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Hai Liang & Francis L. F. Lee

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Thread popularity inequality as an indicator of organization through communication in a networked movement: an analysis of the LIHKG forum

Hai Liang and Francis L. F. Lee

School of Journalism and Communication, The Chinese University of Hong Kong, Hong Kong

ABSTRACT

Many contemporary networked social movements are marked by the absence of central leadership. This raises the practical question of (self-)organizing through communication. The online forum LIHKG was widely recognized as the central communication platform for supporters of the Anti-ELAB movement in Hong Kong. How can we discern whether forum users were engaging in action organization through discussion or merely having conversations? This study proposes that inequality in thread popularity could be a useful way in to tackling that question. An analysis of the contents of LIHKG between June and December of 2019 illustrates that signs of action coordination can be discerned by examining inequality in thread popularity and whether forum users' attention increasingly concentrated on the most popular threads as the number of users increased. An examination of how attention competition and thread content combined to shape thread popularity then provides insights into the characteristics of the forum's organizing efforts.

KEYWORDS connective action; networked social movement; organization through communication; attention competition; opinion leaders

Contemporary networked social movements are often characterized by decentralization and leaderlessness (Anduiza et al., 2014; Bennett & Segerberg, 2012; Castells, 2015). That is, they do not have a formal leadership that is responsible for planning actions, devising strategies, framing issues, pooling and allocating resources, and mobilizing people. Although decentralization has its advantages (e.g., Mico & Casero-Ripolles, 2014; Zeng, 2020), it raises the question of whether and how movements can

CONTACT Hai Liang hailiang@cuhk.edu.hk

(self-)organize through communication. The role of digital media platforms in this process is also significant (Boler et al., 2014; Caraway, 2016; Donovan, 2018; Tsatsou, 2018; Tufekci, 2017).

The Anti-Extradition Law Amendment Bill (Anti-ELAB) Movement in Hong Kong in 2019 demonstrated many features of networked social movements (Lee et al., 2019) and the roles of several digital platforms in the movement attracted significant attention. Specifically, the online forum LIHKG (www.lihkg.com) was widely considered to be the central communication platform for movement supporters. It was the main information source for protesters and a platform on which people promoted relevant discourse, debated protest tactics, and negotiated movement solidarity (Lee, 2020; Lee et al., 2021).

But can there be analytical differentiation between simple discussions and action organization through discussions? That is, how do we know that people were not merely discussing the issues but actually engaging in movement organizing through communication? What were the main characteristics of the organizing efforts, if they existed, on LIHKG?

The present study proposes that the inequality in thread popularity in an online forum could be a useful entry point for examining the presence and characteristics of organization in online discussions. We contend that the extent of inequality in thread popularity under different circumstances can offer insights into whether people were trying to organize and coordinate at the time. Additionally, the predictors of thread popularity can provide insights into how a movement was organized. Therefore, this article makes two types of contributions. The analysis illuminates the characteristics of movement discussions on LIHKG, enriching our understanding of how specific digital platforms served as space for action coordination in the Anti-ELAB Movement. Theoretically, the article develops and demonstrates an approach for empirically examining action coordination through online discussions.

Thread inequality as a sign of organization

Researchers examining contemporary networked social movements have agreed that the rejection of formal organizations as central leaders does not entail that such movements are unstructured or disorganized. On the contrary, studies have demonstrated that apparently leaderless movements can present structured patterns, including the establishment of participation norms, the shaping and shifting of issue focus, and the development of action frames and participatory ethos (Bennett et al., 2014). Therefore, the ways in which movements can organize without formal leadership has been a focus in relevant research. When theorizing the logic of connective

action, Bennett and Segerberg (2012) pinpointed the roles of symbolically open and inclusive personal action frames. Participants engage with issues primarily on individual terms; they do this by finding common ground in easy-to-personalize action frames shared through digital media networks (Bennett & Segerberg, 2013). In the same vein, Castells (2015) explained how the voices of multiple groups can coordinate without strong group identification through the power of shared affect. He argued that networked movements mobilize new members through the construction of affective unity.

Beyond acknowledging personal action frames and shared affect as the basis of mobilization, researchers have been challenged to further describe the organizational process in large-scale connective action. One attempt was conducted by Bennett et al. (2014), who proposed a framework emphasizing the processes of production, curation, and dynamic integration in peer production on Twitter. In another, Agarwal et al. (2014) proposed three standards of crowd-enabled organization: resource mobilization and allocation, responsiveness to external events, and coordinated long-term adaptation, change, or decline.

However, both Agarwal et al. (2014) and Bennett et al. (2014) produced their models of online coordination through inductive analysis. For researchers beginning to examine action coordination on a digital platform, it would be useful if there is an indicator by which one could identify whether some kind of organization through communication is present. Freelon et al. (2018) proposed one such measure by focusing on Tilly's (1999) notion of unity, one of the four key elements of collective actions. In physical protests, unity can be signified by bearing common symbols and chanting the same slogans. By the same token, the use of common symbols (e.g., specific hashtags) on social media can be a sign of Tilly's unity. The frequent use of a small number of common symbols indicates that participants are trying to convey a unified message by drawing upon a shared and delimited set of symbolic resources (Freelon et al., 2018).

Freelon et al. (2018) operationalized unity by using the Gini coefficient for Twitter hashtags used during a movement. A larger Gini coefficient means a higher level of concentration on a small number of common symbols. Similarly, Steinert-Threlkeld (2017) employed the Gini coefficient for hashtags to operationalize the degree of coordination in spontaneous collective action.

The same approach can be applied to other digital media platforms, including discussion forums. In a typical forum, users can initiate discussion threads and others can decide whether or not to reply. Researchers must examine inequality in the discussion threads themselves because there may

not be hashtags to help people follow posts on specific topics. If people are going to a forum only to have discussions with one another, they can simply focus on the posts that interest them. Some people might be curious about what posts are most popular, but there is no strong need to investigate what other users are posting about besides personal curiosity. Conversely, if people go to a forum with the idea that its discussions are aimed at action organization, there will be a stronger need to concentrate on what others are focusing on. Action organization through discussion is effective only if the proposed action plans and ideas can attract the attention of large numbers of users. Forum users who are "action-oriented" should be motivated to see whether there are any action plans or ideas that have attracted attention and are being developed. In this case, inequality among threads would become stronger, and which would be signified by a higher Gini coefficient.

Of course, numerous factors can contribute to inequality among threads, such as differences in the quality of the posts and the presence of particularly persuasive users, among others. A certain degree of inequality among threads is inevitable. Therefore, precisely speaking, what signifies action organization through discussion is not any specific degree of thread inequality but rather how thread inequality varies with other factors. In other words, the relative degree of thread inequality in various situations is important. The first thing researchers should do is to compare the relative degree of inequality among threads on different topics. In the present case, if discussions about the Anti-ELAB Movement involved an attempt to organize, degree of inequality among threads for movement discussions should be higher than degree of inequality among threads for non-movement discussions.

It is also important to note that messages related to trending topics can be posted quite frequently; attention becomes scarce when plenty of information is available (Nye, 2002). Overload can become a particularly serious concern when the discussion involves an attempt to organize; forum users would find it both more difficult and more important to concentrate on the same threads as one another. Therefore, we expect that inequality among threads will increase as the numbers of forum users and posts increase for movement discussions (Himelboim, 2008). However, the same phenomenon may not apply to non-movement discussions as there is no strong incentive to stick to the most popular threads. Summarizing the arguments, two hypotheses are posited:

> H1: Inequality in thread popularity is higher in movement discussions than in non-movement discussions on LIHKG.
>
> H2: Inequality in thread popularity is positively associated with number of users and number of threads for movement discussions but no such positive relationship exists for non-movement discussions.

Principles of organizing and explanations of thread popularity

While *H1* and *H2* aim at establishing the presence of organizing in online discussions, examining the predictors of thread popularity helps discern the principles of organizing at work. This study examines the impact of user characteristics, thread content, and attention competition on thread popularity. Each characteristic has different implications for the understanding of movement organizing through discussions in online forums.

User characteristics

One potential aspect of thread popularity involves who initiates the threads. Some discussion threads could receive more reactions because of their creation by a small group of influential users. As Freeman (1972) argued years ago, informal leaders can arise even in apparently structureless movements because individuals have different skills, backgrounds, and connections (Forster & Browne, 1996; Yukl, 1989). That is, the absence of formal and central leaders for the movement at large does not entail the absence of informal leaders in different arenas. Individuals with specific qualities may serve as these informal leaders. They are not able to steer the movement at large but they have relatively more followers and a stronger influence (Hollander, 1961). In this sense, those forum users who can trigger a lot of replies can be seen as opinion leaders in online discussions (Huffaker, 2010).

Previous studies have found that online leaders are associated with certain profile characteristics, communication activities, and social network positions (Cha et al., 2010; Gonzalez-Bailon et al., 2013; Huffaker, 2010). Specifically, two profile characteristics—gender and account age—have been found to be associated with user influence on LIHKG (Liang & Lee, 2021). They are related to concerns of gender inequality in social movements (Morris & Staggenborg, 2004) and reflective of preferential attachment (Barabasi & Albert, 1999), respectively. The following analysis examines how these two profile characteristics predict thread popularity.

Communication activities may also generate social influence (Huffaker, 2010). Active participation in an online community can foster a sense of social identity (Koh et al., 2007), build relationships (Rice, 1987), and help develop an understanding of the community culture. A thread may be more popular if it is posted by a forum user who is very active in both originating threads and replying to others.

Moreover, the advance of social media has called researchers' attention to the implications of network centrality on social influence (e.g., Chen & Teng, 2017). Huffaker (2010) found that users with more connections and reciprocal ties attracted more replies in online forums. LIHKG does not facilitate the proactive following of other users, which should have reduced the

impact of social connections. Nevertheless, it remains possible that thread popularity would be influenced by the position of the user posting the thread in the network constituted by how users replied to each other.

For this article, the concern is not how each user characteristic predicts thread popularity; the focus is rather on the degree to which user characteristics, when taken together, can explain thread popularity. Strong influence of user characteristics would indicate that action organizing in the LIHKG forum centered on a specific group of relatively stable opinion leaders. Hence, we pose the following research question:

> RQ1: To what extent can user characteristics—including profile characteristics, communication activities, and social network positions—explain thread popularity in movement discussions on LIHKG?

Role of communication content

Threads can attract different levels of attention and reaction due to their content; some threads can be better written, offer more interesting suggestions, articulate more intriguing viewpoints, or better capture the sentiments of the moment than others. These factors may not be easy to operationalize and a single study certainly cannot exhaust all the potentially relevant content characteristics. Given the concern with action organization through discussion, this analysis focuses on three content characteristics.

First, as discussed above, Bennett and Segerberg (2012, 2013) highlighted the role of easy-to-personalize action frames in the mobilization process behind connective action. Personal action frames constitute the common symbols around which actions are organized and coordinated. In the Anti-ELAB Movement, two personal action frames are particularly noteworthy and operationally identifiable: a) *wo-nei* xx ("xx with you," where "xx" can be "sing," "lunch," "shop," and so on) and b) *heung-gong-yan* xx ("Hong Kongers xx," with individuals replacing "xx" with "add oil," "resist," "avenge," and the like at different stages of the movement). We expect threads containing these two personal action frames to attract more reactions.

Secondly, based on our preliminary observations, a common strategy thread initiators used to attract attention was including words such as "urgent," "breaking," or "live" in thread titles. These immediacy signals highlight the urgency of the information being conveyed and, possibly, the need for rapid action. The value of these signals is premised on the perception that people have to be informed about and react quickly to new happenings. If people share a strong sense of the need for timely actions, they are likely to respond to immediacy signals.

Third, the analysis examines the role of emotions. Social movement researchers have noted that emotions can spark participation (van Zomeren & Iyer, 2009). Citizens may support a movement's goals but will not take action until driven to do so by a sense of moral outrage (Castells, 2015; Jasper, 1998), hope (Hill et al., 2018), or other emotions. However, from the perspective of affective intelligence, anger can undermine rational thinking and unbiased processing of new information (Marcus et al., 2000). Anger can also lead to hostility toward the opposite side and thus affective polarization (Lu & Lee, 2019), which may, in turn, make strategic compromise difficult. In any case, this analysis is interested in whether expressions of anger can elicit more responses in LIHKG. We posit a research question accordingly as follows:

> RQ2: How and to what extent are personal action frames, immediacy signals, and expressions of anger related to thread popularity in movement discussions?

Logic of attention competition

In addition to user and content characteristics, this study introduces the logic of attention competition when explaining thread popularity. There is always more content than users can consume, so any one item must compete with others for user attention. Before the social media age, agenda-setting research discussed how multiple issues could compete for public attention in a zero-sum game fashion (Zhu, 1992). Yoo et al. (2019) confirmed that in the digital and social media era the spreading of an information cascade is inhibited by the diffusion of concurrent cascades carrying similar content on Twitter. In a computer simulation study, Weng et al. (2012) demonstrated that attention competition is a sufficient condition for the emergence of inequality of meme popularity on social media.

In the present context, an online discussion thread has to compete with many simultaneous threads for user attention. The most immediate implication is that, if a thread is posted when many other users are also posting threads, it will face stronger competition and be, relatively, less likely to gain attention. Moreover, many online systems, including LIHKG, allow users to collectively prioritize important content. Generally, threads with continuous updates (e.g., new replies) will be promoted to the front page (the "most popular" lists on LIHKG). The prioritized threads have more opportunity to be viewed by others and are thus more likely to receive additional replies. When there are more simultaneous threads, a new thread may be displayed for a shorter period of time and therefore attract less attention (Zhang et al., 2020). Therefore, the number of competing threads at the time of posting influences the likelihood of receiving a reply (e.g., Nakazawa & Tatsumi, 2019; Zhang et al., 2020).

In addition, whether a thread can retain user attention depends on whether it can attract rapid responses. Threads that cannot trigger prompt replies may be "pushed down" very quickly. What matters here is the time gap between the thread's appearance and the first reply. According to the preferential attachment mechanism (Barabasi & Albert, 1999; Himelboim, 2008), threads attracting immediate first replies will receive more subsequent replies.

In summary, the dynamics of attention competition could be addressed by examining how the number of concurrent threads (or crowdedness, as in Zhang et al., 2020) and the response time of the first reply shape the prominence of the thread. If attention competition heavily shapes thread popularity, then action organization through discussion on LIHKG was driven more by real-time dynamics than by stable user characteristics. We pose a research question to guide our analysis as follows:

> RQ3: How and to what extent do the number of simultaneous threads and the response time of the first reply shape thread popularity in movement discussions?

Interaction between content and attention competition

In addition to examining the main effects of the three sets of factors described above, the analysis also explores whether content characteristics and attention competition interact in shaping thread popularity. The underlying question involves whether the influence of specific types of content characteristics on thread popularity would varies when attention competition intensifies. In a protest movement, the number of online discussion posts is likely to increase sharply during and immediately after important events. Examining how specific content characteristics shape thread popularity at such times could lead to more information about the principles and character of action organization at times when the movement needs to react to emerging developments. We therefore pose an additional research question:

> RQ4: Does the influence of content characteristics on thread popularity change when attention competition intensifies and, if so, how?

Method

Data collection

The data analyzed below was collected from www.lihkg.com (LIHKG) by scraping and downloading all posts and comments published thereon from June 1 through December 31, 2019. The study was approved by the Survey and Behavioral Research Ethics Committee of the Chinese University of

Hong Kong. Only publicly available (not requiring a login) data was collected. Users on LIHKG can initiate discussion threads and post replies to any thread they wish. In terms of affordances, LIHKG does not offer following or friending functions, and so it does not favor the establishment of stable network structures. Instead, there are different topical sub-forums called channels that are used to organize threads. Most movement-related posts were in the public affairs channel. The movement discussion dataset thus includes all posts and comments from this channel. During the period under examination, there were 18,948,823 comments in 290,570 threads from 154,305 unique users.

A non-movement dataset was created as a reference point. In addition to testing *H1* and *H2*, it will also be useful for examining the predictors of thread popularity in non-movement discussions in order to discern the peculiarity of movement discussions. Specifically, we selected 6 channels from the top 10 most active during the period that are theoretically irrelevant to politics and the Anti-ELAB Movement: entertainment, movies, love, games, sports, and apps. Of course, given the overwhelming importance of the Anti-ELAB Movement, it is possible that some threads in these channels refer to the movement. However, the discussions on these channels should be distant from that movement as a whole. The non-movement discussion dataset includes 3,937,941 comments from 28,127 threads posted from September 1 (when the channels became active) through December 31, 2019; the non-movement discussions involved 74,886 users.

Measures

Thread popularity and inequality in thread popularity. In an individual thread, popularity was measured by number of replies received, though it could also be measured by the sum of likes and dislikes received. The two popularity measures are highly correlated (*Spearman* $\rho = 0.88$) and could generate similar results. The following mainly reports on results based on number of replies because our core arguments were derived based on the dynamics of replying; we note the findings based on the sum of likes and dislikes in the text as additional information.

The Gini coefficient was employed to measure the inequality of threads' popularity within a certain time period for the sake of consistency with previous studies (Freelon et al., 2018; Steinert-Threlkeld, 2017). The Gini coefficient is a common measure of economic inequality ranging from 0 to 1; if all threads had the same number of replies, the Gini coefficient would be 0, indicating perfect equality. We calculated the Gini coefficient for the distribution of replies by week. The averages of the Gini coefficients for movement discussions and non-movement discussions are 0.81 (Mdn = 0.814, SD = 0.022) and 0.82 (Mdn = 0.813, SD = 0.015), respectively.

Profile characteristics. In movement discussions, 37,522 users posted at least one thread while there were 8,237 thread initiators in non-movement discussions. Three profile characteristics of the thread initiators were included. The first is self-reported *gender*; 75% of users in movement discussions claimed to be men while 68% of users in non-movement discussions did. Obviously, self-reported gender may deviate from the initiator's real gender, but the variable remains pertinent because it can illustrate how other users respond to the self-presented gender of an initiator. The second is *account age,* which is defined as the amount of time between LIHKG account creation and the moment of thread posting (movement discussion: M = 675.44 days, Mdn = 848.61 days, SD = 371.42; non-movement discussion: M = 741.48, Mdn = 911.50, SD = 371.28). The third is *rank of user influence*, as measured by the total number of replies received by a user. All users were rank ordered from 1 to 36,356 for movement discussions and 1 to 8,090 for non-movement discussions (rank indices for equal values were replaced by their mean). The rank was used to represent a user's overall influence on LIHKG such that a smaller number represents a higher rank and more overall influence.

Communication activities were measured by *number of threads* (M = 12.14, Mdn = 3, SD = 27.54; M = 5.48, Mdn = 2, SD = 7.81) and *number of replies* to threads (M = 140.3, Mdn = 56, SD = 270.46; M = 150.60, Mdn = 38, SD = 322.76) posted by thread initiators during the time of examination.

Network positions were measured by out-degree centrality, the number of reciprocal ties, and betweenness centrality in the reply-to network. Since there are no networks based on following or friending relationships on LIHKG, we followed Huffaker (2010) to construct a network based on the reply-to relationship. In this network, nodes are the participants and edges are the reply-to relations. If user A replied to user B, there was a tie between them. If a user posted in a thread without mentioning another user explicitly, we considered it as a reply to the thread initiator. A user's out-degree centrality is the number of unique users replied to by that user (movement: M = 954.60, Mdn = 472.00, SD = 1242.55; non-movement: M = 265.10, Mdn = 130.00, SD = 368.06). Reciprocal ties refer to a situation in which A and B replied to each other. Number of reciprocal ties, therefore, is the number of people that the user has interacted with reciprocally (movement: M = 464.10, Mdn = 153.00, SD = 768.58; non-movement: M = 191.50, Mdn = 79.00, SD = 294.47). A user's betweenness centrality quantifies how many users' connections are mediated by the chosen user (movement: M = 18,409,919, Mdn = 2,149,074, SD = 43,084,989; non-movement: M = 14,220,689, Mdn = 2,514,142, SD = 32,355,459).

Content characteristics include personal action frame, immediacy signal, and expressions of anger. *Personal action frame* was measured by a binary

variable indicating whether the first post of a thread included either "*wo-nei* xx" or "*heunggongyan* xx." In movement discussions, 11.1% of threads included one of the two phrases; they are both specific to movement discussions and were not measured in non-movement discussions. *Immediacy signal* was also a binary variable indicating whether the thread title included the words *dat-faat* ("breaking news"), *gan-gap* ("urgent"), *jik-si* ("immediate"), or *yin-cheung* ("live"). 4.5% of titles in movement discussions included at least one of these terms; this variable is also limited to movement discussions.

Emotional expressions in the opening posts of threads were measured as continuous variables (0–100) using the Chinese version of LIWC (Huang et al., 2012), which is a commonly used dictionary of emotions in psychology. The focus was on anger (movement: M = 0.04, Mdn = 0.00, SD = 0.87; non-movement: M = 0.05, Mdn = 0.00, SD = 0.95), but we also included a measure of positive emotion (movement: M = 0.06, Mdn = 0.00, SD = 1.08; non-movement: M = 0.17, Mdn = 0.00, SD = 1.96) to serve as a point of comparison. It is important to note that LIWC was not designed for Cantonese, which is the dominant language on LIHKG. As a supplementary measure of expressions of anger, we registered the presence of *swearing* by determining whether the content of the first post included any taboo Cantonese words, as compiled by Lee et al. (2019). In movement discussions, 23.3% of the first posts contained swear words; the corresponding percentage in non-movement discussions was 23.5%.

Attention competition was measured by two variables. *Crowdedness* was measured by the number of threads posted from two and a half minutes before to two and a half minutes after the target thread was posted (M = 11.14, Mdn = 8, SD = 12.89; M = 2.07, Mdn = 2, SD = 1.17). We experimented with different time frames (±0.5, ±2.5, ±5, ±15 minutes) and ±2.5minutes was the most powerful predictor in terms of effect size. A larger value indicates that the period was crowded and attention competition was intensive. Additionally, *response time of the first reply* was measured by the duration in minutes between the thread's creation and the posting of the first reply (M = 13,576.82, Mdn = 1.47, SD = 39,128.47; M = 514.45, Mdn = 1.25, SD = 2439.49). If there was no reply, the maximum value of the variable was used.

Results

Inequality in thread popularity

Regarding *H1*, the weekly Gini coefficients for the distribution of replies in both movement and non-movement discussions were consistently high, indicating that only a few influential threads had the ability to trigger

intensive discussions. The average of the Gini coefficients for the distribution of replies was 0.81 (Min = 0.75, Mdn = 0.81, Max = 0.85, SD = 0.02) across the 32 weeks of movement discussions. The average in non-movement discussions was 0.82 (Min = 0.78, Mdn = 0.81, Max = 0.86, SD = 0.02). Degree of inequality was virtually the same for the two, and the small SDs indicate that the coefficients are stable. Hence, *H1* is not supported. The findings suggest that inequality in thread influence is a common phenomenon in online forums. By itself, it is not a good signal for action coordination through discussion.

Nevertheless, as explained in the conceptual discussion, the way in which the relative degree of thread inequality varies according to other factors could be a better indicator of the presence of action coordination in a discussion. Figure 1 presents the correlations between the inequality of thread popularity and number of participants who had posted at least once a week. As expected, the Gini coefficient is positively correlated with number of users who posted at least once a week (*Spearman* $\rho = 0.68$, $p < .001$) in movement discussions. However, the correlation between the two is insignificant; in fact, a negative correlation exists in non-movement discussions (*Spearman* $\rho = -0.40$, $p = .116$, see the lower graph in Figure 1).

The same pattern emerges when number of posts is used in place of number of users. Figure 2 shows that inequality in thread popularity is positively and significantly related to the number of posts in movement discussions, while the relationship is negative and significant in non-movement discussions; *H2* is therefore supported. Users in movement discussions concentrated on the most popular posts to an even greater extent when the number of users and number of posts increased.

Predicting thread popularity

The next step is examining the predictors of thread popularity. Since the distribution of the dependent variable is highly skewed, negative binomial regression was employed. This form of regression is a generalization of Poisson regression, which is widely used to model count variables. We included five components of the independent variables: profile characteristics, communication activities, social network positions, content characteristics, and attention competition. Some of the variables are highly skewed and were therefore log-transformed when used in the model. Table 1 shows the results for movement and non-movement discussions separately. Although the distribution of popularity appears zero-inflated (too many threads with 0 reply), a zero-inflated negative binomial model did not fit the data better than a negative binomial model ($\chi^2(15) = 0.45$, $p = 1$).

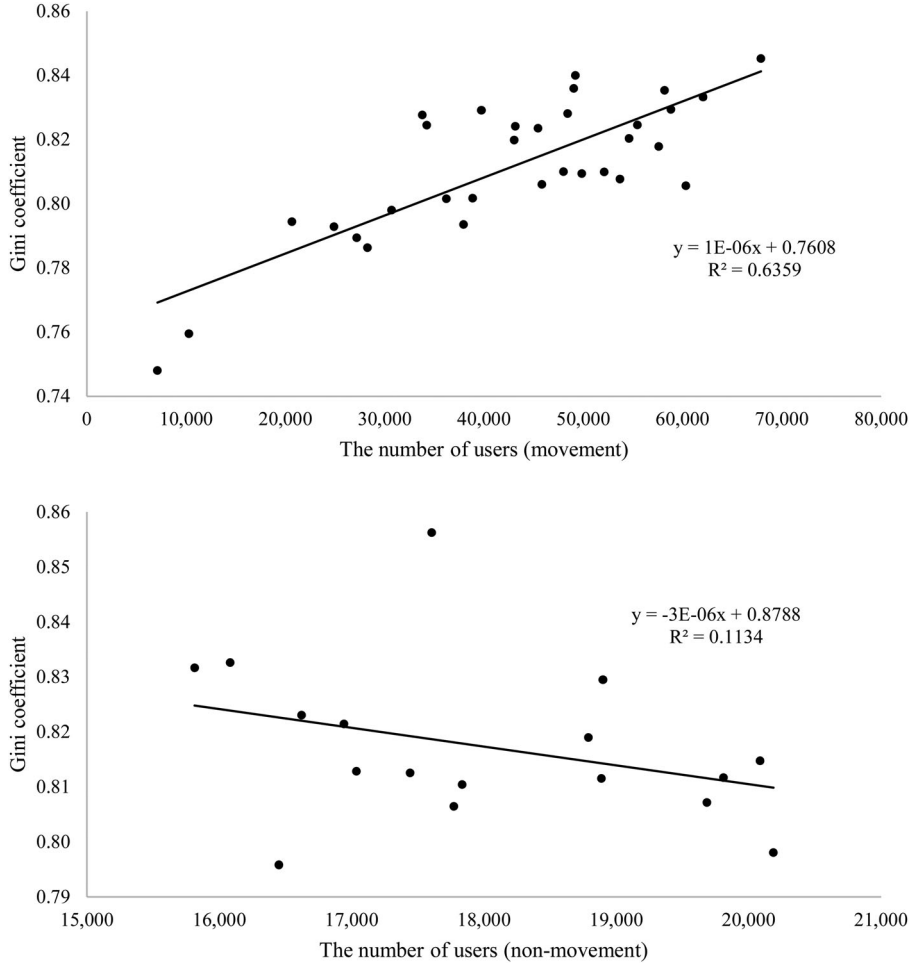

Figure 1. Correlations between the number of users and inequality of thread popularity.

Note. All Gini coefficients and numbers of users were calculated weekly. The rank correlation coefficient in the upper figure is 0.68 ($p < .001$) while the correlation in the lower is -0.40 ($p = 0.116$).

The full models fit the data well (pseudo R^2*s* are 67.3% and 86.1%, respectively). Net R^2 for a component was calculated by the overall R^2 minus the R^2 for the regression model, excluding that component. For example, the net R^2 for attention competition in movement discussions was calculated as 67.3% (the overall R^2) minus 49.3% (the R^2 of the model excluding the two attention competition variables).

Answering *RQ1*, seven of the eight user characteristics were significantly associated with thread popularity in movement discussions and all eight variables were significantly related to thread popularity in non-movement discussions. Specifically, posts by users with more user influence (and thus

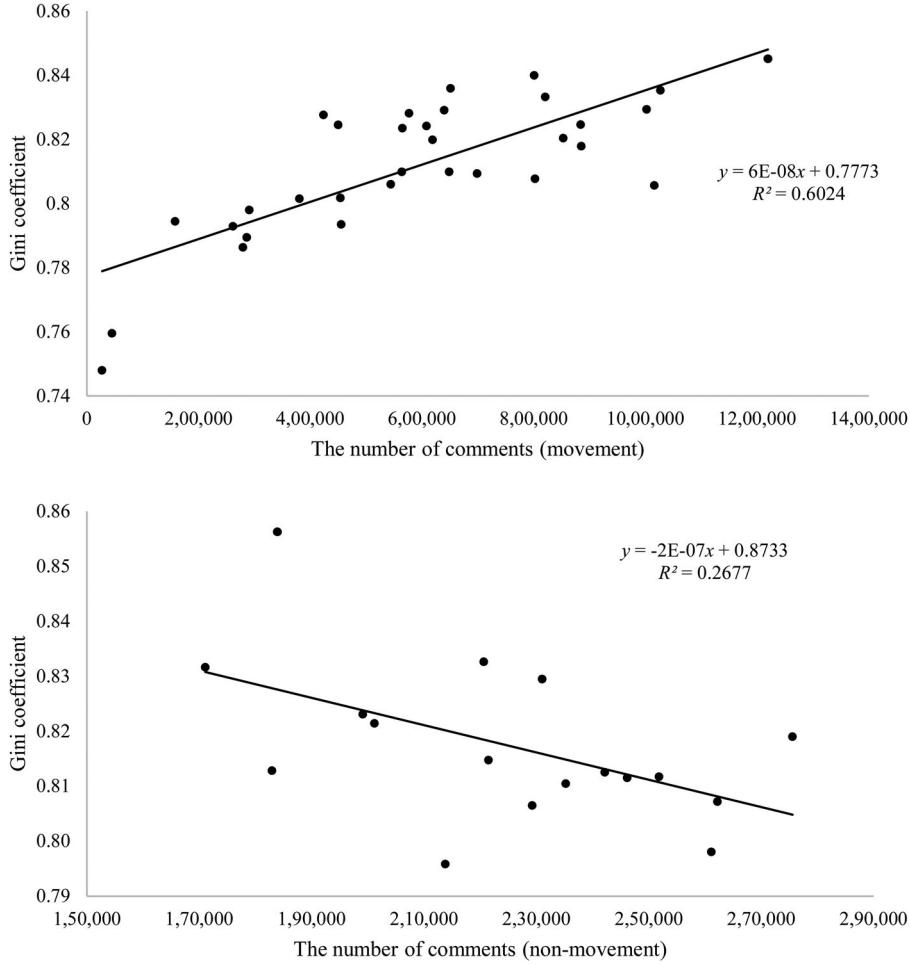

Figure 2. Correlations between the number of posts and inequality of thread popularity.

Note. All Gini coefficients and number of users were calculated weekly. The rank correlation coefficient in the upper figure is 0.72 ($p < .001$) while the correlation in the lower is -0.51 ($p = 0.039$).

smaller values in the variable), by users with smaller out-degree centrality, by users with higher betweenness centrality, by users who posted fewer threads, and by users who replied more to others all received more replies themselves. Interestingly, while male users' posts received fewer replies than female users' posts in movement discussions, the opposite was true in non-movement discussions. Account age did not relate significantly to thread popularity but did have a positive relationship with thread popularity for non-movement discussions. In addition, number of reciprocal ties was negatively associated with thread popularity in movement discussions, though it related positively with thread popularity in non-movement discussions.

Table 1. Negative binomial regression models in predicting thread popularity.

	Movement		Non-Movement	
	Estimate (SE)	Net R^2	Estimate (SE)	Net R^2
Profile characteristics				
Gender (Male)	−0.02**	4.0%	0.10***	13.1%
	(0.01)		(0.01)	
Account age (log)	−0.00		0.05***	
	(0.00)		(0.01)	
Rank of influence (log)	−0.37***		−0.66***	
	(0.00)		(0.01)	
Network position				
Out-degree (log)	−0.51***	7.9%	−0.50***	2.3%
	(0.01)		(0.01)	
Reciprocal ties (log)	−0.23***		0.06**	
	(0.01)		(0.02)	
Betweenness (log)	0.25***		0.12***	
	(0.00)		(0.00)	
Communication activity				
# threads (log)	−0.95***	15.0%	−1.52***	30.6%
	(0.00)		(0.01)	
# replies (log)	0.60***		0.50***	
	(0.00)		(0.01)	
Content characteristics				
Immediacy signal	0.62***	0.5%		0.2%
	(0.03)			
Personal action frame	0.12***			
	(0.02)			
Anger	0.00		0.01	
	(0.01)		(0.01)	
Swearing	0.12***		0.16***	
	(0.02)		(0.02)	
Positive emotion	−0.00		−0.00	
	(0.01)		(0.00)	
Attention competition				
Crowdedness (log)	−0.12***	18.0%	−0.04***	3.5%
	(0.00)		(0.01)	
Response time (log)	−0.26***		−0.20***	
	(0.00)		(0.00)	
Attention × Content				
Crowdedness × Immediacy	−0.06***	0.0%		0.0%
	(0.01)			
Crowdedness × Frame	−0.00			
	(0.01)			
Crowdedness × Anger	−0.00		0.00	
	(0.00)		(0.01)	
Crowdedness × Swearing	−0.02**		0.01	
	(0.01)		(0.03)	
Crowdedness × Positive	−0.00		−0.00	
	(0.00)		(0.01)	
Intercept	6.69***		8.53***	
	(0.04)		(0.09)	
θ	0.61		0.81	
	(0.00)		(0.01)	
N	290,570		28,127	
R^2 Nagelkerke	67.3%		86.1%	

Note. *Log* indicates that the variable was log-transformed. Net R^2 for a component was calculated by the overall R^2 minus the R^2 excluding that component.
*$p < .05$,
**$p < .01$,
***$p < .001$.

More importantly, the three sets of user characteristics combined to improve the model fit by 23.1% in movement discussions; the same sets of user characteristics improved the model fit by 57.3% in non-movement discussions. In other words, user characteristics explain thread popularity in non-movement discussions to a substantially larger extent. This suggests a mixed picture regarding the role of opinion leaders in LIHKG discussions. On the one hand, user characteristics do matter, which suggests that some users did serve as leaders in the online forum. On the other hand, the overall influence of stable user characteristics was much weaker in movement discussions as compared to other kinds of discussions on the same platform. This suggests limits on the impact of stable leadership in the context of action coordination through discussion in a networked social movement.

Regarding *RQ2*, the content characteristics listed in Table 1 show a rather small impact on thread popularity in both movement and non-movement discussions. According to the net R^2s (0.5% and 0.2%), they were the least important components in our models. However, titles with immediacy signals and posts including personal action frames did lead to increased replies. This finding points to the presence of the logic of connective action in online discussions. When emotions are concerned, neither anger nor positive emotion related significantly to thread popularity, but posts involving swearing elicited more replies in both movement and non-movement discussions.

Regarding *RQ3*, crowdedness was negatively associated with number of replies. If one thread was posted at the same time as several others, it attracted fewer replies. Additionally, the response time of the first reply was negatively associated with thread popularity. Threads that attracted quicker initial replies ultimately had more replies. These two variables could uniquely contribute to 18.0% of the model fit. The figure is bigger than the net R^2 of profile characteristics, network positions, and communication activities when the latter three were treated separately. Additionally, the influence of attention competition on thread popularity in non-movement discussions is much weaker (net $R^2 = 3.5\%$). This is consistent with the aforementioned point that thread popularity in movement discussions was driven less by stable user characteristics than by the dynamics unfolding in the discussion.

Finally, *RQ4* asks whether the impact of content characteristics varied when attention competition was more or less intensive. A series of interaction effect terms between crowdedness and the content characteristics was created to answer this question. None of the interaction effect terms were statistically significant in the model for non-movement discussions. For movement discussions, the interaction between personal action frame and crowdedness was insignificant, though crowdedness did interact with

immediacy signals and swearing to influence thread popularity. Given the signs of the interaction terms and the original main effect terms, the findings suggest that the influence of immediacy signals and swearing declined when attention competition became serious. Interestingly, these findings suggest that LIHKG users were generally less driven by strong negative emotions and the urge to act immediately when discussions were most intense.

Additional analysis using dependent variables based on a summary of likes and dislikes created virtually the same substantive results (full information omitted due to space constraints): thread popularity is explained by network positions, communication activities, immediacy signal, personal action frame, swearing, and the two attention competition variables; attention competition explains thread inequality to a much larger extent in movement discussions while user characteristics explain thread inequality to a much larger extent in non-movement discussions. One interesting difference, however, is that there was a significant interaction effect between crowdedness and personal action frame such that the positive impact of personal action frames on thread popularity was stronger when attention competition was stronger. Overall, the results are highly consistent and suggestive of the robustness of the main findings.

Discussion and conclusions

In the absence of formal, central leaders, the Anti-ELAB Movement was widely regarded as prioritizing action organization by ordinary people through digital media platforms. This challenges researchers to discern the presence and characteristics of such organizing through communication. By focusing on LIHKG, this article aims to illustrate how this question can be answered by examining thread popularity. The analysis first follows Steinert-Threlkeld (2017) and Freelon et al. (2018) to use inequality, operationalized through the Gini coefficient, as a measure of action organization through discussion. The results show that discussions on LIHKG indeed exhibited a very high degree of inequality in terms of thread popularity. People's attention and responses were highly concentrated on a relatively small portion of the popular threads. However, comparison between movement and non-movement discussions found that non-movement discussions were similarly concentrated. Therefore, level of inequality in thread influence by itself is not a very convincing indicator of action organization through discussion.

Instead, our findings suggest that the ways in which inequality in thread popularity is related to the number of users and the number of posts present in a discussion is a better indication of the presence of action

coordination. In an online forum, increases in the number of participants and posts make it more difficult for users to identify and follow the most popular posts. When a discussion (a non-movement discussion in this case) does not involve action organizing, people do not feel the urge to stick to the focus of others' attention, so an increase in number of participants and posts would lead to the diversification of people's attention. However, when a discussion (a movement discussion in this case) does aim at action organization, people need to concentrate on what others are focusing on. In this scenario, increases in the number of participants and number of posts only lead to an even stronger urge to identify with and stick to the same focus. Therefore, our findings contribute to the literature in that they confirm the utility of focusing on inequality to discern the presence of action organizing but also point to the need to treat degree of inequality in relative terms and in relation to other factors. There is a need for a more nuanced use of the indicator when conducting empirical analysis.

The second part of the empirical analysis examines the predictors of thread popularity. In a general sense, the findings show that the popularity of individual threads can be predicted by user characteristics, content characteristics, and the logic of attention competition. This echoes existing research on how various factors can explain the extent to which online content would obtain reactions (e.g., Chen & Teng, 2017; Nakazawa & Tatsumi, 2019; Zhang et al., 2020). However, our analysis goes beyond the extant literature in two ways. First, it is one of the first studies to examine how several sets of factors combine to explain the popularity of online content. The R^2 values of the regression model are very high, suggesting that the model has already incorporated the most significant factors. Second, and more importantly, the comparison between how sets of factors explain thread popularity in movement and non-movement discussions provides insights into the characteristics of action organization via discussion on LIHKG.

Specifically, in line with Bennett and Segerberg (2013) theorization, personal action frames play a certain role in attracting user attention to published posts; people tended to react to posts containing some of the more recognizable personal action frames. Second, and consistent with a general understanding of the lack of stable leadership in networked social movements, stable user characteristics explained thread popularity in movement discussions to a much lesser extent than they explained thread popularity in non-movement discussions. By contrast, the logic of attention competition, though it was represented by two relatively straightforward variables, explained a substantial proportion of the variance in thread popularity in movement discussions and had a much smaller influence on thread popularity in non-movement discussions. This highlights the dynamism of online discussions and the action organization embedded within them.

Moreover, the impact of swearing declined as discussion became intensive, although negative emotions expressed through swearing were able to attract attention and reactions. This suggests that one should not dismiss LIHKG, at least during the period under study, as merely a site for people to vent their anger and bash their opponents. Of course, this is not to say that LIHKG discussions constitute the kind of rational deliberation envisaged by theorists of the public sphere. There was certainly highly emotional content on the forum, but there were no signs that the discussion as a whole was driven primarily by such content; the influence of incivility even declined somewhat when people were most actively discussing.

Overall, this article explores how thread popularity can be used to examine the presence and characteristics of action organization in digital communication. It is important to note, however, that the exact findings are not generalizable to other contexts. For instance, the relative strength of attention competition in driving thread popularity is likely to be partly rooted in the affordances of LIHKG itself; it prevents the establishment of fixed network structures and may undermine the influence of factors such as network positions because it does not allow following or friending. However, we believe that the approach adopted—discerning the presence of action organization through discussion by analyzing the relative degree of inequality in content popularity, examining the characteristics of action organization by studying the predictors of content popularity, and comparing the characteristics of both movement-related content and non-movement-related content on the same digital media platform—can be applied to other digital platforms and in other contexts.

Despite its important contributions, the study does have certain limitations that need to be acknowledged. First, the weakness of the chosen measures may be part of the reason why content characteristics had little influence on thread popularity. In fact, the results suggested that, among the three indicators related to expressions of emotions, only swearing—the measure based on Lee et al. (2019) that is sensitive to the language used in Hong Kong—had a significant impact on thread popularity. Additionally, the measure of personal action frames included only two of the more recognizable (and operationalizable) frames. We may be able to discern a somewhat stronger effect of content characteristics if better measures become available.

Second, the analysis of the predictors of thread popularity treats user characteristics, content characteristics, and attention competition as three sets of variables that are parallel to one another. However, there could be additional relationships between these three sets of variables that merit examination. For instance, it would be interesting to see whether certain types of users and/or certain types of content are more likely to emerge at

times of intensive attention competition. It would also be interesting to see whether user characteristics and content characteristics are related to one another in specific ways. Examining these relationships may offer further insight into the dynamics of movement-related online discussions.

Third, the Anti-ELAB Movement lasted for an extended period of time. It would be meaningful to see whether the phenomenon of thread inequality and the predictors of thread popularity change over time. In fact, we have conducted additional analysis and found that thread inequality in movement discussions on LIHKG and the predicted power of the logic of attention competition actually declined over time. The former suggests a decline in the extent to which people were using LIHKG as a platform for action organization while the latter indicates that, to the extent that a degree of action organization through discussion still existed, the action organizing efforts became less driven by the dynamics of real-time events. These findings correspond to general observations of the evolution of the Anti-ELAB Movement itself, though systematic explication of such changes would have to be the subject of another study.

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Notes on contributors

Hai Liang is an Assistant Professor at the School of Journalism and Communication at the Chinese University of Hong Kong. His research interests include computational social science, political communication, and public health.

Francis L. F. Lee is a Professor at the School of Journalism and Communication at the Chinese University of Hong Kong. He is the lead author of *Media, Social Mobilization, and Mass Protests in Post-colonial Hong Kong* (Routledge, 2011) and *Media and Protest Logics in the Digital Era: The Umbrella Movement in Hong Kong* (Oxford University Press, 2018).

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