Social media and collective action participation: A socio-psychological investigation

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Abstract

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This thesis investigates effects of social media on collective action participation by addressing selection bias, disentangling social media mechanisms, analyzing mediating socio-psychological factors, and examining cumulative and social network effects. Utilizing a survey on a large scale street demonstration in Taiwan, I propose a structural-cognitive model to explain the effects of social media. I find that social media

expression, rather than social media information, predicts protest participation. The effect is curvilinear and not due to various possible selection bias. Social media expression increases levels of identification, friend positive incentive, and individual efficacy, which in turn lead to protest participation. Furthermore, social media activates networks supportive of protest and plays an important role in cumulative effects of protest. It increases not only intentions to attend protests in the future, but also intentions to organize protests. My results suggest social media as a new mobilization structure that changes psychological states of individuals, which broadens the pool of collective action sympathizers and produce long-term effects. Social media fundamentally changes the composition of individuals in a society that is conducive to collective action. The study demonstrates how a synthetic framework between disciplines of sociology, psychology, and communication enable a holistic understanding of collective action.

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Introduction

The impact of social media on collective action is increasingly debated. The role of social media, such as Facebook and Twitter, has been emphasized by many in explaining recent large scale protests and revolutions, such as the Arab Spring, or the Occupy Movement in the US (Castells 2012; DeLuca, Lawson, and Sun 2012; Hussain and Howard 2013; Segerberg and Bennett 2011). However, while the role of social media has drawn much attention, this study is motivated by several unresolved questions. Does social media really incentivize individuals to take part in collective action, or is there a confounding problem in that those who frequently use social media are already the politically active? Moreover, social media includes many dimensions, such as enhanced networking technology, efficient information transmission, or a platform for public discussion. The specific aspects of social media, as well as the mechanisms that are conductive to collective action are not fully disentangled. Suppose social media does incentivize individuals, does it have an effect on all, or only for specific groups?

In terms of the effect of social media, the functional relationship between social media and collective action has not been explored. Does increase social media usage lead to a linear impact on collective action, or are there threshold or even substitution effects? What are the cumulative effects of social media? Does it create long term effects on mobilization or one-time effects? Also, the social network effects of social media are unclear. Does social media generate new ties, or does it simply reproduce existing ones? Finally, we lack a macro-micro model to explain the relationship between social media technology and individual action. In other words, should collective action theory be replaced with a new theory of social media, or is there a bridge between the two?

This thesis aims to extend previous research by addressing these questions. I find multiple points. First, social media expression, rather than information consumption on social media, has a positive effect on protest participation. Information consumption without active expression on social media has no significant impact on protest, while the reverse does not hold. Regarding selection bias, social media expression has

its own unique effect on protest participation even after considering various backgrounds of individuals, including previous political activity, attitudes of family and friends, previous social media activity, and demographic attributes. Moreover, the relationship between social media expression and protest participation is curvilinear. On average, social media expression has a positive effect on protest participation. However, results suggest a threshold point and afterwards marginal increases in social media expression decreases the incentive to protest.

Psychological factors are critical in explaining the effect of social media expression. Identification, friend incentives, and individual efficacy mediate the relationship between social media expression and protest. Multiple checks suggests that the relationship is unlikely due to artifact of causal endogeneity or confounding variables.

Social media has important implications on mobilization. Social media plays an important role in producing cumulative effects of protest. Previous protest experience has a positive effect on social media expression, which in turn has both a direct effect on willingness to participate in future protests, and an indirect effect through the experience of protest. For willingness to organize future protests, social media expression plays an even more important role. Social media expression is the sufficient condition that leads to willingness to organize future protests. Without social media expression, even the experience of physically participating in protests is not enough to induce willingness to organize. Furthermore, from a social network perspective, social media has a network effect in that it may either create new friends or convert existing friends to form a social network supportive of protest.

The structure of this thesis is as follows. First I provide a review on theories of collective action and research on the relationship between social media and protest, followed by core debates, limitations of current studies and contributions of this study. Data and methods of this study are then presented. The next section reports findings of the study. Analyses One and Two disentangle mechanisms of social media, address selection bias, and test for functional form. Analyses Three examine social psychological factors that mediate the relationship between social media and protest. Analysis Four to Six perform robustness checks as well as identify social network effects. Analysis Seven and Eight look at long term and cumulative effects of protest and the

role of social media. Finally, the last section summarizes empirical findings and lays out theoretical contributions.

Mobilization and collective action theory

Social movement recruitment has been a longstanding issue of research. Mobilization refers to the process of how passive individuals become active participants (Tilly 1978). Mobilization structure research focus on the social relations and organizational structures that affect the process of mobilization (Zhao 2007).

The problem of mobilization can at least be traced to Olson's (1965) theory of collective action. For Olson, the marginal effect of each individual on the outcome of collective action is so small that it may seem irrational for individuals to participate in collective action rather than "free ride" the benefits. Olson further discusses that the provision of selective incentives is key for individuals to participate.

To solve the "free rider" problem, scholars have investigated different factors that lead to mobilization. The resource mobilization theory argues that mobilizing resources, including money, organizations, media and party relationship, are key to the mobilization process (McCarthy and Zald 1977; Jenkins 1983). Participation in collective action is determined by how well organizations can utilize resources to motivate potential participants. On the other hand, others focus on not only formal organizations, but relationships between individuals as well, and view social networks as the answer to the free-rider problem. Social networks composed of relationships through organizations, such as parties, church, unions, are considered an important factor in encouraging people to participate in social movements (Morris 1981). Gould (1991) studies the Paris Communes and argues that social networks are the key to participation in collective action. McAdam (1990) finds that prior social ties generated in the "Freedom Summer" campaign led to participation in subsequent social movements such as civil rights or feminist movements. Deng (1993) analyzes student movements in Taiwan after the 1980s, and contends that student club organizations played a critical role in initiating movements and mobilizing resources. In short, network scholars contend that personal relationships between individuals may transform into mobilization power in times of unrest.

Some scholars draw attention to macro variables of the political system. The political process model focuses on "political opportunity structures" that may be conducive to mobilization (Eisinger 1973; McAdam 1996; Tarrow 1988). The political process model contends that recognizing changes in the political system is critical in explaining mobilization. An increase in political opportunities creates an opening for the oppressed, which explains variations of macro trends of movement uprising.

In contrast, micro theories discuss factors on the individual level. Some explore how meanings are generated for individuals, and how movement activists create symbolic meanings that encourage participation through framing. Framing refers to the process of selecting aspects of perceived reality, making them salient to promote a particular problem definition, moral evaluation, causal interpretation, or problem solution (Entman 1993). Framing processes create frames which resonate with potential participants are crucial to movement participation (Noonan 1995; Snow et al. 1986; Benford and Snow 2000). On the other hand, others study psychological factors relating to social movement participation such as grievances and anger (Opp 1988), social incentives (Fireman and Gamson 1979; Opp 1993), identification (Klandermans and de Weerd 2000; Melucci 1988; Polletta and Jasper 2001), or individual efficacy (Van Stekelenburg 2013; Van Zomeren et al. 2008) are identified as proximate determinants of collective action participation.

Opp (2009) proposes a synthetic structural cognition model to fully understand mechanisms between macro to micro factors. For instance, political opportunity structures should be linked to individual factors, such as sense of efficacy, to truly understand how they impact individual motivations. Similarly, being embedded in a social network conducive to protest may lead to an increase of identification, which in turn leads to collective action (Stekelenburg and Klandermans 2010). However, when discussing the impact of social media, the relationship between social media and collective action factors is underdeveloped. In fact, to my knowledge there is no systematic study that tests the relationship between social media and collective action factors, which is the aim of this study.

Internet and social media: the new wave

Since the turn of the century, internet media have gained increased attention in its role in collective action. Mele (1999) uses the Jervay region as an example to discuss how residents used the internet to enhance their movement. Clark and Themudo (2006) show how the anti-globalization movements in the US used the internet as participants' base of connection. Earl and Kimport (2009) point out that the internet makes it possible for movement participants to promote and attain diverse goals online. Stein (2009) studies American social movement websites and concludes that the internet can help gather resources for social movements. Some studies put their focus on multi-network hyperlinks, indicating that websites connecting to one another increases the spread of information and hence resource mobilization (Biddix and Park 2008; Kropczynski and Nah 2011). Nonetheless, analysis of social networks should not be limited to online communication. Scholars have pointed out that mobilization power is at its best when online recruitment is backed by existing social network ties offline (Diani 2000; Van Laer 2010). In other words, those social networks offline may be reproduced online and vice versa (Meek 2012; Mercia 2011; Wellman et al. 2001).

Scholars have contended that the internet can serve as an alternative media to mobilize participants. The internet may place tools of cultural production in hands of ordinary people. Movement organizations may use the internet as a media to better represent themselves (Srinivasan and Fish 2009; Youmans and York 2012). Through the internet, activists can distribute essential information, such as the goals of the movement, or how to contribute resources (Biddix and Park 2008). Furthermore, activists may use the internet to gain attention from mainstream media such as newspapers or television (Lester and Hutchins 2009) or even influence their agendas (Tang and Sampson 2012). Furthermore, the internet may encourage online users to participate in offline social movements (Bennett, Breunig, and Givens 2008; Brunsting and Postmes 2002; Harlow 2011; Mercea 2010; Wojcieszak 2009). Whereas Diani (2000) questions the possibility of online trust generation due to lack of the warmth and intensity compared to face-to-face interaction, Nip (2004) contends that trust and collective identity can be created through the internet. Furthermore, because of technological advances, internet users may interact highly with one another more than ever

and foster common identities (Petray 2011). Hsiao (2011) even argues that internet media may be conceived as a "virtual ecology" that generates modes of communication, network ties and trust during daily lives, which can transform into movement bases during mobilization phases.

Recently, the ever increasing interactivity of the internet and social media platforms has facilitated a new wave of large scale social movements, with the most prominent cases being the "Arab Spring" in the Middle East and the "Occupy Movement" in the US. The term "Web 2.0" has largely been used to coin the social media technology involved. While many have debated the difference between Web 2.0 and Web 1.0, in general the term Web 2.0 refers to internet technology that emphasizes intensive communication, participation, instant information exchange, and collaborative work between users. It encourages users to actively participate in the information spread and collective intelligence making process (Goodchild 2007; Murugesan 2007; O'Reilly 2007). Social media increases the efficiency of communication and broadens the scope of users involved in the information production process, which contributes to the information spread and mobilization process of social movements (Sedra 2011). In fact, many scholars have argued for the importance of interactive social media such as Facebook, Twitter, or Myspace in facilitating the new wave of social movements (Castells 2012; DeLuca et al. 2012; Howard and Hussain 2011; Segerberg and Bennett 2011; Tufekci and Wilson 2012). In short, social media builds on existing advantages of internet media, but allows further interaction and participation, which in turn may provide even stronger mobilization power in collective action.

Social media and collective action: debates and limitations

Although many scholars stress social media's impact on mobilization, others are skeptical about the effect. The biggest critique is that could the protests emerge without social media. Arguably the most famous critique is by Gladwell (2010), who draws numerous examples of how large scale protests emerged before the advent of social media, and argues that it is grassroots organization that is key to success of social movements rather than social media. Johannessen (2015) also finds that social media information mainly reaches to activists or sympathizers, while traditional me-

dia, such as newspapers, reaches a wider audience. In other words, with all the attention to social media, is there selection bias in that those who actively Tweet, for example, are those who would have promoted protests in another way if there were no social media? Because of difficulty of addressing selection bias in that those who actively use social media may be those prone to protest, the critiques have not been well addressed. The predicament is best summarized by Tufekci (2014), who notices that we observe those who have action on social media but know little about those who do not. In other words, while social media supporters need not explain all factors that played a role in protest, they at least need to show that social media has an independent effect regardless of participants' previous background. To my knowledge, the only study that addresses selection bias is the Chile study by Valenzuela, Arriagada, and Scherman (2014). Through a matching process on political interest, political efficacy, political trust, and socioeconomic status, they argue that regular social media use has a positive effect on likelihood of participating in protests even when controlling for the mentioned characteristics. While the study is a true advance on current knowledge, due to the aggregate cross sectional nature of the data, it does not provide individual level data to truly control for individual characteristics

Another important critique is that online social media activity may actually conflict with physical protest participation. Studies have coined the term "slacktivism" to describe low cost participation online, such as such as posting or "liking", which leads to no subsequent action that requires significant costs (Morozov 2009; Rotman et al. 2011). If one could feel good through easy participation online, why spend the time and energy to physically participate? Responses to this critique is mixed. While some studies show that online participation leads to subsequent civic action (Valenzuela 2013; Vie 2014), others find no such effect (Kristofferson, White, and Peloza 2014; Lee and Hsieh 2013).

One additional factor that muddies the debate is that there are multiple social media mechanisms that might lead to protest participation. However, these mechanisms are not well distinguished. On one hand, there is the "information hypothesis", which argues that social media increases consumption of information that in turn generates willingness to participate in civic action. In daily life, social media can provide news

on political issues that increases political awareness (Gil de Zúñiga, Jung, and Valenzuela 2012). In times of unrest, social media increases the visibility of protests, which in turn mobilizes those who consume the information, such as stirring up grievances and even collective action (Howard and Hussain 2011). In short, the information hypothesis argues that social media provides information that cannot be gained otherwise. By recurrently distributing large amounts of protest information, visibility of protest is increased, and participants are mobilized.

On the other hand, the "expression hypothesis", argues that interactivity of the internet allows individual citizens to express and discuss political opinions, which may increase civic awareness and lead to collective action. Some even argue that the internet serves as a new public sphere that allows civic communication (Chatfield et al. 2012; Dahlgren 2005), which may in turn lead to civic participation (Valenzuela 2013). Bennett and Segerberg (2012) point out that personalized, individual sharing on social media in a trust relationship forms a new type of *connective action* that is conducive to collective action. While the two hypotheses may have reciprocal relationships, it is important to distinguish which ones lead to participation. This study tests the two hypotheses independently, and disentangles different mechanisms to contribute to the debate.

Methodological difficulties also muddy the debate. Current studies can be roughly divided into two types. Macro level studies, mostly done by communication scholars, contribute by showing the relationship between social media trends and protest trends. They show that floods of information are online, and many are actively expressing political opinions on social media (DeLuca, Lawson, and Sun 2012; Howard and Hussain 2011; Petray 2011). However, we need individual level data to see if these macro trends do have an impact on individuals. In other words, macro level studies provide the necessary condition (i.e. if there were no trends observed, social media would definitely have no impact), but we need individual data to examine the sufficient condition.

Most individual level data come from studies that focus on participants of protests, but less on non-participants (Agarwal et al. 2014; Tufekci and Wilson 2012). They illustrate possible mechanisms that provide foundations for hypothesis testing. How-

ever, a limitation of selecting on the dependent variable is that they do not allow hypothesis testing. Quantitative studies that do not sample on the dependent variable are needed to test the hypotheses to complement them. The problem is that these studies are practically difficult because on the one hand we do not want to select on the dependent variable by only surveying those who participated, but on the other hand if no purpose sampling is conducted, often there are not enough cases of participants in the sample. As suggested by the "five percent rule" (Lichbach 1996), in most protest cases no more than five percent of supporters of a movement actually participate, meaning that often there are too few cases to allow statistical analysis in a random representative sample of a general population. In fact, the limitation of inability to address selection bias is closely related to the difficulty of not selecting on dependent variable. By utilizing a unique protest where there are large proportions of the younger generation who participated, this study allows enough statistical power without the need for purposive sampling on the dependent variable. It aims to complement previous studies: it provides individual data that complement macro studies, and tests mechanisms identified in previous studies.

Finally, as mentioned in previous section, the macro to micro theory building is far from complete. A structural cognitive approach should be utilized to understand how social media relate to psychological factors identified by collective action theory. While some studies allude to psychological factors such as grievances (Howard and Hussain 2011), identification (Bennett and Segerberg 2012), or social incentives (Valenzuela, Arriagada, and Scherman 2012), a systematic and direct test on the relationship is still pending, which is the goal of this paper.

Data and Method

Case description

This study draws on the Sunflower Movement in Taiwan as the research case. The Sunflower Movement was a protest driven by a coalition of students and civic groups between March 18 and April 10, 2014 in Taipei, the capital of Taiwan. Participants protested the passing of the Cross-Strait Service Trade Agreement by the ruling party, the Kuomintang, without clause-by-clause legislative review. For the first time

in Taiwan, protestors occupied the parliament for twenty days to express discontent. On March 30, the protest rallied over half a million participants in a public demonstration[1], marking the largest movement organized by Taiwanese students. Still, while the movement was mainly organized by students, participants were not restricted to students. The movement was well known in Taiwan because it was reported everyday on mass media. Given the scale of the movement, a large proportion of the younger generation participated in the movement[2]. Hence, the case has the advantage of avoiding the "five percent rule" (Lichbach 1996), indicating that this is a rare opportunity that allows enough statistical power to analyze factors that lead to social movement participation. In fact, in the research sample, which is *NOT* a purposive sample on the dependent variable, 37% of the respondents attended the Sunflower Movement.

The Sunflower Movement generated a great deal of discussion. During the issue of protest, many users of social media posted, responded, and liked related posts. Although hard to directly estimate the amount of information online, the official Facebook page of the movement received more than 390,000 likes, signifying the visibility of the movement on social media. The Sunflower Movement is an ideal case where we can understand why potential participants participated or did not participate, and the role social media played.

Survey design

Overview and pretest procedures

This study utilizes an online questionnaire. Before the questionnaire was held out, three pretests were conducted (Groves 2011). First, an expert review; to ensure measures align with theoretical constructs, the questionnaire was handed out to experts in fields of collective action or survey design. Second, cognitive interviews; to check if respondents interpret questions well, ten Taiwanese citizens were recruited through

[1] Since there is no actual count, the estimate is derived from density calculations based on Ariel photos (see Cool3c.com, 2014). Note that this is a conservative estimate because it only counts participants in the largest rally, but not other demonstrations.

[2] If 500,000 is the number of participants, then the number corresponds to 15.5% of all Taiwanese people aged 20-30. Since the movement was in Taipei, if we restrict to only those aged 20-30 in the Taipei Metropolitan area (i.e. Taipei City and New Taipei City), the proportion is 57.5%. If we restrict to all college students since this is a student organized protest, the proportion is 37.5%.

personal networks and cognitive interviews were conducted through a "think aloud" procedure. Respondents elaborated what they were thinking while completing the questionnaire. Third, field test; A draft version of the questionnaire was handed out through personal network to 27 respondents. In contrast to cognitive interviews, feedback was obtained after they completed the questionnaire. In other words, the latter two methods complement one another by in that one has dense interaction with the researcher while the other mimics the field situation. The reason why respondents in the cognitive interviews and field tests were recruited from personal networks is prevention of contamination of the final sample. Since information on the internet transmits easily, any open posting on the web would risk contaminating the final sample. All pretest results were excluded from the analysis in the study.

After the pretest procedures, the questionnaire was posted online on PTT, a large BBS forum site in Taiwan (described in detail later). The survey was posted from 5 May, 2015 to 25, June, 2015. To increase incentives for answering the questionnaire, a lottery was conducted randomly selecting respondents to win an IPad or convenience store coupons.

Target Population

The study restricts participants to those from age 18 to 30. The restriction criteria is that we wish to select a target population that is relatively available, both on time and on obligations, to participate in the protest. By selecting a population that is available for protest, we can identify the mechanisms that mobilized them. Age 18 is the legal age in Taiwan as an adult as well as the average time students graduate from high school, and age 30 is roughly the average age people in Taiwan get married (Directorate General of Budget, Accounting and Statistics 2014). Hence, this study selects a group who are biological available on a life stage with less obligations from school or family. The post asking for respondents indicated that they should answer the questionnaire only if they are from ages 18 to 30. However, a few respondents (n=37) indicated that their age were outside the range. Results do not change whether or not the cases are excluded in the analysis.

Note that although the sample is drawn from a younger generation, by no means is

this study aiming at a population based inference on proportions. In other words, the goal of the study is not to estimate the proportion of the younger generation in Taiwan that went to the Sunflower Movement, nor the percentage that use social media. Instead, this study is aimed at testing mechanisms on the relationship between social media factors and collective action participation. These aims do not necessitate the drawing of a random representative sample.

Sampling

The questionnaire was posted on a series of forums on PTT. PTT is a popular site in Taiwan on the BBS (Bulletin Board System), which is highly used by the younger generation. Users who wish to participate are then directed to a survey website where they answer the questionnaire. The BBS has been used since 1983 in Taiwan (Shen 1995). Although the interface has remained much the same since 1983 and is rather primitive, it is largely used by the younger generation, many of whom are college students. The number of users on PTT, the main site on the BBS, can exceed a hundred thousand simultaneously at its peak even now. Users use PTT as their main daily routine of gaining information and socializing. The PTT contains many boards that are differentiated by topic (e.g. political issues, news, movies). In this study, the questionnaire was posted on various boards, including those that are unrelated to politics and those that may be. Most respondents are recruited from boards that are unrelated to politics, such as StupidClown, where users post personal funny stories, or MobileComm, where respondents discuss smartphones. Details can be seen in Table 1. In other words, the questionnaire was purposely posted to *avoid selecting on the dependent variable*. Respondents were mostly recruited from boards that have no connection to protest or politics. Also, analyses below also controlled for board effects, and results do not change.

Insert Table 1 here

Questionnaire design

Since the official language is Mandarin in Taiwan, the questionnaire was translated

by the author and posted in Mandarin. The questionnaire consisted of around 50 questions (varying due to skip patterns) and takes about 10-15 minutes to complete. The questionnaire is a retrospective survey that asks about their behavior and thoughts.

To reduce the problem of endogeneity between variables, procedures were conducted to mimic a longitudinal survey. The questionnaire can roughly be divided into three time frames that are chronologically after each other. The first time period consists of items asking about thoughts and behavior *before* the issue of protest. The second time period consists of items about thoughts and behavior *after* the issue of protest but *before* they went to the protest (for protestors), or *during* the time of protest (for non-protestors). The reason is that thoughts and behavior may change after people protest, so we need to identify only those that happened before they participated if we want to identify potential factors that lead to protest. For non-protestors, there is no such problem and we need only ask about their thoughts and behavior during that time period. The third time period consists of questions about future intentions on protest. Through the survey design, we can chronologically order factors and reduce problems of endogeneity.

Measures

Protest

Protest was measured by a binary item: "Did you physically participate in the Sunflower Movement?" (0 = *no*, 1 = *yes*).

Social media variables

Social media expression

Social media expression was measured by a scale with five items (Cronbach's α=0.9): "On your social media, how often did you post comments on the Trade Agreement issue or the Sunflower Movement?", "On your social media, how often did you reply to other people's posts on the Trade Agreement issue or the Sunflower Movement?", "On your social media, how often did you repost or re-share other people's posts on the Trade Agreement issue or the Sunflower Movement?", "On your social media, how often did you "like" other people's posts on the Trade Agreement

issue or the Sunflower Movement?", On your social media, how often did you did you encourage others to physically participate in the Sunflower Movement?" Respondents indicated their frequency by a five point scale (1= *never*, 5= *everyday*).

Social media environment

Social media environment consisted of two items (γ=0.71): "On my social media, there were a lot of posts about the Trade Agreement issue or the Sunflower Movement", "A lot of my friends on my social media expressed their opinions about the Trade Agreement issue or the Sunflower Movement". Respondents indicated their agreement with these items using 4-point scales (1 = *strongly disagree*, 4 = *strongly agree*).

Control variables

Demographic variables

Several demographic variables were measured including gender (0 = *male*, 1 = *female*), age, father education and mother education (1 = *less than elementary school*, 7 = *doctoral*), family income (1 = *30000 NTD or less*, 6 = *90000 NTD or more*).

Previous political behavior

Previous political behavior was measured including "On average, how often did you discuss political or social issues with others", "On average, how often did you read political or social news" (1 = *less than once a month*, 5 = *everyday*). Also measured was whether the respondent ever had the experience of: attend protest, attend political rally, attend community meeting, work for politician, NGO experience, solve community problems with others (0 = *no*, 1= *yes*).

Previous social network or norms

Attitudes of those around the respondent were measured by asking about their family and friends: "In general, most of my family would wish that I attend a street demonstration that protests against an injustice issue", "In general, most of my friends would wish that I attend a street demonstration that protests against an injustice issue" (1 =

strongly disagree, 4 = *strongly agree*). Internalized norms were measured by the item "If there were a protest against an injustice issue, I would feel bad if I stayed at home" (1 = *strongly disagree*, 4 = *strongly agree*).

Previous social media behavior

Previous social media behavior consisted of a series of items: "On average, how often on your social media site did you post comments on political or social issues?", "On average, how often on your social media site did you comment on other people's posts on political or social issues?", "On average, how often on your social media site did you repost or re-share other people's posts on political or social issues?", "On average, how often on your social media site did you "like" other people's post on political or social issues?", "On average, how often on your social media site did you encourage others to take action to support political or social issues by posting or responding posts?" (1 = *less than once a month*, 5 = *everyday*).

Social psychological variables

Incidental grievances

Incidental grievances was measured by the item "I felt angry towards the government" Respondents indicated their agreement with 4-point scales (1 = *strongly disagree*, 4 = *strongly agree*).

Identification

Identification consisted of two items: (γ=0.72): "In general, I felt close towards those who would physically attend the movement", "In general, I admired those who would physically attend the movement" (1 = *strongly disagree*, 4 = *strongly agree*).

Ideology

Measured with the item "In general, I agreed with the goals of the movement" (1 = *strongly disagree*, 4 = *strongly agree*).

Social incentives

Family positive social incentives was measured with the item "In general, my family would wish that I physically attend the Sunflower Movement." Family negative social incentive was measured with the item "In general, my family would react negatively if I did not physically attend the Sunflower Movement." Similarly, friend social incentives were measured by "In general, my friends would wish that I physically attend the Sunflower Movement", "In general, my friends would react negatively if I did not physically attend the Sunflower Movement" (1 = *strongly disagree*, 4 = *strongly agree*).

Individual efficacy

Measured by the item "I felt that I would have an impact if I attended the Sunflower Movement" (1 = *strongly disagree*, 4 = *strongly agree*).

Group efficacy

Pretest results indicate that group efficacy should be split into two different dimensions. Group efficacy on the government was measured by "I felt that the Sunflower Movement would have an impact on the government", while group efficacy on the society was measured by "I felt that the Sunflower Movement would have an impact on the society" (1 = *strongly disagree*, 4 = *strongly agree*).

Issue relevance

Measured by the item "I felt that the Trade Agreement was important for me or my future" (1 = *strongly disagree*, 4 = *strongly agree*).

Future protest willingness

Participation in future protest

Measured by the item "If an issue you consider unjust happens in the future, are you inclined to participate in relevant street protests?" (1 = *inclined to not participate*, 2 = *no inclination*, 3 = *inclined to participate*).

Organization of future protest

Measured by the item "If an issue you consider unjust happens in the future, are you willing to organize a street protest?" (1 = *not willing to organize*, 2 = *no inclination*, 3 = *willing to organize*).

Validity Checks

To prevent repeated responses, a cookie restriction on the website was implemented. Also, respondents were asked to give their PTT id and their email address for contact purposes of the lottery. Finally, upon contact respondents would have to provide their name and address in order for the prizes be mailed to them. In other words, a respondent would have to own two PTT ids and emails, as well as two names and addresses, and remove previous cookies to be possible for repeated response. Thus, under speculation the number of repeated responses is very low if any.

A total of 948 respondents completed the survey. Two validity checks were conducted before analysis. First, those who completed the survey in an extraordinary short time (i.e. below four minutes; the median response time is 10 minutes and 39 seconds) were excluded. Second, to exclude respondents who were not paying attention to the questions, the questionnaire designed two questions that are contradictory to one another: "In general, I felt angry towards those who would physically attend the movement" and "In general, I admired those who would physically attend the movement". Respondents who answered "Agree/Strongly Agree" on both questions were excluded from analysis. After the validity checks, the effective sample size is 913.

Results

Analysis One: net effects of social media variables

Overview, data management, and estimation method

The goals of Analysis One is twofold. First, as mentioned, there may be competing hypotheses (the expression hypothesis vs the information hypothesis) on how social media impacts collective action participation. Second, a big limitation in current studies is the possibility of selection bias in that those who actively use social media are

the politically active. This study utilizes the set of questions on behavior or attitude *before the issue of protest* as control variables, which estimate the net effect of social media on protest participation.

Respondents who indicated that their social media expression or their social media environment were against the Sunflower Movement were excluded from analysis (n = 78) since their social media behavior or environment are fundamentally different from others. For instance, we would not expect a person who posts lots of articles against the movement to participate in the movement, while we might expect otherwise. The final sample size for analysis is 835. Including them in the analysis does not change results. However, it does increase unnecessary standard errors.

Logistic regression was run with protest as the dependent variable. The category "Don't Know" was recoded as missing values. For the social media variables that are key in the model, the proportion of "Don't Know" is below 2%. Therefore, the sample size variation in the models is due to missing values for different combinations of the controls, which impact less on the implications. Descriptive statistics of variables in Analysis One is shown below in Table 2.

Insert Table 2 here

Results and discussion

Insert Table 3 here

Insert Table 4 here

Testing the two social media hypothesis

Model 1 and Model 2 examine bivariate relationships on social media expression and social media environment. By design protest is measured after the social media factors so as to reduce the problem of causal endogeneity. Model 1 and 2 indicate that *independently* social media expression and social media environment both have a positive effect on likelihood of protest. However, when the two are *jointly tested* in Mod-

el 3, results indicate that after controlling for social media expression, there is no significant relationship between social media environment and protest, while the reverse is not true. In other words, the key factor of social media that leads to participation is action on social media rather than information consumption. In fact, the coefficient of social media expression does not change at all when controlling for social media environment. Results provide supportive evidence for the expression hypothesis but not the information hypothesis.

Addressing selection bias

Models 4 to 8 address various possible selection bias that may have led to the relationship between social media expression and protest, including demographic backgrounds, previous political behavior, social network and norms, and even previous activity on social media. Results point to the same conclusion in that the net effect of social media expression on likelihood of protest exists, and even barely changes at all, after controlling for selection bias[3].

Analysis Two: functional form between social media expression and protest

Overview, data management, and estimation method

As mentioned, a critique on the effect of social media is the possibility of "slacktivism", which means that individuals can feel good by participating online instead of physically participate. Results in Analysis One indicated that on average social media expression has a positive effect on probability of protest. However, it might be that the relationship is non-linear, and have threshold or even substitution effects. Testing the functional form of the relationship between social media expression and protest probability would be the goal of Analysis Two. Variables, data management strategy, and estimation method are the same as Analysis One.

[3] The McKelvey-Zavoina pseudo R-squared for Model 1 is roughly 0.12, suggesting that around 12% of the variance for the protest latent variable is explained by social media expression. The pseudo R-squared for Model 8 is 0.29.

Results

Insert Figure 1 here

As seen in Figure 1, as the level of social media expression increases, the proportion that participated in the protest increases as well. However, up to a threshold if level of social media expression is too high, proportion that protested actually decreases. A brief look indicates that if the individual very actively participates online, he/she may be not willing to physically participate.

Insert Table 5 here

To examine the pattern above, a square term for social media expression was added to the model, as seen in Table 5 below. To make the point clearer, only results from Model 1 (the bivariate model), Model 3 (the joint model) and Model 8 (the full model with all the controls) are shown, but results from other models are the same.

As seen, the negative significant coefficient for the squared term fits with the above pattern in that excessive social media expression may lead to less protest likelihood.

Insert Figure 2 here

To make the point clearer, a simulation was done based on results from Model 8 to show the relationship between social media expression and protest probability, with all other variables held at their mean (Figure 2). As social media expression increases, probability of protest increases as well. In fact, a person with moderately high social media has a fifty percent more chance of protesting compared with a person with very low social media expression. Nevertheless, after crossing the threshold, excessive social media expression decreases the probability of protest. Although the confidence intervals are wider, the point estimates of predicted probabilities do suggest substitution effects.

An investigation on exactly the reason substitution effects happen is beyond the lim-

its of this study. However, from the literature it suggests the effect of "slacktivism". It may be that people who extensively use social media do not feel the need to physically participate compared to those who moderately use social media. They might have satisfied the need of a feeling of involvement, or they might even be specialized online activists. In other words, there may be two heterogeneous groups of sympathizers. One consisted of people who moderately use social media and physically participate, and another consisted of "slacktivists" who do a lot online but are not willing to physically participate. Both supporters and critics of slacktivism may be right but also with limitations. Overall social media expression does have a positive effect on protest, but on the extreme spectrum there might exist a nontrivial group of slacktivists.

Analysis Three: social psychological factors that mediate social media expression and protest

Overview, data management, and estimation method

Analyses One and Two suggest that social media expression is a key mechanism linking social media technology and protest. However, as regards to collective action theory, it is still unclear how social media expression translates into individual incentives that lead to collective action, which would be the focus of Analysis Three.

Respondents who answered "Don't Know" were coded as missing categories. There is a substantial proportion of respondents who answered "Don't Know" in certain items, such as items regarding identification or family social incentives. Interestingly, compared with those who *did not* participate in the Sunflower Movement, participants were much more unlikely to answer "Don't know", suggesting that if people had no idea of whether they felt emotional close to the movement, they had little incentive to participate. Theoretically, because these are questions about incentives, "Don't Know" could indicate zero incentive and be coded as the middle category. Results do not change either way.

Respondents who indicated that their social media expression was against the Sunflower Movement were excluded from analysis since we are interested in how sup-

portive social media expression relates to protest. Effective sample size for analysis is 828. Descriptive statistics of variables in Analysis Three is shown below in Table 6.

Insert Table 6 here

Results

Psychological factors that relate to social media expression

Correlational analysis was utilized to identify psychological factors associated with social media expression:

Insert Table 7 here

As seen, incidental grievances, emotional identification, admiration identification, friend positive incentive, and individual efficacy have a correlation of .3 or larger with social media expression, while other factors are below .3. Hence, incidental grievances, emotional identification, admiration identification, friend positive incentive, and individual efficacy stand out as factors related to social media.

Psychological factors that relate to both social media expression and protest participation

Insert Table 8 here

As seen in Table 8, psychological factors are often associated with one another, which leads to the question of which ones are uniquely predictive of protest. To examine the problem of confounding variables, multiple regression was run with the psychological factors as the independent variables and protest as the dependent variable (Table 9).

Insert Table 9 here

As seen in Table 9, after accounting for confounding problems, friend positive incentive, identification, and individual efficacy show up as unique predictors of protest. In other words, these factors are the only ones that are uniquely related to both social media expression and protest participation. Hence, the following parts would use them for analysis.

Testing mediation: a structural equation modeling approach

Theoretically, psychological factors are proximate determinants that predict protest because they directly impact the individual's decision making, while social media expression should be a more distant factor. Structural equation modeling was run to test if identification, friend positive incentive, and individual efficacy mediate the relationship between social media expression and protest. The scales of social media expression and identification were re-specified as latent variables. Since the variables were measured in ordinal fashion (e.g. Strongly Disagree to Strongly Agree), the weighted least squares with means and variance adjusted (WLSMV) estimation was used, which has been shown to perform better for categorical data (see Beauducel and Herzberg 2006; Muthén and Asparouhov 2002). The statistical software *Mplus 7.3* was used for estimation.

Insert Figure 3 here

In Figure 3, confirmatory factor analysis was conducted for the latent variable "social media expression, with all five social media expression items having standardized factor loadings from 0.77~0.94. An error correlation between responding on social media and reposting on social media was specified due to unexplained negative residual correlation after the latent variable specification. Fit statistics suggest good fit (χ^2 (4)= 15.948, CFI= 0.999, TLI=0.997, RMSEA= 0.06, WRMR = 0.435).

As seen, there exists a negative error correlation between social media responding and reposting. Nevertheless, because the magnitude of errors themselves are so small (i.e. error variances less than 0.06 after the latent specification), one should not dwell on this negative relationship.

As the factor loadings of the latent variables are satisfactory, a structural regression model was estimated to investigate whether the psychological factors mediate the relationship between social media expression and protest.

Insert Figure 4 here

Fit indices of the model suggest a good fit ($\chi^2(27)= 95.938$, CFI= 0.995, TLI=0.992, RMSEA= 0.056, WRMR= 0.738)[4]. In addition, none of the residual correlations have an absolute value of 0.1 or higher, the rule of thumb for examination model fit (Kline 2011). Standardized coefficients are reported since many of the variables are on a latent scale and the metric itself is not meaningful (all structural equation models in the following sections will also be reporting standardized coefficients).

As seen, identification, friend social incentive, and individual efficacy partially mediate the relationship between social media expression and protest participation. Friend social incentive and individual efficacy are proximate determinants of protest participation, while identification may play a mediating role that relates to the other two. Note that in the model the relationship between the psychological factors were specified as correlated rather than causal. Since the psychological items were measured within the same time frame, it does not allow direct test of causality. This paper stays agnostic to the causal relationship. However, comparisons with alternative models without covariances between psychological factors suggest worse fit, suggesting that there are causal or reinforcing relationships between the psychological factors.

Analysis Three suggest multiple points. First, social media expression is closely associated with some collective action factors but not others. Incidental grievances, identification, ideology, friend positive incentives, and individual efficacy stand out as the psychological factors that are relatively associated with social media expression. On the other hand, friend negative incentives, family positive incentives, family negative incentives, group efficacy, and issue relevance are less associated with social media expression.

Second, of the factors associated with social media expression, not all directly im-

[4] The McKelvey-Zavoina pseudo R-squared for protest is 0.23.

pact protest participation. Identification, friend positive incentives, and individual efficacy directly impact protest participation, while incidental grievances and ideology have no significant effect on protest once the three mentioned factors are taken into account.

Third, results from structural equation modeling illustrate that identification, friend positive incentives, and individual efficacy partially mediate the relationship between social media expression and protest participation.

Analysis Four: Addressing causal endogeneity of the relationship between social media expression and psychological factors

Overview, data management, and estimation method

Although results from Analysis Three indicate that identification, friend social incentive, and individual efficacy mediate the relationship between social media expression and protest participation, the cross-sectional nature of the data does not allow a true test of the relationship. As mentioned, social media expression and psychological factors were both measured in the same time frame (i.e. after issue of protest until protest participation/end of protest). Although structural equation modeling supports the mediation hypothesis, one may still question direction of the causal relationship. To partially address this problem, the current analysis utilizes the set of questions regarding participants' social media expression on social/political issues *prior to the issue of protest*. In other words, if expression on social media does lead to an increase in identification, friend positive incentive, and individual efficacy, we should see a positive relationship between prior social media expression and these psychological factors. On the other hand, if it is psychological factors that lead to increased social media expression, we should not see such a positive association. Structural equation modeling was used to model the same model as above, except that the social media expression variables are now those regarding the individuals' prior behavior on social media. Note that the full effective sample is used because there is no need to exclude individuals that expressed against the Sunflower Movement since the independent variable is now regarding social issues in general.

Results and Discussion

Insert Figure 5 here

Fit indices of the model suggest a good fit ($\chi^2(27)= 66.154$, CFI= 0.996, TLI=0.994, RMSEA= 0.040, WRMR= 0.682). In addition, none of the residual correlations have an absolute value of 0.1 or higher.

As seen in Figure 5, the results are almost identical with Analysis Three, except that the effects from social media expression to the psychological factors are smaller. This is expected because these measure expression on social and political issues in general rather than specific to the Sunflower Movement, while the psychological factors are those directed towards the Sunflower Movement. However, the chronological nature of the variables give confidence to the claim that social media expression has a causal effect on identification, friend social incentives, and individual efficacy, which in turn lead to protest participation.

Analysis Five: Addressing causal endogeneity of the relationship between psychological factors and protest

Overview, data management, and estimation method

Similar to Analysis Four, one may question the causal relationship between the psychological factors and protest. Although *by survey design* items on the psychological variables were *chronologically before protest participation*, it is still possible that respondents telescoped backwards based on whether they participated in the Sunflower Movement. To address this possibility, a robustness check was performed using *future willingness to protest* as the dependent variable. In other words, if the psychological factors do lead to protest, we should see a positive relationship between psychological factors and future willingness to protest. On the other hand, if the causal relationship is reversed, we shall not observe such a relationship. Structural

equation modeling was used to model the exact same model above, except that the dependent variable is now future willingness to protest rather than participation in the Sunflower Movement. Data management is the same as Analysis Three.

Results and Discussion

Insert Figure 6 here

Fit indices of the model suggest a good fit ($\chi^2(27)= 107.786$, CFI= 0.994, TLI=0.990, RMSEA= 0.060, WRMR= 0.798). In addition, none of the residual correlations have an absolute value of 0.1 or higher.

As seen in Figure 6, we observe a positive association between the psychological factors and future willingness to protest. For future willingness to protest, identification and individual efficacy show up as significant predictors, while friend positive incentive does not. Note again that since there are reciprocal relationships between the psychological factors, this does not mean that friend positive incentive has no effect on future willingness to protest. Hence more disentanglement of the psychological factors should be left for future studies, although it seems that individual efficacy is more robust to different specifications. The key is that the chronological nature of the variables give confidence to the statement that the psychological factors as a whole have a causal effect on protest participation.

Analysis Six: Confounding problems and social network effects

Overview, data management, and estimation method

The purpose of Analysis Six is twofold. First, while we see that social media has a positive relationship with friend social incentives, identification, and individual efficacy, one might wonder if there are omitted variables that confound the relationship. For instance, one might argue that protest activists have both a higher level of social media expression and a higher level of identification with the Sunflower Movement. To test this possibility, control variables in Analysis One (previous political behavior

and attitudes) were used as exogenous variables in the current analysis. The model uses previous protest, arguably the key proxy for confounders, as the control variable, but adding other variables do not change results.

Second, as sociologists, one might be interested in the role of social networks. One would wonder how previous network ties impact social media expression, which in turn impact social networks and ultimately protest. To address this question, the current analysis utilizes the item on previous friend social incentives (i.e. attitudes of friend networks).

A structural equation modeling approach was implemented with data management method as the same as Analyses Three.

Results

Insert Figure 7

Results are shown in Figure 7. Since the model is complex, coefficients of non-significant relationships (the dashed lines) are not shown to better comprehend visually. Fit indices of the model suggest a good fit ($\chi^2(37)= 116.732$, CFI= 0.994, TLI=0.990, RMSEA= 0.051, WRMR= 0.702). In addition, none of the residual correlations have an absolute value of 0.1 or higher.

As seen, there is no direct relationship between previous protest and the psychological factors, suggesting a limited confounding problem. In other words, social media expression has direct effects on all three psychological factors even when controlling for previous protest behavior.

On the other hand, networks do seem to have cumulative effects. Previous friend incentive has a direct positive effect on social media expression and protest participation. Furthermore, it directly impacts friend incentives, identification, and individual efficacy, suggesting that a social network supportive of protest is likely to elicit these psychological factors. Still, the effect from social media expression to friend incentives remains even after controlling for previous social incentives. It suggests that social media expression may be generating new ties or converting existing ties to ones

that are supportive of protest. Of course, there is a micro to macro gap since the data is measured on individual level, and social media expression of an individual cannot change the attitude of the whole social network. However, the association suggests that the network change is more likely to happen for those who have a higher level of social media expression. It suggests that the interactivity of social media allows individuals to express themselves, and through reciprocation of expression a collective is converted or new ties are generated through the process.

Analysis Seven: willingness of future protest participation and organization

Overview, data management, and estimation method

The Analyses presented suggest that social media expression has a positive effect on protest participation regardless of previous background, and that social incentives, identification, and individual efficacy mediate the relationship. However, one might wonder if the effect is a one-time effect, or a long-term one that may inspire individuals to participate or even organize collective action in the future. To investigate the question, Analysis Seven utilizes the set of questions asking respondents whether they would participate or even organize protests if they encounter an issue they consider unjust in the future as the dependent variable.

The logic of estimation is similar to Analysis One in that previous backgrounds of respondents are controlled for. However, since the dependent variables are now ordinal variables rather than binary ones, an ordinal probit estimation procedure was implemented. Data management strategy is the same as Analysis One, and hence Table 10 only lists descriptive statistics of the additional dependent variables, while those for other variables are the same as Analysis One.

Insert Table 10 here

As seen, most respondents are inclined to participate in protests against issues they see as unjust. However, the proportion of those willing to organize such a protest is

much lower.

Results

Control variables in Model 1 to Model 8 in Analysis One were utilized in the current analysis. Results are very similar in that social media expression has a positive effect on future inclination to participate or future willingness to organize protests. However, due to fitted probabilities of zero or one in combinations of some variables, an estimation with all variables was not possible. Alternatively, a model that includes factors that showed up to be significant in *Analysis One* (i.e. income, previous protest, and previous participation in community problems) is estimated to demonstrate the results, but results are similar across combinations of control variables. Results indicated that social media expression has a linear significant positive effect on *both* willingness to participate in future protests and willingness to organize future protests. To better visualize the results, simulations were run with all other variables held at their mean (Figure 8 & 9).

Insert Figure 8 here

Insert Figure 9 here

As seen, the predicted probabilities of "not willing to participate/organize protest" and "no inclination" decrease as the level of social media expression increases, while the probability of willing to organize future protests increases. In other words, social media expression has a positive effect on willingness to participate/organize future protests even when controlling for previous protest behavior or other background characteristics. Results suggest that the effect of social media expression is not a one-time effect, but potentially a long term one. Of specific importance is the willingness to organize future protests. Social media expression may transform a bystander to become an activist in the future. Those influenced by social media may not only being passive as a participant, but are willing to take active roles in future collective action.

Analysis Eight: cumulative dynamics of protest and social media expression

Overview, data management, and estimation method

Analysis Seven indicated that social media expression has a positive effect on protest participation and future willingness to attend or even organize protests. However, one could be interested not only in simple effects, but cumulative dynamics between previous protests, protest, future willingness, and social media expression. For instance, how does previous protest affect social media expression? How does current protest affect future willingness to protest, and what role does social media play in the process?

Variables, data management strategy, are the same as Analysis Three. To model cumulative dynamics, structural equation modeling was implemented.

Results

Since there are two variables related to future protest willingness (i.e. willingness to participate or organize), two models are estimated separately. Figure 10 shows results modeling willingness to participate in future protests as the endogenous variable.

Insert Figure 10 here

Fit indices of the model suggest a good fit ($\chi^2(16)= 46.685$, CFI= 0.998, TLI=0.996, RMSEA= 0.048, WRMR= 0.618). In addition, none of the residual correlations have an absolute value of 0.1 or higher.

As seen, the experience of previous protest has a positive effect on both social media expression and protest. Social media expression has both a direct effect on future willingness of participating in protests, and an indirect effect through participation in the current protest (the Sunflower Movement). In other words, even for those who did not attend the Sunflower Movement, expression on social media about the movement still increased their willingness to participate in future protests.

Insert Figure 11 here

Figure 11 shows results modeling willingness to organize future protests as the endogenous variable. Fit indices of the model suggest a good fit ($\chi^2(16)= 35.403$, CFI= 0.998, TLI=0.997, RMSEA= 0.038, WRMR= 0.511). In addition, none of the residual correlations have an absolute value of 0.1 or higher.

Results indicate that the experience of previous protest has a positive effect on both social media expression and protest. Social media expression has a direct effect on future willingness to organize a protest. However, in contrast to the previous model, protest or previous protest have no direct effect after accounting for social media expression. In other words, results suggest that for the individual to be willing to organize protests, social media expression is a sufficient condition. If the individual attends protests but is not willing to express him/herself on social media, the likelihood of willing to organize protests in the future is low.

Results indicate several points. First, there is a cumulative effect between protest experiences. Previous protest increases the likelihood of the current protest, which in turn increases the willingness of participating in a future protest.

Second, previous protest experience has a positive effect on social media expression. Those who have previously attended protests are more likely to express themselves on social media. Note that this connection should not be confused with results from Analysis One, which indicated that social media expression has a positive effect on protest even when controlling for previous protest experience. Results in Analysis One suggest that social media expression has a net effect regardless of whether the individual previously attended protests. In contrast, results in Analysis Eight suggest that those who previously protested have a higher level of social media expression compared to those who never protested before.

Third and most importantly, social media expression lead to an increase in willingness in both attending and organizing protests. Social media expression has a direct effect on willingness to attend future protest and an indirect effect through protest participation. However, in terms of willingness to organize future protests, social media expression is a sufficient condition. Those who attend protests but do not express

themselves on social media are unlikely to organize protests in the future.

General discussion and conclusion

Empirical findings

A summarization of findings is as follows.

First, results suggest that social media expression, rather than information consumption on social media, has a positive impact on protest participation. Information consumption without active expression on social media has no significant impact on protest, while the reverse does not hold. The results support the expression hypothesis over the information hypothesis in that interactivity of social media is the key factor that is conducive to protest (Analysis One).

Second, social media expression has its own unique effect on protest participation even considering various backgrounds of individuals, including previous political activity, attitudes of family and friend networks, previous social media activity, and demographic variables. In other words, after accounting for various potential selection bias, results still indicate a net effect from social media expression to protest participation (Analysis One). Social media expression mobilizes even individuals that have never protested before, creating a new group of potential protest participants in the future (Analysis Seven). Furthermore, it creates new social network ties or converts ties to ones that are supportive of protest, suggesting a network generation effect (Analysis Six).

Fourth, the relationship between social media expression and protest participation is curvilinear. On average, social media expression has a positive effect on protest participation. However, results suggest a threshold point and afterwards marginal social media expression has a negative impact on likelihood of protest (Analysis Two).

Fifth, not all social psychological factors are equally associated with social media expression. Social media expression is more associated with incidental grievances, identification with movement, ideology, friend positive social incentive, and individual efficacy. On the other hand, it is less associated with family social incentives, group efficacy, and perception of issue relevance. However, of the psychological factors associated with social media expression, not all are directly related to protest.

Identification, friend incentives, and individual efficacy have a direct effect on protest, while incidental grievances and ideology have no significant relationship with protest after controlling for the previous three factors (Analysis Three).

Sixth, structural equation modeling results indicate that identification, friend incentives, and individual efficacy mediate the relationship between social media expression and protest (Analysis Three). Causal endogeneity and confounding tests support the results, suggesting that the relationship is not due to causal endogeneity or possible confounders (Analysis Four, Five & Six).

Seven, social media expression plays an important role in producing cumulative effects of protest. Previous protest experience lead to protest, which in turn lead to willingness to protest in the future. Results indicate that social media expression is an important mechanism in the process. Previous protest experience has a positive effect on social media expression. Social media expression in turn has both a direct effect on willingness to participate in future protests, and an indirect effect through physically participating in protest. For willingness to organize future protests, social media expression plays an even more important role. Results suggest that social media expression is the sufficient condition that leads to willingness to organize future protests. Without social media expression, even the experience of physically participating in protests is not sufficient to induce willingness to organize protests (Analysis Eight).

Finally, from a social network perspective, social media expression is not merely a product of previous supportive networks. On the contrary, social media expression itself has a network transforming or generating effect net of previous social networks. It may either create new friends or convert existing friends to form a social network supportive of protest (Analysis Six).

Limitations, scope conditions, and problem reduction procedures

As like any other study, this study has limitations and scope conditions.

Population based estimation is beyond the scope of this study because it is not a random sample. Although this study is *NOT* purposive sampling on the dependent variable, it is not random sample either. Hence, while it allows testing of mechanisms, it does not allow population estimation. For instance, it cannot estimate the proportion

in the population that attended the Sunflower Movement, nor the proportion that uses social media regularly. On the other hand, it does allow testing of relationship between social media factors and protest.

Since this is a retrospective survey, recall bias may be also be a potential problem. Multiple procedures were implemented to reduce recall bias. First, as scholars have pointed out, the specification of landmark events, significantly reduce recall bias (Loftus and Marburger 1983; Shum 1998). *By design* this survey is asking about people's experience around a landmark event. As mentioned, the Sunflower Movement marks the largest student protest ever in Taiwanese history was intensively report by mass media. Hence, compared with other retrospective surveys, this study should have a smaller recall bias. The survey asks about an event a year ago, which is not a very long time compared with other surveys that ask about life histories (Berney and Blane 1997; Freedman et al. 1988). In the questionnaire, before respondents answered any questions about politics, two questions about daily life (how often they went shopping, and how often they played electronic games) were implemented to help respondents locate their memory at the time. The percent of respondents answering "don't know" was below 3% on both questions, suggesting that recalling memory at the time was not a difficult task. Also, in the cognitive interviews, interviewees were asked if they had difficulty recalling memory, and none expressed that they had such a problem. So as to prevent respondents from telescoping backwards through their experience during the Sunflower Movement, questions about previous experience or attitudes prior to the movement were placed before any item about the Sunflower Movement was asked.

Finally, suppose that there was a recall bias problem, we would like to ask about what direction the bias would be. If it is adding random noise in the measurements, then the increased sample size should limit the problem. However, if recall consistently overestimates or underestimates variables at once, the problem would be more severe. Theoretically, we would expect that if such recall bias exists, it should affect all variables related to the Sunflower Movement. For instance, if one attended the Sunflower Movement and thus held a positive attitude towards the Sunflower Movement now, it would affect all factors related to the Sunflower Movement, such as ideology,

identification, and group efficacy. However, as shown in the results, not all such variables are strongly associated with protest. In fact, there is great variability in how these variables relate to protest, suggesting a reduced recall problem. Nevertheless, it is impossible to rule out the possibility of some recall bias. Future research should gather true longitudinal data on respondents' experiences, and how they relate to protest. However, there may certain risks in conducting such studies because it may be hard for scholars to anticipate a large protest that is an exception to the five percent rule (Lichbach 1996) and start collecting longitudinal data beforehand.

Some might also raise the question of potentially selecting on the dependent variable. Since this study is not a random probability sample, one might speculate that those who attended the protest were more inclined to respond to this survey. While this certainly is a possibility, multiple procedures have been implemented to reduce the problem. The survey was intentionally posted on boards that are *unrelated to politics*, aiming to sample a population that has little association with protest. The information statement and the recruitment post explicitly asking people to fill out the survey whether they were supportive, against, or did not care about the Sunflower Movement. The aim was to recruit a broad sample consisting of heterogeneous groups. Besides, a lottery was drawn to increase motivations of those who were not interested in politics. Thus, we would expect both those who were interested in politics and those who were not to have an incentive to complete the survey.

Consider also that the fact that around 60% of the sample *did not* participate in the Sunflower Movement, which allows analyses to have enough cases on both sides to distinguish potential effects. Furthermore, for logistic regression sampling on the dependent variable does not bias the coefficients at all, except for the intercept which we normally do not care about (Allison 2012; Prentice and Pyke 1979). In other words, all analyses using protest as the dependent variable are not biased by sampling issues. Finally, suppose that there were a sampling on the dependent variable problem, we would like to understand which way the bias goes. In such a case with perhaps more protest participants, the regression effects are downward biased towards zero (see King, Keohane, and Verba 1994). For instance, social media expression may have a stronger effect on future willingness to protest than estimated in the study, which does

not change its implications.

One might also be curious about the generalizability of results. As the goal of this study is not to estimate population proportions but mechanisms between factors, the question should be what factors different from the sample may alter mechanisms found in this study. There are two potential questions related to the issue of generalizability, one being how well results generalize to the younger generation in Taiwan, and the other being how well results generalize to other societies. For the former question, differences regarding the dependent variable have been discussed in the previous section, while differences on the independent variables are not be a problem in statistical inference on relationships (see King, Keohane, and Verba 1994). Besides, potential confounding variables that may differ between those who use the PTT and those who do not such as gender, income, parent education, or political inclination are accounted for in the analyses. Hence, this paper acknowledges that it is surely possible that there may be some systematic difference between the sample and the younger generation in Taiwan that is not captured by variables included in the survey. However, under speculation such possibility may be low.

As for generalizing the results to other societies, similarly we need to consider factors that are not accounted for in the survey. Hence, differences on factors such as age, gender, political experiences are already accounted for and results should theoretically generalizable. However, this study acknowledges that there is one potential factor that would require future research: culture. It might be that people in Taiwan are more collectivist and people in Western societies are more individualistic, which affect psychological mechanisms. For instance, it is possible that while social media expression increases group identification, we might not see such an effect in individualistic societies. Such hypotheses would require future research to assess.

Finally, there are questions that are truly beyond the limit of this study. The question of culture was mentioned in the previous paragraph, but there are still others. For instance, why does social media expression lead to an increase in identification? Why is the relationship between social media expression and protest curvilinear? Did the new network ties generated through social media have an impact on protests after the Sunflower Movement? Data in this study do not allow direct tests on these questions.

However, theories may provide explanations to some. Future research should explore these issues.

Theoretical implications

Several theoretical issues are implicated by this study.

The study addresses the debate between social media advocates and social media skeptics. Social media has a positive effect on protest participation that is not a false product of selection bias. After examining selection bias issues, future research can move on to identifying various social media effects on collective action, or even compare different types of social media, such as Facebook and Twitter. It actually shows that social media has the transformative power to convert new people who were not publicly interested before.

Because it addresses selection bias issues, this study shows that social media can be a new form of mobilization structure. While previous collective action theorists have emphasized the role of pre-existing organizations or pre-existing networks (Gould 1995; McAdam 1990; McCarthy and Zald 1977), this study shows that social media can serve as an alternative mobilization base regardless of previous social networks or organizations. Those who have participated in organizations, protests, or politics are mobilized by social media as well as those who have not. In fact, results support Hsiao's (2011) argument that the internet should be conceived as a new mobilization structure named "virtual ecologies" that allow participants to interact, form trust, and mobilize collective action which is distinct from previous mobilization structures.

This research also sheds light on the debate between "online activism" versus "slacktivism". Both may be partially correct because the relationship between social media expression and protest participation is not linear. While overall social media expression does increase the probability of protest, over a threshold point at the high end marginal social media expression leads to a decrease. Results imply a substitution effect, and that there may be two heterogeneous groups affected by social media. One is the majority who are mobilized by expressing themselves online, and the other being those who excessively use social media, which satisfied their need to participate and are not willing to physically participate. They could be slacktivists, or even be

activists that are assigned the role of online management. Future work should put more emphasis on examining the nature of the extreme social media users to identify their reason of not physically participating.

The study does much to help disentangling different mechanisms of social media. Information consumption does not appear as the key factor, while individual expression does in collective action mobilization. In other words, while social media does allow large amounts of information, or even information from personal networks to flow, they are not effective in mobilization unless the individual actively takes part in the discussion online. It points support to the importance of interactivity enabled by social media, and perhaps the importance a new "public sphere (Habermas 1991)." It allows an environment for citizens to express their public preferences, receive feedback from fellow citizens, which incentives individuals to take part in public action. In other words, the interactivity of social media allows individual expression on political issues and mutual communication, which facilitates a new civic awareness.

My results also indicate that despite the enthusiasm for social media and claims that a new theory of mobilization is needed, the framework of collective action is still very relevant. Macro-Micro mechanisms (Coleman 1994; Opp 2009) should not be ignored. What is lacking in the current debate on social media protests is specifying the social psychological foundations that determine protest. Without a solid micro foundation that supports that macro structure of social media technology, we are unclear about which parts of social media are relevant for protest. For instance, if it is grievances that matter the most, then maybe it is the video sharing technique of social media that is critical since it enables visualized injustice. On the other hand, if it is social incentives that is key, then it is the interactive connection between friends on social media that is core. This research points out that individual social media expression, which in turn leads to an increase in identification, friend social incentives, and individual efficacy, are the core micro mechanisms that support macro social media trends. It synthesizes internet scholars that start from societal trends (Earl and Kimport 2011; Hussain and Howard 2013) with collective action theorists such as Klandermans (2002), Van Zomeren and colleagues (2008), and Opp and Kittel (2010), who focus on the individual.

Previous collective action theories have focused on how to convert sympathizers into participants, but less on how to convert the apolitical or disinterested. Perhaps due to the legacy of Olson (1965) and the free rider problem, the focus has been on factors that mobilize a fixed group rather than discussing factors that change the composition of the group. It is often assumed that the pool of sympathizers is constant, and can be mobilized through different factors. Resource mobilization theorists focus on how to gather enough resources, framing theorists stress strategic symbolic manipulation, political process theory emphasize political change. However, another equally important question should be how to expand the pool of potential participants. Suppose the proportion of potential participants that can be mobilized through framing, resource, or political opportunities is constant, then the larger the pool of potential participants, the larger the number of participants. This study addresses this question by identifying four factors that broaden the pool of potential participants that are affected by social media.

First, social media mobilizes individuals, and with the experience of protesting people are more likely to participate in the future.

Second, for those who were not mobilized, social media has a direct effect on increasing their willingness to participate in the future. In other words, social media increases the willingness of both participants and non-participants in a protest.

Third, social media changes the social network of individuals. Social media expression either generates new ties or converts existing ties into ones that are supportive of protest. In other words, a collective transformation is under play. Not only is the individual converted by social media, but the individual's surrounding social network as well.

Finally, social media expression has a direct effect on increasing the willingness of individuals to organize protests in the future. In other words, social media not only increases potential sympathizers, but potential activists as well. In other words, more people are willing to bear additional costs of mobilization because of social media, which transforms the pool of potential participants. In sum, social media generates four mechanisms that changes and broadens the pool of potential participants, which is a generally neglected question in collective action theory.

Social media may provide a partial solution to the "start-up problem" in how the initial hurdle of recruitment is overcome. By increasing the number of individuals that are willing to bear additional costs of organizing protests, the difficulty of achieving a critical mass is reduced. Besides, other results in this paper also imply that social media reduces the start-up problem. As Centola (2013) contends, an important factor of overcoming the start-up problem is forming small groups of coalition. As mentioned in the previous paragraph, social media creates a homophily effect by making groups of individuals share attitudes that are supportive of protest. Within such a supportive network, it is much easier to form coalitions, which reduces the start-up problem. Furthermore, the psychological distance between the individual and collective action is reduced. The cost from doing nothing to expressing something on social media is very low.

However, such a low cost action could lead to rippling consequences by increasing identification and individual efficacy, which in turn leads to protest. These two psychological factors may be critical. Identification reduces the psychological distance between the individual and the movement, and individual efficacy reduces perceived cost of attending the movement in that the individual believes that he/she can contribute. On the other hand, without social media, an individual may feel both emotional detached from a protest, and feel they cannot do anything about it anyway. In short, the start-up problem may be reduced in that individuals take incremental steps toward collective action by starting off with a simple social media action, rather than bearing costs all at once.

Finally, this study shows the importance of interdisciplinary perspectives when addressing social problems. Communication scholars point out possible social media factors that may be conducive to collective action. Sociologists provide network and mobilization frameworks that are key to explaining collective action. Social psychologists identify micro-foundations of mobilization. This article has greatly benefited from previous work from different disciplines, and hopes to pay back by shedding light across the social sciences.5

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Tables

Table 1. Summary of PTT boards

Board Name	Board Topic	# of Respondents
HatePolitics	Politics	23
PublicIssue	Public issues	23
MobileComm	Mobile phones	166
StupidClown	Personal funny stories	413
WomenTalk	Women topic	135
Q_ary	Questionnaire	91
Other		6
Did not Respond		56

Table 2. Descriptive statistics of variables in Analysis One

	Descriptive statistics of measures		
Variable	**Range**	**Mean**	**SD**
Protest	(0,1)	0.39	0.49
Social media variables			
Social media expression	(5,25)	12.20	5.58
Social media environment	(2,8)	6.59	1.14
Controls: Demographics			
Female	(0,1)	0.50	0.50
Age	(16,39)	23.52	3.80
Father education	(1,7)	4.30	1.00
Mother education	(1,7)	4.06	0.97
Family income	(1,6)	3.47	1.67
Controls: Previous political behavior			
Discuss politics	(1,5)	2.61	1.23
Read political news	(1,5)	3.70	1.27

Attend protest	(0,1)	0.16	0.37
Attend political rally	(0,1)	0.16	0.37
Attend community meeting	(0,1)	0.18	0.39
Work for politician	(0,1)	0.03	0.17
NGO experience	(0,1)	0.10	0.30
Solve community problem	(0,1)	0.19	0.39
Controls: Previous social network or thoughts			
Family wish protest	(1,4)	2.21	0.78
Friends wish protest	(1,4)	2.85	0.68
Feel bad if did not protest	(1,4)	2.66	0.73
Controls: Previous social media behavior			
Social media posting	(1,5)	1.45	0.86
Social media responding	(1,5)	1.51	0.92
Social media reposting	(1,5)	1.45	0.85
Social media liking	(1,5)	2.04	1.21
Social media encouraging others to protest	(1,5)	1.49	0.89

Table 3. Multivariate logistic regression estimates with protest participation as dependent variable

	Model 1	Model 2	Model 3	Model 4	Model 5
Social Media expression	0.12***		0.12***	0.12***	0.10***
	(0.01)		(0.02)	(0.02)	(0.02)
Social Media environment		0.16*	-0.03	-0.06	-0.02
		(0.07)	(0.07)	(0.08)	(0.08)
Controls: Demographics					
Female				0.52**	
				(0.18)	

Age	0.02	
	(0.02)	
Father education	-0.14	
	(0.12)	
Mother education	0.30*	
	(0.12)	
Family income	0.20**	
	(0.06)	
Controls: Previous political behavior		
Discuss politics		-0.11
		(0.09)
Read political news		-0.10
		(0.08)
Attend Protest		1.64***
		(0.27)
Attend political rally		0.30
		(0.26)
Attend community meeting		0.52*
		(0.26)
Work for politician		-0.52
		(0.53)
NGO experience		0.67*
		(0.31)
Solve community problem		-0.74*
		(0.26)

Number of observations	746	781	723	604	675
*Note: *p < .05; **p < .01; ***p < .001*					

Table 4. Multivariate logistic regression estimates with protest participation as dependent variable (continued)

	Model 6	Model 7	Model 8
Social Media expression	0.11***	0.11***	0.09***
	(0.02)	(0.02)	(0.03)
Social Media environment	-0.04	-0.02	-0.01
	(0.09)	(0.08)	(0.13)
Controls: demographics			
Female			0.38
			(0.26)

Age	-0.01
	(0.04)
Father education	-0.10
	(0.18)
Mother education	0.30
	(0.18)
Family income	0.23**
	(0.08)
Controls: Previous behavior	
Discuss politics	0.06
	(0.14)
Read political news	-0.12
	(0.13)
Attend Protest	1.30***
	(0.36)
Attend political rally	0.43
	(0.33)
Attend community meeting	0.41
	(0.36)
Work for politician	-0.47
	(0.66)
NGO experience	0.47
	(0.43)
Solve community problem	-0.88*
	(0.36)

Controls: Previous social network or thoughts			
Family wish protest	0.22		0.22
	(0.13)		(0.19)
Friends wish protest	-0.03		-0.17
	(0.15)		(0.21)
Feel bad if did not protest	0.04		-0.04
	(0.14)		(0.18)
Controls: Previous social media behavior			
Social media posting		-0.17	-0.14
		(0.15)	(0.23)
Social media responding		0.08	0.12
		(0.15)	(0.23)
Social media reposting		0.26	0.19
		(0.16)	(0.24)
Social media liking		-0.03	0.01
		(0.10)	(0.16)
Social media encouraging others to protest		0.03	0.00
		(0.15)	(0.23)
Number of observations	496	616	350

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

Table 5. Logistic regression estimates predicting protest participation (square term added)

	Model 1	Model 3	Model 8
Social Media expression	0.40***	0.40***	0.44***
	(0.08)	(0.08)	(0.14)

(Social Media expression)^2	-0.01***	-0.01***	-0.01**
	(0.00)	(0.00)	(0.00)
Social Media environment		-0.03	-0.00
		(0.07)	(0.13)
Controls: demographics			
Female			0.35
			(0.27)
Age			-0.01
			(0.04)
Father education			-0.05
			(0.19)
Mother education			0.28
			(0.18)
Family income			0.22**
			(0.08)
Controls: Previous behavior			
Discuss politics			0.10
			(0.14)
Read political news			-0.11
			(0.13)
Attend Protest			1.34***
			(0.37)
Attend political rally			0.39
			(0.33)

Attend community meeting	0.35
	(0.37)
Work for politician	-0.47
	(0.67)
NGO experience	0.42
	(0.44)
Solve community problem	-0.87*
	(0.36)
Controls: Previous social network or thoughts	
Family wish protest	0.25
	(0.19)
Friends wish protest	-0.12
	(0.21)
Feel bad if did not protest	-0.03
	(0.19)
Controls: Previous social media behavior	
Social media posting	-0.14
	(0.23)
Social media responding	0.13
	(0.24)
Social media reposting	0.24
	(0.25)

Social media liking	-0.05
	(0.19)
Social media encouraging others to protest	-0.02
	(0.23)
*Note: *p < .05; **p < .01; ***p < .001*	

Table 6. Descriptive statistics of variables in Analysis Three

Variable	Range	Mean	SD
Protest	(0,1)	0.39	0.49
Social media variables			
Social media expression	(5,25)	12.17	5.56
Social psychological variables			
Incidental grievances	(1,5)	3.48	0.61
Identification	(2,10)	6.60	1.12
Ideology	(1,5)	3.37	0.56
Family positive incentive	(1,5)	2.05	0.80
Family negative incentive	(1,5)	1.66	0.60
Friend positive incentive	(1,5)	2.86	0.69
Friend negative incentive	(1,5)	1.91	0.62
Individual efficacy	(1,5)	2.69	0.74
Group efficacy (government)	(1,5)	3.13	0.66
Group efficacy (society)	(1,5)	3.51	0.551
Issue relevance	(1,5)	3.43	0.59

Table 7. Bivariate correlation of psychological factors with social media expression.

Incentive	Correlation with Social media expression
Incidental grievances	0.35***
Identification	0.42***
Ideology	0.30***
Family positive incentive	0.18***
Family negative incentive	0.14***
Friend positive incentive	0.34***
Friend negative incentive	0.25***
Individual efficacy	0.46***
Group efficacy (government)	0.15***
Group efficacy (society)	0.21***
Issue relevance	0.23***
*Note: *p < .05; **p < .01; ***p < .001*	

Table 8. Correlation matrix between psychological factors.

Incentive	Incidental grievances	Identification	Ideology	Friend positive incentive	Individual efficacy
Incidental grievances	1.00				
Identification	0.55	1.00			
Ideology	0.43	0.57	1.00		
Friend positive incentive	0.23	0.40	0.32	1.00	
Individual efficacy	0.36	0.48	0.39	0.38	1.00

Table 9. Logistic regression estimates predicting protest participation.

(Intercept)	-3.26*** (0.76)
Incidental grievances	-0.13 (0.20)
Identification	0.24* (0.12)
Ideology	-0.36 (0.22)

Friend positive incentive	0.39* (0.16)
Individual efficacy	0.75*** (0.16)
Number of observations	491
*Note: *p < .05; **p < .01; ***p < .001*	

Table 10. Distribution of additional variables in Analysis Six.

Variable	Not inclined/Not willing	No inclination	Inclined/willing
Inclination to participate in future protest	54	163	591
Willingness to organize future protest	120	369	294

Figures

Figure 1. Bivariate relationship between level of social media expression and protest participation.

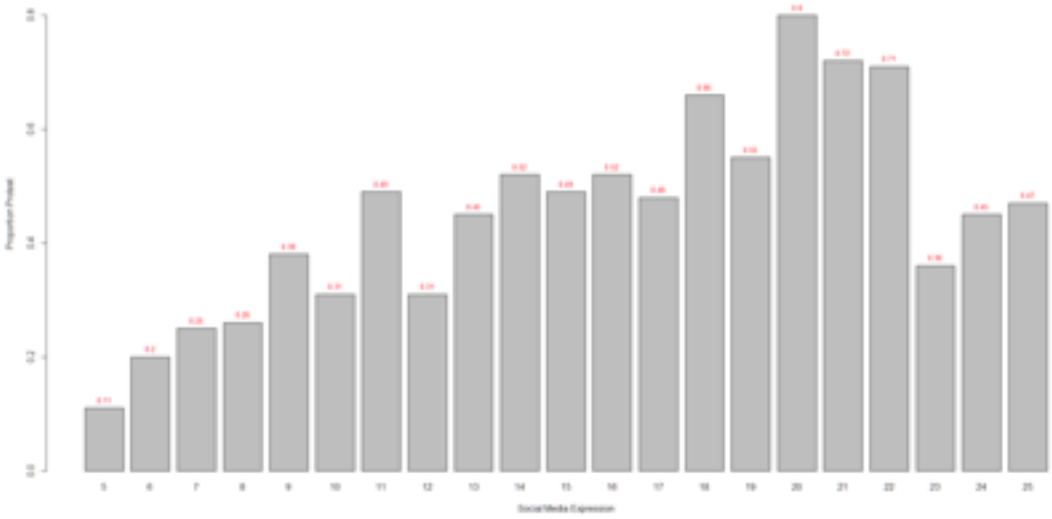


Figure 2. Simulation from Model 8 on relationship between social media expression and protest probability with all other variables held at their mean.

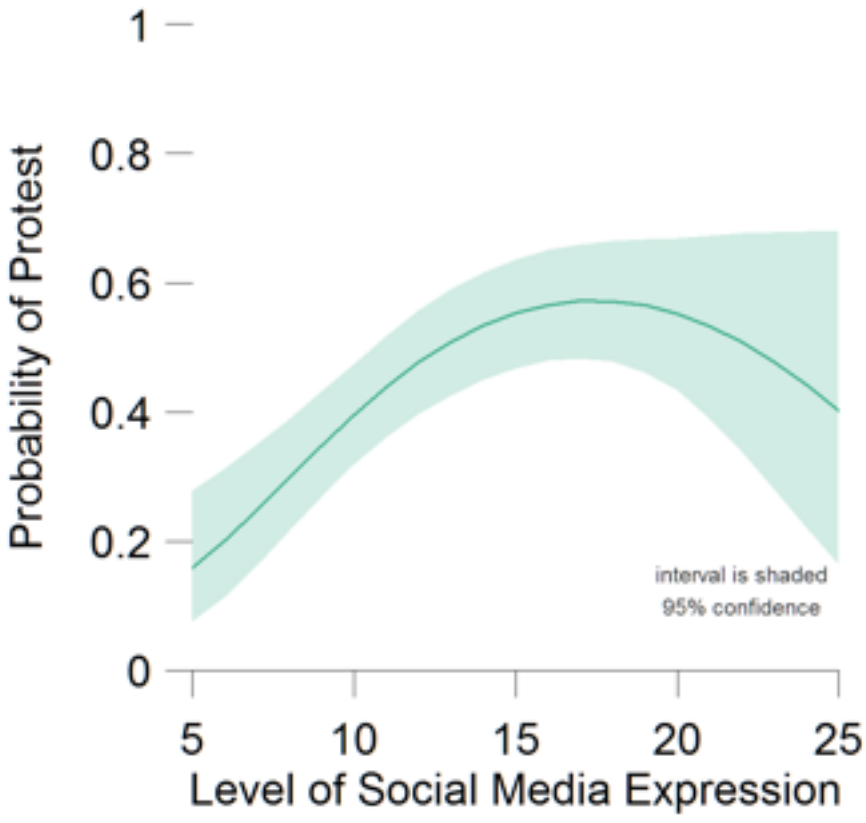
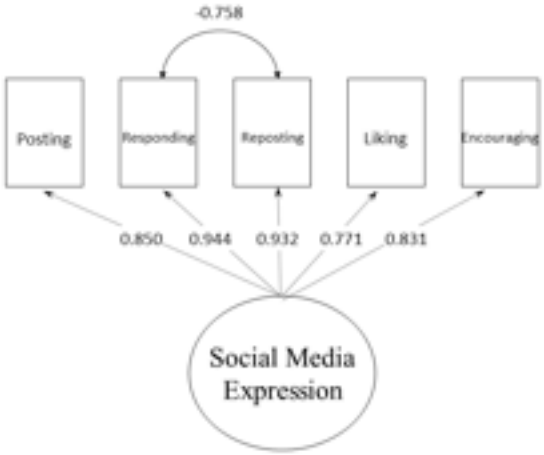
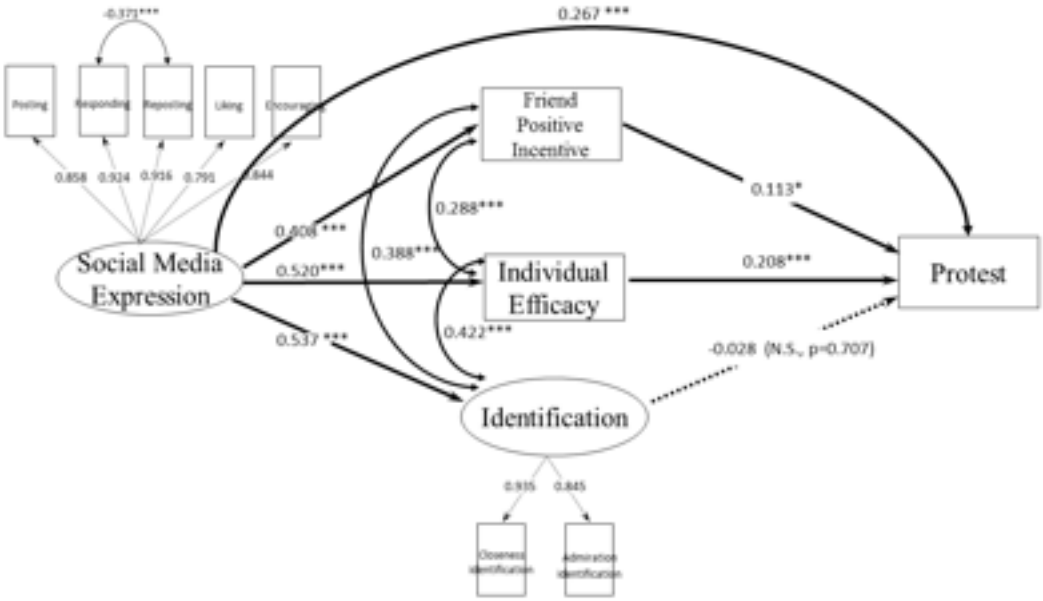


Figure 3. Confirmatory factor analysis on social media expression.



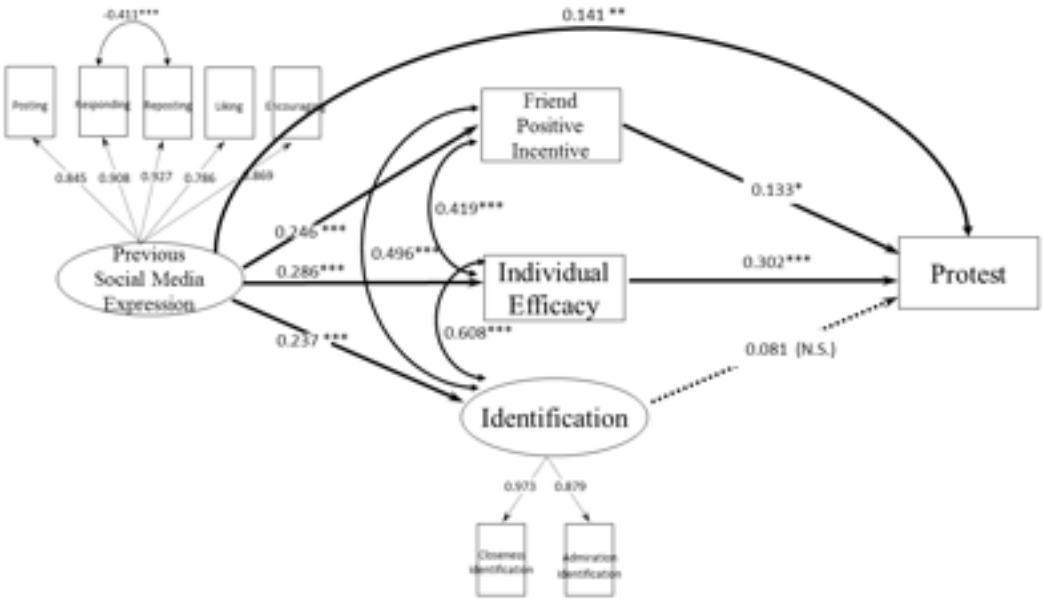
Note: N=828

Figure 4. Structural equation modeling results of relationship between social media expression and protest.



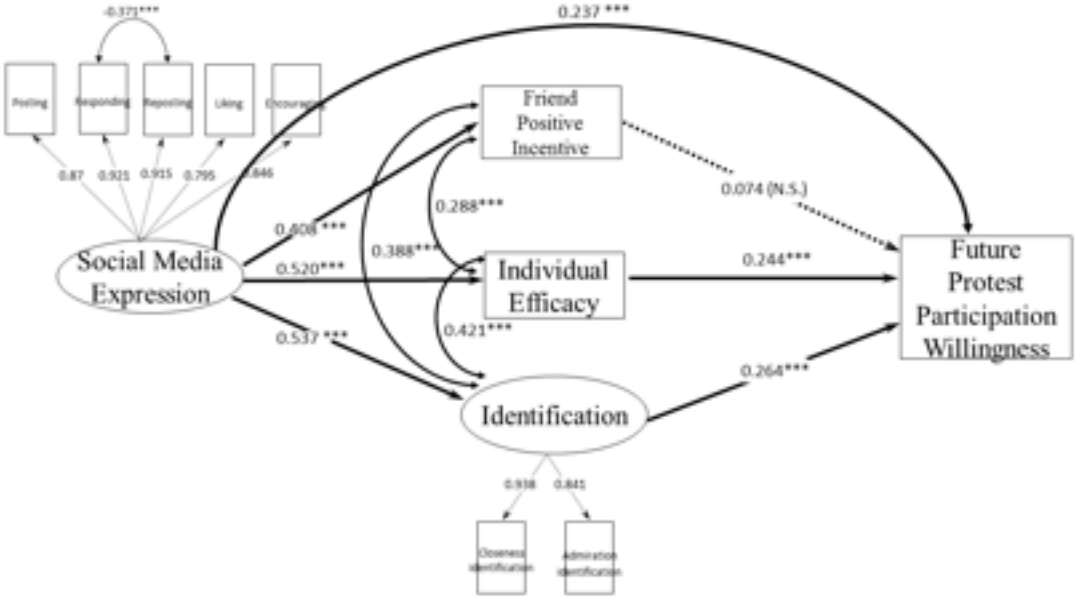
*Note: N=828; *p < .05; **p < .01; ***p < .001*

Figure 5. Structural equation modeling results of relationship between previous social media expression and protest.



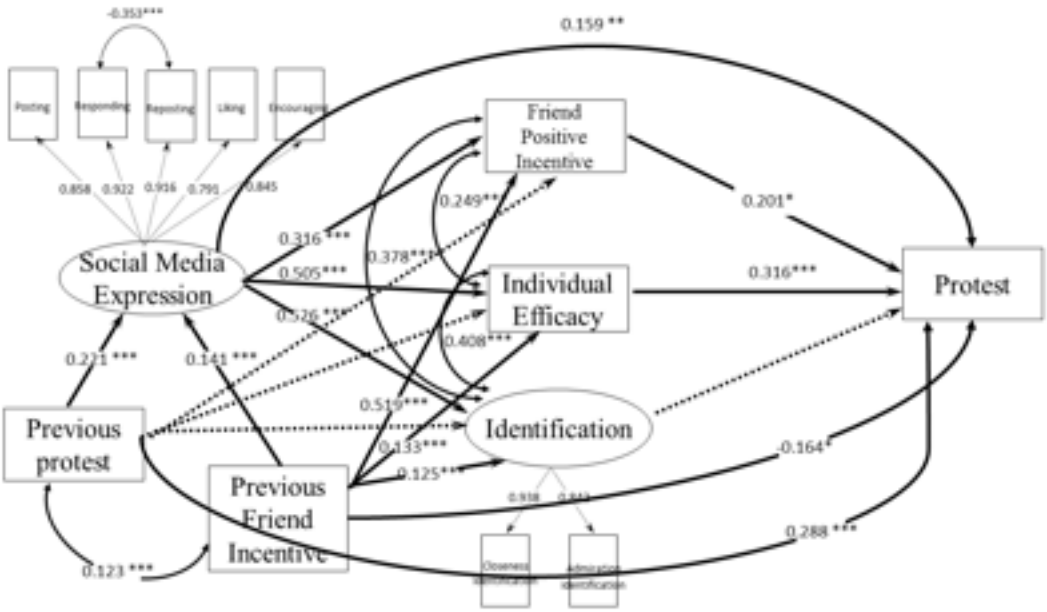
*Note: N=913; *p < .05; **p < .01; ***p < .001*

Figure 6. Structural equation modeling on relationship between psychological factors and future willingness to protest.



*Note: N=828; *p < .05; **p < .01; ***p < .001*

Figure 7. Dynamics between previous protest, social networks, social media expression, and protest.



*Note: N=828; *p < .05; **p < .01; ***p < .001*

Figure 8. Simulation on relationship between social media expression and probability of falling in each category of inclination to participating in future protests with all other variables held at their mean.

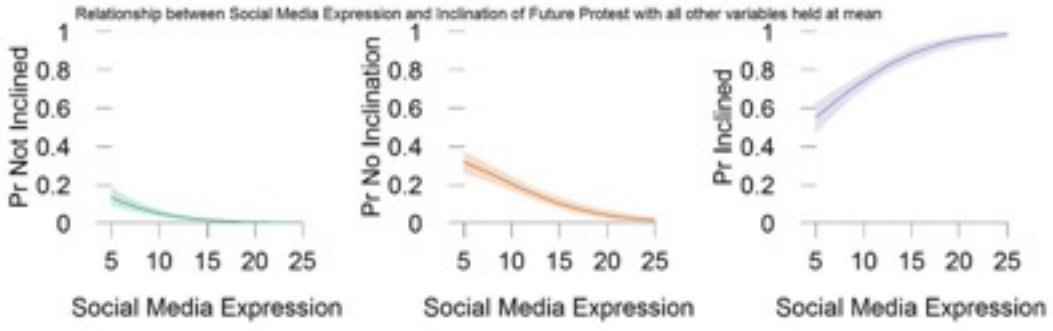


Figure 9. Simulation on relationship between social media expression and probability of falling in each category of willingness to organize future protests with all other variables held at their mean.

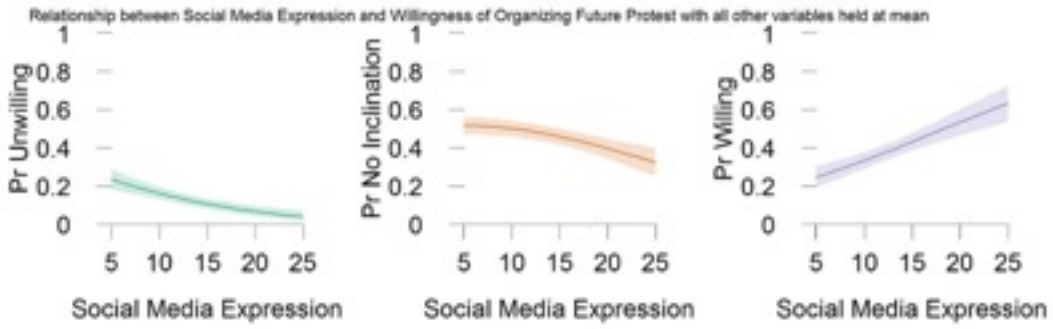
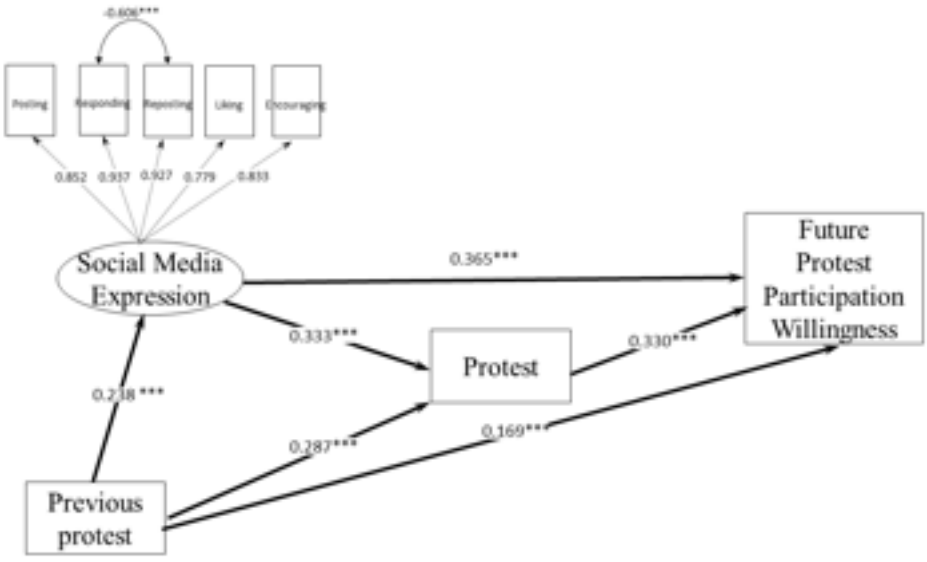
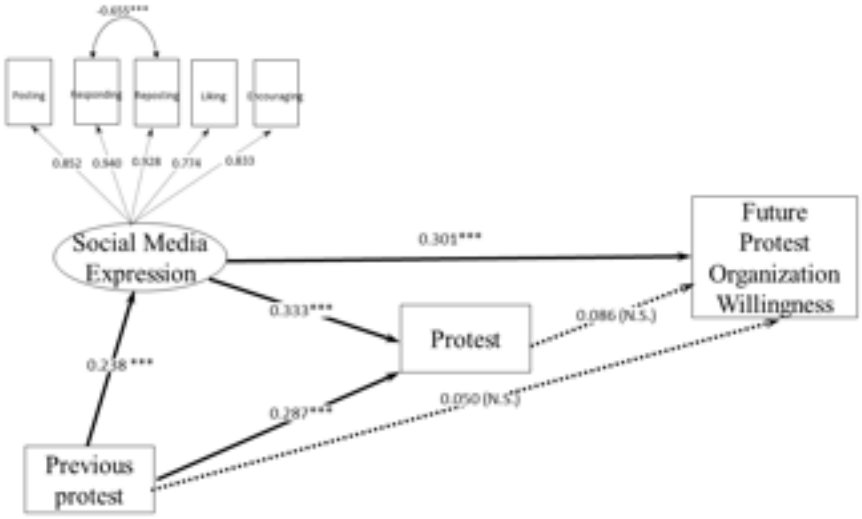


Figure 10. Cumulative dynamics between previous protest, protest, future protest participation willingness, and social media expression.



*Note: N=827; *p < .05; **p < .01; ***p < .001*

Figure 11. Cumulative dynamics between previous protest, protest, future protest organization willingness, and social media expression.



*Note: N= 827; *p < .05; **p < .01; ***p < .001*