from participants in the demonstrations in Egypt, and, therefore, exclude insights into non-demonstrators. Accordingly, their argument does not directly address the collective action problem in the context of regime breakdown. Meanwhile, Brym et al. were unable to detect any function of social media other than SMS messaging, and did not consider the political opportunity structure, focusing instead on social movement theory as their core concept.

Hassanpour (2014) found that social media does not necessarily play a role in coordinating the public or reducing the transaction costs associated with mobilization. His study highlights that the first peak of protest mobilization, the "Friday of Anger" (January 28), came on the first day of the government-enforced media shutdown. Despite this widespread media disruption, protestors flocked to the streets to oppose the continuation of Mubarak's regime. Supporting his contention, Hassanpour shows significant correlations between protest dispersion and media disruption in the results of regression analysis on Cairo's revolutionary unrest.

These previous studies' arguments suggest there is room to improve empirical analyses of social media's role. Additionally, none of these studies provide, as a precondition for their analyses, any hypotheses on the explicit mechanism of social media reducing the collective action problem. Therefore, in the next section, we will illustrate the mechanism through which social media reduces collective action costs, construct a mathematical model

containing this mechanism, and derive hypotheses from the model.

3. Hypothesis based on information diffusion theory[4]

A revolutionary mass movement is initiated through people taking action on the streets to challenge the continuation of a political regime. There are three models to describe the mechanism through which people take to the streets to appeal for a transformation with overcoming the collective action problem.

The first is Granovetter's threshold model of collective action. Granovetter (1978) introduced his threshold concept to explain phenomena such as rioting or adopting a fashion. Whereas people with a low threshold have a shorter response time, those with a high threshold respond after observing a response from the people around them. This model seeks to explain the behavior in different thresholds at each group. The second is the cascade model (Bikhchandani et al., 1992). An information cascade is the collective action that occurs when, rather than trusting their own information, people choose to engage in the same action taken by an antecessor. For example, despite being illogical from the perspective of macroeconomics, financial bubbles arise because it is often logical for each investor with less reliable information

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[4] This study uses the mathematical model developed in Hamanaka (2016).

to follow a precedent investor, or "vanguard", before them.[5] The third is the percolation model

(Masuda and Konno 2005:149-158). Developed before the threshold and cascade models, the

percolation model has been reevaluated due to the rise of network analysis. This model is able

to deal with a wide range of phenomena regarding information proliferation and the occurrence

and convergence of natural phenomena, including an ecosystem or Internet operation system,

premised on a scale-free network.

Considering the Internet as a scale-free network[6], let us discuss the mechanism of the

occurrence and expansion of a revolutionary movement based on information diffusion theory,

with reference to the classical percolation model.[7] A group of people that will become

demonstrators if encouraged ("potential demonstration participants") is referred to as *S(t)*. This

group is regarded as a differentiable function that changes over time. In the context of the

January 25 Revolution, the group referred to as *S(t)* can be defined as the potential

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[5] Ellis and Fender (2010) and Bueno De Mesquita (2010) construct revolution theories using the

information cascade model, while Mekouar (2014) uses information cascades to explain the Arab Spring.

[6] When describing a network using the graph theory, the "number of the other points adjacent to a point"

is called the "degree" (Kanemitsu, 2003:56). When the degree distribution follows the power law, it is

called scale-free (Masuda and Imano, 2005: 22).

[7] The percolation SIR model was originally developed to explain the spread of infection in 1920s, but the

significance of it was sufficiently understood only after around 1980 (Inaba, 2002). Ferguson (2013: 275-

277) employs a speculation of the SIR, Susceptible-Infectious-Recovered, model to describe the dynamics

of a social movement.

demonstration participants associated with the social network. Here, *I(t)* represents

demonstration participants occupying a street, while *R(t)* refers to participants who have either

been removed from demonstrations through security forces' repression or willingly withdrawn

from demonstrations due to conciliation with the government. Parameter *β* represents the

sensitivity of an encouraged person, while parameter *γ* indicates repression and political

conciliation. Based on the above, the percolation model is represented by the following

ordinary differential equation system:

$$\frac{dS(t)}{dt} = -\beta S(t)I(t)$$

$$\frac{dI(t)}{dt} = \beta S(t)I(t) - \gamma I(t)$$

$$\frac{dR(t)}{dt} = \gamma I(t)$$

[Figure 1 here]

The sum of the three differential equations is zero, since the conservation law that the

total population remains constant over time should be observed. In accordance with the

conservation law, the percolation model is embodied in the simultaneous differential equations

with only two variables: *S(t)* and *I(t)*. With any initial values, these differential equations are

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able to demonstrate how their solutions behave over time.[8] The dynamics of the behaviors are

illustrated in Figure 1 for a case in which the initial values are set as 10,000 for the potential

demonstration participants, 1 for the vanguard of a demonstration, a constant for sensitivity,

and changeable variables at four different levels of repression and conciliation.

If the value for repression and conciliation is set at the lowest level (level 1), as many

as 9,000 people will participate in a demonstration in responding to the vanguard. Although the

number of participants decreases due to repression and conciliation over time, the dashed line

at level 1 indicates more than half will continue to demonstrate at time 6. If the value for

repression and conciliation is increased to the next level (level 2), the peak of the number of

participants reaches 8,000, but the dashed line at level 2 shows the decreasing number of

participants with time advances. As γ is increased to the next level (level 3), the peak number

of participants will be little more than around 2,000 described by the dashed line at level 3,

which provides too weak a foundation to expand the scale of the demonstration; consequently,

it will inevitably be suppressed. Further, the dash line at level 3 and after time 3 shows that

around 1,000 people among the potential demonstration participants will not respond to the

vanguard by taking to the streets to protest. With the value for repression and conciliation by

the government at its highest level (level 4), the potential demonstration participants will take

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[8] A numerical analysis was carried out by differentiating the differential equation and solving it with the

fourth-order Runge–Kutta method.

no action, resulting in the failure of a revolution with the arrest of the vanguard.

[Figure 2 here]

Figure 2 depicts the dynamics of changes in the size of a group encouraged via a social network. Where the authorities have divided the encouraged group, a demonstration will not occur when its size is small, as depicted in the top-left and top-right charts of Figure 2. With only a modest increase in the number of potential participants gradually taking to the streets, the movement is still too small to threaten the government, as depicted by the bottom-left chart of Figure 2 denotes the case. However, as the size of a group of potential participants grows significantly through interactions among them, they act on the encouragement by participating in the movement, generating the numerical peak of a demonstration, as depicted in the bottom-right chart of Figure 2 shows it. It should be noted that a scenario displayed in the bottom-right chart of Figure 2 applies the lowest level of repression and conciliation used in Figure 1. Based on the results of analyses using the percolation model, the following three conditions must be satisfied to form a demonstration of sufficient scale to cause a regime change: (1) sensitivity to encouragement (β) is sufficiently high; (2) the extent of repression and conciliation (γ) is small; and (3) there is a substantial number of potential demonstration participants.

In the context of the Arab Spring, these three conditions can be rephrased as follows.

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(1)' People's sensitivity was sufficiently high to respond to encouragements to participate in a mass movement. Reasons for this include public frustrations regarding the government's performance, particularly its poor management of the national economy and public finances, and the psychological factor of recovering dignity, which had been hurt by the government's actions.[9] In addition, due to power succession problems inherent in the longtime rule of Arab countries' regimes, rulers' legitimacies were being questioned.[10] (2)' Several regimes sought to handle the Arab Spring by employing both repression and conciliation policies, as demonstrated by the combination of dispatching security forces with reshuffling and replacing the cabinet, providing subsidies for everyday goods, including foods and fuels, and increasing public spending.[11] Such actions indicate that intensifying repression and violence will not

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[9] Dissatisfaction or complaint as a cause of political change was first explained by Aristoteles, whose argument was subsequently developed in different eras by Locke and Marx. Contemporary politics relies on Davis (1962), who explains that a revolution tends to occur when living standards fall after first being improved. Social movement theory relies on strain concept (Blumer 1986; Smelser 1962).

[10] The heredity of republic presidencies and other most-prominent leadership positions were considered to be a problem. Before the Arab Spring, it was presumed that Gamal Mubarak in Egypt and Saif al-Islam al-Gaddafi in Libya would each succeed their respective fathers.

[11] Zurayk (2011) describes people's anger with poor governmental management of food, fuels, and rising prices in Arab countries. In Egypt, the cabinet resigned en masse on January 29 and the vice presidency was set up for the first time under the Mubarak regime. On February 7, the salary increase for government officials was decided. For more details, see Brynen et al. (2012: 186)

necessarily control a mass movement. The effects of implementing both repression and conciliation policies will suffice to preserve the regime to the extent that the legitimacy of the regime's power continues to be accepted. (3)' If the potential demonstration participants are mutually connected via an information communication tool, a mass movement may expand through the immediate sharing of information, even though such demonstrators have not previously been organized. In the Arab Spring, it was young people who successfully expanded the mass movements, making full use of social networks. Therefore, to a certain extent, frustrated young people mutually connected via social networks were able to become a big force in changing their societies.

Focusing on and detailing the discussion concerning (3)', we can theoretically presume the following. First, Egyptians who participated in the demonstration on the first day, January 25, correspond to vanguards in the percolation model. The vanguards are presumed to have been more proactively involved in social media activities than the followers who participated in demonstrations the following day or even later. Specifically, the vanguards are assumed to have transmitted information more willingly than followers, including by video-recording the demonstrations and verbally relaying their activities. Next, the vanguards are presumed to have participated in demonstrations more extensively and from an earlier stage than followers, as the mass movement in Egypt contained inertia and never discouraged demonstrators from staying in Tahrir Square until the regime breakdown. Given the

presumption that vanguards more proactively engage in social media activities than followers, a correlation should be found between the frequency of social media usage and participation in the demonstrations. Finally, there might be a difference in the frequency of social media usage between demonstrators and non-demonstrators. Citizens afraid of repression are presumed to have refrained from accessing social media because the Internet was subject to surveillance by government authorities; in addition, those without an Internet connection are presumed to have been reluctant to take to the streets since they lacked awareness of the status and progress of the anti-government demonstrations.

Based on the discussions so far, we posit the following hypotheses:

H1. The vanguards and the followers in an anti-government demonstration are distinguishable based on the frequency of their social media activities;

H2. The more proactively citizens engaged in social media activities, the more frequently they participated in anti-government demonstrations; and

H3. The more willingly citizens involved in social media activities, the more frequently they participated in anti-government demonstrations.

4. Data and analysis

From the insight of the percolation model, we have derived three hypotheses regarding social media. The next stage is to conduct quantitative analysis of each hypothesis. We use the two data sets for the analysis. The first is the Tahrir Data Set used by Tufekci and Wilson (2012). This was produced through a face-to-face survey of citizens participating in the sit-in protest in Tahrir Square, at the center of the Cairo. Applying the snowball sampling method, surveyed demonstrators were requested to introduce others to participate in the face-to-face survey. In total, data were collected from 1,200 individuals. The survey mainly investigated the reasons for participation in the anti-government demonstrations, the variety of media used, and the frequency of using such media.

The second data set was produced by the "Middle East Opinion Survey (Egypt 2013)," conducted by the author's research group. Conducted throughout Egypt in mid-November 2013, this survey posed questions concerning, for example, political consciousness, evaluations of the Arab Spring, the relationship between the media and politics, and whether those surveyed participated in the anti-government demonstrations. Though this survey was also conducted face-to-face, civilian participants were selected using ordinary multistage random sampling.

The 1,100 participants are representative of ordinary Egyptians.[12]

Among the three hypotheses, only H1 exclusively concerns the anti-government demonstration participants. Therefore, H1 is tested using the Tahrir data set. We test H2 and H3 including both civilians who did and did not participate in the anti-government demonstrations using data from the Middle East Opinion Survey (Egypt 2013). In the all hypotheses, the social network dimension of mobilization is the independent variable. For comparison, the use of traditional media was included in the econometric models. The control variables are commonly used for analyzing social movement participation (Anduiza et al., 2012; Brym et al., 2014; McAdam and Paulsen 1993). Thus, the following four factors were investigated: (1) the psychological factors promoting demonstration participation; (2) connection/network with some organizations like opposition parties or civil society associations; (3) attributes and resources, e.g. time and money, suitable for demonstration participation; and (4) political opportunity. Because the different data sets have different missing variables, not all of the control variables are included in the model. Descriptions of the data used in the analysis are presented in Tables A and B in the appendix.

(1) The psychological factors promoting demonstration participation include variables such as dissatisfaction with the government's performance and the political leadership (Brym

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[12] The outline of the survey, the simple tabulation, and the research questionnaire are all available on the website of Contemporary Middle East Political Studies in Japan.net (https://cmeps-j.net/).

et al., 2014; Davis, 1962; Wolfsfeld et al., 2013). (2) Participants in such movements often belong to some form of organization, aiming to solve the problems concerning free riders and coordination often inherent in collective actions. Whether an individual belongs to any organizations is an effective explanatory factor for participating in anti-government demonstrations (McAdam 1982; McAdam and Paulsen 1993). (3) Given the risk of clashing with police or the armed forces, young and strong males may be best-suited to participate in anti-government demonstrations (Hoffman and Jamal, 2012). Conversely, it is known that relatively highly educated people participated in the January 25 Revolution. Thus, education level should be included in the analysis (Wilson and Dunn, 2011). Political interests are also included in the attributes and resources of protesters (Boulianne, 2009).

(4) The situation from January 28 to 31 was considered by us as a political opportunity to determine the result of the revolution (Tarrow, 1998). The "Friday of Anger," (January 28) witnessed large demonstrations in various locations throughout Egypt. Among the 850-people killed in the 18-day revolution, most died on January 28. After the Friday, the army was deployed in Cairo to replace the police in suppressing the riot, an objective in which they ultimately failed. On January 29, the cabinet resigned en masse, and a vice president was appointed for the first time under the Mubarak regime. Umar Sulaymān was appointed vice president. On January 31, the new Ahmed Shafik cabinet was formed, and the Defense Department made an important announcement: "The military will not shoot nationals." Based

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on this announcement of the military for non-intervention in the conflict and independence

from politics, we can infer that the end of January was the time at which those opposing the

government were presented with a significant political opportunity (Suzuki 2013: 9-13; Yokota

and Darwish, 2012:151-152). Thus, around this time, the people might participate in the anti-

government demonstrations because they would believe that mass demonstration could bring

down the Mubarak regime in the near future.

[Table 1 here]

[Figure 3 here]

Table 1 shows the results of testing H1 on the logit model. The dependent variables

are vanguards and followers, the numbers of which in the sample are 344 and 704, respectively.

The analysis results show that the vanguards used Twitter and Facebook more frequently than

the followers. This relationship persists even when controlling for the other variables, such as

the use of media, the connection with any civil society associations, and attributes suitable for

demonstration participation. Figure 3 graphically presents the analysis results to facilitate

understanding, with the frequency of using Facebook (0 for not at all, 1 for use sometimes, and

2 for use often) on the horizontal axis and the probability of being a vanguard on the vertical

axis. Holding all other conditions, the same, there is a 6 percent point difference in the

probability of being a vanguard between a person who does not use Facebook at all and one who uses it sometimes. Between a person who uses it sometimes and one who uses it often, there is an 8 percent point difference in the probability of being a vanguard. H1 is, thus, supported by analysis of the Tahrir data set.

Table 2 shows the results of analyzing H2 using the ordinary least squares (OLS) model, Poisson regression model, and negative binomial regression model. The dependent variable was the number of occasions on which respondents participated in the anti-government demonstrations. Of the total sample of 1,059, 942 (85.6%) did not participate, 113 (10.3%) participated 1-5 times, 14 (1.3%) 6-10 times, nine (0.8 %) 11-15 times, and 14 (13%) 16 times or more. From the dependent variable distribution, it was judged that the Poisson regression model and negative binomial regression model were more suitable than the OLS for use in the analysis. OLS regression was also carried out to compare the standard indexes AIC and BIC, to inform selection of the most suitable model. Though the Poisson regression model had greater explanatory power and had the most independent variables with statistical significance, we adopted the negative binomial regression model in this study because the AIC and BIC standard indexes were poor for the Poisson model.

[Table 2 here]

[Figure 4 here]

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Table 2 shows that the frequency of Internet use does not explain the extent of participation in the anti-government demonstrations in any model. Neither e-mail nor SMS use are significant in the negative binomial regression model. We can, thus, conclude that H2 cannot be supported. Oral communication is the only information-sharing means able to explain the extent of participation at the 5% level. As noted earlier, on January 28, the Angry Friday, the Egyptian government shut down the Internet in an attempt to stop the anti-government demonstrations. Therefore, this finding indicates that the most primitive means of communicating information is effective in an emergency. The statistically significant independent variables are being male and the political opportunity at the 1 % level in the negative binomial regression model. The change in the situation after the Angry Friday would be determinative of the January 25 Revolution's success. The extent of each person's participation in the demonstrations can be explained by whether, at that time, they became convinced that the regime would fall. This conviction was measured using a feeling thermometer, ranging from 0 to 100. Figure 4 shows the relationship between this conviction and the number of times a person participated in the demonstrations. Compared with the people convinced that the regime would not fall (political opportunity = 0), the number of times an individual participated increased by 0.16 for people totally convinced that the regime would collapse (political opportunity=100).

[Table 3 here]

[Figure 5 here]

Table 3 shows the results of the logit model and rare event logit model (relogit). The dependent variable was whether the person participated in the anti-government demonstrations. Here, the variable used to test H2 was recoded: all the responses reporting at least one incidence of participation are considered as "participated in the anti-government demonstrations." The rare event logit model was used because the answer distribution for the dependent variable was largely deviated to "not having participated in the anti-government demonstrations." The two models statistically support for H3. Among the media factors, e-mail/SMS and oral communication most strongly explain whether an individual participated in the demonstrations. As shown in Table 3, most of the control variables have some explanatory power. Thus, we can conclude that social movement theory can be appropriately applied to analysis of the January 25 Revolution. Figure 5 shows the relationship between the extent of Internet use and the probability of having participated in the anti-government demonstrations, where the other conditions were the same as in the logit model. Compared with people not using the Internet at all (Internet = 1), those using the Internet every day (Internet = 6) had a 7.44 point higher probability of having participated in the anti-government demonstrations.

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5. Discussion

The results of our analyses support the following propositions. First, the vanguards trying to organize the anti-government demonstrations more actively used social media, compared with the followers. Secondary, active social media users were more likely to participate in the anti-government demonstrations. The reasoning behind both propositions is as follows.

Figure 3 shows that a higher frequency of Facebook use leads to a higher probability of being a vanguard, namely those who took to the streets on January 25, the first day of the demonstrations. Compared with the demonstration participants who did not use Facebook at all, those using it often had a 6-point greater probability of being vanguards. We can infer from this finding that the vanguards used social media actively to encourage followers to participate in the demonstrations.

Figure 5 shows that Egyptians using the Internet daily had a higher probability of having participated in the anti-government demonstrations. Compared with people not using the Internet at all, those using it every day had a 7.44 point higher probability of having participated. This correlation persists even if the various factors of social movement theory are taken into consideration.

The prior research cited in the Introduction highlighted the important role of satellite broadcasters, such as Al Jazeera. Abdelmoula (2015) argued that satellite broadcasting played a critically important role in expanding the demonstrations. Kato and Iwasaki (2013: 273) also argued that "mass media in Arabic such as Al Jazeera played a greater role than" social media. However, the results of analysis in this article do not support these arguments. The results presented in Tables 2 and 3 record no difference in the frequency of viewing satellite broadcasts in the Arabic world between participants and those who did not participate in the anti-government demonstrations. Furthermore, the results presented in Table 1 clearly record no difference between the vanguards and followers in terms of the frequency of viewing satellite broadcasts. This finding can also be found in Tufekci and Wilson (2012), who analyzed the same data.

As the January 25 Revolution unfolded, satellite networks broadcast the scenes in Tahrir Square with a fixed camera. Thus, local people where the broadcast could be received could monitor the status of the anti-government demonstrations. However, Egyptians viewing the coverage did not immediately flock to the streets to participate. It was found that people orally exchanging political information had a greater tendency to participate in the demonstrations, as shown in Tables 2 and 3. Another decisive factor was the political opportunity. It is believed that the situation between January 28 and 31 determined the result of the revolution. The people who became convinced of the fall of the Mubarak regime at that

time were more likely to participate in the demonstrations and did so more often, as depicted in Figure 4.

From these considerations, social media has been found to alleviate the collective action problem associated with the fall of a political system; moreover, social movement theory, especially the political opportunity structure, has been found to be effective in analyzing this popular revolution. Our analysis has elucidated the mechanism underlying participation in the January 25 Revolution and presented new findings beyond those of prior research. Future research needs to investigate whether the same mechanism worked in other counties where the regimes fell or were agitated in the Arab Spring, and whether social media worked in the same way in the anti-government demonstrations beginning June 30, 2013, leading to the coup d'état in July.

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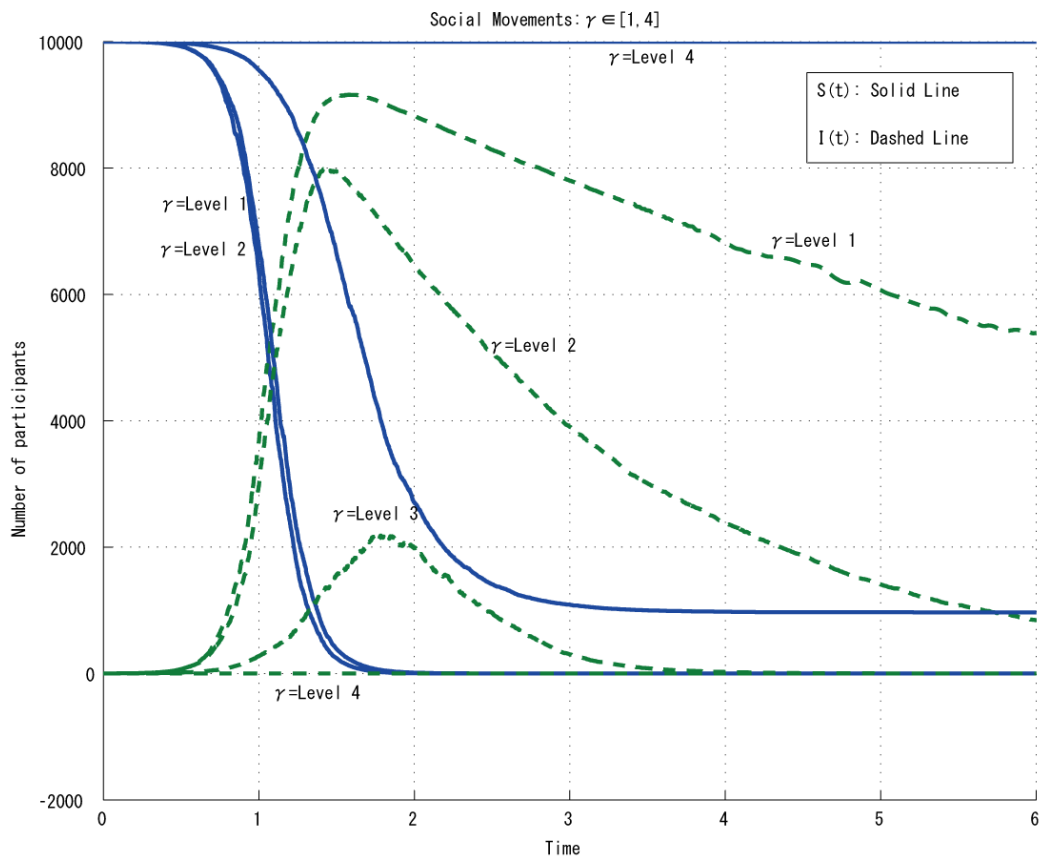
Figure 1. Changes in the number of participants in a social movement associated with changes in the level of repression and conciliation.
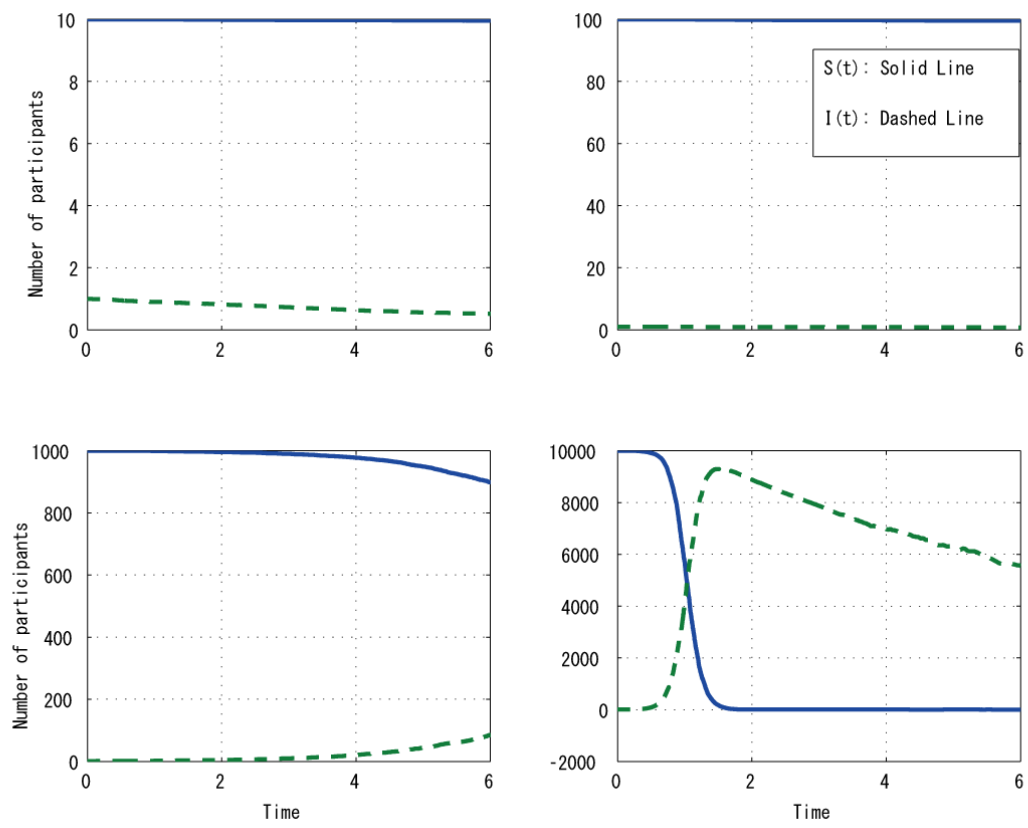
Figure 2. Variation in peak participation with changes in the number of potential demonstration participants.

Table 1. Frequency of social media usage and vanguards (testing H1).

		B	S.E.	
Social Media	Twitter	0.363	0.131	***
	Facebook	0.358	0.096	***
Media	SMS	0.121	0.105	
	Mobile	0.238	0.099	**
	Satellite TV	-0.222	0.113	*
	Radio	0.068	0.126	
	Newspaper	-0.046	0.092	
	Blog	0.215	0.160	
	E-mail	0.150	0.107	
	Oral communication	0.142	0.121	
Network	Affiliation	0.107	0.155	
	Participated in demonstration	0.480	0.149	***
Demography	Age	0.009	0.009	
	Male	0.294	0.173	*
	Education	-0.015	0.053	
	intercept	-2.695	0.489	***

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

N=1039, log likelihood=-613.86, LR $\chi^2(15) = 90.29$, Quasi R^2=0.0685

Table 2. Frequency of social media usage and the frequency of participation in anti-government demonstrations (testing H2).

		OLS			Poisson			Negative binominal		
		B	S.E.		B	S.E.		B	S.E.	
Social Media	Internet	0.013	0.014		0.025	0.046		0.029	0.061	
Media	Egyptian Newspaper	0.023	0.013	*	0.082	0.039	**	0.088	0.053	*
	Arab Newspaper	-0.016	0.026		-0.052	0.077		-0.046	0.101	
	Int'l Newspaper	-0.003	0.034		0.017	0.098		0.048	0.140	
	Egyptian TV	-0.006	0.011		-0.013	0.037		0.006	0.049	
	Egyptian Satellite TV	0.004	0.017		0.019	0.063		-0.002	0.078	
	Arab Satellite TV	0.001	0.011		0.018	0.040		0.012	0.051	
	Int'l Satellite TV	0.020	0.013		0.084	0.040	**	0.083	0.057	
	E-Mail. SMS	0.035	0.016	**	0.082	0.046	*	0.073	0.063	
	Mobile	-0.010	0.010		-0.040	0.035		-0.041	0.046	
	Oral communication	0.017	0.011		0.094	0.046	**	0.111	0.056	**
Psychological	Government caused inequality	0.024	0.039		0.135	0.138		0.163	0.181	
	Mubarak regime evaluation	-0.008	0.006		-0.032	0.020		-0.023	0.025	
Demography	Male	0.151	0.041	***	0.878	0.173	***	0.869	0.205	***
	Age	-0.003	0.002	*	-0.014	0.006	**	-0.014	0.008	*
	Education	-0.001	0.013		0.063	0.059		0.087	0.071	
Political Interest	Talk about politics	0.020	0.017		0.112	0.068	*	0.090	0.086	
Political Opportunity	Convinced Breakdown	0.001	0.000	***	0.007	0.002	***	0.007	0.002	***
	Intercept	-0.068	0.138		-3.637	0.575		-3.840	0.708	***
	N	1059			1059			1059		
	adjusted R² ／ Quasi R²	0.070			0.127			0.085		
	AIC	1985.512			1159.106			1086.536		
	BIC	2079.848			1253.422			1185.838		

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 3. Frequency of social media usage and whether an individual participated in anti-government demonstrations (testing H3).

|		Logit			Rare Event Logit		
		B	S.E.		B	S.E.	
Social Media	Internet	0.133	0.064	**	0.131	0.060	**
Media	Egyptian Newspaper	0.113	0.058	*	0.111	0.061	*
	Arab Newspaper	-0.030	0.115		-0.027	0.126	
	Int'l Newspaper	-0.042	0.152		-0.027	0.152	
	Egyptian TV	0.019	0.054		0.017	0.049	
	Egyptian Satellite TV	0.103	0.094		0.096	0.099	
	Arab Satellite TV	0.025	0.056		0.024	0.057	
	Int'l Satellite TV	-0.007	0.062		-0.006	0.060	
	E-Mail. SMS	0.145	0.066	**	0.140	0.064	**
	mobile	-0.099	0.050	**	-0.096	0.050	*
	Oral communication	0.188	0.065	***	0.182	0.068	***
Psychological	Government caused ine-quality	0.097	0.199		0.199	0.490	
	Mubarak regime evaluation	-0.055	0.028	**	-0.054	0.029	*
Demography	Male	1.168	0.235	***	1.138	0.239	***
	Age	-0.019	0.009	**	-0.019	0.009	**
	Education	0.009	0.079		0.007	0.081	
Political Interest	Talk about politics	0.004	0.092		0.001	0.098	
Political Opportunity	Convinced Breakdown	0.007	0.002	***	0.007	0.002	***
	Intercept	-4.170	0.805	***	-4.030	0.785	***
	N	1059			1059		
	Quasi R^2	0.177			-		

$* \ p < 0.1, \ ** \ p < 0.05, \ *** \ p < 0.01.$
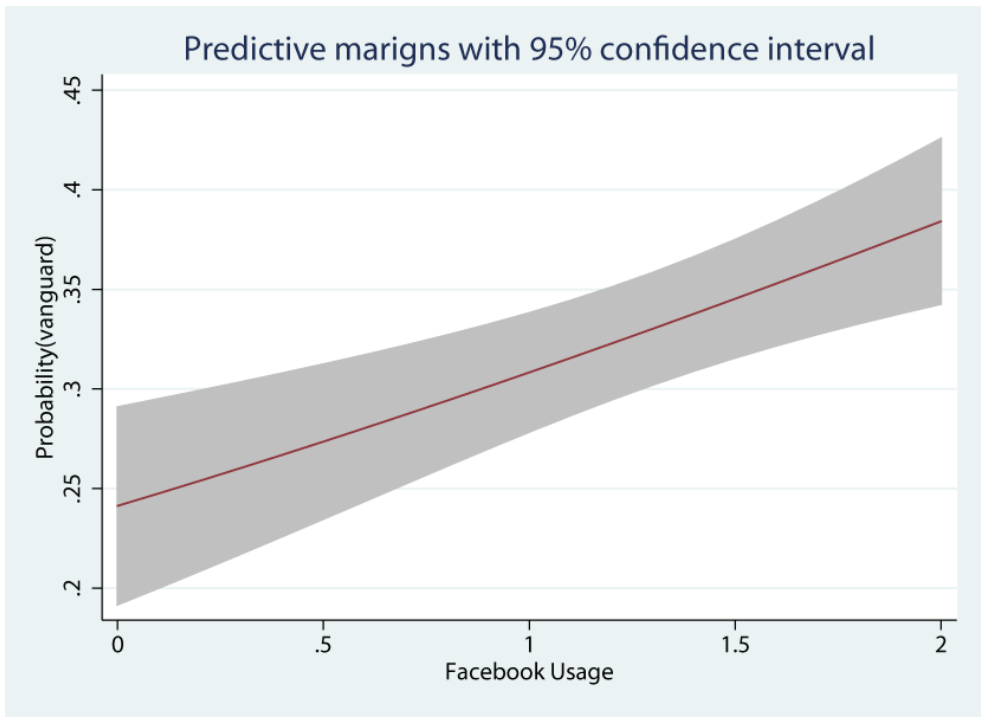
Figure 3. Frequency of Facebook usage and probability of vanguard.
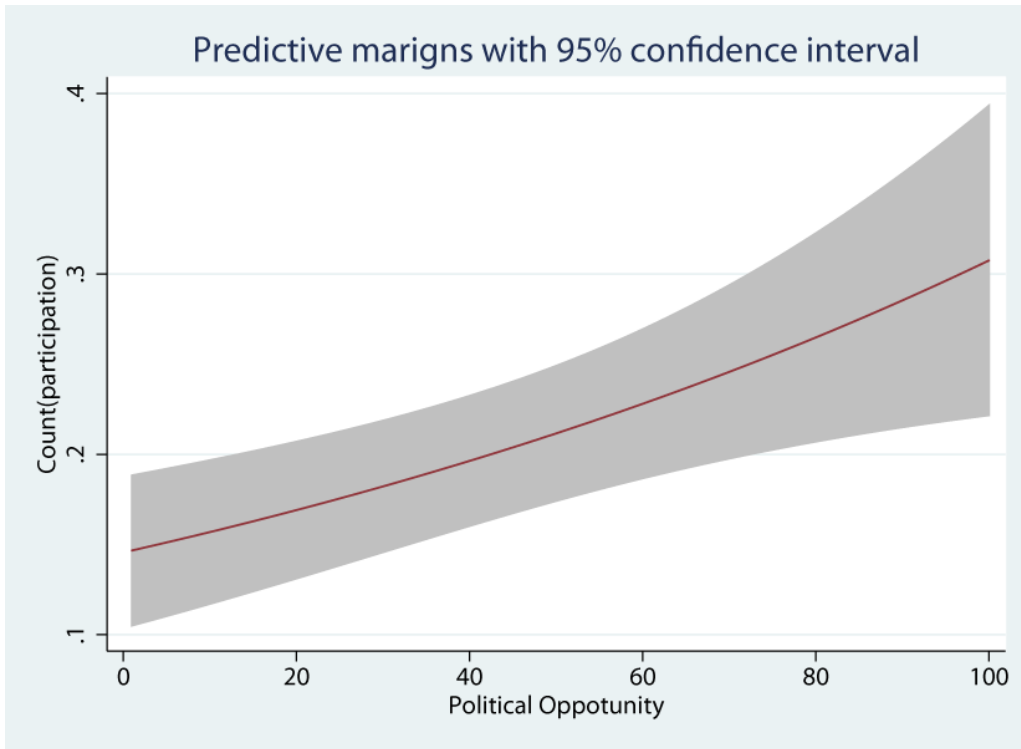
Figure 4. Perceived political opportunity and the number of participation in anti-government demonstrations.
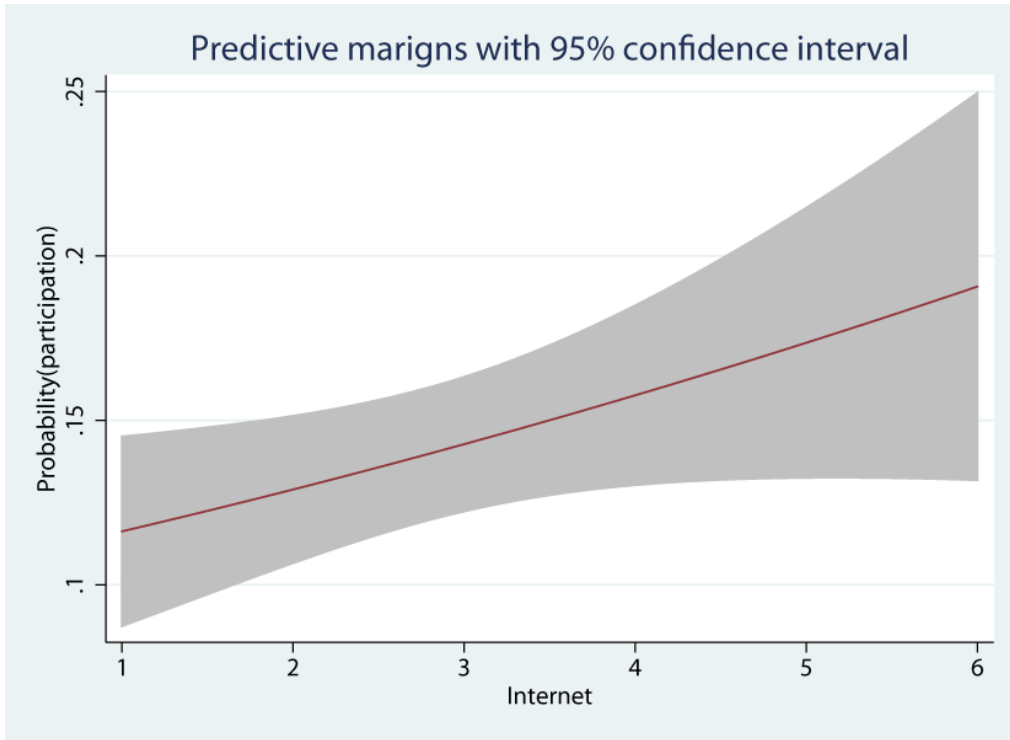
Figure 5. Internet usage and probability of demonstration participation

Table A-1. Descriptive statistics of Tahrir data set.

Variables	obs.	mean	S.D.	min	max
Vanguard	1048	0.3282443	0.4697984	0	1
Twitter	1048	0.1851145	0.5190615	0	2
Facebook	1048	1.23855	0.8644317	0	2
SMS	1048	0.5944656	0.6887331	0	2
Mobile	1046	1.320268	0.768837	0	2
Satellite TV	1046	1.59369	0.6235554	0	2
Radio	1048	0.2624046	0.5621275	0	2
Newspaper	1047	0.8395415	0.7997627	0	2
Blog	1048	0.1383588	0.4292749	0	2
E-mail	1047	0.3839542	0.6686438	0	2
Oral communication	1047	1.60745	0.6103488	0	2
Affiliation	1048	0.3368321	0.4728526	0	1
Participation in demonstration	1047	1.352436	0.477957	1	2
Age	1048	28.44752	9.037813	1	67
Male	1048	0.7681298	0.4222281	0	1
Education	1047	5.303725	1.555664	0	7

(*) "Vanguard" is a dummy variable, equaling 1 if the respondent is a vanguard, and 0 if they are a follower. The variables from "Twitter" to "Oral communication" represent the frequency with which each is used at the time of the January 25 Revolution, equaling 0 for not used at all, 1 for used sometimes, and 2 for used often. The variable "affiliate" equals 1 if the respondent belongs to an organization, and 0 if they do not. "Participation in demonstration" is a dummy variable, equaling 1 for "no" and 2 for "yes."

Table A-2. Descriptive statistics of the Middle East Opinion Survey (Egypt 2013)

Variables	obs.	mean	S.D.	min	max
Participation in demonstration	1092	0.2051282	0.6263766	0	4
Internet	1100	2.141818	1.89292	1	6
Egyptian Newspaper	1100	2.223636	1.763802	1	6
Arab Newspaper	1100	1.288182	0.9565855	1	6
Int'l Newspaper	1100	1.143636	0.6807542	1	6
Egyptian TV	1100	4.578182	1.937203	1	6
Egyptian Satellite	1100	5.24	1.387137	1	6
Arab Satellite	1100	4.055455	2.07538	1	6
Government caused inequality	1100	0.4781818	0.499751	0	1
Mubarak regime evaluation	1077	4.756732	3.560975	0	10
Male	1100	0.5309091	0.4992707	0	1
Age	1100	37.82545	13.57768	18	81
Education	1100	4.120909	1.75084	1	7
Talk about politics	1100	4.216364	1.209044	0	5
Convinced of Government Breakdown	1084	39.5203	38.94915	0	100

(*) The dependent variable "Participation in demo" equals 0 for not participating at all, 1 for 1-5 times, 2 for 6-10 times, 3 for 11-15 times, and 4 for 16 times or more. The variables form "Internet" to "Arab Satellite " represent the frequency which which each is used, equaling 1 for not at all, 2 for less than once a week, 3 for once a week, 4 for a few times a week, 5 for frequently each week, and 6 for every day. "Government caused inequality" equals 1 if the respondent believes it is, and 0 if they think there is another cause. "Mubarak regime evaluation" is a feeling thermometer, ranging between 0 for extreme hatred of the leader and 10 for liking him very much. "Talk about politics" is an ordinal-scale variable, equaling 0 for do not know, 1 for do not talk so at all, 2 for do not talk so much, 3 for cannot say yes or no, 4 for talk so, and 5 for talk so very much. "Convinced of Government Breakdown" is the respondent's degree of conviction, as at the end of January 2011, that Mubarak's regime would fall, ranging from 0 for absolute doubt to 10 for absolutely convinced.