social sciences

MDPI

Article

Agenda-Setting Dynamics during COVID-19: Who Leads and Who Follows?

Lāsma Šķestere [1,*] and Roberts Darģis [2]

[1] Communication Faculty, Riga Stradiņš University, LV-1007 Riga, Latvia
[2] Institute of Mathematics and Computer Science, University of Latvia, LV-1586 Riga, Latvia
* Correspondence: lasma.skestere@rsu.edu.lv

Abstract: The outbreak of the coronavirus (COVID-19) has altered the way news media and social media set their agendas. The growth of social media raises questions about its potential power to set the media agenda. We gathered social media posts and online news site articles to examine agenda-setting dynamics, aiming to explore causal relationship between news media and social media. We used a computer-assisted text analysis to discover the main topics of discussion at the first wave of the pandemic in Latvia. The results revealed that (1) statistics about the pandemic, as well as prevention and control measures were the main topics on social media and in online news sites, and that (2) vector autoregression models provide more empirical support for the influence of online news sites on social media than reverse.

Keywords: intermedia agenda-setting; COVID-19; time series analysis; online news media; social media

check for updates

Citation: Šķestere, Lāsma, and Roberts Darģis. 2022. Agenda-Setting Dynamics during COVID-19: Who Leads and Who Follows? *Social Sciences* 11: 556. https://doi.org/10.3390/socsci11120556

Academic Editors: Vasiliki Tsagkroni and Michael Nevradakis

Received: 24 August 2022
Accepted: 18 November 2022
Published: 28 November 2022

Publisher's Note: MDPI stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Copyright: © 2022 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (https://creativecommons.org/licenses/by/4.0/).

1. The Communication Pattern during Pandemics

The coronavirus pandemic, in addition to having grave consequences on health systems, has also impacted the way we spread important information and how we communicate with each other. The first positive test for COVID-19 in Latvia was announced on 2 March 2020, and since that time the spread of the coronavirus has been at the centre of the media agenda and the public agenda.

Scholars have noted that news media play a vital role in shaping public perception about what is most important on the public agenda. One of the first scholars to talk about the impact of the media on our perceptions was journalist and philosopher Lipmann. In 1922, Lippmann published a book where he noted that we are not capable of directly experiencing the bigger world, so we must rely on the messages and images contracted by news media (Lippmann 1922, p. 29). In 1963, Bernard Cohen refined Lipmann's assumptions by pointing out that media do not tell people what to think, but what to think about (Cohen 1963).

The opinions media present about the coronavirus and the attributes of COVID-19-related issues press representatives highlight are able to trigger global health concerns. During pandemics, the news media function as a mediator between the official public institutions and the public. On one hand, media need to deliver factual information and on the other, they must attract readers to their articles (Schwitzer et al. 2005). During the outbreak of H1N1, journalists were criticized for their tendency to sensationalize issues or to politicize them (Vasterman and Ruigrok 2013; Singer et al. 2020). As the result, the World Health Organization (WHO), shortly after the outbreak, urged media representatives to report information accurately about the threat people were facing (WHO 2020). The WHO emphasizes that media outlets are key players that can shape public perceptions of risk and target communities to protect their health. It also emphasized that having accurate information from reliable sources was vital for people during this pandemic (WHO 2021).

Maxwell McCombs and Donald Show tested Cohen's idea by comparing the news media agenda and the public agenda. They discovered strong correlations between the most salient issues on the news media and the most prominent issues on the public agenda

(McCombs and Shaw 1972). For a certain time, traditional media were considered to be the main agenda-setter, affecting what the public saw as the most important issues of the day. However, the recent popularity of social media has altered the way people think about media. These new interactive platforms are widely used in society to initiate discussions; hence, the audience is, in addition to gathering information, now also able to produce its own content. Journalists in traditional news media are no longer the only ones who can provide information to the public (Harder et al. 2017; Jang and Park 2017). During the time of social distance and limited contact, social media became an important platform to look to for pandemic-related information (Ahmad and Murad 2020) and to exchange information (Qian and Hanser 2021). Social media are used to share scientific news as well as information relevant to social media users (WHO 2020).

So far there is still limited knowledge about the intermedia agenda-setting dynamics between news media and social media. Several researchers who acknowledge the role of social media during a crisis have used Twitter data to analyse agenda-setting dynamics in the pandemic (Tahamtan et al. 2022; Han et al. 2021). To examine intermedia dynamics during the COVID-19 pandemic in Latvia, we looked at online news media articles as the proxy to the news media agenda, and at Twitter posts which were analysed as representations of the social media agenda. The focus of this research was to examine how the media agenda and social media agenda interact during a pandemic and whether one type of agenda can foresee the other.

2. Intermedia Agenda-Setting

In 1972, McCombs and Show identified that mass media directly shape the public agenda by highlighting specific topics, issues, and actors in coverage over others. They investigated the agenda-setting capacity of mass media during the 1968 presidential campaign by trying to match the public opinion of voters with the actual content of mass media. These two scholars found out that the prominence of issues in news media influences the prominence of these issues among the public.

The 1990s was an important time in the development of the second level of agenda-setting. The first level of agenda-setting deals with objects, whereas the second level of agenda-setting looks at the attributes of these objects. Objects have commonly been described as issues or entities about which a person holds an opinion, whereas object attributes are the traits associated with the particular object (Guo et al. 2012). According to McCombs, when news media talk about an object, some attributes are emphasized while others are not mentioned. Kosicki refers to agenda-setting as the "shell of the topic". He describes the shell as the issues or objects examined, whereas the attributes are an exploration of what is inside the shell (Kosicki 1993, p. 112). If we put this into perspective, then one can conclude that the first level of agenda-setting looks at *what* people think about, whereas the second-level of agenda setting deals with the question *how* people think about it.

Another important area of agenda-setting research is potential sources that can shape other media agendas, so-called intermedia agenda-setting (McCombs 2014, p. 12). Intermedia agenda-setting deals with the question of how various media agendas influence one another or, as Du puts it, the extent to which the agenda of news media reflects the content of another medium and deals with content in a similar manner (Du 2008). Traditionally this framework was applied to studying the agenda-setting effect between traditional media (Golan 2006; Kushin 2010; Du 2013) and only recently has the focus changed towards examining the digital environment.

In 2011, Meraz published research in which he concluded that weblogs influence the agenda-setting of traditional elite media (Meraz 2011). Another study compared the topical differences between the *New York Times* and Twitter and discovered that Twitter was a viable source for traditional media regarding entity-oriented topics (Zhao et al. 2011). Neuman and colleagues revealed that social media communicate a distinct agenda compared to that of traditional media, and that it was a better predictor of traditional media than the

reverse (Neuman et al. 2014). In 2019, Barberá published research which focused on the agenda-setting dynamics of Twitter and analysed connections between the issues discussed by legislators and the public. He discovered that legislators are more likely to follow the Twitter agenda than lead it (Barberá et al. 2019). In 2022, Zhou and Zheng examined agenda dynamics using data from Sina Weibo and found that information in social media influenced the media agenda and the agenda of the government during the pandemic in China (Zhou and Zheng 2022).

Since the classical agenda-setting theory was formulated the media landscape has changed significantly and nowadays media have become only one of many sources where people seek information. The development of web-based social tools has provided new ways to create and spread news. These changes have brought to light discussions of how pre-existing media theories operate in the new environment where people, from passive news consumers, have become active news-content creators and, through social media, can influence public debate.

3. Who Sets the Media Agenda?

The rise of social media networks has recharged the debate over whether the general public through social media can influence the agendas of media. Currently anyone with a little knowledge can become an influencer, affecting what people think and how they behave. Thus, it is important to re-examine the foundations of famous media theories and to question how the public, media and politics interact in this new context.

As many researchers have pointed out, now agenda-setting is being transformed by the dramatic growth of audiences that are simultaneously media consumers and producers. In a world of evolving digital media and online publics, the research of agenda-setting has become more complex. Each user of social media may initiate a new discussion or respond to an existing one. The transmitting of information requires minimal cost and effort. Thus, scholars question whether the influence of social media content on news media has been neglected (van den Heijkant et al. 2019).

According to Sayre and his colleagues, "the Internet is at the centre of this change, expanding the definition of news sources and news producers" (Sayre et al. 2010, p. 9). Chadwick indicates that the Internet and social media have created news "hybrid media systems" that have expanded the number of actors which participate in the struggle to shape public discourse and define the political agenda (Chadwick 2017, p. 159). Social media have more room to shape and define the media agenda as well as the political agenda than they have ever had before. In a crisis such as a pandemic, it is important to clarify who sets the agenda in the media arena.

Analyses of Twitter posts in the UK showed that only a small number of topics on the media agenda and public agenda were similar. Media tweets talked more about facts and analysis whereas citizens were more willing to express their feelings (Han et al. 2021). To clarify whether the topics on social media are in line with the topics published by news organizations on news portals, the following questions were asked:

RQ1. What were the main topics of discussion on the social media agenda during the first wave of the pandemic?
RQ2. What were the main topics of discussions on the media agenda during the first wave of the pandemic?

As noted, several studies have shown that the mainstream media still affect the salience of issues in online news media (Vargo et al. 2018; Scharkow and Vogelgesang 2011), while other scholars argue that the dynamics of these relations have changed and, although traditional media have a strong agenda-setting power, that is no longer universal (Meraz 2011; Sayre et al. 2010; Neuman et al. 2014; Jungherr 2016; Han et al. 2021). Despite many studies, a clear answer about the relationship dynamics between social media and online news media is missing. In this study we examined connections between social media agendas and online news media agendas regarding the outbreak of COVID-19. To

understand how online news media and social media interact in setting each other's agenda the following question was asked:

RQ3. Do news articles predict social media posts or is it vice versa?

4. Method

To study the media agenda, we looked for news articles that were published on national news sites from 30 January to 10 June 2020. We analyzed the content of traditional media news sites (diena.lv, nra.lv, la.lv, lsm.lv) as well as the most visited digital-only news sites (delfi.lv, tvnet.lv, apollo.lv, jauns.lv and skaties.lv) (See Table A1 and Figure A1, Appendix A). The tweets posted on Twitter during the same time period were treated as the social media agenda. To search for information about COVID-19 we developed a set of twelve key identifying terms and phrases in Latvian ("COVID", "COVD-19", "virus", "pandemic", "coronavirus", etc.). The search was conducted with the help of SentiOne which offered exclusive software to collect data from Twitter users as well as from the most popular national news portals. A reference to one or more of the search terms in the content of a Twitter post or an article in online news media was considered as the criterion for inclusion in the sample. The authors compiled more than 4600 Twitter posts and more than 4500 news articles for the period from 30 January 2020, when the Crises Management Council of Latvia[1] held its first meeting, to 10 June 2020 when the state of emergency ended.

Although we captured 82,589 tweets about pandemic, only half of them were eligible for further analyses. First, we had to remove the tweets that contained irrelevant keywords (such as Ebola, Spanish flu, etc.) and the tweets that were not published in the Latvian language. Careful examination of the news articles led to removing the pieces that were not written in Latvian or contained information about previous pandemics. As the result, we found 44,789 online news media articles and 46,093 tweets eligible for further analysis.

Content analysis was used to identify the topics or themes of discussion in the first months of 2020. To pin down the most salient topics in news articles and social media posts, a pilot test was conducted with 10 percent of the data units (3100 posts and 4500 news articles). Two coders were asked to read the tweets and articles before coding. The researchers came up with nine topics that were narrowed down to six to increase the number of posts and articles per topic. As a result, all tweets and news articles are grouped as:

> *Spread of COVID-19: posts and articles that fall within this category discuss the initial outbreak and its subsequent spread among countries, signs and symptoms of COVID-19 and modes of transmission;*
>
> *Prevention and control: tweets and news articles that fall within this category discuss what actions should be taken to prevent the virus from spreading and how COVID-19 should be treated;*
>
> *Government response: tweets and news articles that report the measures taken by the government to lower the transmission and spread of the coronavirus, as well as the attitudes towards these decisions;*
>
> *Fear and death: this category comprises news articles and Twitter posts that raise tension by emphasizing the number of people dead or the dire consequences of the spread of the disease;*
>
> *Disinformation: comprises stories and posts that contain or try to expose misinformation, lies, rumours and myths about the spread, treatment or effects of COVID-19;*
>
> *Effect on daily life: stories and posts in this category discuss COVID-19's impact on our daily lives, its effects on economy, culture, education, sports and tourism, as well express emotions towards COVID-19 or the measures taken by the government.*

The coding was done by assigning 1 to 2 keywords that described the tweet's or news article's content. The context of data was taken into consideration. We removed keywords that appeared in more than one topic; thus, each topic was identified by a set of exclusive

keywords. Two communication researchers unaffiliated with the project went through a dictionary to secure that chosen words for each category were truly representative and mutually exclusive. Out of 44,789 news articles only 0.03% did not match any categories and were not coded. 1.76% of 46,093 Twitter posts were not coded for the same reason. To ensure reliability, inter-rater reliability tests were conducted on a random sample of 100 for each media type with Cohen's kappa. The intercoder reliability scores were 0.91 for tweets and 0.92 for news articles. Thus, we combined computer-assisted content analysis and manual coding, providing a validity check and confidence in the chosen methodology.

As for nearly every news organization Twitter has become an information channel to disseminate their own material (Holcomb et al. 2011), we excluded more than 1/3 of all tweets produced by news organizations to strengthen the reliability of the data. Thus, 31,189 tweets were used for the subsequent time series analyses and VAR modelling.

5. Results

As shown in Figure 1, news organizations published on a wide diversity of topics between January and May, covering all six categories. Results revealed that among the 44,789 news articles retrieved, the most common topics were the spread of COVID-19 (41.52%), the government response (29.23%) and prevention and control (17.56%). The effect topic (6.16%) contained articles about the economic consequences, as well as social impacts, on human life. The fear and death topic (3.73%) represented information about the death toll and possible consequences of the spread of the disease. A small part of the articles addressed the question of misinformation (1.77%), and tried to expose lies, rumours and myths about COVID-19. Thus, we can conclude that for news media the most important tasks were to give information about the spread of the virus, modes of transmission, as well as to provide news about the government response to the outbreak of the virus and control measures.

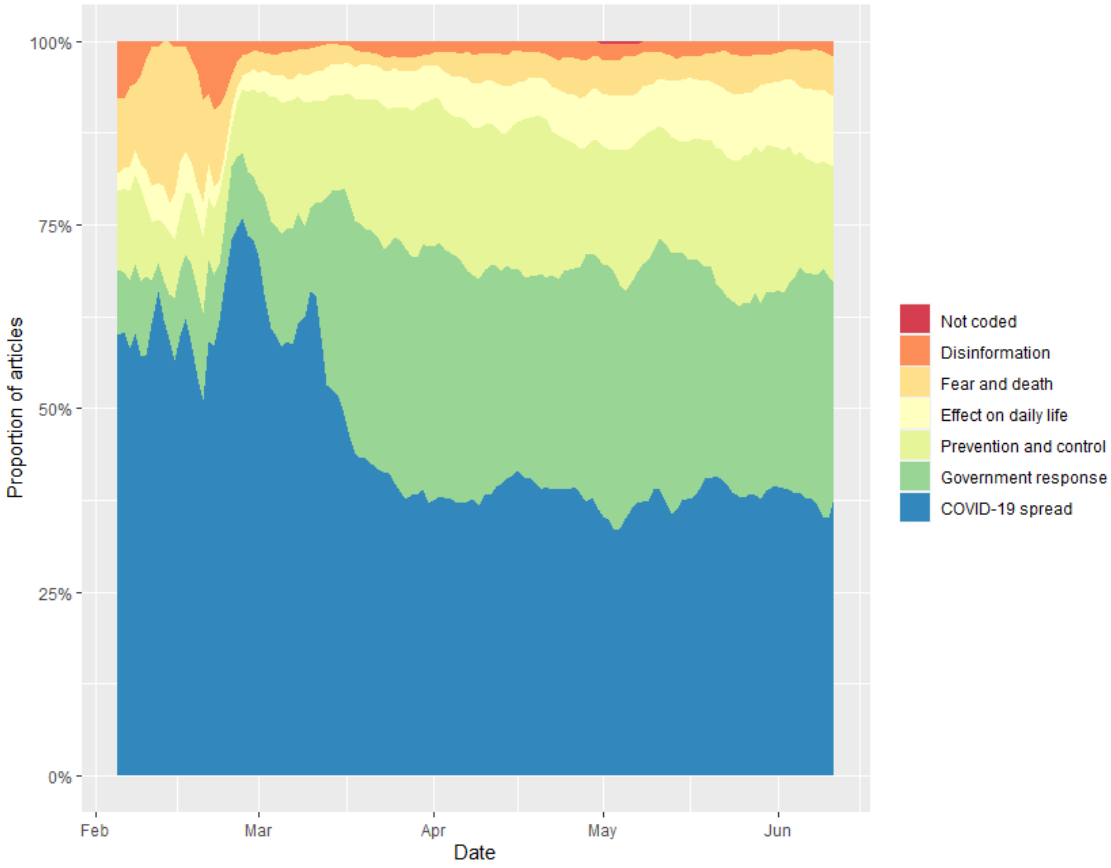


Figure 1. Prevalence of topics in online news media, n = 44,789.

In terms of the citizen-generated tweets, the most prominent topics were prevention and control (32.44%), the spread of COVID-19 (28.98%) and the government response (16.12%) (Figure 2). Twitter users were more eager to discuss safety measures implemented to reduce the spread of COVID-19 than online news media. The effect topic (13.52%) was the fourth most popular and discussed the impacts on human life, such as school lockdowns, working from home, loss of a job, etc. The fear and death topic followed with 4.47% of posts. The smallest subset of posts contained information about rumours as well as misinformation (2.41%).

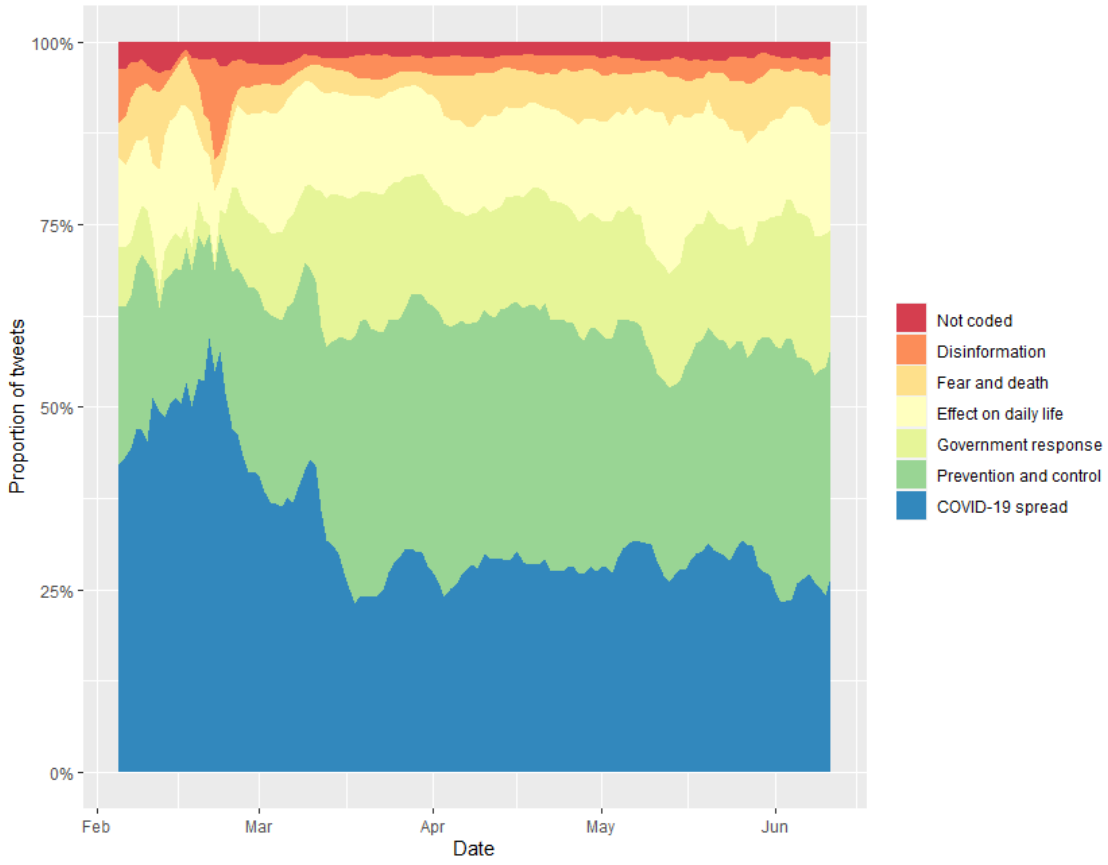


Figure 2. Prevalence of topics in Twitter posts, n = 31,189.

To test the general mutual effect between news media and social media, we started with examining time series of tweets and online news media articles. At the beginning of 2020, when the Crises Management Council was established and Latvia was awaiting its first COVID-19 case, the number of tweets and articles was relatively low. On 2 March, the first COVID-19 patient was announced, causing heated discussions on Twitter as well in news articles. The number of tweets and news articles increased dramatically when the government announced a national lockdown on 12 March and people became heavily affected by the measures that were taken to prevent a rapid spread of the virus. After 7 May, when the government decided that the state of emergency declared in Latvia would be extended until 9 June and eased some restrictions, the number of articles reached one last peak (approximately 550 articles per day). The time series of news media articles and tweets are plotted in Figure 3.

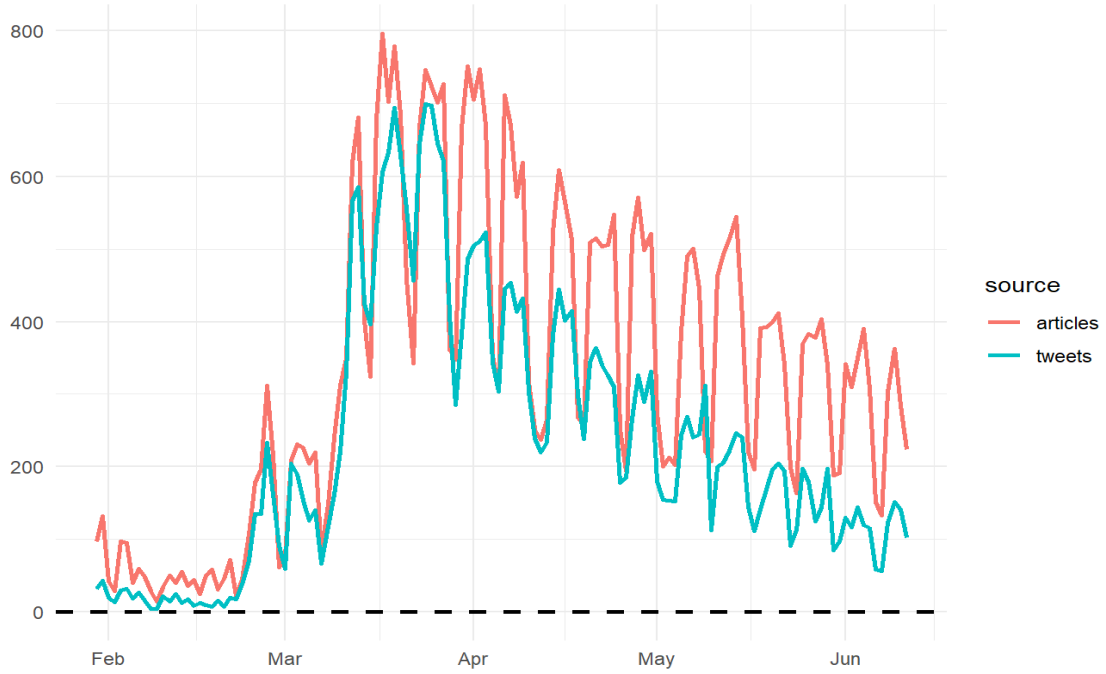


Figure 3. Time series of tweets and news media articles (number per day).

As the volumes of tweets and news media articles are comparable, we analysed the original day counts data without the normalization. Both articles and tweets data exhibited a seasonal weekly pattern that was further confirmed by the ACF and PACF plots (Appendix A, Figure A2). We used a KPSS test, which typically has more power than an ADF test (Kwiatkowski et al. 1992), to test the null hypothesis of stationarity. We found that both the tweet and article series had a unit root, KPSS = 0.55, $p = 0.030$ and KPSS = 0.84, $p = 0.01$ with lag L = 4, respectively.

As both series had a unit root, we checked whether they were cointegrated. Cointegration occurs when there exists a linear combination of integrated variables that is stationary (cointegration vector). In case of cointegration, it is possible to distinguish between the short-term Granger causality and the long-run equilibrium relationship of the variables described by the cointegration vector.

We considered the Johansen cointegration testing procedure with maximum eigenvalue statistics. Preliminary VAR order detection (using an R selectVAR procedure with an AIC criterion) suggested a vector autoregression of order $p = 5$, controlling for the seasonal dummies corresponding to the days of the week. The eigenvalues were 0.081 and 0.020, respectively, and we obtained $L_{max}(0) = 11.0$ and $L_{max}(1) = 2.65$. Comparing to the critical values, we could not reject the cointegration order r = 0 at a 10% significance level. Namely, the series were not cointegrated and we proceeded with a VAR(4) model for the differenced series without a cointegration vector term co-controlling for the days of the week.

We proceeded with a VAR(4) model for the differenced series without a cointegration vector term (Table 1). As the estimated model coefficients were not significant, we refined the model by imposing zero restrictions until only variables significant at a 10% level remained (Model 1). We report the model updated by one parameter being the most significant among the remaining ones (Model 2).

Regarding Model 1, the final tweets equation included the second and the fourth lagged differences of the articles' series. Namely, the number of article mentions Granger-caused the number of tweet mentions. As the model is in the differences, the interpretation is that the history of the last 5 days of article mentions impacted the twitter mentions. We also note that some seasonal dummies are significant. The articles equation included the same two lag parameters as the tweet equation, but it did not include any tweet terms.

Table 1. Restricted VAR(4) model specification for the daily changes of article mentions and tweet mentions.

	Model 1		Model 2	
	Change in article mentions	Change in tweet mentions	Change in article mentions	Change in tweet mentions
Change in article mentions, lag 2	−0.43 [c]	−0.16 [c]	−0.56 [c]	−0.16 [c]
Change in tweet mentions, lag 2			0.26 [†]	
Change in article mentions, lag 4	−0.24 [c]	−0.14 [c]	−0.26 [c]	−0.14 [c]
$I_{Saturday}$	−58.88 [b]		−58.48 [b]	
I_{Sunday}	−177.92 [c]	−81.51 [c]	−177.27 [c]	−81.51 [c]
I_{Monday}	−83.38 [c]	−56 [c]	−87.41 [c]	−56 [c]
$I_{Tuesday}$	83.63 [c]	33.57 [a]	82.08 [c]	33.57 [a]
AIC	2816.7		2814.9	
Correlation of residuals	0.69		0.70	
Box-Ljung test X^2 for the residuals, 15 lags	17.8, $p = 0.27$	22.0, $p = 0.11$	17.7, $p = 0.28$	22.0, $p = 0.11$

Note: "I" denotes seasonal dummy variables, the base being Friday. Model 1 is the maximal model having all parameters significant. Model 2 is Model 1 updated by one parameter being the most significant among the remaining ones. [a] means $p < 0.1$, [b] means $p < 0.05$, [c] means $p < 0.01$. [†] means $p = 0.14$.

Note that the residuals of the above VAR model are correlated with $r = 0.69$. This means that a day's article and twitter mentions were highly positively correlated. This is referred to as instantaneous Granger-causality. Regarding Model 2, we note that, when including the next most significant variable in the VAR model, it turns out to be the second lag of the change in tweet mentions in the articles series ($p = 0.14$). Although this parameter estimate does not reach the 10% significance level, it is quite close. Moreover, Model 2 has a slightly better AIC criterion value, indicating it is better explaining the dependent variable. Thus, it can be said that, to some extent, tweets Granger-caused the articles as well.

6. Discussion and Conclusions

The COVID-19 pandemic started at the end of 2019. The first positive test for the COVID-19 in Latvia was announced on 2 March 2020 and the number of publications continues to grow in online news media as well as on social media. Whenever such massive health crises occur, the spread of information related to the disease grows exponentially. Sensing new unfamiliar risk, individuals turn to the media, and media can either mitigate or accelerate crises by spreading information and setting an agenda to the broader public.

In this research, we studied the relationship between the social media agenda and the media agenda. First, we had to observe how much attention each type of media paid to COVID-19 and what were the main topics in Twitter and in online news sites. The research analysis revealed that a lot of attention in online news media was given to the spread of COVID-19, information about the actions of the government, followed by prevention and control measures. The discussions on Twitter showed that the prevention and control measures were the most prevalent topic, followed by general information about the spread of the coronavirus. The third most widespread topic was the response of the government, in the form of either support or criticism. Thus, we can conclude that in online news more attention was given to the actions of the government, however in social media the public was more eager to discuss the measures that were implemented to prevent further spread of the virus. This finding is in line with earlier studies that suggest the importance of sharing feelings on social media platforms (Glasgow et al. 2016; Shaw et al. 2013; Han et al. 2021).

Secondly, we tried to uncover mutual influences between these two agendas. To analyse the flow of information between online news media and social media VAR models were applied. The results confirmed that, in the case of COVID-19, a day's articles and

Twitter mentions were positively correlated and that news media articles Granger-caused social media posts. We found proof that, to some extent, the article mentions Granger-caused the number of tweet mentions. Our results corroborate the previous research of Su and Borah (2019) and Zhou and Zheng (2022), finding that social media can dominate agenda-setting under certain conditions.

This study highlights the value of Twitter data. Even though Twitter users are not a representative part of the population (Blank 2017; Jungherr 2016), the amount of Twitter users as well as the number of Twitter discussions uphold the assumption that online communications might offer a comprehensive assessment of what the priorities of the day are. According to our findings, these discussions were treated as newsworthy by online news media and thus were able to reach larger audiences.

While this study is important for understanding how COVID-19 is perceived in the media, there are several limitations that must be noted. The analysis only examined the first 4.5 months of COVID-19 news coverage. More research needs to be done to understand how media topics evolved during that time. Secondly, topic detection was done manually by the authors of this research and this could have caused research-related bias.

This article contributes to a better understanding of the agenda-setting dynamics between the social media agenda and the media agenda. As results indicated, social media have some power to set the agenda of public debates in media; however, online news sites are a more powerful agenda-setter. The answer to the question of who sets the media agenda in digital environment is resounding: traditional media websites and digital-born news sites.

Author Contributions: Conceptualization, L.Š. and R.D.; methodology, L.Š.; software, R.D.; validation, L.Š. and R.D.; formal analysis, L.Š.; investigation, L.Š.; resources, L.Š.; data curation, L.Š.; writing—original draft preparation, L.Š.; writing—review and editing, L.Š.; visualization, L.Š. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Data Availability Statement: Publicly available datasets were analyzed in this study. This data can be found here: Skestere, Lasma, 2022, "COVID-19 articles and social media posts", https://doi.org/10.48510/FK2/AFUHAZ, Dataverse, V1.

Conflicts of Interest: The authors declare no conflict of interest.

Appendix A

Table A1. News media sites and number of news articles.

Name of Media	Number of Articles
Tvnet.lv	7499
Jauns.lv	5529
Nra.lv	5133
Delfi.lv	4877
La.lv	4845
Lsm.lv	5090
Apollo.lv	3668
Diena.lv	3295
Skaties.lv	3268
Bnn.lv	900
Ir.lv	334
Vestnesis.lv	326
Lvportals.lv	25
Total	44,789

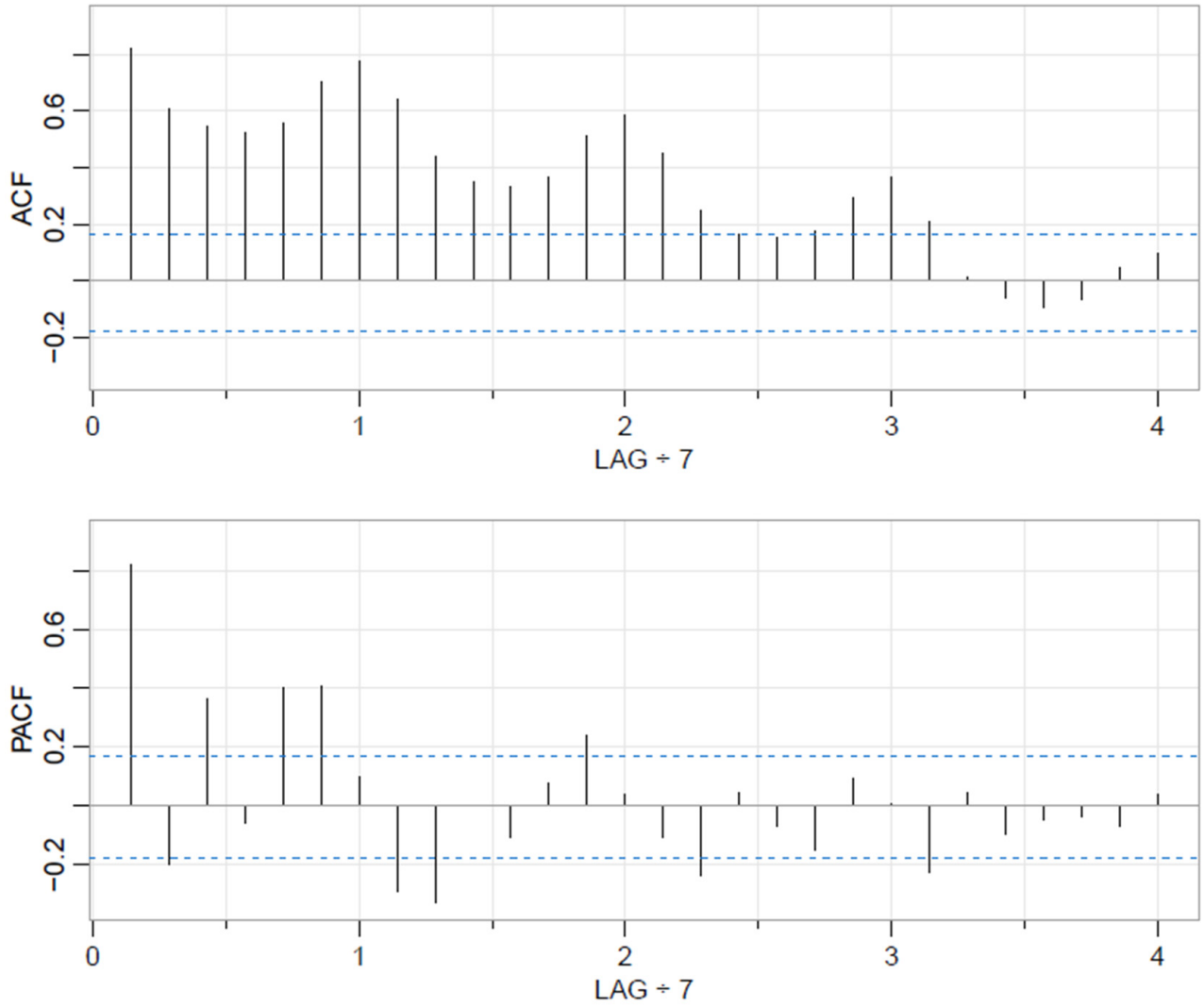


Figure A1. ACF and PACF plots for the article time series.

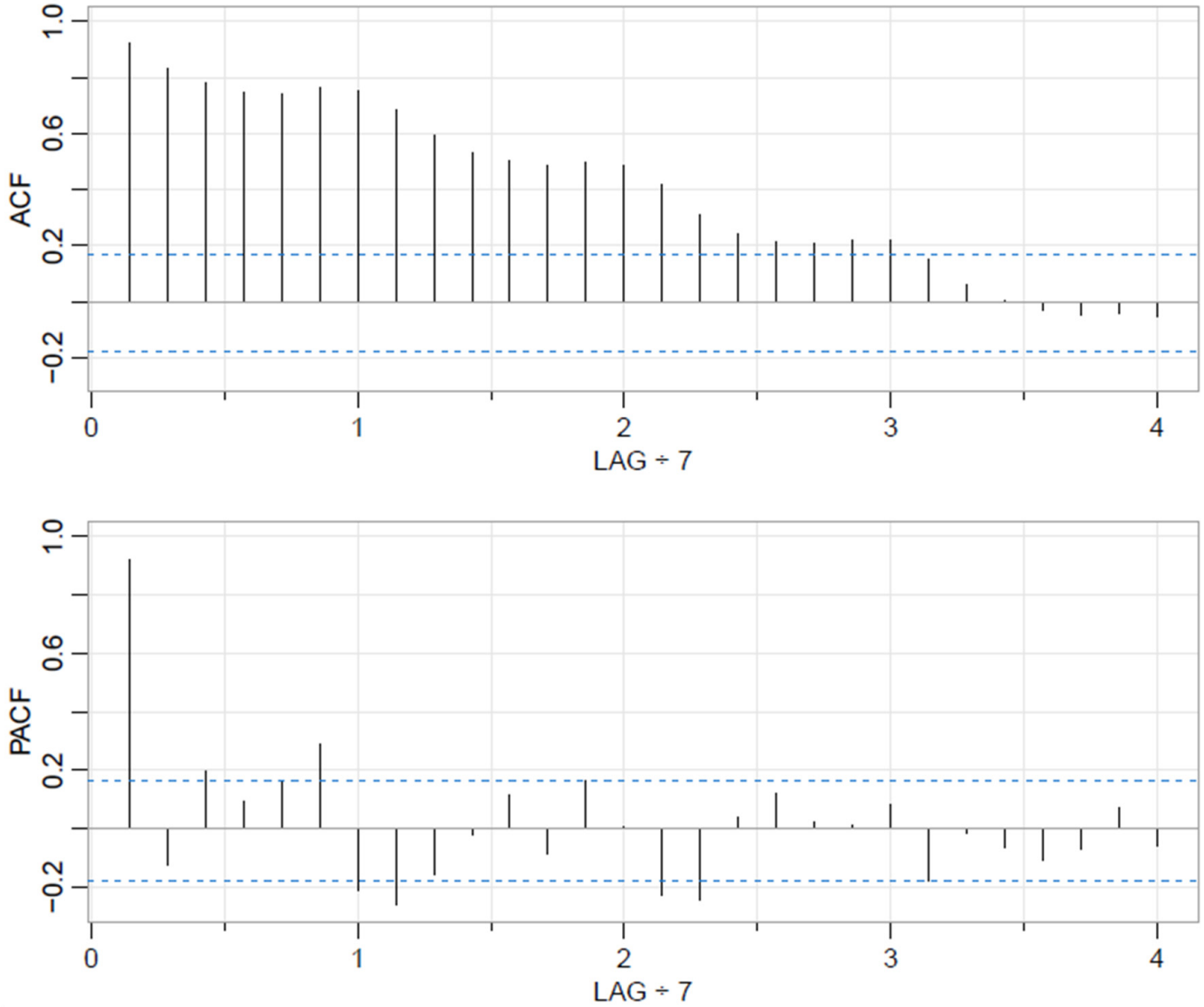


Figure A2. ACF and PACF plots for the tweet time series.

Note

[1] According to the by-law of the Crisis Management Council, the Crisis Management Council is a coordinating institution, the objective of the operation of which is to ensure coordinated actions of state and local government institutions in taking measures for the prevention and suppression of danger to the state, as well as measures for the liquidation of consequences caused thereby.

References

Ahmad, Araz Ramazan, and Hersh Rasool Murad. 2020. The impact of social media on panic during the COVID-19 pandemic in Iraqi Kurdistan: Online questionnaire study. *Journal of Medical Internet Research* 22: e19556. [CrossRef] [PubMed]

Barberá, Pablo, Andreu Casas, Jonathan Nagler, Patrick J. Egan, Richard Bonneau, John T. Jost, and Joshua A. Tucker. 2019. Who Leads? Who Follows? Measuring Issue Attention and Agenda Setting by Legislators and the Mass Public Using Social Media Data. *American Political Science Review* 113: 883–901. [CrossRef] [PubMed]

Blank, Grant. 2017. The Digital Divide Among Twitter Users and Its Implications for Social Research. *Social Science Computer Review* 35: 679–97. [CrossRef]

Chadwick, Andrew. 2017. *The Hybrid Media system: Politics and Power*. Oxford: Oxford University Press.

Cohen, Bernard Cecil. 1963. *The Press and Foreign Policy*. Princeton: Princeton University Press.

Du, Ying Roselyn. 2008. Mass Media's Agenda Setting Function in the Age of Globalization: A Multi-National Agenda-Setting Test. Doctoral dissertation, University of North Carolina, School of Journalism and Mass Communication, Chapel Hill, NC, USA.

Du, Ying Roselyn. 2013. Intermedia agenda-setting in the age of globalization: A multinational agenda setting test. *Global Media and Communication* 9: 19–36. [CrossRef]

Glasgow, Kimberly, Jessika Vitak, Yla Tausczik, and Clay Fink. 2016. "With your help... we begin to heal": Social media expressions of gratitude in the aftermath of disaster. In *International Conference on Social Computing, Behavioral-Cultural Modeling and Prediction and Behavior Representation in Modeling and Simulation*. Berlin: Springer, pp. 226–36.

Golan, Guy. 2006. Intermedia agenda setting and global news coverage. *Journalism Studies* 7: 323–33. [CrossRef]

Guo, Lei, Hong Tien Vu, and Maxwell McCombs. 2012. An Expanded Perspective on Agenda-Setting Effects: Exploring the Third Level of Agenda Setting. *Revista de Comunicación* 11: 51–68. Available online: https://www.researchgate.net/publication/303199053_An_expanded_perspective_on_agenda-setting_effects_Exploring_third_level_agenda_setting (accessed on 5 April 2022).

Han, Chunjia, Mu Yang, and Athena Piterou. 2021. Do news media and citizens have the same agenda on COVID-19? An empirical comparison of twitter posts. *Technological Forecasting and Social Change* 169: 120849. [CrossRef]

Harder, Raymond A., Julie Sevenans, and Peter Van Aelst. 2017. Intermedia agenda setting in the social media age: How traditional players dominate the news agenda in election times. *International Journal of Press/Politics* 22: 275–93. [CrossRef]

Holcomb, J., K. Gross, and A. Mitchell. 2011. How Mainstream Media Outlets Use Twitter. Pew Research Center. Available online: https://www.pewresearch.org/journalism/2011/11/14/how-mainstream-media-outlets-use-twitter/ (accessed on 10 November 2022).

Jang, S. Mo, and Yong Jin Park. 2017. Redirecting the focus of the agenda: Testing the zero-sum dynamics of media attention in news and user-generated media. *International Journal of Communication* 11: 3998–4017.

Jungherr, Andreas. 2016. Twitter use in elections campaigns: A systematic literature review. *Journal of Information Technology & Politics* 13: 72–91. [CrossRef]

Kosicki, Gerald M. 1993. Problems and Opportunities in Agenda-Setting Research. *Journal of Communication* 43: 100–27. [CrossRef]

Kushin, Matthew James. 2010. Tweeting the issues in the age of social media? Intermedia agenda setting between the New York Times and Twitter. Doctoral dissertation, Washington State University, Edward R. Murrow College of Communication, Pullman, WA, USA.

Kwiatkowski, Denis, Peter CB Phillips, Peter Schmidt, and Yongcheol Shin. 1992. Testing the Null Hypothesis of Stationarity Against the Alternative of a Unit Root: How Sure Are We That Economic Time Series Have a Unit Root? *Journal of Econometrics* 54: 159–78. [CrossRef]

Lippmann, Walter. 1922. *Public Opinion*. New York: Harcourt, Brace and Company.

McCombs, Maxwell. 2014. *Setting the Agenda: The Mass Media and Public Opinion*. Cambridge: Polity.

McCombs, Maxwell E., and Donald L. Shaw. 1972. The agenda-setting function of the mass media. *Public Opinion Quarterly* 36: 176–87. [CrossRef]

Meraz, Sharon. 2011. Using Time Series Analysis to Measure Intermedia Agenda-Setting Influence in Traditional Media and Political Blog Networks. *Journalism & Mass Communication Quarterly* 88: 176–94.

Neuman, W. Russell, Lauren Guggenheim, S. Mo Jang, and Soo Young Bae. 2014. The Dynamics of Public Attention: Agenda-Setting Theory Meets Big Data. *Journal of Communication* 64: 193–214. [CrossRef]

Qian, Yue, and Amy Hanser. 2021. How did Wuhan residents cope with a 76-day lockdown? *Chinese Sociological Review* 53: 55–86. [CrossRef]

Sayre, Ben, Leticia Bode, Dhavan Shah, Dave Wilcox, and Chirag Shah. 2010. Agenda Setting in a Digital Age: Tracking Attention to California Proposition 8 in Social Media, Online News and Conventional News. *Policy & Internet* 2: 7–32.

Scharkow, Michael, and Jens Vogelgesang. 2011. Measuring the public agenda using search engine queries. *International Journal of Public Opinion Research* 23: 104–13. [CrossRef]

Schwitzer, Gary, Ganapati Mudur, David Henry, Amanda Wilson, Merrill Goozner, Maria Simbra, Melissa Sweet, and Katherine A. Baverstock. 2005. What Are the Roles and Responsibilities of the Media in Disseminating Health Information? *PLoS Medicine* 2: e215. [CrossRef] [PubMed]

Shaw, Frances, Jean Burgess, Kate Crawford, and Axel Bruns. 2013. Sharing news, making sense, saying thanks: Patterns of talk on twitter during the queensland floods. *Australian Journal of Communication* 40: 23–40.

Singer, Phillip M., Charley E. Willison, and Scott L. Greer. 2020. Infectious disease, public health, and politics: United States response to Ebola and Zika. *Journal of Public Health Policy* 41: 399–409. [CrossRef] [PubMed]

Su, Yan, and Porismita Borah. 2019. Who is the agenda setter? Examining the intermedia agenda-setting effect between Twitter and newspapers. *Journal of Information Technology & Politics* 16: 236–49. [CrossRef]

Tahamtan, Iman, Devendra Potnis, Ehsan Mohammadi, Vandana Singh, and Laura E. Miller. 2022. The Mutual Influence of the World Health Organization (WHO) and Twitter Users During COVID-19: Network Agenda-Setting Analysis. *Journal of Medical Internet Research* 24: e34321. [CrossRef] [PubMed]

van den Heijkant, Linda, Martine Van Selm, Iina Hellsten, and Rens Vliegenthart. 2019. Intermedia Agenda-Setting in a Policy Reform Debate. *International Journal of Communication* 13: 23. Available online: https://ijoc.org/index.php/ijoc/article/view/11017 (accessed on 5 April 2022).

Vargo, Chris J., Lei Guo, and Michelle A. Amazeen. 2018. The agenda-setting power of fake news: A big data analysis of the online media landscape from 2014 to 2016. *New Media &Society* 20: 2028–49. [CrossRef]

Vasterman, Peter LM, and Nel Ruigrok. 2013. Pandemic alarm in the Dutch media: Media coverage of the 2009 influenza A (H1N1) pandemic and the role of the expert sources. *European Journal of Communication* 28: 436–53. [CrossRef]

WHO. 2020. Director-General's opening remarks at the media briefing on COVID-19. Available online: https://www.who.int/director-general/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19---5-march-2020 (accessed on 15 June 2022).

WHO. 2021. COVID-19: And Informative Guide: Advice for Journalists. Available online: https://apps.who.int/iris/handle/10665/339256 (accessed on 5 April 2022).

Zhao, Wayne Xin, Jing Jiang, Jianshu Weng, Jing He, Ee-Peng Lim, Hongfei Yan, and Xiaoming Li. 2011. Comparing Twitter and Traditional Media Using Topic Models. In *Advances in Information Retrieval, Proceedings of the European Conference on Information Retrieval, Beijing China July 24–28*. Edited by Paul Clough. Lecture Notes in Computer Science. Berlin/Heidelberg: Springer, vol. 6611. [CrossRef]

Zhou, Shuhuan, and Xia Zheng. 2022. Agenda Dynamics on Social Media During COVID-19 Pandemic: Interactions Between Public, Media, and Government Agendas. *Communication Studies* 73: 211–28. [CrossRef]