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Are Echo Chambers Based on Partisanship? Twitter and Political Polarity in Poland and Hungary

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Abstract

In this study, we investigate how Twitter allows individuals in Hungary and Poland to experience different political views. To comprehend citizens' exposure to political information, "who's following who?" graphs of 455,912 users in Hungary (851,557 connections) and 1,803,837 users in Poland (10,124,501 connections) are examined. Our conceptual point of departure is that Twitter follower networks tell us whether individuals prefer to be members of a group that receives one-sided political messages, or whether they tend to form politically heterogeneous clusters that cut across ideological lines. Methodologically, such connections are best studied by means of computer-aided quantitative research complemented by the sociocentric approach of network analysis. Our data date from September 2018. The findings for Poland do not support the hypothesis of clusters emerging along partisan lines. Likewise, the Hungarian case reveals sharp group divisions on Twitter, the nodes however are diverse and *overlapping in terms of political leaning*. The data suggest that exposure and segregation in follower networks are not necessarily based on partisanship.

Keywords

Twitter, political information-seeking, network analysis, Hungary, Poland, echo chamber

Introduction

The question of politically driven divisions on social media has attracted increased scholarly attention; however, the vast majority of empirical analyses thus far have largely been limited to the Western European context (Larsson & Ihlen, 2015; Vaccari et al 2016) or to single-country studies (Boutet, Kim, & Yoneki, 2012; Feller, Kuhnert, Sprenger, & Welpe, 2011; Gruzd & Roy, 2014; Guerrero-Solé, 2014; Maireder & Ausserhofer, 2014; Messing & Westwood, 2014; Yardi & boyd, 2010). This article seeks to remedy this deficit by providing a systematic large-scale study of political polarization on Twitter that considers the follower networks of 77 political parties, politicians, and media outlets in Hungary (27) and Poland (50). In line with the most recent trends in the literature on online political information seeking, we ground our conceptual and methodological framework in network analysis to explore exposure patterns on Twitter (Del Valle & Borge Bravo, 2018; Himelboim, McCreery, & Smith, 2013; Himelboim et al., 2016; Williams, McMurray, Kurz, & Hugo Lambert, 2015).

This study examines the role of social media in contributing to political polarization. Social media, especially Twitter, is often discussed in terms of its potential for facilitating the discursive isolation of users (Garrett, Carnahan, & Lynch, 2011; Hong & Kim, 2016; Morales, Borondo, Losada, & Benito, 2015). As individuals create communication networks on Twitter with those who share similar beliefs, it has been argued that social media significantly contributes to the polarization of public opinion (Bail et al., 2018; Marozzo & Bessi, 2017). Context, however, matters: communicative separation may occur for certain topics, while no significant differences may be traced in other issues (Barberá, Jost, Nagler, Tucker, & Bonneau, 2015). Thus far, with only a few exceptions (Guimarães, Wang, & Weikum, 2017; Vaccari et al., 2016), little knowledge is available concerning the cross-country specificities on Twitter and political polarity.

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To fill this gap, we offer a comparative study that asks whether Twitter users tend to expose themselves to politically diverse information in follower–followee networks. In this article, we provide empirical evidence of sharp group divisions in follower networks in both the countries examined. It is, however, also revealed that clusters are not necessarily held together by connections to one-sided political information providers alone. Our evidence derives from a comparative analysis of the follower networks on Twitter in Hungary and Poland. These two post-communist Central European countries are perfect for analyzing polarity on social media. Both countries have developed highly polarized political environments with a low level of consensus among the members of the political elite (Baylis, 2012). In addition, in recent years, the European Union's (EU) plan to enforce a *compulsory quota* system to *allocate asylum seekers* to countries across the EU has increased the polarization between the Integrationist and Europessimist camps in Hungary and Poland.

Specifically, we test whether individual users tend to exclusively follow the Twitter updates of political content producers (i.e., the Twitter accounts of parties, politicians, and news media outlets) from only one side of the political spectrum or whether they connect to a broad range of political opinion and information providers. In other words, we ascertain the membership of Twitter clusters surrounding political actors in 2018. This big data-driven approach to exposure to politics is based on two "who's following who?" graphs of 455,912 users in Hungary (851,557 connections) and 1,803,837 users in Poland (10,124,501 connections). The results of this study suggest that fragmented online social media outlets such as Twitter have the potential to contribute to partisan segregation; however, this is not a universal experience of all users. Approximately half of Twitter account holders are likely to be exposed to one-sided political information and opinions. In terms of the views and topics they provide, the other half follow a more or less diverse mixture of Twitter accounts. In this sense, our research mitigates the perception of political segregation.

Exposure to Diverse News and Segregation Along Partisan Lines on Twitter

Some have argued that social media has positive and potentially strong effects on political knowledge by providing more opportunities to access political content (Bode, 2016; Boulianne, 2009), while others doubt this, assessing social media as comprising predominantly entertainment-focused platforms (Baumgartner & Morris, 2010; Dimitrova, Shehata, Strömbäck, & Nord, 2014). Not surprisingly, an increasing number of empirical analyses focus on Twitter from the perspective of exposure to political information. One strand of the literature explores information-seeking patterns by looking at the correlation between exposure and the topological or geographical properties of messages (boyd, Golder, & Lotan, 2010; Conover et al., 2011; Java, Song, Finin, & Tseng, 2007). A number of studies have examined the impact of exposure when sharing a piece of information: previous works have found strong evidence that there is a strong correlation between exposure and hashtag adoption on Twitter (Lin, Margolin, Keegan, Baronchelli, & Lazer, 2013; Romero, Galuba, Asur, & Huberman, 2011).

In explicating the role that social media platforms such as Twitter play in users' accessing of divergent political messages and information, the literature offers four prominent explanations (Boulianne, 2015). The first holds that Twitter networks increase exposure to "weak ties," augmenting users' likelihood of both learning about opportunities to participate and being asked to participate in civic life (Gil de Zúñiga, Jung, & Velenzuela, 2012). Second, users learn about news from what other users post, and since they are exposed to the news incidentally by their contacts, this type of information may be influential (Bode, 2012). Thus, social platforms may enable citizens to learn about political issues, which facilitates participation in civic life (Xenos, Vromen, & Loader, 2014). Third, users of social media have a greater chance of being contacted by political organizations, and through this contact, of being asked to participate on their behalf. Fourth, participation is contagious among users of social media, as they are affected by contacts who post political opinions (Bond et al., 2012).

There are, however, confusing reports about the extent to which Twitter users are exposed to political diversity. Twitter offers the ability to easily and rapidly generate political content and share political information with others at low cost. Statistics, however, show that there are only a small number of active users on Twitter (Just & Holtz-Bacha, 2017). Most account holders follow the updates of celebrities, journalists, and politicians. The follower–followee relationship on Twitter has altered information exposure patterns, which may affect the quality of public discourse as a whole. The characteristics of exposure on social media have received considerable scholarly attention. A rich vein of literature discusses the two theses on the topic: segregation along partisan lines and diversity in social media exposure.

Studies posit that individuals carefully choose information that matches their previous beliefs (Gergen, 2008; McPherson, Smith-Lovin, & Cook, 2001). Individuals tend to form new social network connections primarily with others who are often like them (McPherson et al., 2001), leading to fragmented interactions and divided groups that are increasingly homogeneous (Van Alstyne & Brynjolfsson, 1996). Focusing on self-exposure to information sources, Sunstein (2007) warns that the availability of a growing number of sources leads to a narrowing of the scope of the news and views to which people choose to expose themselves. More recent examinations of selective exposure behavior suggest that while people tend not to actively expose themselves to

individuals and information sources with whom they disagree, neither do they actively avoid them (Garrett et al., 2011; Holbert, Garrett, & Gleason, 2010; Parmelee & Bichard, 2012). Examining political interaction on Twitter on major topics of the 2010 midterm elections, Himelboim and colleagues (2013) found that users preferred following, mentioning, and replying to users with similar political views. Examining Korean politicians' use of Twitter, Choi, Park, and Park (2011) found that users preferred posting hyperlinks to sites associated with politicians within the same party.

Conover et al. (2011) also attempted to link selectivity and political orientation in network analysis. Based on a sample of 1,000 users, they found evidence that political networks on Twitter are highly segregated, as users tend to retweet more from those users who share the same political affiliation. Feller et al. (2011) achieved similar results in analyzing conversations about German political parties during the 2009 federal elections. They found that political tweeters tend to be segregated according to shared political affiliation. Boutet and co-authors (2012) also investigated users' political affiliation based on mention/retweet behavior and the segregation of retweets on Twitter during the 2010 UK general election. They found a highly segregated partisan structure, and that party members were more likely to retweet material from their own party than material from other parties.

Arguments about a sharp, politically driven group division on social media have also received criticism (Fletcher & Nielsen, 2018; Kobayashi, Ogawa, Suzuki, & Yamamoto, 2018; Lee & Kim, 2017; Weeks, Lane, Kim, Lee, & Kwak, 2017). This skeptical group of scholars propagates the limited relevance of selective exposure arguing that Twitter offers a wide range of political information. The two main modes of being engaged with a piece of information are following the updates of someone and sharing updates (retweeting). To fully understand whether political segregation on Twitter is avoided, one should differentiate between diversity in follower–followee and in tweeting–retweeting relationships among users. An, Cha, Gummadi, Crowcroft, and Quercia (2012) provide a comprehensive account of exposure on Twitter. Based on data from the United States, they compellingly demonstrate that follower–followee relationships are far more diverse in terms of political orientations than are sharing activities. Such differences have been confirmed by Ogawa, Yamamoto, Miyata, and Ikeda (2013), who found that selective exposure tends to be strong for the retweetee, whereas it is rather moderate for the followee and @tweetee. We interpret these results as a sign of a weak form of separation: Twitter users segregate themselves into echo chambers by sharing like-minded opinions even though they are exposed to different opinions.

Yardi and boyd (2010) observe that the diverse information environment did not produce a communicative situation that fostered deliberation; rather, it reinforced in-group and out-group affiliation. The authors highlight new pathways to perceiving the big picture of exposure by analyzing tweets about the shooting of George Tiller, a late-term abortion doctor, and the messages posted after the incident by pro-life and pro-choice users. Their data suggest that retweeting connections were established between differently minded individuals, which indicates exposure to divergent views. They concluded that users show a limited ability to engage in meaningful discussion.

An increase in one-sided arguments and a decrease in cross-cutting information seeking is therefore a likely source of polarization. The literature, however, tells us that Twitter is a mixed blessing as regards experiencing diverse politics. It is safe to say that at the heart of the discussion on exposure to political information on Twitter is the essence of democracy. It is often argued that multiple sources of political information are most valuable when they come from diverse viewpoints (Gentzkow & Shapiro, 2008). On the contrary, a lack of personal ties to those with different political views is likely to have detrimental effects on political tolerance (Mutz, 2002). Taken together, these two points emphasize the importance of providing citizens with an ideologically diverse set of high-quality information to sustain a healthy democracy (Putnam, Leonardi, & Nanetti, 1994).

We argue that one-sided exposure to politics segregates users, resulting in the polarization of political information exchanges. To demonstrate the strong version of selective exposure, the follower–followee relationship needs to be explored. If connections exhibit politically diverse links between users in follower–followee networks, it is very likely that information consumption cut across partisan lines on Twitter. It is also plausible to assume that the deep division between one-sided information seekers among followers on Twitter creates a less advantageous circumstance for sharing news across ideological lines.

Case Selection: Hungary and Poland

The importance of exposure to diverse political information is even more crucial in societies that have relatively limited experience of democracy and social pluralism. Hungary and Poland are two representatives of such societies (Blokker, 2013).

Since 2010 in Hungary and 2015 in Poland, national politics have been dominated by national conservative and right-wing populist political parties, Fidesz (Hungary) and Law and Justice (Poland), whose elites openly support and imitate the political direction taken by Viktor Orbán. In both the cases, the national governments have implemented political reforms that have been widely criticized by, for example, the Venice Commission for Democracy through Law, the Council of Europe, and the European Parliament. The governments of both the countries are also likely to collide with the EU due to the reforms they have introduced. However, according to polls (e.g., Public Opinion Research Center in Poland, cbos.pl; Závecz Research in Hungary, zaveczresearch.hu), the parties are still supported by 40%-50% of likely voters. The

complete explanation for this phenomenon requires taking many factors into consideration.

In the first decade of the 21st century, increasing numbers of political observers and analysts warned of growing polarization in Polish and Hungarian politics, especially among the members of the elites (Baylis, 2012; Körösényi, 2013). In addition to rising polarization, it has also been widely argued that the populism-in-power in both the countries endangers pluralism in politics (Bayer, 2013; Galston, 2018). Therefore, we argue that Hungary and Poland are excellent illustrative cases for assessing exposure to divergent voices. Although Twitter is not the most popular means of gaining political information in Central and Eastern Europe (CEE), the number of users that are opinion leaders and trendsetters is especially high. In Hungary, the number of Twitter users was approximately 600,000 (0.9% of all Internet users in Hungary) in 2017,[1] while in Poland, the figure was 4.6 million (16.5% of all Internet users in Poland).[2]

In the literature, a relatively small number of studies focus on follower–followee relations on Twitter. Moreover, a clear majority of these studies have been conducted in English-speaking countries or in Western Europe. As far as we know, no such studies have been conducted in CEE countries—one of our aims is to fill this gap.

Research Question and Hypotheses

Given the special context of the two countries examined, our research is driven by the following question and hypothesis:

RQ: What are the users' preferences for acquiring information on Twitter? Do they prefer to follow one-sided, two-sided, or a variety of one-sided and two-sided political or media accounts?

H1: Twitter users mostly follow accounts that are congruent with their beliefs. This means that users tend to follow accounts that have a political leaning similar to theirs and avoid accounts that differ in their political orientation.

Methodology

To better understand voter exposure to political information on social media platforms, we consider social media as a social network. Membership of either a politically homogeneous or heterogeneous Twitter network indicates the characteristics of exposure which filter the news from highly personalized social media connections.

The data were collected automatically by means of the Twitter REST API in September 2018. The date is quite important, because it was after Twitter had launched its program of eliminating fake accounts due to a policy of improving the health of conversation. It is estimated that from May to July 2018, Twitter removed tens of millions of accounts that had been locked after detection of sudden changes in their behavior. As a consequence there was a noticeable decrease in follower counts, which may suggest that the numbers became more accurate (Confessore & Dance, 2018; Gadde, 2018; Timberg & Dwoskin, 2018). The Twitter network is composed of directed and often asymmetric ties of attention, and so features "hubs" (a component of the Twitter network with high-degree nodes) belonging to major journalists, celebrities, politicians, and other popular content producers (Kwak, Lee, Park, & Moon, 2010). Such hubs form the basis of our sampling strategy.

Based on the distribution of followers (only a very small proportion of accounts is followed by large groups of users), we decided to include in our analysis only accounts that are in the top 1% of all followed accounts in Hungary or Poland. Our research problem concerns the consumption of political news on Twitter, hence we selected the accounts of most popular politicians (prime ministers, leaders of political parties, the president of Poland, government spokespersons, and members of national parliaments and the European Parliament), political parties, and news media. However, we have not included in our analysis tabloid, celebrity, satirical, business, or technology media as they do not usually provide political content (in terms of coverage of political events). We are interested in accounts that are oriented toward local audiences, and therefore we singled out only accounts that publish in Hungarian (in Hungary) or Polish (in Poland).

As for the political leaning of the sampled media outlets in Hungary, we rely for our labeling on the categorization of Atlatszo.hu, a watchdog NGO and online newspaper for investigative journalism.[3] In the case of Poland, we used the list of Polish media and their political leaning in Matuszewski (2018b). We have used the following labels: "anti-government," 'without partisan affiliation[4],' and "pro-government." In the case of politicians, we classified them according to their political membership (members of the governing party as "pro-government," and members of the opposition as "anti-government").

In the next step, we collected data on followers (also only Hungarian or Polish speaking) of the listed Twitter accounts. Therefore, our network's focus is on the connections between users and the main political or news media followees. The data comprise 455,912 unique users in Hungary (851,557 edges) and 1,803,837 users (10,124,501 edges) in Poland. We have assumed that the behavior of Twitter users is not uniform, and it would be an oversimplification to draw conclusions based on statistics pertaining to the network as a whole. Thus, we detected communities of users sharing similar follower–followee patterns. In this analysis, we use the multilevel algorithm proposed by Blondel, Guillaume, Lambiotte, and Lefebvre (2012). Its main advantages are high accuracy for large networks and speed of computation (Yang, Algesheimer, & Tessone, 2016).

To verify our hypothesis, we also developed a measure of individual preferences. We checked what kind of accounts (pro-government, anti-government, without

Table 1. Results of Cluster Analysis and Preferences of Users in the Clusters: Hungary.

Community	*n* (users)	Proportion of all users (in %)	Mean of users' pref.[a]	95% HDI	Proportion of users with preferences (in %)			Heavily biased (in %)	Mean number of followees[b]	95% HDI
					< 0.4	0.4–0.6	> 0.6			
1	151,845	33.31	0.228	0.227–0.23	54.25	45.75	0	54.25	1.45	1.44–1.46
2	43,583	9.56	0.265	0.264–0.267	68.43	22.97	8.59	42.57	3.84	3.78–3.9
3	38,538	8.45	0.281	0.28–0.282	86.56	13.44	0	22.7	2.52	2.51–2.53
4	161,827	35.5	0.917	0.916–0.918	0	16.68	83.32	83.32	1.17	1.16–1.18
5	21,033	4.61	0.578	0.576–0.579	8.59	57.7	33.71	16.63	3.62	3.6–3.65
6	39,086	8.57	0.655	0.654–0.656	0.61	35.76	63.63	15	2.55	2.53–2.56
Total	455,912	100	0.533	0.531–0.535	32.9	29.1	38.0	55.4	1.87	1.86–1.88

[a]Our prior was noninformative uniform(0, 1), since we expected any value in the range from 0 to 1.
[b]Our prior was exp (.2), since we knew that our result should be a positive number and we expected that the average number of news media or political followees was around 5, and the distribution was exponential.

partisan affiliation) each user follows. We then calculated their preferences using the following formula

$$Preferences = \frac{number\ of\ pro-gov\ accounts + number\ of\ accounts\ without\ partisan\ affiliation}{number\ of\ pro-gov\ accounts + 2 \times number\ of\ accounts\ without\ partisan\ affiliation + number\ of\ anti-gov\ accounts}$$

The results of this formula are quite simple to interpret. The closer to 1, the more one-sided and pro-government users' preferences are; the closer to 0, the more one-sided and anti-government the preferences are; and the closer to 0.5, the more balanced (a user follows both pro- and anti-government accounts) or neutral (a user follows political accounts without partisan affiliation) the preferences are.

We argue that it would be misleading to treat as neutral only the preferences of users who attain a score of exactly 0.5. For example, if a user follows one opposition member of parliament and three neutral media outlets, the score is $4/(1+2\times3)\approx0.57$. Followees without political affiliation prevail, and the score is close to 0.5. Therefore, having in mind the limited number of sources that have been taken into account, and that this limits the possible scores, we decided to consider scores between 0.4 and 0.6 as a region of practical equivalence (i.e., ROPE, Kruschke, 2014) to 0.5.

In our analysis, we have modeled uncertainty in a probabilistic way as the Bayesian approach indicates (Albert, 2009; Jackman, 2009) and we have used a 95% highest density interval (HDI; Kruschke, 2014) for statistical inferences.

Results

The multilevel algorithm detected six clusters in the Hungarian political Twitter network and five clusters in the Polish one.

There are two main clusters in the Hungarian network (1 and 4 in Table 1) that together account for 68% of all vertices. The first comprises 151,845 users and has an anti-government leaning ($M=0.228$; however, SD is 0.249, since a significant share of users (46%) have balanced preferences; see Figure 1. and Table 1). The second community is similar in size (161,827 users) but most users in it have pro-government preferences ($M=0.917$). On average, users in these communities follow, respectively, 1.5 and 1.2 of the accounts that we have selected for our study (see Table 1).

There are also three smaller but still rather politically homogeneous communities. In communities 2 and 3 (9.56% and 8.45% of all users, respectively), most users prefer anti-government followees ($M=.265$, and .281, respectively). Users in community 6 prefer pro-government followees ($M=.655$). The average number of accounts followed varies from 2.5 to 3.9; however, the users tend to prefer one-sided sources of information.

There is only one community (5) in which most users prefer followees without political affiliations, or ones that lean both ways ($M=.578$). Furthermore, the average number of accounts followed here was one of the highest (significantly higher than the total mean).

It is noteworthy that the distributions of users and their preferences are not Gaussian. The measures we have used support the general inferences, but we need to add some details. In every community, we found a significant proportion (13%-58%) of users who prefer accounts without political affiliation or ones that lean both ways (see Figure 1 and Table 1). The communities are classified comprising users who prefer anti- or pro-government followees, because, in every case, one of the groups of users outweighs the other. Therefore, if we call the communities biased, this does not necessarily mean that all users in those communities have biased preferences.

The communities in Poland are also mostly biased. However, in contrast to the Hungarian network, the total share of users who follow both pro- and anti-government followees or followees without political affiliation is much lower (14%, in comparison to 29%). Whereas, in Hungary, the shares of user with balanced, pro-, and anti-government leanings are almost equal (38%, 29%, 33%), in Poland, the

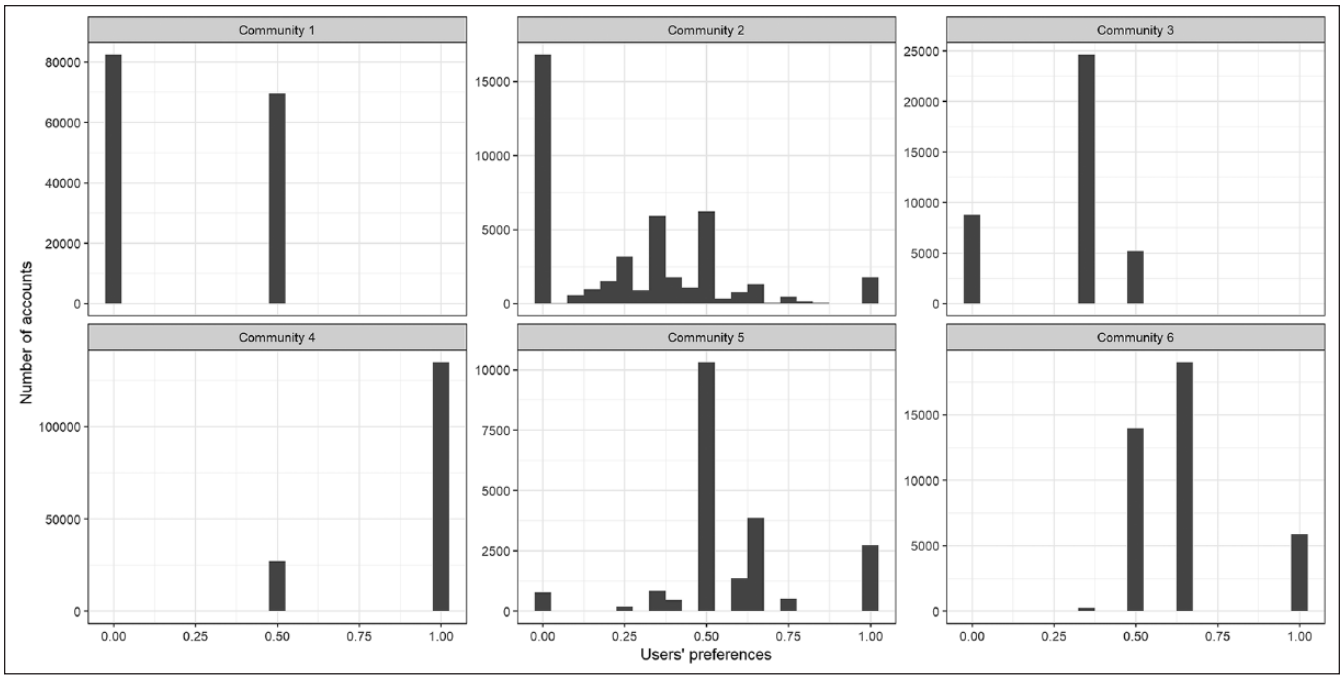

Figure 1. Preferences of users in communities: Hungary.

Table 2. Results of Cluster Analysis and Preferences of Users in the Clusters: Poland.

Community	*n* (Users)	Proportion of all users (in %)	Mean of users' pref.[a]	95% HDI	Proportion of users with preferences (in %)			Heavily biased (in %)	Mean number of followees[b]	95% HDI
					<0.4	0.4–0.6	>0.6			
1	1,062,498	58.9	0.159	0.157–0.16	88.79	5.56	5.65	62.73	3.06	3.05–3.08
2	416,753	23.1	0.470	0.469–0.473	43.04	25.56	31.39	29.83	11.53	11.42–11.64
3	61,667	3.42	0.185	0.184–0.186	87.18	11.22	1.6	37.52	5.92	5.89–5.95
4	211,625	11.73	0.361	0.36–0.363	60.07	30.86	9.07	13.41	7.09	7.04–7.14
5	51,294	2.84	0.641	0.638–0.642	21.44	35.94	42.61	34.29	3.44	3.42–3.45
Total	1,803,837	100	0.269	0.266–0.270	72.9	14.2	12.9	47.7	5.62	5.56–5.68

[a]Our prior was noninformative uniform(0, 1), since we expected any value in the range from 0 to 1.
[b]Our prior was exp(.2), since we knew that our result should be a positive number and we expected that the average number of news media or political followees was around 5, and the distribution was exponential.

majority of users (73%) prefer anti-government leaning followees, 13% prefer pro-government leaning ones, and 14% have balanced preferences. The results suggest that the Polish follower–followee network is more polarized than the Hungarian one, however, it is also overwhelmed by users who mostly follow anti-government accounts.

A total of 74% of users belong to moderately to highly homogeneous anti-government leaning communities 1, 3, and 4 (mean of the users' preferences in community 1: 0.159; in community 3: 0.185; and in community 4: 0.316). The main differences between them are the average number of followees (community 1: 3.1; community 3: 5.9; and community 4: 7.1), the proportion of given news media outlets' accounts, and political accounts.

The other two communities are rather heterogeneous. The mean of users' preferences in community 2 is 0.47, which is close to the neutral score of 0.5; however, the highest *SD*—0.322—occurs here, which indicates great variation in the preferences. The distribution of data (see Figure 2) suggests that this community encompasses large proportions of users with extreme preferences, but also users with balanced ones.

The last community (5) comprises users with moderately anti-government preferences (21%), balanced preferences (36%), and a dominant group of users with pro-government preferences (43%); thus, the mean of users' preferences is slightly pro-government. However, the average number of followees is one of the lowest (3.4). As a result, we also classify this community as heterogeneous.

The combined results suggest that a majority of Hungarian and Polish Twitter users have politically biased preferences. A total of 55% of Hungarian and 48% of Polish users are

Table 3. Top Vertices in the Communities According to Their Indegree Score. Hungary.

Community	Main vertices (inside community indegree score and share of users who follow the vertices in brackets)
1	hvg_hu (151,845, 100%), TV2_HUN (69,469, 45.75%)
2	hvg_hu (27,088, 62.08%), TV2_HUN (15,543, 35.62%), mno_hu (10,502, 24.07%), indexhu (10,048, 23.03%), dajcstomi (8,962, 20.54%), Atlatszo (8,852, 20.29%), 444hu (7,209, 16.52%), ketfarkukutya (6,652, 15.25%), Fideszmpsz (6,076, 13.93%), magyar_hirlap (5,816, 13.33%), narancsonline (4,644, 10.64%), nepszava (4,560, 10.45%), JobbikMM (4,231, 9.7%), atv_hu (4,118, 9.44%), Origo_hu (3,954, 9.06%), lehet_mas (3,914, 8.97%), mszptweet (3,754, 8.6%), nolhu (3,724, 8.54%), 24ponthu (3,197, 7.33%), szanyitibor (2502, 5.73%), kdnp (2361, 5.41%), javorbenedek (2196, 5.03%), EC_Budapest (1585, 3.63%), zoltanspox (1507, 3.45%), hirtv (1188, 2.72%), vagoi (1147, 2.63%), portfoliotwitt (1102, 2.53%), szigetv (997, 2.29%), HungaryToday (964, 2.21%), jobbikit (962, 2.2%), 888ponthu (924, 2.12%), RTLHirado (893, 2.05%), hungariantimes (810, 1.86%), MagyarParlament (662, 1.52%), vonagaborjobbik (654, 1.5%), fuggetlennemzet (647, 1.48%), kisalfoldhu (616, 1.41%), jobbikvas (570, 1.31%), FideszEP (531, 1.22%), hir7hun (491, 1.13%), hetilap (396, 0.91%), delmagyar (375, 0.86%), momentumhu (326, 0.75%), 168_Ora (309, 0.71%), MInapilap (257, 0.59%), hungary_journal (154, 0.35%), Riposthu (139, 0.32%), DKoalicio (115, 0.26%), MLPLiberalisok (106, 0.24%), M1Hirado (75, 0.17%), lokal_hu (52, 0.12%), n1tv (40, 0.09%), KeletMO_napilap (27, 0.06%)
3	mno_hu (38,538, 100%), TV2_HUN (29,788, 77.29%), hvg_hu (28,763, 74.63%)
4	TV2_HUN (161,827, 100%), hvg_hu (26,987, 16.68%)
5	Fideszmpsz (19,326, 91.88%), hvg_hu (16,652, 79.16%), TV2_HUN (15,387, 73.15%), mno_hu (10,554, 50.17%), mszptweet (7,085, 33.68%), dajcstomi (7,084, 33.68%)
6	dajcstomi (39,086, 100%), hvg_hu (31,942, 81.72%), TV2_HUN (23,761, 60.79%), mno_hu (4,938, 12.63%)

heavily biased, meaning that they follow only one-sided accounts. The users rarely follow many political or news media accounts. Their number is, on average, limited to 1.9 in Hungary and 5.6 in Poland.

These findings support our hypothesis that Twitter users follow accounts with which they share political leanings and avoid accounts that support views different from theirs. However, in both the countries we have detected minor communities that comprise a relatively large proportion of users with balanced preferences (from 13.4% to 58% in Hungary, and from 5.6% to 35.9% in Poland).

The types of nodes in the networks are important to understand the differences between communities. Both in Poland and Hungary we can distinguish main news media accounts that are followed by users in all clusters (see Figures 3 and 4). In Hungary these are: TV2_HUN, hvg_hu, mno_hu; and in Poland: tvn24, NewsweekPolska, gazeta_wyborcza, tvp_info, gazetapl_news, TygodnikWPROST, Radio_TOK_FM, Polityka_pl. Clusters differ in the proportion of users who follow these accounts, but always at least a few percents of users in every cluster do it. What we find important is that there is no similar pattern of divisions in the case of political accounts. In Hungary, in half of the communities (3 out of 6) users do not follow accounts of politicians or political parties. Yet, in only one community users followed accounts affiliated with only one political option (community 6). In other cases, the followed political accounts are diversified (belong to pro- and anti-governmental politicians and political organizations). In Poland, there is one political account that was followed by users in all communities and it belongs to the Prime Minister. However, inside the communities we did not notice any clear patterns of preference of political accounts. As in the case of Hungary, Twitter users in Poland follow a variety of politicians and political organizations. Thus, we may conclude that political divisions are not observed in Twitter's follower–followee network structures in both the countries.

The results suggest that differences between communities depend on news media preferences but also—which we believe is more important—on a number of followed political accounts. There are communities in which users follow only or mostly news media accounts, and communities in which users also follow accounts of politicians or political organizations. But they follow diversified (both pro- and anti-government) accounts. Also, in these communities the number of followed accounts is significantly higher than the mean. It leads to the conclusion that the main differences between communities do not base on partisanship, but they reflect rather how interested users are in what political accounts publish on Twitter without division on pro- or anti-government accounts.

Concluding Remarks

This study has explored Twitter's follower–followee network structures in two CEE countries to assess whether communicative segregation is particularly salient on social media. Twitter is commonly known as a social media platform and news source (Bastos, Travitzki, & Puschmann, 2012) that increasingly polarizes the political communication ecosystem. This is because Twitter users mostly see content from the other users they choose to follow. Networks of connected users on Twitter define the set of content to which each user is exposed. Fears are rising that such personal selection creates communicative situations in which certain ideas, beliefs, or data points are reinforced through repetition in a closed system that does not allow for the free movement of alternative or competing ideas or concepts (Sunstein,

Table 4. Top Vertices in the Communities According to Their Indegree Score. Poland.

Community	Main vertices (inside community indegree score and share of users who follow the vertices in brackets)
1	tvn24 (831,904, 78.3%), NewsweekPolska (514,309, 48.41%), gazeta_wyborcza (421,866, 39.7%), tvp_info (353,603, 33.28%), gazetapl_news (336,115, 31.63%), TygodnikWPROST (226,902, 21.36%), PremierRP (208,241, 19.6%), Radio_TOK_FM (153,740, 14.47%), Polityka_pl (64,411, 6.06%)
2	PatrykJaki (144,860, 34.73%), tvn24 (135,174, 32.41%), prezydentpl (120,452, 28.88%), SchetynadlaPO (115,797, 27.76%), PremierRP (114,583, 27.47%), pisorgpl (110,334, 26.45%), trzaskowski_ (107,684, 25.82%), tvp_info (105,855, 25.38%), NewsweekPolska (102,953, 24.69%), gazeta_wyborcza (89,488, 21.46%), Macierewicz_A (75,226, 18.04%), marekjurek (75,123, 18.01%), ZiobroPL (74,740, 17.92%), gazetapl_news (73,987, 17.74%), RobertBiedron (72,844, 17.47%), JkmMikke (72,758, 17.45%), Gasiuk_Pihowicz (72,627, 17.41%), TygodnikWPROST (69,252, 16.6%), jbrudzinski (61,416, 14.73%), Radio_TOK_FM (56,801, 13.62%), rzeczpospolita (54,879, 13.16%), TomaszSiemoniak (52,391, 12.56%), Jaroslaw_Gowin (51,461, 12.34%), Polityka_pl (50,915, 12.21%), Arlukowicz (46,111, 11.06%), Nowoczesna (46,009, 11.03%), KosiniakKamysz (45,952, 11.02%), MarekKuchcinski (44,814, 10.75%), MorawieckiM (43,065, 10.33%), bbudka (41,711, 10%), DoRzeczy_pl (40,155, 9.63%), PAPinformacje (38,621, 9.26%), 300polityka (38,357, 9.2%), Platforma_org (37,843, 9.07%), r_czarnecki (37,736, 9.05%), AndrzejHalicki (35,917, 8.61%), FaktyTVN (35,470, 8.5%), StKarczewski (34,105, 8.18%), wPolityce_pl (32,649, 7.83%), Tygodnik_Sieci (32,572, 7.81%), WiadomosciTVP (32,414, 7.77%), niezaleznapl (31,919, 7.65%), ZandbergRAZEM (31,695, 7.6%), KLubnauer (29,569, 7.09%), wassermann_ma (28,412, 6.81%), PiotrGlinski (27,845, 6.68%), SlawomirNitras (26,703, 6.4%), SlawekNeumann (26,529, 6.36%), RMF24pl (26,503, 6.35%), JoannaLichocka (26,177, 6.28%), pkukiz (25,526, 6.12%), polskathetimes (25,201, 6.04%), JoankaSW (25,191, 6.04%), Kukiz15 (25,144, 6.03%), jakubiak_marek (24,516, 5.88%), PresidentWalesa (23,738, 5.69%), Andruszkiewicz1 (23,656, 5.67%), M_K_Blonska (23,324, 5.59%), natematpl (22,477, 5.39%), RobertWinnicki (22,354, 5.36%), TygodnikLisicki (22,260, 5.34%), styszka (21,951, 5.26%), szefernaker (21,810, 5.23%), KrystPawlowicz (21,655, 5.19%), RadioMaryja (21,592, 5.18%), _Wolnosc (21,221, 5.09%)
3	tvn24 (35,870, 58.16%), NewsweekPolska (29,174, 47.3%), gazeta_wyborcza (26,707, 43.3%), RobertBiedron (25,549, 41.43%), gazetapl_news (23,879, 38.72%), tvp_info (23,831, 38.64%), Arlukowicz (23,263, 37.72%), PremierRP (23,106, 37.46%), TygodnikWPROST (20,047, 32.5%), Radio_TOK_FM (15,962, 25.88%), Polityka_pl (10,433, 16.92%), MichalBoni (9,987, 16.19%), marekjurek (9,474, 15.36%), SlawomirNitras (7,886, 12.79%), rzeczpospolita (7,174, 11.63%), Jaroslaw_Gowin (5,139, 8.33%), TomaszSiemoniak (5,054, 8.19%), EwaKopacz (4,137, 6.71%), prezydentpl (3,924, 6.36%), joannakluzik (3,784, 6.14%), ProtasiewiczJ (3,556, 5.77%), 300polityka (3,405, 5.52%), KosiniakKamysz (3,199, 5.19%)
4	tvn24 (134,077, 63.34%), NewsweekPolska (94,398, 44.59%), gazeta_wyborcza (87,808, 41.48%), tvp_info (83,740, 39.56%), gazetapl_news (76,601, 36.19%), TygodnikWPROST (58,871, 27.81%), Radio_TOK_FM (48,792, 23.05%), PremierRP (43,889, 20.73%), FaktyTVN (41,873, 19.78%), rzeczpospolita (39,594, 18.7%), Polityka_pl (38,702, 18.28%), RMF24pl (36,746, 17.36%), polskathetimes (33,130, 15.65%), WiadomosciTVP (31,458, 14.86%), natematpl (24,062, 11.37%), wirtualnapolska (22,427, 10.59%), RadioZET_NEWS (20,706, 9.78%), RadiowaTrojka (20,684, 9.77%), prezydentpl (20,411, 9.64%), DziennikPL (20,325, 9.6%), 300polityka (20,214, 9.55%), tygodnik (16,558, 7.82%), RobertBiedron (15,450, 7.3%), PR24_pl (14,404, 6.8%), PAPinformacje (13,235, 6.25%), pisorgpl (12,551, 5.93%), marekjurek (11,959, 5.65%), onetpl (11,012, 5.2%), Arlukowicz (10,912, 5.15%), FAKT24PL (10,906, 5.15%)
5	prezydentpl (44,675, 87.09%), NewsweekPolska (21,785, 42.47%), PremierRP (21,634, 42.17%), tvn24 (19,025, 37.09%), gazeta_wyborcza (12,575, 24.51%), tvp_info (12,230, 23.84%), PAPinformacje (9,765, 19.04%), gazetapl_news (8,407, 16.39%), TygodnikWPROST (6,659, 12.98%), Radio_TOK_FM (5,508, 10.74%), Polityka_pl (4,944, 9.64%), rzeczpospolita (3,086, 6.02%)

2017). The lack of cross-cutting interactions is especially dangerous in the realm of political discussion as it produces echo chambers by letting people communicate only with like-minded groups. Moreover, it is widely argued that echo chambers are not compatible with the normative claim of plurality in obtaining political information. While digital media have great potential for cross-ideological exposure, they also allow users to avoid individuals and information sources with whom they disagree (Gergen, 2008). Individuals tend primarily to form new social network connections with others who are often similar to them (McPherson et al., 2001), leading to fragmented interactions and divided groups that are increasingly homogeneous (Matuszewski, 2018a; Van Alstyne & Brynjolfsson, 1996). Focusing on self-exposure to information sources, Sunstein (2007, 2017) warned that the availability of a growing number of sources leads to a narrowing of the scope of the news and views to which people choose to expose themselves.

This work challenges the notion of existence of echo chambers on Twitter. To some extent, our findings support the sets of theoretical claims and empirical evidence that are provided by previous studies. We demonstrated that Twitter follower networks are clustered in Hungary and Poland. In other words, the results of the study confirm that group division is prevalent in social media. However, it appears that, in both countries, there are significant

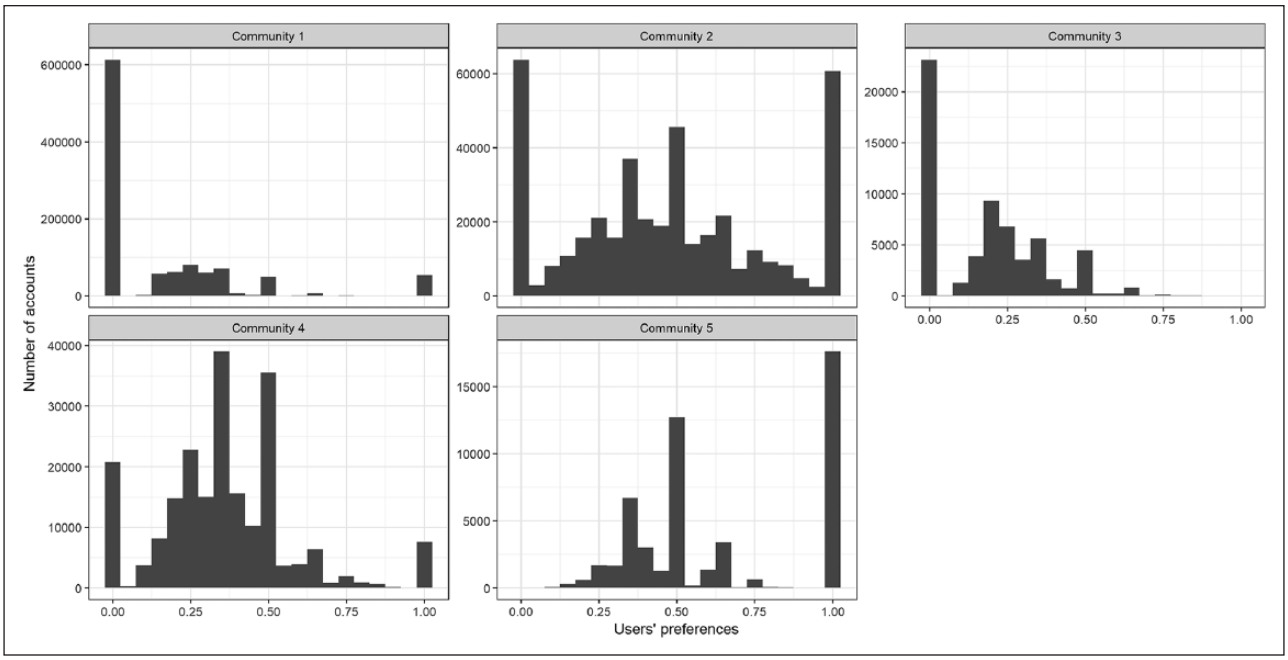

Figure 2. Preferences of users in communities: Poland.

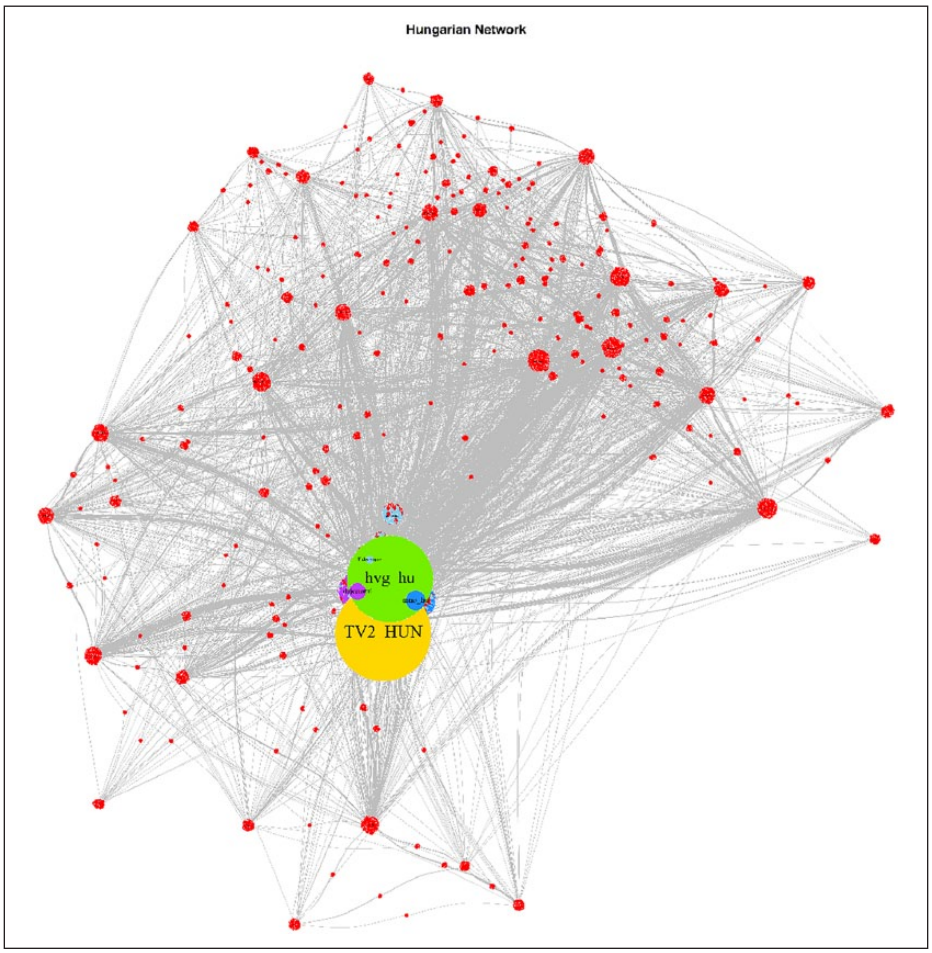

Figure 3. Communities in the Hungarian network. Sample of 100,000 users. Colors based on community detection performed on the whole network.

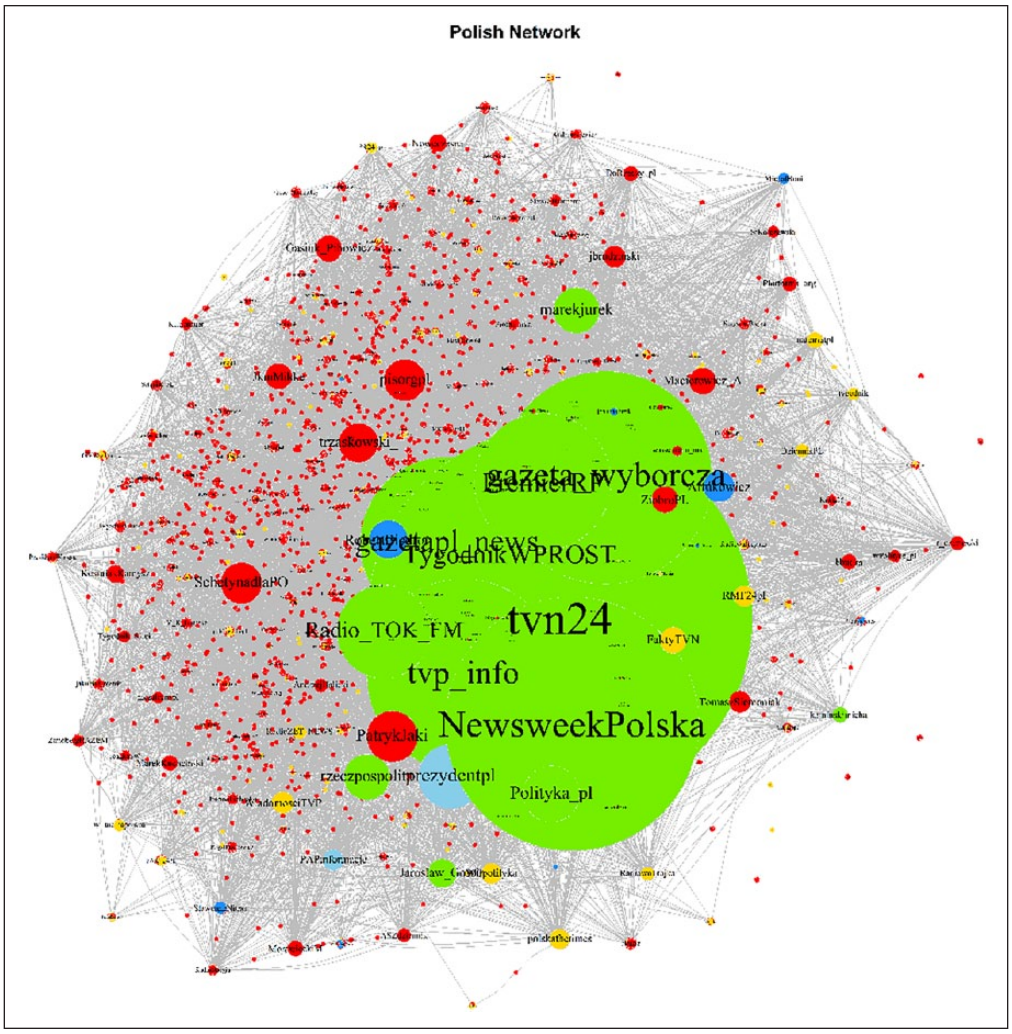

Figure 4. Communities in the Polish network. Sample of 100,000 users. Colors based on community detection performed on the whole network. Only the names of the 100 users with the highest indegree score are visible.

proportions of users who follow diverse politically relevant Twitter accounts. With this in mind, we argue that Twitter has the capacity to facilitate multiple-sided exposure in obtaining political news.

In this article, we have shown that the digital citizens of two politically polarized societies from CEE do not selectively avoid cross-cutting information. Our main empirical claim is that segregation on Twitter has not axiomatically been found on partisanship. This observation is even a more meaningful contribution to the digital political sciences, since Hungary and Poland are among the least ethnically and linguistically diverse, but most politically polarized countries in the EU. The results indicate that fragmentation in follower–followee networks on Twitter does not conform to the metaphor of the echo chamber in either Hungary or Poland. Considering this, we advocate keeping an equal conceptual distance from both optimistic and pessimistic accounts of the impact of social media on exposure to politics. Since sharp group divisions have been discovered in both the cases examined, the findings of our empirical analysis cannot fully support the claim of the optimistic view that Twitter users have been inundated with an unlimited amount of information from numerous sources and contrasting viewpoints (Park & Kaye, 2017). Similarly, neither is the pessimistic assumption that Twitter provides limited potential for cross-ideological interactions (Stroud, 2008; Sunstein, 2008) proven by our analysis. Therefore, we join the branch of literature that calls for the theoretical and paradigmatic renewal of research on political exposure in social media (Bruns, 2017; Karlsen, Steen-Johnsen, Wollebæk, & Enjolras, 2017; Vaccari et al., 2016). This study cautiously suggests going beyond not only the echo chamber metaphor but also the thesis concerning Twitter's perceived role in the practice of deliberative democracy in CEE countries. Cross-ideological exposure might exist on Twitter, though without a substantial contribution to the

communicative integration of the follower–followee network groups that deliberation requires.

We are nonetheless aware of some inherent limitations of our analysis. A first limitation is that Twitter is a platform for elite communication in both countries. Therefore, we should be wary of generalizing the findings to other members of the population. The second limitation concerns the definition of the connection between Twitter accounts: our analysis discovered one major mechanism for political interaction on social media—following someone's update on Twitter. Other discursive mechanisms, such as retweeting or mentioning, remain hidden from our eyes. Referring to the work of Conover and his colleagues (2011), one can argue that the partisan division in the network of retweeting significantly differs from the network of mentioning. If the Twitter networks in Hungary and Poland had been organized around other connections—and not follower–followee relationship—the analysis might have resulted in slightly different findings. The third limitation is that we have analyzed only what users had chosen to follow, but we cannot be certain that they are, or how often they are, exposed to content from the selected accounts. In Hungary, the average number of accounts followed is 62.4 (median = 24), and in Poland it equals 252.4 (median = 43). It is possible that updates from political and news media accounts are not the most important consideration and that Twitter algorithms expose only some of them to users, and these not necessarily evenly. Thus, it is important to distinguish the initial intention to obtain specific content (which we have analyzed) from actual exposure to it. Finally, our study was not able to assess the motivation of Twitter users in deciding which accounts they follow and the ways in which they engage with shared information on social media.

Further research is required to examine the full scope of political interactions on Twitter. We also lack comparative data from post-authoritarian countries, which would be essential to see potential common patterns in the online segregation. Such comparisons would significantly contribute to the comprehension of similarities and differences between societies which experienced dictatorship. It is plausible to assume that sharp group division on digital platforms can be connected to the deep societal cleavages that are usually considered as post-authoritarian heritage in CEE (Evans, 2004). In addition, there is a pressing need for a systemic analysis to discover whether there is an interplay between Twitter networks, the structure of the public discourses, and the quality of democracy. In light of the recent rise and consolidation of populism, it is tempting to say that separation in digital public spaces contributes to the spread of fake news and social distrust around the globe (Gerbaudo, 2018; Postill, 2018).

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Notes

1. http://kozossegikalandozasok.hu/2017/01/04/magyarok-a-kozossegi-mediaban-2017-elejen/
2. https://www.wirtualnemedia.pl/artykul/twitter-jacy-sa-jego-polscy-uzytkownicy-przewazaja-mezczyzni-osoby-z-duzych-miast-i-ze-srednim-lub-wyzszym-wyksztalceniem-analiza
3. https://drive.google.com/file/d/1pwWmEBKt6TkrvKEefwjCjeQn-JauT505/view
4. We define them as accounts that are not politically affiliated and provide exposure to diverse topics and opinions (Sunstein, 2018: 84).

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