Online Incivility, Cyberbalkanization, and the Dynamics of Opinion Polarization During and After a Mass Protest Event

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This study is concerned with the role of persistent online incivility in the dynamics of public opinion polarization. It examines how cyberbalkanization, contentiousness of the political context, online incivility, and opinion polarization at the collective level relate to each other. Focusing on Hong Kong and drawing upon data from different sources, the analysis shows that online incivility—operationalized as the use of foul language—grew as volume of political discussions and levels of cyberbalkanization increased. Incivility led to higher levels of opinion polarization. Online incivility, therefore, can be a mediating mechanism through which the political context and the phenomenon of cyberbalkanization exert influence on polarization.

Keywords: incivility, swearing, cyberbalkanization, opinion polarization, political context

Opinion polarization has become a common concern among political communication researchers in many countries around the world in the recent decade. In some countries such as the United States, public opinion polarization was partly driven by elite discourses and behavior (Druckman, Peterson, & Slothuus, 2013; Levendusky, 2010). The growth of partisan media also fueled the trend of polarization (Jamieson & Cappella, 2008; Robison & Mullinix, 2016)—that is, public opinion became more polarized because political elites and the mainstream media scene have become more polarized.

In addition, scholars have commented on how digital media can exacerbate the phenomenon. One widely adopted argument is that the proliferation of online media outlets and the fragmentation of discussion space have led to the formation of echo chambers within which like-minded people congregate. The overall result is a more balkanized cyberspace (Sunstein, 2017). When people receive only consonant information and views, their opinions become more extreme, and thus polarization occurs (Levendusky, 2013).

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Following this line of thinking, opinion polarization is the result when people stop talking to each other. However, during times of political controversies, what one may see in the online arena is not so much the absence of debates than heated arguments —often with a significant share of yelling, swearing, and/or name-calling—between people on opposite sides. It seems that uncivil talk is as likely to lead to polarization as the absence of talk.

Incivility in political discourse itself has received much scholarly attention (Herbst, 2010; Mutz, 2015). Yet few studies have examined incivility and cyberbalkanization simultaneously as possible antecedents of opinion polarization. This study examines the relationships among online incivility, cyberbalkanization, and opinion polarization. Specifically, this study focuses on Hong Kong before and after the Umbrella Movement. It employs techniques of computer-assisted analysis of online contents and combines it with longitudinal survey data. The analysis aims to show whether and how, at the collective level and over time, online incivility and cyberbalkanization relate to each other and to changes in degree of opinion polarization. The findings provide us with unique insights into the possible impact of persistent incivility in public discourse on the dynamics of public opinion formation. This study will inform ongoing debates about the impact of incivility and cyberbalkanization and enrich our understanding of how online political discourses influence public opinion.

Literature Review

The Concept of Polarization

Opinion polarization can refer to a cluster of interrelated phenomena. First, some researchers examined polarization in terms of citizens' ideological consistency (Abramowitz & Saunders, 2008). When citizens become more ideologically consistent, people on opposite sides become less likely to share common views on specific issues. The public is therefore more polarized on the whole.

Second, some researchers examined polarization in terms of the distance between opposite sides' ideologies or issue opinions. At the individual level, polarization is thus often studied in terms of attitude extremity (Kim, 2015; Lee, 2016). At the collective level, polarization becomes an opinion distribution marked by bimodality and a high degree of dispersion (DiMaggio, Evans, & Bryson, 1996).

Third, researchers have examined polarization as a matter of group identities and intergroup relations. The concept of affective polarization was developed to refer to the extent to which people feel negatively or even hostile toward the opposite camp (Iyengar & Hahn, 2009; Iyengar, Sood, & Lelkes, 2012). Although the three manifestations of polarization are distinctive, they should be positively related to each other because mutual hostility should become more likely when ideological distance increases and opinion overlap decreases. Nevertheless, the empirical analysis of this study focuses on polarization in the second sense because of availability of relevant longitudinal data.

Digital Media and Polarization

One main line of argument regarding how digital media might facilitate opinion polarization can be traced to the seminal article by Bennett and Iyengar (2008). They argued that digital media have facilitated

heightened levels of selective exposure due to channel proliferation and the tendency of media outlets to "go niche" in a hypercompetitive environment. People find it easier to stick to what they are interested in or agree with. Beyond media consumption, people also tend to talk to like-minded others when engaging in interpersonal talk (Huckfeldt, Johnson & Sprague, 2004). Hence online political discussions are likely to occur mainly among like-minded people. The overall result is balkanization of online political communication (Sunstein, 2017), reinforcement of existing views, and polarization of the public.

Since Bennett and Iyengar (2008), numerous studies have illustrated the impact of partisan selective exposure on polarization (e.g., Stroud, 2011; Tsfati & Nir, 2017), whereas others have demonstrated the degree to which online discussions are balkanized (e.g., Jacobson, Myung & Johnson, 2016). However, few studies have examined the relationship between cyberbalkanization and opinion polarization at the collective level. Lynch, Freelon, and Aday (2017) analyzed Twitter data in post-Arab Spring Egypt and found a trend of online political communication splintering into noncommunicating clusters. The trend was linked to the expression of fear. The authors argued that the process "reinforces both in-group solidarity and the dehumanization of rival groups" (p. 1161), but their study does not have a measure of opinion polarization. In contrast, Chan and Fu's (2017) study on Hong Kong developed a measure of degree of cyberbalkanization based on the sharing actions of politics-oriented Facebook pages. Combined with a measure of collective-level opinion polarization derived from publicly available poll data, they found that degree of cyberbalkanization related to and preceded opinion polarization.

Despite such empirical support, the argument linking selective exposure and opinion polarization has been questioned in several ways. Some researchers argued that the tendency toward selective exposure is not as strong as is usually assumed. Although people do prefer like-minded content, they do not avoid counterattitudinal content (Garrett & Stroud, 2014). In addition, people typically consume content from multiple media outlets with varying political stances (Fletcher & Nielsen, 2017). Diversity of consumed media ensures exposure to at least some counterattitudinal information (Dubois & Blank, 2018).

Most pertinent to this article, while the absence of cross-cutting exposure may lead to opinion reinforcement, it is unclear if talking across the divide necessarily generates the opposite result. Theorists of deliberative democracy argued that democratic talk can help build mutual understanding, trust, and respect (Young, 2000). Indeed, empirical studies have shown that cross-cutting exposure allows people to know the rationales of the other side and become more tolerant (Mutz, 2006; Price, Cappella, & Nir, 2002). However, studies of the impact of interpersonal political talk typically examine discussions among in-group members with a high level of trust. In the online arena where people often talk to strangers, there can be a stronger tendency for people to see themselves and the disagreeing others as members of distinct groups. Following social identity theory (Tajfel & Turner, 1979), people tend to hold their own group in higher regard. Criticisms coming from out-group members are likely to be perceived as attacks on the in-group, "motivating efforts to regain self-esteem by denigrating the opposition" (Suhay, Bello-Pardo, & Maurer, 2018, p. 98).

Therefore, through the lens of the social psychology of intergroup interactions, discussing with disagreeing others can be polarizing because of people's tendency to self-defend. Whether disagreement actually polarizes is also likely to depend on other factors, such as how contentious the political environment is (Wells et al., 2017) and how people talk. This brings us to the concern of incivility.

Incivility in Political Discussions and Polarization

There is no single definition of *civility* or *incivility* adopted by all researchers. Herbst (2010, pp. 12–13) noted three types of definitions of civility: (1) good character and virtue of an ideal citizen, (2) good manners and self-control, and (3) proper behavior in democratic communication. Depending on the definition of civility, the definition of incivility varies accordingly. Focusing on political communication research, Muddiman (2017) identified a distinction between personal and public incivility. Personal incivility centers on violations of general social norms of interpersonal interactions. Mutz (2015), for example, defined incivility as "communication that violate the norms of politeness for a given culture" (p. 6). In contrast, public incivility focuses on violation of the norms of democratic discourse (Papacharissi, 2004), such as spreading misinformation or refusing to compromise.

Public and personal incivility are not mutually exclusive. For instance, Sobieraj and Berry (2011) found a significant level of what they called "outrage discourses" in cable TV news, blogs, and talk radio. In their definition, outrage discourses "provoke a visceral response from the audience . . . through the use of overgeneralizations, sensationalism, misleading or patently inaccurate information, ad hominem attacks, and partial truths about opponents" (p. 19). Outrage discourses thus involve both personal and public incivility. However, personal and public incivility remain distinctive concepts. Comparatively, personal incivility is more relevant to the problem of opinion polarization. This is because violation of norms of interpersonal communication is likely to pose a more direct challenge to people's self-esteem. The present study, therefore, follows the personal incivility approach.

In the United States, concerns arose about incivility largely because of the increase in the political elites' use of uncivil discourses (Mutz, 2015), which in turn can lead to the use of incivility by citizens (Gervais, 2017). Incivility was also found to be prevalent online. According to a Pew Research Center report in 2014, 60% of Internet users said they had witnessed someone being called offensive names online (Duggan et al., 2014). Coe, Kenski, and Rains (2014) found a significant amount of uncivil comments on the website of a U.S. local newspaper. Beyond the United States, the growth of online incivility also attracted the attention of European scholars (e.g., Rost, Stahel, & Frey, 2016).

Researchers have examined the various impacts of online incivility on Internet users. For example, Borah (2014) found that uncivil comments associated with news articles may influence readers' perceptions of the articles. Hmielowski, Hutchens, and Cichirillo (2014) found that, given the pervasiveness of online incivility, engagement in online political discussions can lead to acceptance of the normality of incivility in political talk, which can in turn lead to an intention to use uncivil discourses.

More important, incivility can influence how people view the other side and process incoming information. Empirically, Wang and Silva's (2018) experiment found that exposure to incivility in the form of mockery and insult could lead to negative emotions. An analysis by Hwang, Kim, and Kim (2018), meanwhile, shows that exposure to uncivil counterattitudinal viewpoints leads to lower levels of open-mindedness and higher levels of defensiveness. Theoretically, these results occur because incivility in the context of intergroup communication can lead people to view the other side as attacking one's own group. This can motivate defensive reactions that are "in-group biased, emotionally motivated, and anti-

deliberative" (Wang & Silva, 2018, p. 73). In addition to emotional responses, when out-group members violate the norms of interpersonal interactions, people may conclude that the out-group is not worthy of listening to (Hwang et al., 2018). More basically, incivility often involves the use of highly emotional language. Incivility might therefore evoke negative emotions and stronger attitudes even when people are not talking to out-group members.

When people are open-minded, "deliberative uptake" through discussion (Bohman, 1998) is more likely to occur. Consequentially, people's attitudes are likely to become more moderate and/or ambivalent (Mutz, 2006). On the contrary, when people become more defensive, they might counterargue with dissonant information and views, in the process making their own views even more extreme (Bail et al., 2018). When people on both sides develop more extreme opinions, they become more distant from each other—in other words, public opinion becomes more polarized.

However, few studies have directly examined the relationship between incivility and polarization or attitude extremity. One exception is Hwang, Kim, and Huh (2014), whose experimental study found no evidence of the effects of incivility on attitude extremity. Nevertheless, in a laboratory experiment, participants are typically exposed to only a limited amount of incivility. In reality, people may not react too strongly to only a few instances of uncivil comments. A person can easily skip the few uncivil comments and brush them aside as trolls from a few idiosyncratic individuals. But it would become more difficult to remain unaffected when incivility becomes pervasive and recurring—that is, the polarizing impact of incivility is much more likely to arise when online discussions are persistently uncivil. This study thus employs data that allow us to examine whether degree of online incivility influences opinion polarization at the collective level and over time.

Context, Hypotheses, and Research Questions

The following analysis employs data from Hong Kong. Based on survey data about people's attitudes toward the government, Lee (2016) found an increase over time in opinion polarization at the collective level. The increase is arguably associated with heightened conflicts between Hong Kong and mainland China as a result of the problems created by continual integration and China's reluctance to allow Hong Kong to democratize (So, 2017). Such conflicts fueled the growth of contentious politics, cumulating in the Umbrella Movement in 2014.

The Umbrella Movement was a 79-day occupation campaign calling for the institutionalization of "genuine democracy." However, the Chinese and Hong Kong governments refused to make meaningful concessions. The movement ended as the activists lost steam and public opinion started to support an end of the occupation (Lee & Chan, 2018). After the end of the occupation, part of the movement sector further radicalized (Lee, 2018), signified by the rise of "localism" and even calls for Hong Kong independence (Kaeding, 2017; Veg, 2017). The Hong Kong government employed hardline tactics against radicalism. Between 2016 and 2018, several pro-independence candidates were banned from participating in the Legislative Council elections. By the time this article was written, nine main organizers of the occupation campaign were judged guilty of incitement. Four were jailed.

This article is concerned not with the Umbrella Movement itself, but with the role of political communication via digital media in the dynamics of public opinion polarization during and after a major protest event. Sharing the same concern, Chan and Fu (2017) combined Facebook data with opinion poll data and showed an impact of cyberbalkanization on collective-level opinion polarization in the period between late 2014 and mid-2015. However, their study did not examine how other factors might influence polarization or whether cyberbalkanization related to online incivility. Built upon their research, this study focuses more on the role of incivility in opinion polarization.

We begin by examining how cyberbalkanization relates to online incivility. There are competing possibilities here. When people start engaging with disagreeing others, heated debates may ensue, and people may become more prone to adopt uncivil discourses to attack the other side. However, it is also possible that discussion among in-group members could reinforce people's opinions, leading to more extreme expressions. Discussion among in-group members might also create a "safe space" in which people feel freer to express their strongest viewpoints. Given the competing possibilities, we posit a research question as follows:

RQ1:   *How does degree of cyberbalkanization relate to degree of online incivility?*

In addition to cyberbalkanization, online incivility may result simply when the political atmosphere becomes "hot." In times of heightened political activities, people pay more attention to the news (Boczkowski & Mitchelstein, 2013) and discuss politics more often (Wells et al., 2017). As more people engage in political talk, it may be more difficult to maintain the quality of talk. Once someone starts trolling, others may follow (Cheng, Bernstein, Danescu-Niculescu-Mizil, & Leskovec, 2017). The result is an increase in not only the amount but also the proportion of uncivil talk. The latter is our first hypothesis:

H1:   *The proportion of uncivil messages rises when the volume of online discussion increases.*

It should be emphasized that the dependent variable of H1 is not amount of incivility but proportion of uncivil messages. When the volume of political discussion increases, the amounts of all kinds of contents— including uncivil messages —are likely to increase. It is less clear if the proportion of uncivil messages increases; therefore, H1 is worth testing.

After examining the antecedents of online incivility, the next hypothesis regards the relationship between incivility and polarization. Following the conceptual discussions in the previous section, we posit a positive impact of incivility on opinion polarization:

H2:   *The degree of incivility in online political discussions has a positive impact on opinion polarization at the collective level.*

Moreover, the impact of incivility may depend on whether people talk to the other side. We can revisit the two mechanisms through which incivility may influence people. First, incivility may affect people simply because emotional language can generate strong emotions and attitudes. In this case, incivility in in-group or intergroup communication can generate polarization. Second, incivility may generate polarization because,

when used by out-group members against a person, the person can take it as an attack on one's own group. In this case, we can expect incivility to generate polarization mainly when it occurs in intergroup communication (Gervais, 2017). To avoid setting up a null hypothesis, we set up a hypothesis following the second scenario:

H3:   *There is an interaction effect between incivility and cyberbalkanization on opinion polarization such that polarization is particularly likely to occur when incivility combines with low levels of cyberbalkanization.*

Methods and Data

Measuring Cyberbalkanization

The data analyzed were partly borrowed from past research and partly derived from original work. For the time-series data on extent of cyberbalkanization, we directly adopted the index from Chan and Fu (2017). Due to space constraints, we can only summarize their approach. They first identified relevant Facebook pages through a computerized snowballing approach plus manual confirmation by the researchers. The snowballing began from five prominent pages that had a clear supportive or oppositional attitude toward the occupation campaign—for example, the page of the student movement group Scholarism (which played an important role in the Umbrella Movement) and the page called "Salute to Hong Kong Police," which was set up to render support to police actions against the occupation. A total of 2,983 pages were identified as relevant. All publicly available posts of these pages published between July 1, 2014, and June 30, 2015, were retrieved using Facebook Graph API (which was still available when the content was collected). They then developed an R program to scan the timeline of the pages for all posts shared from other pages during the period. This created the postsharing network among the pages in the sample.

The community structure in the network and the community membership of the Facebook pages were determined by the Walktrap community detection algorithm (Pons & Latapy, 2006). With the community structure and membership of pages ascertained, one can see the frequency with which a certain Facebook page has shared posts from other pages belonging to the same community, as well as the frequency with which the Facebook page shared posts from pages belonging to other communities. The former constitutes *strong ties sharing*, whereas the latter constitutes *weak ties sharing*. Cyberbalkanization, then, is operationalized based on the relative proportion of strong and weak ties sharing. In other words, the degree of cyberbalkanization is high when Facebook pages belonging to the same community frequently share materials among themselves but do not share materials from pages belonging to other communities.

In order to produce a time series, Chan and Fu (2017) derived the daily amounts of strong and weak ties sharing. They then calculated the cyberbalkanization index (CBI) according to three slightly different formulas. This study uses the index CBI_{diff} because it performed the best in Chan and Fu's analysis ($M = 5.099$, $SD = 0.499$, min = 3.829, max = 6.956).

Measuring Opinion Polarization

For the time series on opinion polarization, the raw data came from the opinion poll conducted by the Public Opinion Program (POP) at Hong Kong University. This is the same source of data used in Chan

and Fu's (2017) analysis. The polls were conducted following standard procedures of random sampling for telephone surveys in Hong Kong. As discussed earlier, *polarization* can refer to several interrelated phenomena. This study treats polarization as an attribute of an opinion distribution (DiMaggio et al., 1996). A polarized opinion distribution is one with characteristics of bimodality and high levels of dispersion. More specifically, following existing Hong Kong studies on the topic, the polarization index was created based on how people rated the performance of the chief executive of the Hong Kong government on a scale of 0 to 100. The POP repeatedly conducted surveys with the question. From the results, Chan and Fu used the proportion of respondents giving extreme scores (below 2.5 or above 97.5) to represent degree of polarization. Yet Chan and Fu's measure does not take into account the extent to which the scores are evenly distributed at the two extremes (i.e., degree of bimodality). Consequently, their measure can conflate a one-sided negativity (or positivity) with polarization. Lee (2016), in contrast, developed the following measure of polarization:

$$\text{Polarization score} = \sqrt{(E1 + E2) \times ((E1 + E2) - |E1 - E2|)},$$

where *E1* and *E2* refer to the percentages of respondents at the two extremes of the scale, respectively.

The first component of the index captures the amount of extreme opinions, whereas the second component captures degree of evenness at the two extremes. This study adopts Lee's (2016) operationalization. But similar to Chan and Fu (2017), the polarization scores were interpolated to create a daily time series. If all respondents' ratings are between 2.5 to 97.5, the polarization score will be 0. If 10% of the ratings are below 2.5 and 10% are above 97.5, the polarization score will be 0.2. The largest possible value of the index is 1, which will appear when 50% of the ratings are below 2.5 and 50% are above 97.5. A larger value indicates a higher level of polarization. In our data, the mean of the polarization index is 0.142 (*SD* = 0.017, min = 0.099, max = 0.180).[1]

Measuring Incivility

As pointed out in the conceptual discussion, this article adopts the "personal approach" (Muddiman, 2017) to define and examine incivility. The literature has typically operationalized personal incivility by paying attention to name-calling, vulgarity, use of pejorative speech, threats, swearing, disparaging comments based on race or ethnicity, and so forth (e.g., Coe et al., 2014; Santana, 2014). However, it is virtually impossible to develop a comprehensive scheme encompassing a full range of uncivil discourses for computerized coding. This study focuses on swearing (i.e., the use of foul language) as an indicator of incivility. While using only swearing to represent personal incivility has its limitations, there are both conceptual and methodological advantages. Conceptually, swearing is not just "being impolite"; it involves the use of strong and provocative language most likely to arouse emotional responses from the addressees.

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[1] One limitation of this measure is its reliance on arbitrary cutoff points for "extreme scores." We adopted Chan and Fu's (2017) operational definition of extreme scores to enhance comparability with their study. Admittedly, other cutoff points could have been chosen. Nevertheless, there is no strong conceptual reasons why choosing another set of cutoff points should alter the findings substantively. The limitation should not create huge problems for the validity of the findings.

Therefore, it is likely to capture the kind of incivility that can polarize people. Methodologically, swearing can be captured by a relatively stable set of keywords that are widely recognized in a culture as "foul." The identification of swearing is thus more reliable than the identification of other elements such as threats, which may be expressed in an almost infinite variety of ways.

Specifically, one of the co-authors compiled a list of 73 "foul terms" based on long-term observations of online discourses and understanding of the local culture. The terms included foul language in Cantonese such as *buk-gaai* and online expressions used to signify specific foul terms. One example of the latter is "DLLM," widely used by young people in Hong Kong to represent *diu-nei-lou-mou*, which literally means "fuck your mother."

We examined all publicly available comments in three arenas: (1) the subforums of Discuss Hong Kong (https://www.discuss.com.hk/) related to public affairs, (2) the subforums of UWants (https://www.uwants.net/index.php) related to public affairs, and (3) 300 Facebook pages related to Hong Kong politics, which were selected—based on the authors' identification of the more prominent and relevant pages—from the above-mentioned sample of 2,983 pages used by Chan and Fu (2017). Discuss Hong Kong and UWants are two of the most prominent and widely used public forums in Hong Kong. They were often ranked among the top 40 most frequently visited websites in the city by Alexa.com (https://www.alexa.com/; Discuss Hong Kong was often featured in the Top 10 list).[2] A computer program was developed to automatically scrap the forum contents at the end of 2017, whereas all comments posted on the 300 Facebook pages were scraped using Facebook's APIs. We focused on "comments" on Facebook because the contents of the comments, instead of the contents of the Facebook posts, represent discourses and input from ordinary users. All comments were downloaded first and then filtered by time period (i.e., July 2014 to June 2015).

By searching for foul terms in the comments, we derived, for each arena, a daily measure of the percentage of comments with swearing—that is, the number of comments with any preidentified foul terms divided by the total number of comments on that day. Percentages of swearing comments in the three arenas are significantly correlated (r ranges from 0.40 to 0.44, $p < .001$ in all cases). The correlations are expected because the use of incivility is likely to be partly driven by ongoing political events. However, the correlations are only moderate in size. Amount of incivility is seemingly also driven by the conversational dynamics in each online arena. For parsimony, we averaged the three time series to derive an overall time series of online incivility. To smooth out the daily idiosyncrasies, we further transformed the time series into one based on 10-day average scores. The value on each day is the average percentage of comments with foul language in the 10 previous days (inclusive of the day itself). Taking this step is also consistent with our conceptual argument that persistent incivility is more likely to have impact on public opinion.

The percentages of swearing comments might be inflated by a few active trolls. To rule out this possibility, we calculated the percentages of unique swearing authors over time. The average percentage of

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[2] Alexa.com ranked websites dynamically, and the authors did not have access to historical data from Alexa.com. The claim was based on various citations of Alexa.com's data by different online authors and websites.

swearing authors is actually higher than the percentage of swearing comments (4.9% versus 2.8%, $t =$ 23.43, $p < .01$). It implies that users who posted comments with foul language were actually less active than users who posted comments without foul language. Percentage of swearing comments, therefore, cannot be the result of a small number of active swearers.

Figure 1 shows the time series of the 10-day average scores for incivility. The scores range from more than 1.5% to less than 5% in the period. Some fluctuations are understandable in relation to ongoing events. For instance, the percentage rose beyond 2.5% for the first time on October 6. The previous 10 days were exactly the beginning of the Umbrella Movement. Swearing then rose sharply in late November, which was the period of the final escalation of the protests (Lee & Chan, 2018, p. 177–178). The score reached its peak on December 15, 2014, the day when the police evicted the last occupied area.
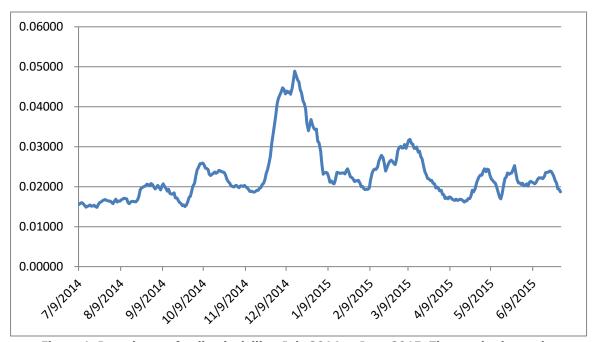

Figure 1. Prevalence of online incivility, July 2014 to June 2015. The y-axis shows the proportion of comments involving swearing.

It should be emphasized that the scores represent only the relative degree of incivility in online discourses on different days. The exact percentage is unimportant. That is, having only 3% of the posts involving swearing does not mean that only 3% of the posts were uncivil. The assumption is that when the percentage of posts containing swearing increased from 3% to 4%, the degree of incivility in general increased.

Analysis and Findings

RQ1 asks if cyberbalkanization could lead to higher or lower levels of incivility. We employed a vector autoregression (VAR) model to answer the question. VAR is a model for capturing the linear interdependencies among multiple time series. It generalizes the univariate autoregressive model by including more than one time series. Because the time period under study includes the Umbrella Movement, which was a distinctive context of extraordinarily high levels of political conflict, we conducted analyses for the whole time period, within the Umbrella Movement (i.e., September 28 and December 15, 2014, when the occupation was going on), and outside the Umbrella Movement, respectively. This allowed us to discern whether the context of a mass protest event could alter the relationships among the variables. In addition, for comparison and illustration, we examined whether incivility could lead to higher or lower levels of cyberbalkanization.

Table 1 summarizes the findings. The top half of the table shows that cyberbalkanization was consistently positively related to incivility. CBI_{t-1} obtains a significant coefficient in all three columns. That is, people became more likely to use uncivil discourses as they stopped talking to out-group members. In comparison, the results in the bottom half of the table show that incivility is consistently not significantly related to cyberbalkanization. The proliferation of uncivil discourses did not lead people to change who they talk to. Statistically, it is more likely that cyberbalkanization leads to incivility than the other way around.

Table 1. Mutual Impact Between Incivility and Cyberbalkanization (VAR).

Dependent variable	Whole Period	Within UM	Outside UM
Incivility			
$\quad CBI_{t-1}$	0.238***	0.159*	0.025**
$\quad Incivility_{t-1}$	0.479***	0.667***	0.409***
$\quad$ Intercept	0.000	0.019	−0.009
$\quad$ Adjusted R^2	.316	.557	.215
Cyberbalkanization			
$\quad CBI_{t-1}$	0.692***	0.811***	0.540***
$\quad Incivility_{t-1}$	0.024	0.041	0.015
$\quad$ Intercept	0.001	−0.001	−0.001
$\quad$ Adjusted R^2	.488	.679	.292
n	350	84	265

Note.—Entries are the coefficients estimated from regression with VAR(1). CBI and incivility variables were rescaled by subtracting mean and then dividing by standard deviation. CBI = cyberbalkanization index; UM = Umbrella Movement; VAR = vector autoregression; VAR(1) = first-order vector autoregression.
* $p < .05$. ** $p < .01$. *** $p < .001$.

H1 predicts volume of discussion to be another factor leading to the rise in the proportion of uncivil discourse. Besides testing this hypothesis, to provide more information about how the major variables relate to each other, Table 2 shows the simple bivariate correlations among degree of online incivility, degree of

cyberbalkanization, opinion polarization, a dichotomous variable representing whether a day falls within the Umbrella Movement, and volume of discussions based on the total number of posts or comments in the three online arenas (logged to reduce skewness).

Table 2. Correlations Among Key Variables.

	1	2	3	4
1. Incivility	...			
2. Cyberbalkanization	.36***	...		
3. Umbrella Movement	.20***	.61***	...	
4. Volume (log)	.31***	.52***	.82***	...
5. Polarization	.37***	.39***	−.12*	−.12*

Note.—Entries are Pearson correlation coefficients.
* $p < .05$. *** $p < .001$.

Two results are worth noting. One is that degree of incivility is related positively and significantly to both the Umbrella Movement variable and volume of discussion. There was a higher proportion of uncivil messages in the online arena during the Umbrella Movement, and the proportion of uncivil messages in the online arena tended to be higher when the sheer volume of online discussions increased. This is consistent with H1.

To test H1 more formally, we employed both ordinary least squares (OLS) regression and regression with the autoregressive integrated moving average (ARIMA). The regression with ARIMA errors is also known as a *dynamic* regression model, which assumes the error term in the regression model follows an ARIMA model and can capture the dynamics of the time-series data. It produces coefficients that could be interpreted in the same way as OLS regression coefficients. Using both OLS and ARIMA allows us to discern the robustness of specific findings. The relationship between degree of incivility in online discussions and volume of discussion remains significant in both OLS regression controlling for autocorrelation (i.e., incivility$_{t-1}$; $\beta = .030$, $p < .01$) and an ARIMA (1,0,0) model (B = 0.598, *SE* = 0.123, $p < .01$). H1 is therefore supported.

The other result worth noting is that the intercorrelation between the Umbrella Movement variable and volume of discussion is very strong. Therefore, multicollinearity will arise if we include both the Umbrella Movement variable and volume of discussion into the same multivariate analysis. H1 is already confirmed, so the following uses only the Umbrella Movement variable because the periods inside and outside the movement constituted two distinctive contexts.[3]

We again employ both OLS regression and ARIMA to test H2 and H3. In Table 3, AR(1) indicates the lagged dependent variables in OLS regression models and the first-order autoregressive term in ARIMA models. The first column of Table 3 shows that in a regression analysis controlling for the lagged variable of opinion polarization, only incivility has a significant impact on polarization—polarization increased when

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[3] We also conducted the multivariate models by using volume of discussion instead of Umbrella Movement. The results are consistent with the those reported next.

online incivility increased. However, in the ARIMA models, incivility does not relate to polarization significantly. In addition, cyberbalkanization does not relate to polarization significantly, although its coefficient is indeed positive. There is also no significant interaction effect between incivility and cyberbalkanization on polarization.

Table 3. Impact of Incivility and Cyberbalkanization on Opinion Polarization.

	Polarization	
	OLS model	ARIMA model (1,0,0)
AR(1)	0.949***	0.998***
Incivility	0.030*	0.044
Cyberbalkanization	0.028	0.100
Incivility × Cyberbalkanization	−0.005	−0.065
Umbrella Movement	−0.015	−0.030
Intercept		0.158
Adjusted R^2	.949**	
Log likelihood		313.9
n	351	352

Note.—Entries in the two columns are standardized regression coefficients and the coefficients estimated from regression with ARIMA errors (1,0,0), respectively. AR(1) = first-order autoregressive term; ARIMA = autoregressive integrated moving average; OLS = ordinary least squares.
* $p < .05$. ** $p < .01$. *** $p < .001$.

        The first two columns suggest that the impact of incivility on polarization does not seem to be robust, and the analysis does not replicate Chan and Fu's (2017) finding on the impact of cyberbalkanization on polarization. Nevertheless, research suggests that the dynamics of opinion polarization and online discussions can vary according to how contentious the political environment is (Wells et al., 2017). As we mentioned, the Umbrella Movement was a context of extraordinarily high levels of political conflict. Similar to Table 1, we broke down the whole time period into within and outside the Umbrella Movement. The same regression and ARIMA analysis—minus the Umbrella Movement variable—was reconducted for the two periods separately.

        As Table 4 shows, when regression analysis was employed, both incivility and cyberbalkanziation had a significant impact on opinion polarization within the Umbrella Movement, but not outside the Umbrella Movement. That is, during the Umbrella Movement, the level of opinion polarization increased when online incivility became more prominent and when public communication in social media became more balkanized. When ARIMA was used, both incivility and cyberbalkanization had significant impacts on polarization both within and outside the Umbrella Movement. Interestingly, when the two time periods were separated, much stronger support for H2 was found—incivility does have a highly significant relationship with polarization in three of the four columns in Table 4. Nevertheless, H3 continues to receive no support from the findings. The impact of incivility on opinion polarization did not depend on whether public communication on social media was more or less balkanized.

Table 4. Explaining Opinion Polarization.

	OLS		ARIMA model	
	Within UM	Outside UM	Within UM	Outside UM
AR(1)	0.938***	0.992***	0.990***	0.996***
Incivility	0.106***	0.011	0.322***	0.383***
Cyberbalkanization	0.056***	0.007	0.088**	0.205***
Incivility × Cyberbalkanization	−0.039	0.009	−0.098	−0.059
Intercept			−0.541	0.568
Adjusted R^2	.992	.990		
Log likelihood			120.2	181.8
n	85	266	85	266

Note.—Entries in each pair of columns are standardized regression coefficients and the coefficients estimated from regression with ARIMA errors (1,0,0), respectively. AR(1) = first-order autoregressive term; ARIMA = autoregressive integrated moving average; OLS = ordinary least squares; UM = Umbrella Movement.
* $p < .05$. ** $p < .01$. *** $p < .001$.

Before moving to the discussion, we further examined whether opinion polarization may lead to an increase in incivility—that is, if the influence also exists in the direction opposite to that posited in H2. In the regression model, after controlling for the lagged incivility variable, polarization relates negatively to incivility ($\beta = -.02$, $p = .01$). In the ARIMA model, polarization does not relate significantly to incivility ($B = 0.026$, $SE = 0.028$, $p > .05$). In any case, the findings show that polarization did not precede a rise of online incivility. People did not become more likely to swear online after public opinion became more polarized.

Discussion

This article aims to examine the relationships among online incivility, cyberbalkanization, and opinion polarization. The findings, when taken as a whole, largely confirm the impact of incivility in online political discourses on public opinion polarization at the collective level. The study thus differs from previous experimental studies (e.g., Hwang et al., 2018) in its capability to empirically demonstrate the effect of uncivil discourses on polarization.

This difference is probably rooted in the fact that experimental studies usually examine only the short-term consequences of a limited amount of uncivil discourse. While instances of incivility may also generate emotional responses, such responses may be ephemeral. In contrast, this study employed time-series analysis. It measured changes in the degree of cyberbalkanization, opinion polarization, and extent of online incivility over time. When operationalizing incivility, the measure captured the overall and continual presence of uncivil discourses in the online arena: the amount of incivility on a certain day is the average of the proportion of posts containing foul language in the 10 days previous to (and inclusive of) the day analyzed. The 10-day average operationalization not only smoothens the time series technically; conceptually, it means that we are examining the impact of a prolonged period of uncivil online discourse.

The emphasis on persistent incivility should conform to what scholars are actually concerned about. Many people are passionate about the political issues that are central to their identities, values, and ways of life. The occasional appearance of uncivil discourse is understandable and even arguably normal (Herbst, 2010; Papacharissi, 2004). It would not be difficult for people to brush aside instances of incivility as innocuous expressions of intense feelings. In some cases, incivility may accompany moral outrage that is often the basis of political actions. But incivility may indeed become a problem when it is too strong and persistent. In this scenario, incivility becomes much more likely to lead to problematic consequences such as undermining mutual trust and respect or, as shown in this article, increasing polarization in public opinion.

This study examines two predictors of online incivility. The findings show that the proportion of uncivil comments increases when volume of political discussion increases. This finding is not tautological: When volume of political discussion increases, the amounts of both civil and uncivil discourses naturally increase, but it is not logically necessary for the proportion of uncivil comments to increase. However, the finding is also unsurprising. Volume of discussion can be treated as a sign of the "hotness" of the political atmosphere because people tend to become more active in political communication in periods of intensive political events (Boczkowski & Mitchelstein, 2013; Wells et al., 2017). When the atmosphere becomes heated, people become more likely to experience and express stronger emotions; hence, the likelihood of swearing and other forms of interpersonal incivility also increase.

Interestingly, this study finds that cyberbalkanization can lead to the rise of online incivility. As suggested in the Context, Hypotheses, and Research Questions section, a possible reason for cyberbalkanization to lead to incivility is that talking to like-minded people may reinforce one's existing views. As one's opinion becomes stronger, the use of more extreme expressions may become more likely. In addition, talking to like-minded others creates a safer discursive space in which people feel freer to employ extreme language when criticizing out-group members. Moreover, people may actually be engaging in mobilization when talking to like-minded others. Using strong and emotional language may be a means for people to stir others to actions. In any case, the finding shows that who people talk to and how people talk can be related. Because incivility has an independent impact of opinion polarization, the findings also suggest that incivility can be a mediator of the impact of cyberbalkanization on polarization.

In addition, it should be noted that we borrowed Chan and Fu's (2017) measure of cyberbalkanization in the present study, and the measure is based on how Facebook public pages share each other's contents. This measure thus does not directly examine whether ordinary citizens on different sides of the political divide actually talk to each other. Taking this measurement characteristic into account, the impact of cyberbalkanization on online incivility may be interpreted as the impact of the actions of major political and media actors on online discourses. When the political and media actors who manage the Facebook pages begin to retreat into their respective echo chambers, they may also begin to become more critical toward the other side. This can lead to higher levels of confrontational rhetoric in the online arena, leading to higher likelihood of uncivil discourse.

The empirical results add to our theoretical understanding of the role that incivility plays in the political dynamics that can lead to opinion polarization. Polarization is likely to arise when the political atmosphere becomes heated and contentious (Lee, 2016) and when citizens and political groups on opposite

sides stop talking to each other (Chan & Fu, 2017; Sunstein, 2017). What this study adds to the picture is that political contexts and cyberbalkanization can have polarizing effects partly because of how they influence the characteristics of political discourses. The study shows that "how people talk" can be an important mediator between exogenous factors such as contentiousness of the political environment and public opinion outcomes such as polarization. In addition, this study shows that cyberbalkanization can have both direct and indirect effects on opinion polarization. From a normative perspective, the findings shed further light on why cyberbalkanization can be a problematic phenomenon for democratic deliberation. It is not only that people may fail to understand each other if they do not talk across the political divide; it is also possible that people may use more extreme language and develop more extreme attitudes as a result if they keep talking only to like-minded others.

Meanwhile, this study fails to find the hypothesized interaction effects between incivility and cyberbalkanization. As noted in the Context, Hypotheses, and Research Questions section, incivility may lead to polarization either because being sworn at by out-group members is taken as an attack on oneself and one's group, or because the strong and provocative language involved in swearing could by itself evoke strong emotions among people. In the former case, incivility should lead to more extreme attitudes mainly when it occurs in intergroup communication. In the latter case, incivility can lead to more extreme attitudes regardless of who is swearing at whom. The present findings seem to suggest that incivility has led to polarization in the Umbrella Movement case due to the mechanism of evoking strong emotions.

A few limitations of the study should be noted. First, this study focuses only on the period before, during, and after the Umbrella Movement in Hong Kong. Although the analysis treated the 79-day Umbrella Movement as a period with an extraordinarily high level of contentiousness (as suggested by the extraordinarily large amount of political discussions), one might argue that the political atmosphere in Hong Kong was heated even before and after the protest event.[4] Future studies can examine whether incivility, cyberbalkanization, and opinion polarization related to each other in similar ways in contexts with substantially lower levels of contentiousness. One might also test whether the "failed" interaction effect hypothesis might perform differently in other contexts.

Second, this study operationalizes degree of incivility only through the use of foul language. Despite the conceptual and methodological grounds for doing so, swearing is undeniably only one form of personal incivility (Muddiman, 2017). Although the findings have confirmed the utility of the approach, future studies can broaden the measure of incivility. In addition, whereas this study constructs a single measure of incivility in various online arenas, future studies can examine whether incivility could flow from some online arenas to others. As noted, the fluctuations in degree of incivility in the three online arenas are only moderately correlated, which suggests that incivility can be driven by the internal conversational dynamics within each arena (e.g., Cheng et al., 2017). Research can pay more attention to the generation of incivility through such internal dynamics.

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[4] In fact, the idea of an Occupy campaign was fervently debated between early 2013 and right before the formal beginning of the Umbrella Movement. The debates surrounding whether the legislature should accept the government's political reform proposal continued after the end of the Umbrella Movement.

Third, this study does not examine exactly how swearing was employed in the online discourses. In-depth and possibly qualitative analysis of the utilization of uncivil speeches in online discussions can provide additional insights into why and how cyberbalkanization leads to incivility and why and how incivility leads to opinion polarization. It is also possible that swearing was systematically associated with other discursive features of online discourses. Further analysis may help specify the extent to which swearing itself matters, or whether swearing taps into other discursive features or dynamics.

Despite the limitations, this article enriches our understanding of the factors leading to opinion polarization. It shows the role played by incivility. Therefore, in addition to the question of whether people talk to disagreeing others, more attention should be paid to how people talk and how these two issues correlate. Meanwhile, we do not intend to issue a simplistic call for eliminating incivility in political discourses. Incivility does have its place and strategic uses in politics (Herbst, 2010), but there should be an awareness of how persistent incivility can undermine constructive dialogue and foster hostility.

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