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Fragmentation in high-choice media environments from a micro-perspective: Effects of selective exposure on issue diversity in individual repertoires

Abstract: Online communication is often seen to promote audience fragmentation because it facilitates selective exposure and therefore is likely to divide audiences into sub-publics that hardly share common issues with other sub-publics. This study takes a micro-perspective on fragmentation by focusing on issue diversity in media items users have encountered in a particular week. Diversity was assessed via content analyses based on online diaries of 645 participants who recorded their media use concerning the German debates on climate change and federal elections. Findings show lower degrees of diversity for users of non-journalistic online media than for users of journalistic mass media.

Keywords: fragmentation, selective exposure, issue diversity, media repertoires

Introduction

In the last two decades, online media have greatly expanded the number of available media items (Neuman, Park, and Panek, 2012). This expansion does not only result from non-journalistic online media (NJO) but also from the mass media's online services. Content expansion through NJO, on the one hand, and mass media, on the other hand, is likely to have different effects on the public agenda. While the mass media's online offshoots follow the "media logic" (Strömbäck and Esser, 2014) and apply journalistic norms and routines (Boczkowski, 2010; Haßler, Maurer, and Oschatz, 2014), NJO do not need to comply with journalistic

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criteria. They primarily follow the users' individual preferences in user-generated content (UGC; Dylko and McCluskey, 2012) conveyed in blogs, or via social network sites (SNS) or the logic of actors sustaining political or commercial websites. While the online expansion on the side of the mass media may be assumed to lead to 'more of the same', NJO may be assumed to apply a different selection logic and thus contribute to a higher degree of diversity.

From a public-sphere theory perspective, an increase in diversity enhances the validation of claims in public discourse, thereby improving the chances of generating "considered public opinions" (Habermas, 2006, p. 412), of finding better solutions, and of achieving consensus or of identifying irreconcilable differences. In public-sphere theory, 'public opinion' includes all types of claims. Since issues reflect selective relevance assignments, issues are an important dimension of public opinion.

In "high-choice media environments" (Prior, 2005, p. 577) such as online communication the chances to consider conflicting opinions which may later result in considered opinions are limited. This relates to changes in media exposure that go hand in hand with the expansion of media content in general, but particularly regarding online content. Considering the large number of political news items on offer, media exposure has become increasingly selective. If every user chooses a different news item, the audience divides into small fragments with only few overlaps between the media repertoires (Hasebrink and Popp, 2006), and only few common issues for public discourse (McQuail, 1997; Webster and Phalen, 1997).

The relation between expanded content and a necessarily lower share of media exposure has attracted attention ever since the mass media started to increase the range of television programs. Applied to diversity in online environments, the phenomenon is referred to as "paradox of online communication" (Mutz and Young, 2011). It states that more content diversity on offer allows for more selectivity in media use, which will most likely follow the user's opinions. Consequently, the degree of diversity in the aggregated media content encountered by an individual user across channels and platforms will be low. Accordingly, these media repertoires will be internally homogeneous, but heterogeneous if the entire spectrum of individual media repertoires is considered.

From a macro-perspective, the existence of homogeneous clusters that clearly deviate from other homogeneous clusters translates into audience fragmentation. Since users with a preference for NJO can choose from a particularly large set of media items representing diverse opinions, they are more likely to split up along ideological lines. Hence, online use may be assumed to promote fragmentation. This line of thought forms the conceptual background of this study. It aims at assessing the impact of online media use on the degree of fragmentation by

measuring issue diversity in individual media repertoires on the micro-level. The research question is tackled in an online diary study that investigates individual media use on the German debates about climate change and federal elections.

Diversity in high-choice media environments

It is obvious that there is no linear relationship between an increase in media items and an increase in diversity. Diversity may only increase to the degree to which the ongoing expansion of political content can be attributed to users or other non-journalistic actors not following the media logic. The potential increase in diversity through NJO content applies, although it is not necessarily more diverse in itself. As opposed to mass media content, which ideally aims at balanced reporting, NJO content only represents the view of an individual user or a website operator. Consequently, the chances to encounter a high degree of diversity are limited if a user only attends to one or a few NJO outlets. However, due to the broad range of users and websites represented on the web, the aggregate of all NJO outlets will most likely show a high degree of diversity. As this differentiation shows, the degree of diversity in NJO depends on the aggregation level on which it is measured. When studying the effects of online communication, the individual users' exposure to online communication in general and NJO content in particular has to be considered before drawing a conclusion about the diversity a given user is exposed to. This perspective has increasingly received attention among scholars of selective exposure under online conditions.

Selective exposure to online media

While it is commonly agreed that it takes a high degree of diversity in the individual media repertoires to develop a considered opinion, empirical evidence is contradictory. Several studies point to a positive effect of NJO on opinion diversity: Y. Kim (2011) showed that the use of SNS in general determines the extent to which users come into contact with opinion-challenging content and substantiated this for using Facebook and Twitter (Y. Kim, Hsu, and de Zuñiga (2013). An, Cha, Gummadi, and Crowcroft (2011) also emphasize the positive role of online communication. They showed that follower audiences received a considerable amount of politically diverse news content by reading (re-)tweets. These studies support the weakened social boundaries thesis, which argues that members of social networks, over time, may build up "weak ties" (Granovetter, 1973) with

others not part of their inner social circles likely to have different positions (Brundidge, 2010, p. 684).

However, there are strong theoretical arguments and empirical findings supporting the opposite view. The first argument regards the concept of selective exposure (Cotton, 1985). Given the abundance of different information sources, users can easily find content in line with their own preferences and selectively restrict their exposure to supportive information, thereby decreasing the diversity in their individual media repertoires. Media exposure then mostly reflects users' personal opinions, and communication is restricted to an exchange between like-minded peers. Referring to Sunstein's (2001) seminal book, these homogeneous spaces have been frequently labeled echo chambers.

Selective exposure has been shown to be a typical media use pattern for online media in general and for NJO in particular. The research tradition in this field has been very productive, thus a few selected studies exemplify the types of studies that have generated the evidence for selective exposure in online environments. Using an experimental design, Garrett (2009) found that people prefer opinion-congruent over opinion-challenging online content. Other studies revealed an ideology-coherent use of blogs (Johnson, Bichard, and Zhang, 2009), and a tendency to link to blogs, micro-blogs and SNS from like-minded users (Adamic and Glance, 2005; Conover et al., 2011; Gaines and Mondak, 2009). Considering the evidence from the total body of literature on selective exposure to online media, the assumption of selective exposure to NJO content rests on a sound empirical basis.

Audience fragmentation through online media

Although the individual echo chambers resulting from selective exposure are a micro-level phenomenon, they point to the macro-level phenomenon addressed in the concept of audience fragmentation. Selective exposure divides the audience into small sub-publics with little or no overlaps with other sub-publics. This lack of shared media content between audience members is commonly referred to as audience fragmentation (McQuail, 1997; Webster and Phalen, 1997). It is important to note, however, that the inference from selective exposure to fragmentation presupposes that users follow different criteria for selective exposure.

While some scholars have raised concerns about audience fragmentation in high-choice media environments (e.g., Bennett and Iyengar, 2008), other scholars see no reason to worry. In this relatively new research field, not only the findings are still inconsistent, but also the perspectives and the corresponding indicators are diverse and contested. Some scholars study audience fragmenta-

tion by assessing the overlaps between audiences of different media outlets or channels, while others focus on the degree of issue diversity in the aggregated media content that users encounter. These two strands of research are not systematically associated with evidence for or against fragmentation. For both types of indicators, the findings are mixed.

The audience overlaps perspective

Findings. Based on individual tracking data from a large U.S. sample, Webster and Ksiazek (2012) found a high degree of audience overlap between the online and television audiences of more than 200 television channels and online outlets. Further evidence against fragmentation through online communication was provided by Gentzkow and Shapiro (2011). They collected tracking data of individual online media use at two points of time, 2004 and 2008, and found that U.S. conservatives and liberals share a substantial amount of online content in their media use.

Two other studies of audience fragmentation for online news sites, however, diverge from the previous findings. Boczkowski (2010) showed that articles from online news providers that do not overlap with those from other online news sites are accessed more frequently than articles that share content with other articles. The preference for unique rather than shared content indicates that the audience is dispersed across very different news items. Moreover, Tewksbury (2005) distinguished between audience and outlet specialization and found that some online outlets, such as the *BBC* or *USA Today*, attract audiences with special interests rather than general audiences. Furthermore, the sociodemographic composition of some online news audiences significantly differs from other audiences.

Critique. The evidence for or against fragmentation through online media use provided by this strand of research is conflicted. There is a fair chance that audiences overlap under the conditions of online media, but at the same time, there is evidence indicating that online media use promotes the splitting-up of audiences. However, reliable conclusions may be premature due to the shortcomings of this research perspective. Some studies on audience overlaps have focused on high-reach online media (Tewksbury, 2005; Webster and Ksiazek, 2012), mostly disregarding the low-reach online content in the long tail (Anderson, 2006). Because there are presumably fewer overlaps between audiences in the long tail, fragmentation is likely to be underestimated.

A problem caused by focusing on channel overlaps is the disregard of the particular content that users encounter via those channels (see, for an exception,

Tewksbury, 2005). Thus, it is unclear whether users have encountered the same media items within the same channels. This shortcoming can result in an overestimation of fragmentation if users have encountered different items on a shared channel or an underestimation if users have encountered the same item on different channels. Therefore, the content that audience members encounter via different channels and platforms must be analyzed to determine whether subsets of the public sphere are cut off from debates.

The diversity of issues perspective

Findings. Schönbach, de Waal, and Lauf (2005) contributed to fragmentation research using an approach based on the diversity of issues. They analyzed whether internet use limits the diversity of issues encountered by individual users by measuring the number of issues media users considered important. Based on survey data, Schönbach, de Waal, and Lauf (2005) found that, while print media use had a positive effect on the diversity of issues people encountered, online newspapers had no effect. Apparently, online users encounter a less-complete range of issues than readers of print media.

In another study, de Waal and Schönbach (2008) investigated the degree to which audience members encountered diverse issues and how this was affected by their media use. The results of this study conflicted with their earlier findings. Although print media use still proved to be the main driver of issue diversity, the study showed that online news media use also slightly increased issue diversity. The more study participants used online media, the more issues they considered important. In order to analyze the effect of online communication on fragmentation, Gehrau (2013) related internet adoption to the diversity of issues that people perceived to be important on an aggregate level during the period 1994–2005. His findings do not support the assumption that online communication leads to fragmentation; he found almost no change in issue diversity as internet adoption increased.

Critique. The diversity of issues typically encountered by online users is not less than that faced by people using print media. Seen from this perspective, fragmentation through online media use is unlikely. However, diversity-driven studies do have some issues. They disregard the different types of media items encountered by users because they operate with very generic categorizations (e. g., internet adoption) or widely defined genres of online media use (e. g., online newspaper use). In consequence, the variance of issue diversity within more specific subtypes of online media and genres is largely ignored. Further, some analyses have not simultaneously considered traditional mass media and

online media (e. g., Gehrau, 2013). Hence, the particular role of online media in audience fragmentation remains unclear.

Synthesis

The empirical evidence against fragmentation caused by online media use outweighs evidence for fragmentation in both the studies based on the diversity of issues perspective and the studies based on the audience overlaps perspective. Online media do not appear to foster fragmentation. However, the total body of research on fragmentation does not allow a conclusive interpretation for two reasons: First, due to different levels of analysis, the findings are contradictory (Webster and Ksiazek, 2012). Second, the individual studies lack adequate designs, leading to validity problems in assessing fragmentation and impeding definite conclusions. This applies to both diversity studies and studies assessing audience overlaps. The study of audience fragmentation under online conditions reveals not only inconsistencies in terms of indicators, levels of analysis, and findings, but also deficits in the studies' set-up. This is particularly true for the outlet-centric research assessing the overlaps between audiences.

Moving fragmentation research forward: The media repertoires perspective

The present study aims to overcome these weaknesses by taking both online and offline media into account and considering the content that individual users encounter in all types of media over a given time span. These individual media repertoires include every single media item encountered by a media user. The media repertoires are sensitive to media use across channels and platforms and provide a fine-grained measurement of individual media use (e. g., S. J. Kim, 2014; Taneja, Webster, Malthouse, and Ksiazek, 2012). This allows selective exposure to be identified by comparing the large volume of available media content and the smaller volume of media content in each individual media repertoire. Assuming that users preferably select opinion-congruent content out of the wide range of media content on offer, selective exposure is indicated as soon as the diversity in individual repertoires is lower than the diversity in the media content on offer. Accordingly, this study investigates selective exposure via diversity in individual media repertoires. Due to the users' selection patterns, particularly pronounced in high-choice media environments, the media audience may split up into fragments clustering around sets of homogeneous content. As mentioned above, this

raises concerns about the quality of public discourse because the audience fragments are unlikely to share common issues. The degree to which media users share common issues, however, depends on the totality of issues in the individual repertoires. The greater the number of different issues that users encounter, the more likely they are to share common issues. Yet, as will be shown, statements on fragmentation are based on a different type of measure than statements on selective exposure.

Issue diversity can be divided into two concepts, each representing an important condition for a well-functioning public sphere. *Issue equability* marks the first concept and indicates the degree to which different issues have similar shares in a media repertoire. As this means that the issues are evenly distributed, this concept is very close to the everyday understanding of diversity: All issues receive the same amount of attention; there is no hegemonial issue in public discourse. This way, media users have the chance to encounter a broad range of issues which empower them to validate relevant claims of other users as well as media actors in public discourse.

Issue completeness is the second concept applied for measuring issue diversity. It indicates the degree to which individuals come into contact with the complete set of issues through media use. This relates to two problems: First, particular patterns of selective exposure may lead to a restricted picture of reality, which does not include all the issues necessary for opinion formation. Second, incomplete sets decrease the chance that users unanimously encounter a particular issue. In extreme cases, different users may not share any issues at all and public discourse on common issues would not be ensured. Hence completeness represents a key condition for impeding fragmentation.

Research question and hypotheses

Generally speaking, this study investigates the effect of online media use on audience fragmentation. It tackles the question by focusing on the micro-level of selective exposure and inferring the chances of fragmentation from the issue diversity in individual media repertoires. Because the use of NJO is assumed to facilitate selective exposure more than the predominant use of journalistic mass media, the research question is specified: The present study investigates to which extent the use of NJO affects the diversity of issues in the individual repertoires.

Based on a great deal of evidence for selective exposure and assuming that selective exposure decreases issue equability in the individual media repertoires, the following basic selective exposure hypothesis is derived:

H1a: Issue equability in individual media repertoires is lower than in the overall media content on offer.

Evidence further suggests that different types of media play different roles in selective exposure. Selective exposure may be particularly reinforced by NJO. In NJO, users are likely to find more content in line with their personal opinions because NJO are not committed to the selection logic and professional norms of the mass media. Applied to NJO, the selective exposure hypothesis reads:

H1b: NJO use leads to a less equal distribution of issues in the individual media repertoire than the use of mass media.

Because even under high-choice conditions, it is hard to avoid every media item which challenges the user's personal opinion, media repertoires are likely to comprise a wide range of issues. However, as opposed to mass media use, the use of NJO may result in a less complete range of issues in the repertoires, because NJO do not follow journalistic norms of balanced reporting, meaning that the respective users are unlikely to share common issues with other parts of the audience. This results in the following audience fragmentation hypothesis:

H2a: NJO use leads to a less complete range of issues in the individual media repertoire than the use of mass media.

Against the backdrop that personal characteristics related to political media use are known to affect political knowledge (see, e. g., Eveland and Hively, 2009), political interest, education, and sex are likely to affect the completeness of issues in individual media repertoires as well. Still, it may be assumed that the effect of NJO use is strong enough to persist, even if typical audience characteristics are considered simultaneously. Consequently, the last hypothesis addresses the relation between media use and audience characteristics:

H2b: H2a holds true, even when controlling for personal factors.

Method

Topics

The hypotheses were tested using data from two studies conducted in Germany in 2012 and 2013. The first study examined the topic of climate change, while the second study focused on the German federal election of 2013. Anthropogenic climate change is a topic of high social and political relevance, because it is widely agreed that climate change is caused by human-produced carbon dioxide emissions (e. g., Solomon, Plattner, Knutti, and Friedlingstein, 2009) that result in severe rises in temperature and sea levels worldwide. The national media dealt with the academic debate, climate change related civil engagement and consequences for a globalized economy. The federal election of 2013 marks another relevant political topic. As widely expected, chancellor Angela Merkel won the election. Coverage included events directly related to the campaign as well as a range of policy issues.

While electoral campaigns are regular, albeit temporarily confined periods of exceptional public interest, climate change is a long-term topic, which receives public attention mainly when being discussed at global political summits (Schäfer, Ivanova, and Schmidt, 2013). Investigating audience fragmentation in two different contexts, this study aims to minimize the limitations of single-context studies in order to increase the generalizability of its findings.

The climate change study was conducted during the Rio+20 United Nations Conference on Sustainable Development in Rio de Janeiro in June 2012 and the electoral campaign study was conducted two weeks prior to the German federal election in September 2013.

Data collection of individual level media use

The study's particular interest lies in the equability of issues in both mass media and NJO as well as in the equability and completeness of issues in the individual media repertoires. In order to collect data on the individual media use and to compose the individual media repertoires, two online diary studies were conducted.

Prospective participants were sampled from Facebook groups and blogs, and from a commercial panel. Three quota criteria were applied in order to recruit only those participants between the ages of 18 and 50 years who were at least moderately interested in politics, and habitually used some kind of mass media

or NJO as sources for political information. The restriction to the particular age group served the purpose of limiting potential age-related media selection biases. The other two sampling criteria were applied in order to increase the chances that participants attend to public affairs media items. By sampling participants from both NJO and a commercial panel, the study aimed to recruit individuals with different media preferences.

Selected participants were invited to take part in a seven-day online diary study. The online diaries were designed to record respondents' exposure to climate change related, or, respectively, election-related content in mass media and NJO. Exposure to television news, newspapers, and political magazines was assessed using closed-ended questions. Due to a great variety of media items, exposure to NJO was measured via open-ended questions. Every day, respondents were asked to provide the URLs or names of the websites they had visited that day.

The diary study was designed to overcome the bias of recall-based news exposure measures which tend to overestimate media exposure (Prior, 2009). It did not interfere with participants' daily media use routines (i. e., via observation of media use) and allowed for a valid measurement of media repertoires. It ties in with other fragmentation studies that have put particular emphasis on finding accurate patterns of media exposure (e. g., Tewksbury, 2005).

After the diary week, a final online survey was conducted to collect data on demographic and other personal characteristics. Participants were included only if they had kept the online diary for seven days and if they had taken the online survey. Since the study demanded commitment from the participants, dropouts, especially during the diary period, were inevitable, even though participants were incentivized through the chance to win prestigious goods (*Amazon Kindle* e-readers and costly bicycle panniers) if they completed the online diaries and the online survey.

In the climate change (CC) study, data from 444 participants was obtained. In the election (E) study, 201 participants were included in the analyses. Participants' demographic characteristics differed only slightly between the two studies. This applies to age (CC study: $M = 35.03$, $SD = 9.02$; E study: $M = 36.44$, $SD = 8.58$), sex (scaled from 1 "female" to 2 "male": CC study: $M = 1.43$, $SD = 0.50$; E study: $M = 1.51$, $SD = 0.50$), and education (scaled from 1 "no educational qualification" to 5 "university degree": CC study: $M = 3.70$, $SD = 1.30$; E study: $M = 3.68$, $SD = 1.35$).

Data collection on media content

After the diary period, the media items recorded in the diaries were collected and assigned to the respective individual media repertoires. The print media items were mainly obtained through the Lexis-Nexis database; small-circulation, local print media items were requested directly from media outlets. Television and radio programs were either downloaded from the outlets' websites or obtained via the onlinetvrecorder.com database. Online media items were downloaded using a web scraper which followed the URLs that the participants had recorded in their diaries. Online media items included either mass media websites of traditional media outlets or NJOs such as websites of NGOs or institutions, blogs, or publicly available SNS. If participants only recorded the name but not the URL of the online content they had used, the media items were retrieved via event and topic-specific search queries (CC study: "Rio+20", "climate change", "global warming"; E study: "Merkel" (incumbent), "Steinbrueck" (candidate of the opposition), "election", etc.). Considering that mass media usually update their content more frequently than NJOs, queries of journalistic media were limited to items from the day of media use, whereas NJO items were searched for based on a one-week period. In the CC study, 1,163 different media items were identified, for the E study it were 1,637. Mass media items were found in 68.4 % and 81.2 % of all media items in the CC study and the E study, respectively. NJO items comprised 31.6 % of all media items in the CC study and 18.8 % of all media items in the E study.

Independent variables

In order to test H1b, H2a, and H2b, the number of mass media or NJO items in the individual repertoires was calculated. In the CC study, the average number of mass media items encountered by individual users was 3.64 (SD = 4.75), and the average number of NJO items encountered by individual users was 1.12 (SD = 2.48). In the E study, the average number of mass media items was 16.22 (SD = 19.35), and the average number of NJO items was 2.38 (SD = 6.31). The difference reflects the comparatively high level of public interest during election campaigns.

Dependent variables

In order to assess the equability and completeness of issues in the individual repertoires, a quantitative content analysis of the media items encountered was con-

ducted using topic-specific coding schemes. The issues marked particular aspects of the two topics: In the CC study, 11 issues were identified that were found in at least 5% of all media items (logic also applied in the E study), five of them nonpolitical ("ecology", "ethics and civil society", "economy and globalization", "science", and "other nonpolitical issues"), six of them political ("environmental policy", "climate policy", "energy policy", "foreign policy", "economic policy", and "other political issues"). In the E study, only political issues were identified ("campaign and media events", "politicians", "parties", "economy and social policy", and "other political issues"). Intercoder reliability according to Holsti (1969) based on a sample of 40 media items was at .74.

Two indicators were constructed to capture equability and completeness as addressed in the hypotheses. Equability was used to test the selective exposure hypotheses (H1a and H1b). It was calculated based on a formula of standardized diversity (Agresti and Agresti, 1978), which was previously adapted for online selective exposure research (Brundidge, 2010):

$$Dst = (1 - \sum_{i=1}^{k} pi^2)/(1/1 - k)$$

In the above formula, k stands for the number of issues and p stands for the share of each issue in the individual media repertoire. The indicator is scaled from 0 (only one issue encountered [repeatedly] / minimum equability scenario) to 1 (all issues encountered [repeatedly] / maximum equability scenario). The values for this indicator in the CC study were the following: nonpolitical issues, $M = .54$, $SD = .35$; political issues, $M = .46$, $SD = .33$. In the E study, the corresponding value was $M = .72$, $SD = .26$.

Selective exposure in general (H1a) was studied by comparing the issue equability in the repertoires with the issue equability in the media on offer. The latter parameter is an aggregation of all media items from all the individual repertoires (CC study, unpolitical issues: $D_{st} = .96$; CC study, political issues: $D_{st} = .83$; E study: $D_{st} = .91$). Because this aggregation disregards items that were not encountered by any of the participants, it is only a proxy for the actual media items on offer. However, considering the great deal of variance in the media use between the individual participants, the equability in the media on offer can be assumed to be underestimated only slightly compared to the actual number of items on offer. For testing H1b, issue equability measures were correlated with either mass media or NJO use on the individual level.

The indicator for audience fragmentation addressed in H2a and H2b is the issue completeness in the individual repertoires. It reflects the degree to which the different issues in the media items on the two topics were encountered at least once. The variable is scaled from 0 (no issue encountered/incomplete scenario)

to 1 (all the different issues encountered at least once/complete scenario). In the CC study, the values for issue completeness included in the repertoires are the following: nonpolitical issues, $M = .34$, $SD = .31$; political issues, $M = .26$, $SD = .25$. The corresponding values in the E study are $M = .72$, $SD = .35$.

Control variables

For testing H2b, several control variables were considered. The following variables concern habitual media use: television news use (CC study: $M = 3.31$, $SD = 0.88$; E study: $M = 3.23$, $SD = 0.93$), political blog use (CC study: $M = 1.58$, $SD = 1.32$; E study: $M = 1.79$, $SD = 1.30$), and political SNS use (CC study: $M = 1.78$, $SD = 1.46$; E study: M = 1.76, $SD = 1.45$). They are scaled from 0 (never) to 4 (daily). Further, newspaper use (CC study: $M = 4.11$, $SD = 2.51$; E study: $M = 4.63$, $SD = 2.45$) was included, which is scaled from 0 (never) to 7 (daily). Cognitive characteristics included in the analyses are importance of climate change issue (CC study: $M = 3.14$, $SD = 0.90$), scaled from 0 (very unimportant) to 4 (very important) and interest in politics (CC study: $M = 3.78$, $SD = 0.90$; E study: $M = 3.99$, $SD = 0.92$), scaled from 2 (somewhat interested, participants with values 0 and 1 were previously filtered out due to quota criteria) to 5 (very interested). Finally, face-to-face interpersonal communication on both climate change (CC study: $M = 0.93$, $SD = 0.92$) and the German elections (E study: $M = 1.05$, $SD = 1.00$) was included. Face-to-face interpersonal communication is scaled from 0 (never) to 3 (extensively).

Results

H1a posited a general selectivity for all media users. The hypothesis was tested by comparing the issue equability in the content on offer with issue equability in the individual repertoires. For both topics, findings show a lower degree of issue equability in the individual repertoires than in the media items on offer (Table 1).[1] That means that the issues addressed in the media items represented in the individual repertoires were less evenly distributed than in the media items on offer. Instead, they showed a focus on few particularly pronounced issues while other issues were represented only marginally. While in the media items on offer atten-

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1 Since issue equability was compared between individual-level data for the repertoires and aggregate-level data for the media items on offer, the test of H1a did not allow for significance tests of difference.

tion was directed almost evenly across issues, users showed pronounced selection practices. Participants picked media items which focused on particular sets of issues. The findings indicate a general pattern of selective exposure and thus support H1a. This pattern was more pronounced for the climate change topic than for the election topic. The lower level of users' selectivity in the election topic may be explained through its prevalence in many media outlets during the campaign, which made it difficult to avoid particular election issues.

Table 1: Issue equability and general selective exposure.

	CC study: Non-political issues		CC study: Political issues		E study: Political issues	
	D_{st} (SD)	N	D_{st} (SD)	N	D_{st} (SD)	N
Overall content	.96	866	.83	701	.91	1632
Mass media content	.94	554	.78	475	.90	1325
NJO content	.97	312	.91	226	.95	307
Individual media repertoires	.54 (.35)	304	.46 (.33)	296	.72 (.26)	179

Note. D_{st} = Standardized diversity index (Agresti & Agresti, 1978).

It was assumed that users of NJO are more susceptible to selective exposure than users relying on the mass media (H1b). This hypothesis was tested by correlating the number of items from mass media with the issue equability in the individual repertoires and comparing it with the respective value for NJO. Naturally, both types of media use were positively and significantly related to issue equability (Table 2), meaning that the chance of encountering evenly distributed issues increased with every additional media item. If the correlation between mass media items and issue equability is higher than the correlation between NJO items and issue equability, the predominant use of mass media may be assumed to increase the equability more strongly. This would show that the type of media use makes a difference for the diversity of issues in the repertoires and that NJO use in particular may prevent users from encountering a diverse range of issues.

NJO use (r = .21 to .37) showed lower correlations than mass media use (r = .36 to .54). This means that NJO use was less likely to induce issue equability. Differences between the correlation coefficients were examined using an approach suggested by Weaver and Wuensch (2013).[2]

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2 William's t-test for non-dependent samples for comparing two non-independent correlations with one variable in common: in this case, the comparison between either the number of mass media *or* NJO items in the media repertoires with one common variable, issue equability

Correlations between either of the two media use types and issue equability differed significantly regarding nonpolitical climate change issues ($p < .001$). In contrast, and not in line with the hypotheses, the lower correlations for political issues related to NJO use did not differ significantly compared to mass media use ($p > .05$). Altogether, the findings are not entirely consistent, but considering the total picture, they still support the assumption of selective exposure. Thus, H1b is partially supported by the data: Using NJO is associated with more selective exposure.

Table 2: Selective exposure in individual media repertoires.

Correlations: Issue equability with	CC study Non-political issues		CC study Political issues		E study Political issues	
	r	N	r	N	r	N
Number of mass media items in media repertoire	.54***	304	.46***	296	.36***	179
Number of NJO items in media repertoire	.30***	304	.37**	296	.21**	179

Note. r = Pearson's correlation coefficient; **p < .05, **p < .01, ***p < .001.*

Given a higher susceptibility to selective exposure via the use of NJO, it was assumed that the two different types of media use result in different levels of issue completeness (H2a). The hypothesis was tested by comparing the correlations between media use and issue completeness in the individual repertoires. Both types of media use significantly increased the chances of coming into contact with issues in public discourse (Table 3). However, using mass media rather than NJO particularly resulted in greater opportunity to encounter the complete range of issues. This difference proved to be significant for both topics and both political and nonpolitical issues. Findings from both studies therefore strongly support H2a. They show that users who predominantly use NJO encountered a smaller range of issues, which makes them less likely to share issues with other audience members. Thus, these findings on the micro-level of individual media repertoires point to audience fragmentation on the macro-level.

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or issue completeness, respectively. See Weaver and Wuensch's (2013) corresponding SPSS syntax online: https://sites.google.com/a/lakeheadu.ca/bweaver/Home/statistics/files/6_Williams_test.txt?attredirects=0

Table 3: Micro-level audience fragmentation.

Correlations: Issue completeness with	CC study Non- political issues		CC study Political issues		E study Political issues	
	r	N	r	N	r	N
Number of mass media items in media repertoire	.74***	444	.75***	444	.54***	201
Number of NJO items in media repertoire	.49***	444	.54***	444	.26**	201

Note. r = Pearson's correlation coefficient; *p < .05, **p < .01, ***p < .001.

The next test concerns the question whether media use patterns affect the completeness of issues in the individual repertoires. Since this test considers user characteristics only (as opposed to the analyses regarding selective exposure), it is now possible to include alternative explanations for contact with the complete range of issues in a multivariate model. H2b was tested using OLS regression analyses. The findings (Table 4) show that the number of mass media and NJO items in the individual repertoires had the strongest positive effects on the completeness of issues: The more media items participants had encountered, the more likely they were to receive the complete picture of the political or nonpolitical issues in public discourse. With the exceptions of education, habitual TV news use, and political SNS use, which had slightly positive effects, none of the control variables affected the completeness of the issues. This finding clearly supports H2b. Further, the stronger positive effect of mass media use compared to NJO use, which was already shown above, remained very pronounced. The effect was stronger for the climate change topic than for the election coverage.

Table 4: Factors explaining issue completeness.

	CC study		E study
	Nonpolitical issues	**Political issues**	**Political issues**
	β *(SE)*	β *(SE)*	β *(SE)*
Block 1: Control variables			
Age	.01 (.00)	-.04 (.00)	.10 (.00)
Sex	-.07 (.02)	-.05 (.02)	.08 (.05)
Education	.03 (.01)	.06 (.01)*	.12 (.02)
Hab. TV news use	.06 (.01)*	.02 (.01)	.08 (.02)
Hab. newspaper use	.06 (.00)	.05 (.00)	.03 (.01)
Hab. political blog use	.00 (.01)	.03 (.01)	.00 (.02)
Hab. political SNS use	.08 (.01)*	.02 (.01)	.05 (.02)
Interest in politics	.00 (.01)	.00 (.01)	.06 (.03)
Importance of climate change issue	.00 (.01)	.00 (.01)	--
Face-to-face interpersonal communication	.02 (.01)	.05 (.01)	.09 (.03)
Adj. R^2 (%)	17.9	18.7	18.0
Block 2: Focal predictors			
Number of mass media items in media repertoire	.63 (.00)***	.61 (.00)***	.39 (.00)***
Number of NJO items in media repertoire	.29 (.00)***	.34 (.00)***	.15 (.00)*
Incremental adj. R^2 (%)	47.0	49.3	15.0
Total adj. R^2 (%)	64.9	68.0	33.0
N	427	427	188

Note. OLS regression, β = final standardized regression coefficient, *SE* = standard error;
*$p < .05$, **$p < .01$, ***$p < .001$.

Conclusion

The starting point of the study was the concern that high-choice media environments such as online media, and NJO in particular, promote audience fragmentation by ways of facilitating selective exposure. If media users select media items in line with their personal opinions, the audience splits up along ideological lines with only a few common issues shared between the members. Following the diversity-based line of fragmentation research, fragmentation was tackled by assessing issue diversity in media repertoires collected via online diaries. This provided the advantage that the exact content encountered by individual users was included in the analysis of audience fragmentation. Compared to the

outlet-centric approach that focuses on general channel preferences, only the present study allowed identification of selective exposure on a very fine-grained level. This served as a starting point for inferring the degree of fragmentation in high-choice media environments.

It was argued that selective exposure is indicated through a higher degree of issue equability in the media content on offer than in the media items individual users have selected. The findings supported the assumption of selective exposure for both topics under study. They showed that the issues in the media content on offer were distributed more evenly than in the users' media repertoires. Even though the findings are not completely consistent for all types of issues, the data show that using NJO leads to even more selective exposure than using mass media. Context matters, however: Political issues proved to be more immune to selective exposure than nonpolitical issues (e. g., social issues). This might be due to the users' relevance assignment to political issues and to the political issues' particular prevalence in all types of media, which limits individual selectivity. Other factors that drive selective exposure are interest in politics or issue involvement (see, for example, Knobloch-Westerwick and Meng, 2009). In the C study, in which selective exposure was more pronounced for nonpolitical issues than for political issues, most participants showed a high degree of interest in politics because political interest was one of the criteria applied to sample interested users of political media content. However, political interest was the same for both political and nonpolitical issues, indicating that interest in politics was probably not the factor causing variations in selective exposure in this study. Other plausible explanations for the different levels of selective exposure in the online world are hostile media perceptions that result in individuals' avoidance of dissonant media items (Borah, Thorson, and Hwang, 2015) and popularity cues such as aggregated numbers of likes or shares that accompany media items and may steer individual selection (Porten-Cheé, Haßler, Jost, Eilders, and Maurer, 2018; Messing and Westwood, 2014). These factors may differ for political and nonpolitical issues and lead to different levels of selective exposure.

With regard to fragmentation, it is particularly relevant whether users encounter the complete set of issues because it increases the chances of sharing common issues with other audience members. Findings show that mass media use increases issue completeness, while NJO use is likely to result in incomplete sets of issues. From this perspective, NJOs can take less credit than mass media for paving the ground for common public discourse. Altogether, this micro-level study has yielded evidence that the use of NJO such as SNS, blogs or websites reinforces selective exposure and may consequently result in audience fragmentation.

Limitations concern the comparison of the media items in the individual

media repertoires with the total media items on offer in the analysis of selective exposure. First, equalizing the total media items on offer with the aggregate of different media items in the individual repertoires underestimates the share of media items that do not attract much attention and do not reach a large audience. This share, however, cannot be quantified because there is no solution for determining which information was available to the individual user. Second, personal variables could not be included in the analysis of selective exposure because the analysis was based on a comparison between two data sets, one on the level of media users, one on the level of media items. Consequently, selective exposure could not be assessed on the level of users only. This, however, would be necessary in order to determine the impact of personal opinion on individual selection of media items with congruent or dissonant slants. Therefore, the impact of personal preferences usually assumed to guide media use (Hartmann, 2009) could only be considered in the analysis of issue completeness. A third limitation concerns the concentration on diversity in selective exposure. Widening the focus to include approaches that assess overlaps between audiences is likely to reveal the bigger picture and allow for more specific statements on the macro-level of audience fragmentation. Fourth, the study applied a user-centric approach to explain micro-level fragmentation, disregarding those people who do not usually rely on media for their information. As a consequence, the study does not demonstrate whether people who do not use media lose touch with relevant issues or compensate for their lack of media information by talking to peers. The regression models showed that face-to-face interpersonal communication had no effect on issue completeness on the individual level. This means that, for individuals not relying on media for information, education is the only factor that increases contact with relevant issues. Finally, much of the information users receive today appears due to the algorithmic preselection of online platforms such as the Facebook timeline. This news-finds-me perspective (Gil de Zuñiga, Weeks, and Ardèvol-Abreu, 2017) contrasts with the user perspective in this study, which applies diaries that are heavily dependent on the users' recall of the media items they encountered. Respondents could make entries in the online diaries while they read the media items; thus, even media items that were not actively selected could be recorded in the online diaries.

Despite these restrictions, the micro-approach to fragmentation applied in this study proved to be expedient because it went beyond general accounts of media use. Through the diary design it was possible to combine survey data and exact media use data in order to compose individual media repertoires. Investigating the effect of online media on audience fragmentation, it is indispensable to consider individual media use. Finally, fragmentation research should move in the following directions: First, a theoretical model that combines dif-

ferent thematic contexts, other media-level variables (e. g., popularity cues; see Messing and Westwood, 2014), and individual characteristics (e. g., hostile media perception; see Borah, Thorson, and Hwang, 2015) is needed to make the different approaches to fragmentation and their related findings more comparable. Second, fragmentation research in high-choice media environments must direct more attention to normative public sphere theory. This perspective would provide orientation in assessing critical levels of fragmentation that may harm public discourse and, subsequently, democratic opinion formation. Third, given the need for individual media use data in fragmentation research, methodical approaches applied in further studies should consider the analytical concept of media repertoires when assessing the overlaps in media content encountered by different users on multiple issues.

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