Algorithmic social media use and its relationship to attitude reinforcement and issue-specific political participation – The case of the 2015 European immigration movements

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Jakob Ohme

ABSTRACT

Selective exposure to likeminded political viewpoints on algorithmic social media platforms is considered a potential source of polarization of public opinion. We still know little about the proposed mechanism or how potential reinforcement of specific attitudes affects citizens' political behavior, especially in a nonelectoral context. Focusing on the issue of immigration during the refugee influx to Europe in autumn 2015, this study investigates the effects of social media usage on attitude reinforcement, connecting it to political participation in refugee-related activities. A panel study conducted among Danish citizens (n = 847) reveals that frequent social media usage reinforces existing attitudes and mobilizes political participation. However, citizens who become more extreme in their attitude toward immigration over time are found to be less likely to become politically active regarding this specific issue.

The algorithmic filtering of media content is a core concern for a digital society (Thurman, Moeller, Helberger, & Trilling, 2019). Media are important sources of information in the formation of political viewpoints and affect citizens' democratic participation (Delli Carpini, Cook, & Jacobs, 2004; Downs, 1957). But so far, little is known about how the algorithmic turn affects these core functions of democracy. The content selection mechanism of social media, which displays content in users' personalized newsfeed based on previous online behavior, is the defining characteristic that explains why these platforms specifically are believed to foster exposure to politically likeminded viewpoints (Garrett, 2009). Although users can initially curate their social media content (Thorson & Wells, 2015), most decisions about what people get to see rely on algorithms (Diakopoulos, 2019; Klinger & Svensson, 2018).

Research suggests that citizens on social media tend to select information that agrees with their personal predispositions; moreover, algorithmic media preselects content that is shown to users based on their previous user behavior (Bakshy, Messing, & Adamic, 2015; Messing & Westwood, 2014; Mothes & Ohme, 2019). So far, algorithmic influences on individuals' news exposure have been rarely explored (but see: Marquart, Ohme, & Möller, 2020; Thorson, Cotter, Medeiros, & Pak, 2019). The present study extends previous work on the role of news media use for attitude formation (e.g. Lecheler & de Vreese, 2012) and asks how the use of *algorithmic* media specifically is connected to the development of political attitudes and political participation.

I approach this question by adapting a specific part of the Reinforcing Spiral Model (RSM) by Slater (2007) to the algorithmic media environment. More specifically, we test whether using algorithmic media for political information exposure exerts different effects on the development of attitudes over time, compared to usage of other, nonalgorithmic media sources. Hence, attitude reinforcement – here understood as moderately positive or negative attitudes becoming more extreme over time – is the main concept under investigation. As described in the model, previous media exposure can influence attitudes that, in turn, influence subsequent media use. I argue that this spiral process is amplified by algorithmic media in two ways: (1) as explained in the original model, previous media use influences attitudes; but (2) algorithmic platforms boost this process by preselecting information for users to further engage

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with. Compared to *individual selective exposure* (Knobloch-Westerwick & Meng, 2009) as the main driver for attitude reinforcement in the original model, *algorithmic content selection* accelerates exposure to attitude consistent information and can contribute to attitude reinforcement. As a consequence, suggested in the RSM, I add the attitude-behavior relationship to this investigation to test whether attitude reinforcement as a result of algorithmic media use affects issue-specific political participation.

This study examines the formation of attitudes toward immigration as a part of citizens' social identity (Mangnum & Block, 2018). The investigation was conducted during the influx of immigration to the European continent in autumn 2015. It sheds light on the interplay between algorithmic media use, attitude reinforcement, and citizens' political activity in three ways. (1) The study examines whether algorithmic media use contributes to attitude reinforcement about *immigration* as a threat, and political participation in *refugee-related activities*. This coherence makes it possible to closely observe the contingency of the attitude-behavior relationship on algorithmic media use in nonelection times. (2) Based on a panel design with two online surveys (*n* = 847) conducted among the Danish population before and after the highest refugee movements (UNHCR, 2017), the study is able to model media effects on attitude changes over time. (3) A smartphone-based media diary was used on ten subsequent days in between the two survey waves. This approach addresses recent criticism of cross-sectional self-report measures of selective exposure (e.g. Nelson & Webster, 2017) and helps to distinguish clearly between the extent of citizens' exposure to *offline media, nonalgorithmic online media* or *algorithmic social media*.

Dynamics of immigration attitudes

Several million people took refuge and sought asylum in Europe in the year of 2015 (UNHCR, 2017). The sudden character of the influx of immigration, coupled with its size, was a challenge for European citizens and the politics of Europe. The topic of immigration was one of the most heavily debated issue in this year, and public opinion in many countries was divided on how to handle the high number of new arrivals. Denmark was not a main destination for most refugees during this time and the country subsequently took in only a relatively small number of asylum seekers (UNCHR, 2017). However, due to its geographical location, it was still affected. Being a neighboring country of Germany that took in almost one million refugees in 2015, Denmark is also positioned on one of the main refugee tracks toward Sweden, at that time known for its friendly policy toward asylum seekers. Hence, the 'hot autumn' in the country was characterized by thousands of refugees walking in tracks on Danish highways, leading to scenes that ranged from a policeman playing with a small girl on a closed highway, to a citizen spitting from a bridge to the bypassing track of people. The immigration wave was a divisive topic in media coverage at this time: public opinion was divided on how strict immigration policy should be for newly arriving citizens (Hovden & Mjelde, 2019). Our study was conducted at this point in time, presenting us with a unique opportunity to study the interplay between media use, attitude development, and political participation.

Attitudes toward immigration are important for three main reasons: they measure public support for policy decisions such as immigration legislation; they influence the everyday behavior of citizens that can affect successful integration and the wider social climate in a country; they help to determine national identity, who is a member of the host society and who is not (Esses, Dovidio, & Hodson, 2002). Research shows that attitudes toward immigration can be affected by media exposure (Diehl, Vonbun-Feldbauer, Barnidge, 2019; Jacobs, Meeusen, & d'Haenens, 2016); however, how far media use is *responsible* for attitude change over time is a different question.

Research on the dynamics of immigration attitudes is sparse and evidence differs across countries. Meuleman, Davidiov, and Billiet (2009) find long-term attitude changes in 10 of the 17 studied countries over a time frame of five years. In contrast, Kustov, Laaker, and Reller (2019) find a rather high stability of attitudes toward immigration in a meta-analysis. Empirical clarity on short-term changes in immigration attitudes has not been reached, either. While Kustov, Laaker, and Reller (2019) see small chances for short-term changes,

Esses et al. (2002) find evidence that the 9/11 attacks on the U.S. significantly changed public opinion on immigration. Other external shocks, such as a high influx of refugees, may therefore lead to changes in attitudes toward immigration attitudes as well.

The current research occupies the fortunate position of being able to investigate attitude changes over the course of four months that saw the issue of immigration reach particular saliency amongst the Danish population. Adding to the research of short-term attitudes changes, we first ask:

RQ1: Do attitudes toward immigration among the Danish population change over time around the height of the refugee influx in 2015?

Attitude reinforcement through algorithmic social media use

External shocks, such as a sudden and high influx of refugees, may be able to "increase the salience and issue importance of immigration to individual[s]" (Kustov, Laaker, & Reller, 2019). They can thereby contribute to the accessibility of attitudes, an important precondition for setting the reinforcing spiral in motion, as modeled by Slater (2015). The RSM model broadly suggests that attitudes close to peoples' social identity – such as immigration – can be created and sustained through frequent media use (Tajfel & Turner, 1986). Especially if people feel threatened by external events or at times when rival ideologies become salient, they will try to strengthen their sense of collective identity and turn toward their in-group (Esses, Dovidio, Hodson, 2002; Slater, 2015). People do this with the help of selective exposure, namely by making a "selective choice of attitude- and identity-consistent communication experiences" (Slater, 2015, p. 377). The selection of psychologically more comfortable interpersonal and mediated experiences helps to reinforce social identity; people are likely to engage in this selective behavior until the feeling of threat has diminished (Slater, 2015; Tajfel & Turner, 1986). While maintaining social identity can be one outcome, attitudes moving toward extremes is another possibility. Especially if exposure to countervailing perspectives is constantly minimized, attitudes of people that were initially more moderate can be reinforced (Slater, 2007). As suggested by social identity theory (Tajfel & Turner, 1986), such a mechanism may be most likely if people experience an identity threat. It is therefore reasonable to investigate the relationship between information exposure and attitude development by focusing on citizens' perception of immigration as a threat. Hence, the central concept of this study is attitude reinforcement, defined as moderately positive or negative attitudes becoming more extreme over time, i.e. moving toward the nearby pole. Importantly, media exposure can contribute to an attitude development other than reinforcement, for example by attenuating or reversing attitudes. Toward the background of increased algorithmic media usage, however, this study only focuses on whether exposure contributes to reinforcement specifically.

Findings of previous studies support the reinforcing spiral model in a traditional media environment, where people mainly actively engage in selective exposure to media content (e.g., Knobloch-Westerwick & Meng, 2009; see Slater, 2015 for an overview). Social media platforms, in turn, may contribute to proattitudinal information exposure based on two main mechanisms: first, through the creation of cognitive consonance for users based on preselection of information similar to previously used content and in line with expressed preferences; second, by creating personal networks through individual cross-linking of users based on shared interest, values, and personal bonds (Hagen, In der Au, & Wieland, 2017). On algorithm-driven media platforms, people seek congenial information less actively but may see these information more as a by-product (Gil de Zúñiga, Weeks, & Ardèvol-Abreu, 2017). Hence, exposure to likeminded political viewpoints on social media is to a greater extent unintentional, and the phenomenon of selective exposure thereby becomes increasingly automated on these platforms. Although people still make active choices when it comes to content they consume (Ohme & Mothes, 2020), the algorithmic preselection may increase the amount of congenial information they see, compared to actively seeking information in offline media or nonalgorithmic online media.

Regarding social influence, research finds that political discussion in networks with likeminded

others is related to more extreme attitudes, compared to more heterogeneous discussion networks (Huckfeldt, Mendez, & Osborn, 2004). Attitude reinforcement as a result of being exposed to arguments in a homogenous discussion network can also occur if citizens are exposed to more homogenous media messages (Song & Boomgarden, 2017; Stroud, 2010). This attitude-consistent exposure will initiate a process where "group members are persuaded to develop more polarized attitudes in the direction of the group norm" (Stroud, 2010, p. 558).

This is in line with Slater (2015), who states that the reinforcement spiral mechanism may produce more extreme attitudes in cases where group identification is strong and unaffected by other social identifications, or if "social group norms carefully minimize exposure to countervailing perspectives" (p. 376). Hence, both, social influences and algorithmic preselection of information may be potential catalyzers for selective exposure and subsequent attitude reinforcement (Song & Boomgaarden, 2017; Wojcieszak, 2011; Wojcieszak, Azrout, de Vreese, 2018). First studies indicate such a mechanism. Based on a panel study, Lee (2016) found indications of polarization concerning the 2014 Umbrella movement in Hong Kong among the public due to social media use. Hagen et al. (2017) find that citizens who use social media frequently are more likely to hold an extreme position toward Chancellor Angela Merkel's famous statement about challenges of immigration in Germany (*"We can do it!"*).

While these studies show that information usage seems to correlate with, if not be responsible for in some way, attitudes people hold, they do not specifically investigate the reinforcement of attitudes, i.e. the development from moderate to more extreme attitudes over time. In our context, we therefore focus on the repeated *exposure to political information* from algorithmic and nonalgorithmic media sources as the independent variables, and test how strongly using these different media channels predicts such attitude reinforcement. The weakness of this approach is that we cannot take into account the actual exposure to immigration information. Hence, other potential reasonings, such as the greater incivility of comments on social media (e.g., Su et al., 2018), are not part of this investigation. However, we can rely on repeated measurements and thereby get a realistic picture of what media channels people received political information from during the height of the refugee influx in 2015.

Figure 1 illustrates the approach. As described in the original approach by Slater (2007), selective media exposure over time is likely to reinforce attitudes, regardless of which media channels people use. We extend this model by predicting that social influences and algorithmic preselection of media content on social media platform strengthens this mechanism and leads to a reinforcement of previously held attitudes. Hence, we expect:

H1: The more frequently citizens are exposed to political information on algorithmic social media platforms during the apex of the refugee influx in 2015, the more extreme their attitudes toward immigration become over this period.

Attitude reinforcement can take two directions. In our case, citizens who are already slightly skeptical about immigration would become more negative toward immigration over time; people who view immigration rather positively may develop even more proimmigration attitudes. Therefore, it is of interest to find out whether algorithmic media use contributes equally to reinforcement of pro- and anti-immigration attitudes. So far, there is no evidence that the reinforcement mechanism is only true for one of the two proposed directions. Previous research has not addressed media effects on specific tendencies of issue-specific attitude reinforcement. Therefore, we ask:

RQ2: Does exposure to political information on algorithmic social media contribute differently to pro- and anti-immigration attitude reinforcement?

Attitude reinforcement and political participation

Finally, we are interested in the attitude-behavior relationship, i.e. whether people whose attitudes are reinforced over time are more likely to become politically active about this issue. In their Civic Voluntarism Model, Verba, Schlozman, and Brady (1995) postulate that participation is dependent upon citizens' resources (e.g., time or money),
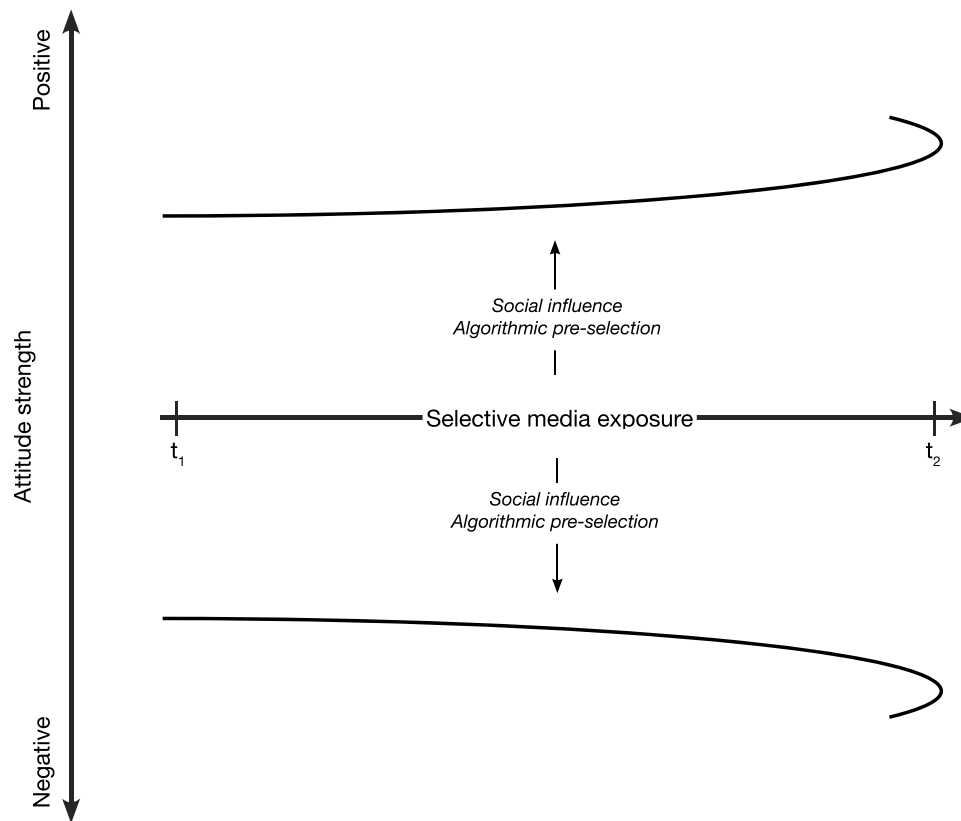
Figure 1. Attitude reinforcement through social influence and algorithmic selection based on Reinforcement Spiral Model (RSM). Curves at the end indicate starting spiraling process

political engagement (e.g. political interest and civic values) and recruitment (being explicitly asked to participate) by others. As Slater (2015) describes, the increased accessibility of attitudes caused by selective media exposure can ultimately affect behavior. Holding a more certain political attitude as part of political engagement is therefore likely to increase levels of political participation. In the case of immigration, political behavior in the form of political participation is a way that citizens can publicly express support or discontent with current rules and thereby potentially contribute to policy change, such as immigration legislation (Esses et al., 2002).

While an extensive body of research shows that political media use – and here especially social media use – positively contributes to political participation (Boulianne, 2015; Ekström & Shehata, 2016; McLeod, Scheufele, & Moy, 1999), it is less clear whether this is also the case when the direct relationship between media use and political participation is mediated by a reinforcement of attitudes. In addition, most studies have focused on

general patterns of political participation, while media effects on issue-specific participation received less attention (Ho et al., 2011). As outlined in the RSM, the consumption of political information at a time where a specific issue is highly salient can affect citizens' standpoints on this issue. The reinforcement of attitudes toward this issue may therefore be related to the extent of citizens' political activity that addresses the perceived political problem. Hence, exposure to political information on algorithmic social media may affect participation in a specific policy area due to the possibility of attitude reinforcement about this issue. This is in line with Stroud (2010), who claims that polarization can have normatively desirable outcomes, such as political participation by citizens, as a necessity in a participatory model of democracy (Strömbäck, 2005). Holding a political standpoint and being certain about a political issue are important preconditions for political activity by citizens (Alvarez & Franklin, 1994; Anderson et al., 2014). Given that people who become more extreme in their existing political attitudes are more decided about political

standpoints, it is worth investigating the connection between attitude reinforcement and political behavior.

Little is known about the direct impact of attitude reinforcement on political behavior outside the electoral arena (Kleiner, 2016). Some characteristics of this relationship can be derived from research on (selective) exposure to likeminded viewpoints. Discussing political issues with like-minded people can have a mobilizing effect on political participation (Mutz, 2002). People exposed to proattitudinal content online may find their existing views being supported and therefore become more certain about political issues (Tsfati, Stroud and Chotine, 2014). In line with that finding, proattitudinal exposure can also increase the likelihood of political expression on social media for people with strong political viewpoints (Weeks, Lane, Kim, Lee, & Kwak, 2017). We know that people who hold strong issue positions show higher levels of general political activity (Mason, 2015). So far, however, it has not been investigated if people who become more certain about a specific political viewpoint over time are more or less likely to become politically active in that policy area.

Two scenarios are possible. (1) People whose attitude is reinforced over time may feel an increased desire to react in regard to the relevant policy issue (Kleiner, 2016). Anderson et al. (2014) describe that the intensification of political attitudes goes along with making an issue appear 'ripe for a policy solution'. In this first scenario, attitude reinforcement could make a citizen politically active. (2) Most political issues that lead to diverging opinions go along with an increased level of societal conflict about the issue. It is therefore possible that a reinforcement of existing attitudes causes citizens to react with conflict avoidance or despair (Kleiner, 2016). Expressing an extreme political attitude in public (by means of participation) may appear risky, and research has found that avoiding conflict may be a reason for not participating politically (Ulbig & Funk, 1999). Furthermore, if it seems hopeless that a policy solution will meet a citizen's standpoint, this may give rise to cynicism. Political cynicism, in turn, can be demobilizing for democratic behavior (Elenbaas & De Vreese, 2008). Hence, attitude reinforcement can also prevent citizens from taking political action.

In one of the first studies on the democratic outcomes of political polarization, Kleiner (2016) examines public opinion reinforcement and connects it to the level of political participation in 88 European regions. She finds that a higher level of general, ideological polarization among the public is positively related to citizens' political activity in these regions. In contrast, the present study connects attitude reinforcement to issue-specific political participation in a single-country study, where immigration at the time was the most pressing issue politically. Here, we are specifically interested in the role of algorithmic media use as an initiator of attitude reinforcement, and thereby in the indirect mediating effects that attitude reinforcement over time may have on the relationship between political media exposure and political participation. Therefore, we ask:

RQ3: Does a reinforcement of existing attitudes toward immigration over time affect participation in refugee-related activities?

RQ4: Does exposure to political information via algorithmic media have an indirect effect on participation in refugee-related activities through a reinforcement of existing attitudes toward immigration?

Method

The analysis is based on variables from two waves of a six-wave longitudinal study in Denmark. The two online surveys were conducted in June and October, marking the period with the highest increase in asylum seekers coming to Denmark in 2015 (UNHCR, 2017). Attitude toward participation was surveyed in both waves, while the participation in refugee-related activities was only surveyed in the second wave. Between the two waves, a ten-day smartphone-based diary study was used to tap the respondents' media exposure.

Sample

The sample consists of 847 respondents. All respondents took part in the first and second survey wave and in at least four mobile diary surveys, which provides a comprehensive assessment of their media exposure between the two waves. Respondents were recruited using a pollster's database and national register data. Three groups were

included: a *general* population sample, a sample of *elderly* and a *youth* sample. The general and the elderly samples were recruited from the pollster's database, which is representative of the Danish population. The sampling strategy relied on a light quota on age and gender. In the general population sample, 10,315 were invited to take the online survey, and 45% (n = 4641) accepted; 60% of the elderly agreed to participate (n = 1831). For the youth sample 13,700 persons aged 17–21 at wave one were randomly sampled, using national register address data[1]; 19% (n = 2653) accepted. In total 9125 (4641 + 1831 + 2653) individuals were part of the study.

The first survey wave (conducted in June), the fourth wave of the longitudinal study, included 2680 respondents from the national sample (attrition rate from wave 1 (n = 4641): 42%). The elderly sample included 1292 respondents (attrition rate from wave 1 (n = 1831): 29%), and the youth sample 769 (attrition rate from wave 1 (n = 2653): 71%). In the second wave (conducted in October), 2084 respondents in the general sample, 1076 respondents in the elderly sample and 651 respondents in youth sample were retained (overall retention rate 80%). Of the respondents participating in both waves, 1064 (28%) participated in the mobile media diary study. 79% of these participated at least four times in the mobile dairy leading to a final sample of 847. Despite our extensive sampling strategy, we cannot state that the study sample is representative for the Danish population, since respondents were five years older, had a slightly higher political interest and used mobile Internet 3% more often than respondents from the initial sample.[2]

Measures

Exposure to political information (EPI)

To measure exposure to political information between the two waves, we asked the respondents on ten subsequent days what they had been exposed to rather than let them assess their media use retrospectively for the complete time. We used a smartphone-based diary measure with questions constructed around three modes of reception, i.e. *Audio*, *Page* and *Stream* (Engel & Best, 2012, see Appendix A for detailed measures) rather than

around exposure categories from previous studies (e.g. TV, Print or Radio). It is argued that these modes better account for media exposure in a convergent media environment because the actual sources of exposure are differentiated, which reduces respondents' recall efforts (Ohme, Albæk, & de Vreese, 2016). Furthermore, the measurement allows for a fairly exact distinction between information reception from algorithmic and nonalgorithmic sources, which is crucial in the context of this study. Respondents included in the sample participated between four and ten days in the diary study. To account for this variation in participation and to make data comparable, a relative exposure measurement was calculated on an individual data level. The measures for each type of exposure were summed into three indices of exposure to political information. Reported frequency were divided by the number of days each respondent had participated in the survey. Values ranged between 0 and 1, 1 indicating exposure to the political information source on all days of the diary study from offline media sources (M =.40, SD = .30), nonalgorithmic online sources (M=.11, SD = .14), and algorithmic social media sources (M =.16, SD = .25).[3] On average, hence, people received political information from offline sources on 40%, from nonalgorithmic online sources on 11% and on algorithmic social media sources on 16% of the days.

Attitude toward immigration

Immigration attitudes can be measured in a variety of ways. The European Social Survey, for example, mainly asks respondents, whether their country should allow different groups of people to come and live there (Davidov et al., 2015). Given our goal to investigate attitude development as a result of media exposure, we focus on the threat dimension of immigration, as another part of immigration attitudes (e.g., Rydgren, 2004). Hence, the attitude toward immigration was assessed by asking respondents about their agreement with the statement "*Immigration is a serious threat to Denmark*" on a 5-point scale. The values were recoded so that a high value indicates strong skepticism toward immigration (5 = *fully agree*) while a low value means weak skepticism (1 = *fully disagree*).

Attitude reinforcement is defined as the strengthening of an existing attitude for people between the two points in time. Respondents who reported "partly agree" in the first wave with the statement "*Immigration is a serious threat to Denmark*" and "fully agree" in the second wave (*anti-immigration reinforcement*: scale value change from 4 to 5; *n* = 43) and respondents who changed their attitude from partly disagree to fully disagree (*proimmigration reinforcement*: scale value change from 2 to 1; *n* = 34; see Table D), received the value 1 in this dichotomous variable (attitude reinforcement: *M* = 0.09, *SD* = .28, *n* = 77). All other respondents (*n* = 770) who did not indicate the described reinforcement received a 0.

Participation in refugee-related activities

In the second wave, respondents were asked whether they had participated in ten participatory acts during the months with high refugee influx to Denmark. We distinguished between activities that clearly indicate support for refugees ("*Handed out food or organized primary care*"; "*Initiated a donation or crowdfunding campaign for refugees*") and activities that encompass opportunities for participation in favor of and against immigration ("*Participated in a demonstration or community event about refugees*"; "*Expressed your opinion about refugees in a post or comment on Facebook or similar social media sites*"; see Table B for a full list of items and frequencies). Respondents were asked if they participated in any of these activities (*yes* = 1, *no* = 0). Subsequently, two indices of *refugee help* (*Min* = 0, *Max* = 1, *M* = .08, *SD* = .13) and *refugee-related participation* (*Min* = 0, *Max* = 1, *M* = .05, *SD* = .13) were calculated.

General political extremity

Previous studies have found that a higher level of ideological, political polarization can affect citizens' political participation (Kleiner, 2016; Mason, 2015). To rule out that potential effects of immigration attitude reinforcement on participation are the result of respondents' general level of holding more extreme attitudes, the variable of general political extremity was added to the analysis. We use participants' self-placement on a political left-right scale (*M* = 4.6, *SD* = 2.3, *Min* = 0, *Max* = 10) as a proxy to assess their political extremity. The scale

was recoded from highest level of extremity (former values 0 and 10) to lowest level of extremity (former value 5), resulting in a final 6-point measure (M = 2.0, SD = 1.5, Min = 0, Max = 5).

Controls

Age (*M* = 40, *SD* = 19, *Min* = 18, *Max* = 81), gender (49% female), formal education, political interest (*M* = 6.8, *SD* = 2.4, *Min* = 0, *Max* = 10) were added as control variables to the model.

Analytical strategy

First, we explore direct effects of political media exposure on attitudes toward immigration after the apex of refugee influx in a lagged dependent variable model. In a second step, we examine interaction effects of previous attitude and political media exposure on immigration attitudes. Next, by using a logistic regression model, we test explicitly if algorithmic media use reinforces existing attitudes toward immigration. Finally, we use SEM path analysis to investigate the mediating effect of both positive and negative polarization on participation in refugee-related activities.

Results

Our first research endeavor is to test whether a citizens' attitude toward immigration changed over time around the height of the refugee influx in 2015. Indeed, we see that based on our 5-point measurement, more people perceived immigration as a serious threat in October (*M* = 2.8, *SD* = 1.3), compared to June (*M* = 2.6, *SD* = 1.3), *t*(846) = −6.4837, *p* < .001. Hence, the public attitude became slightly more critical about immigration around the apex of the refugee influx in 2015.

In terms of direct effects that predict a higher skepticism toward immigration in the second wave, after Denmark experienced a significant influx of refugees, males, older citizens, people with lower education, and lower levels of political interest were more skeptical about immigration (Table 1, Model 1). Exposure to political information via any of the three channels does not have a direct effect on immigration attitude. This is not surprising since we only look at general media exposure, and only a one-sided coverage of the immigration

Table 1. Moderation analysis of media effects by previous immigration attitude (OLS).

	Perceiving immigration as a threat				
	(1)	(2)	(3)	(4)	(5)
	Immigration Attitude t2	Immigration Attitude t2	Immigration Attitude t2	Immigration Attitude t2	Immigration Attitude t2
Gender (female)	−.091** (.092)	−.013 (.063)	−.013 (.063)	−.014 (.063)	−.013 (.063)
Age	.252*** (.003)	.121*** (.002)	.120*** (.002)	.118*** (.002)	.120*** (.002)
Education	−.154*** (.023)	−.001 (.016)	−.001 (.016)	−.002 (.016)	−.001 (.016)
Political Interest	−.129** (.022)	−.026 (.015)	−.027 (.015)	−.028 (.015)	−.025 (.015)
Exposure to political information (EPI)					
EPI Offline	−.016 (.196)	−.029 (.134)	−.023 (.171)	−.029 (.134)	−.029 (.133)
EPI Online	−.015 (.375)	.005 (.256)	.005 (.257)	−.025 (.324)	.006 (.254)
EPI Social Media	−.052 (.221)	−.008 (.151)	−.008 (.151)	−.007 (.151)	−.068* (.196)
Immigration Attitude t1 (Pro-Immigration reference)					
Anti-Immigration		.762*** (.075)	.781*** (.135)	.725*** (.096)	.716*** (.086)
Undecided		.399*** (.080)	.394*** (.140)	.390*** (.101)	.377*** (.092)
EPI by previous attitude (t1)					
EPI Offline x Anti-Immigration			−.024 (.241)		
EPI Offline x Undecided			.006 (.256)		
EPI Online x Anti-Immigration				.062+ (.559)	
EPI Online x Undecided				.010 (.653)	
EPI Social Media x Anti-Immigration					.098*** (.345)
EPI Social Media x Undecided					.036 (.396)
General political extremity	−.040 (.032)	−.076** (.022)	−.075** (.022)	−.075** (.022)	−.075** (.022)
N	837	837	837	837	837
adj. R^2	.081	.573	.572	.574	.577

Standardized beta coefficients; Standard errors in parentheses.
$^+p < 0.10$, $^* p < 0.05$, $^{**} p < 0.01$, $^{***} p < 0.001$

issue could explain why using media in general would shape attitudes toward immigration. For reasons of model simplification, we add immigration attitude at t1 as lagged as a categorical variable to Model 2 and find that holding an anti-immigration attitude strongly predicts the perception of immigration being a threat at t2, compared to holding a proimmigration attitude.[4]

In the next step of the analysis, estimate interaction effects between media exposure and respondents' previous attitudes. Hence, we test whether the effect of being exposed to political information via *offline media, nonsocial online media* or *algorithmic social media* is dependent on previously held attitude on this matter by the means of a moderation analysis that was separately estimated for each type of media exposure. The models reveal that for people already holding an anti-immigration attitude, exposure to online and social media increases the likelihood that this attitude becomes more negative (Table 1, Model 4 and 5). Especially political social media exposure has a significantly different effect for people who perceive immigration as a threat compared to people who do not. For an easier interpretation of media exposure effects on immigration attitude for groups

with different previous attitudes, we estimate the marginal effects and display results in a graph (Figure 2). These graphs show that social media use most clearly contributes to a reinforcement of existing attitudes over time. Interestingly, this finding applies to people holding both immigration-friendly and -skeptical attitudes. Hence, we find some initial support for Hypothesis 1.

Logistic regression analysis was used to more strictly test if algorithmic use of political information indeed contributes to attitude reinforcement. The predicted probabilities illustrate this: For the pattern of overall reinforcement (i.e. attitudes becoming more positive or more negative), the probability for people with a high political information exposure via offline or nonalgorithmic online media is at 9% and 10%, respectively. In turn, citizens who strongly exposed to political information via algorithmic, social media have a 22% chance of overall attitude reinforcement (Table 2; see Table C for full model estimations). Hence, Hypothesis 1 receives further support.

RQ2 asked whether political media exposure contributes differently to pro- and anti-immigration attitude reinforcement. In a next step, we therefore estimate the likelihood for attitude changes based on
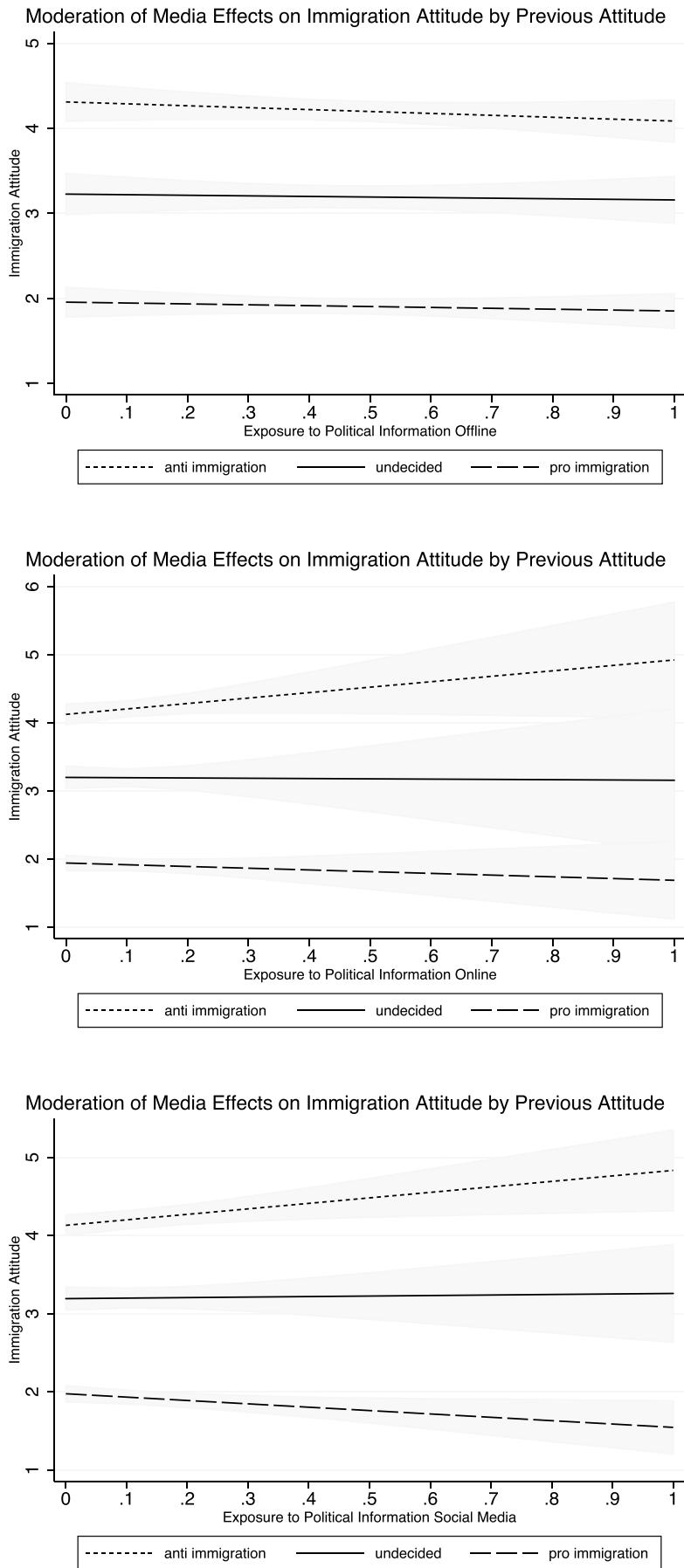
Moderation of Media Effects on Immigration Attitude by Previous Attitude

Moderation of Media Effects on Immigration Attitude by Previous Attitude

Moderation of Media Effects on Immigration Attitude by Previous Attitude

Figure 2. Moderation of media effect by previous attitudes.

Table 2. Predicted probabilities of attitude reinforcement by media exposure.

	Attitude reinforcement t1 → t2		
	Overall Reinforcement Predicted Probabilities (95% CI; LL, UL)	Positive Attitude Reinforcement Predicted Probabilities (95% CI; LL, UL)	Negative Attitude Reinforcement Predicted Probabilities (95% CI; LL, UL)
Exposure to political information (EPI)			
EPI Offline (0– 1)			
None (0)	7% (.034,.108)	3% (.006,.059)	3% (.010,.060)
Medium (0.5)	8% (.066,.106)	3% (.019,.047)	5% (.034,.066)
High (1.0)	10% (.047,.159)	3% (.002,.063)	7% (.021,.122)
EPI Online (0– 1)			
None (0)	8% (.059,.108)	3% (.017,.051)	5% (.028,.066)
Medium (0.5)	9% (.025,.150)	3% (−.006,.070)	5% (.004,.101)
High (1.0)	9% (−.049,.234)	3% (−.047,.107)	6% (−.056,.175)
EPI Social Media (0– 1)			
None (0)	7% (.052,.093)	3% (.014,.040)	4% (.026,.058)
Medium (0.5)	13% (.085,.175)	5% (.020,.078)	8% (.039,.111)
High (1.0)	22% (.077,.368)	10% (−.015,.220)	13% (.010,.254)
N	837	794	804

Number of respondents that show attitude reinforcement: 77 (positive: 34; negative: 43). LL and UL represent the lower-limit and upper-limit of the 95% confidence interval; $^+ p < 0.10$, $^* p < 0.05$, $^{**} p < 0.01$, $^{***} p < 0.001$

media use for the separate directions, that is positive[5] and negative attitude reinforcement.[6] While predicted probabilities of attitude reinforcement for high levels of political information exposure offline and via nonalgorithmic online media are at 3 % for positive and 6–7% negative reinforcement, they are at 10% and 13% for high levels of political social media exposure, respectively (see Table C for logistic regression results). Hence, algorithmic media use contributes to reinforcement of both pro- and anti-immigration attitudes while other media use has less of an influence. Although we find a slightly higher probability for citizens' attitudes turning more negative than positive for those who strongly rely on social media in their news diet, it becomes obvious that the attitude reinforcement mechanism is present for both directions: positive attitudes becoming more positive and negative attitudes becoming more negative.

The next question is how issue-specific attitude reinforcement relates to issue-specific political activity (RQ3). We first estimate direct effects of political media exposure on political participation. As explained above, we look at two types of participation: refugee help and refugee-related participation. While female citizens are more likely to engage in both types of activity, age is not a determining factor for political behavior here. Interestingly, political interest is only a significant predictor of refugee-related participation, compared to providing immediate help to refugees. Exposure to political information through offline

media and algorithmic, social media predicts higher levels of being active in refugee help activities. In turn, nonalgorithmic online media use and especially social media use predict refugee-related participation (Table 3). Importantly, results indicate that people who show a reinforcement of positive attitudes toward immigration were more likely to engage in refugee help. Citizens who increase in their perception of immigration as a threat, in turn, were less likely to engage in refugee help as well as in participation in refugee-related activities. Hence, we find indication that not only media exposure but also the development of attitudes over time is responsible for levels of issue-specific political activity among citizens.

Lastly, it is of interest whether exposure to political information via algorithmic media has an indirect effect on participation in refugee-related activities through a reinforcement of existing attitudes toward immigration (RQ 4). Results in Table 4 are less conclusive on this matter. With coefficients around zero, we do not see indication that a positive attitude reinforcement contributes to either refugee help or other refugee-related participation. For negative attitude reinforcement, we see slightly stronger, negative coefficients throughout all six models, which points to the possibility of a negative indirect relationship of media use via a reinforcement of negative attitudes on participation. Although all tests lack statistical significance, this is expectable due to the small individual effects and the small sample size of this study. Hence, while we find algorithmic media use likely to contribute to attitude reinforcement and attitude reinforcement in

Table 3. Predicting participation in refugee-related activities (OLS).

	Political Participation	
	Refugee Help	Refugee-related Participation
Gender (female)	.198*** (.009)	.135*** (.008)
Age	−.014 (.000)	−.013 (.000)
Education	.186*** (.002)	.066* (.002)
Political Interest	.042 (.002)	.148*** (.002)
Exposure to political information (EPI)		
EPI Offline	.130** (.019)	−.038 (.016)
EPI Online	.054 (.037)	.112** (.031)
EPI Social Media	.074* (.022)	.282*** (.019)
Positive Attitude Reinforcement t1 → t 2	.077* (.023)	−.006 (.019)
Negative Attitude Reinforcement t1 → t 2	−.067* (.020)	−.052+ (.017)
General political extremity	.009 (.003)	.097** (.003)
N	837	837
adj. R^2	.116	.182

Standardized coefficients. Standard errors in parentheses.
[#]$p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 4. Indirect effects of attitude reinforcement on participation.

	Positive Attitude Reinforcement Coef. (*p*.)	Negative Attitude Reinforcement Coef. (*p*.)
	Refugee Help	
Mediated Path (unstandardized, indirect effects) *Media Exposure → Attitude Reinforcement → Political Participation*		
EPI Offline	−.000(.887)	−.002(.291)
EPI Online	.000(.972)	−.001(.853)
EPI Social Media	.003(.144)	−.003(.140)
	Refugee-related Participation	
EPI Offline	.000(.930)	−.001(.329)
EPI Online	.000(.973)	−.000(.853)
EPI Social Media	.000(.912)	−.002(.200)
N	794	804

Unstandardized coefficients. *P*-values in parentheses.
Saturated models; include Gender, Education, Political Interest, and General Political Extremity.

turn predicts the level of political participation, with the data at hand we can only presume a mediation effect in case of negative attitude reinforcement as a hinderer of political participation.

Discussion

Social media platforms are increasingly used to receive political news and information (Newman, Fletcher, Kalogeropoulos, Levy, & Nielsen, 2017). This study examines the question of whether social influence and the algorithmic preselection of the content users see in their social media news feeds contribute to a reinforcement of previous attitudes and political participation in activities connected to these attitudes. With the European immigration movements in 2015, we look at a case in time that had a lasting influence on immigration policies and the reputation of many countries in Europe.

This study demonstrates that immigration attitudes are subject to change in times when external shocks, such as a high influx of refugees, occur. In our case, the public opinion in Denmark became more critical toward immigration between June and October of 2015 – those months with the highest refugee influx (UNHCR, 2017). This finding supports previous research that finds immigration attitudes to change in times of political upheaval, such as the 9/11 attacks in the U.S. (Esses, Dovidio, & Hodson, 2002). However, it contradicts other studies that find immigration attitudes to be rather stable (Kustov, Laaker, & Reller, 2019). It becomes clear that measurement frequency plays an important role here: we find that short-term changes of immigration attitudes are possible, while more research is needed on lasting long-term changes.

What causes such changes in immigration attitudes? The Reinforcing Spiral Model (Slater, 2015), suggests that political attitudes closely linked to our

social identity – such as immigration – can be created and sustained through frequent media use. In such cases, people strengthen their sense of collective identity and turn toward their ingroup (Esses et al., 2002; Slater, 2015). One mechanism to uphold previous attitudes in these situations is to select congenial information. This study argues that seeking information on social media exposure may amplify the mechanism of partisan selective exposure for two reasons: first, the social relevance of information encountered on platforms like Facebook or Twitter, and second, the algorithmic preselection of information users see in their newsfeed, based on previous usage behavior (Diakopoulos, 2019; Klinger & Svensson, 2018). Indeed, we find strong indication for such an attitude reinforcement mechanism as outcome of political social media usage. The likelihood to report attitude reinforcement was twice as high for citizens who strongly rely on social media than for those who strongly rely on used nonalgorithmic or offline media for their daily news fix. The study thereby extends insights from recent studies that found media effects on immigration attitude mostly based on outlet type, such as broadsheet newspapers (Diehl et al., 2019) and public vs. commercial television (Jacobs et al., 2016). Algorithmic media exposure is another crucial factor that can contribute to reinforcement of immigration attitudes. This finding strongly supports the thesis that an algorithmic news selection in combination with the homophily of social media networks can affect political attitudes of citizens in a reinforcing way. It thereby supports other studies that find a positive relationship between algorithmic media use and attitude reinforcement (Hagen et al., 2017; Lee, 2016) and extends it by testing this relationship on the basis of panel data. The study provides initial evidence that algorithmic media use can affect attitude reinforcement over time. Crucially, it is of less importance, which valence previously held attitudes have, since algorithmic media use contributes to both: positive attitudes becoming more positive and negative attitudes becoming more negative.

But what are the democratic outcomes of such an attitude reinforcement? Few studies so far have investigated effects of attitude polarization on political behavior, especially in a nonelectoral context (Kleiner, 2016). Especially when following the argument that immigration attitudes ultimately revert to normal after short-term changes, one could argue that

attitude reinforcement is of little relevance. However, our study finds that such a pattern of attitudes becoming more pronounced can have direct effects on real world outcomes. Citizens who become more positive over time were also more likely to help refugees arrive in the country. In turn, people who showed reinforcement of an already critical immigration attitude were less likely to participate in both refugee help activities but also in political activities that can change policy decision, such as partaking in demonstrations or signing petitions. The fact we do find these diverging results for different directions of reinforcement and refugee-related participation, however, may also be attributed to the possibility that despite the neutral formulation of items, respondents may have interpreted their stance differently. In sum, while attitude reinforcement can lead to outcomes that helped refugees settle, the pattern of strengthening attitudes over time did inhibit that this group of citizens became politically active about the topic. Reasons for that may be conflict avoidance or increasing political cynicism (Kleiner, 2016; Ulbig & Funk, 1999). This point furthermore begs the question of whether social media exposure, by contributing to attitude reinforcement, partly nullifies its own positive effects on political participation found by extant research. Future studies should follow this path and investigate whether social media mobilizes participation among parts of society with stronger or less pronounced political attitudes and thereby contributes to participation gaps (Dalton, 2017).

Importantly, this finding points back to the described spiral process by Slater (2015) and supports the existence of an attitude-behavior relationship as suggested in the RSM: if the part of the public that feels most strongly about an issue does not make use of the democratic means available to initiate policy changes, the felt threat to social identity is unlikely to diminish. Hence, the spiral of reinforcing attitudes, amplified by algorithmic media use, will continue to evolve.

Limitations

By examining the high point of immigration waves in 2015, our study investigates media-driven reinforcement of attitudes during a specific historical situation. It thereby provides unique insights into the interplay of a digital media environment and

political real-world developments. However, we have to keep in mind that this strength of the study is also a limitation. By investigating a single issue in a single country, little can be inferred about how social media may affect the formation of public opinion for less controversial issues or in less politicized times. It is therefore important to investigate the relationship between algorithmic media use and attitude reinforcement beyond the contexts of immigration waves.

A second limitation of our study is the potential underestimation of attitude reinforcement. Using a 5-point scale to measure agreement to the respective statements does not allow for great nuances. We therefore only capture the extreme parts of attitude reinforcement and potentially miss the more gradual developments that respondents could not indicate. It is recommended that future research apply measurements that allow for greater variance. Related to this, our study uses a straightforward, single-item measurement that assess the perception of immigration as a threat. Assessing this dimension is helpful since it is closely related to citizens' social identity. However, it is only one way of measuring immigration attitudes and future studies may use more general attitude measurements.

Lastly, using panel data and an innovative smartphone-based survey mode relies on the frequent participation of respondents and thereby comes at the expense of panel attrition. Our study sample deviates marginally from the original sample with representative characteristics for the Danish population. The respondents have slightly higher political interest and education, are marginally older than respondents in the main sample and use mobile Internet slightly more frequently. We found no deviances for gender and social media use, though. Nevertheless, the results of this study have to be read against these deviations. For example, algorithmic selection may work differently on mobile devices and citizens may perceive information differently when being exposed to them on a smartphone (Ohme & Mothes, 2020). The results we find for algorithmic media usage may therefore deviate in a population that makes less use of mobile internet.

The influx of millions of people to a continent can have far-reaching political consequences. Although newly arrived people have been visible in many cities, train stations or while marching on highways, most Europeans received their information about the political events during the fall 2015 via media. In Denmark, the question of how to take care of a significant number of people was quickly replaced in importance by the quest for policy solutions to limit the influx. These political debates divided society here and in many other countries. Our study finds that such a divided public opinion about how to deal with refugees was potentially fostered by newly emerging ways of consuming political information, such as algorithmic media usage. People who held strong political opinions about immigration, however, were less likely to become active in fostering policy changes. Political participation, which is closely related to the concept of political efficacy (Andersen, Bjarnøe, Albæk, & De Vreese, 2016), could have a cathartic effect in such cases. However, we see that using algorithmic social media prevents relief from holding the stronger political attitudes that it creates in the first place. Being stuck in-between reinforcing attitudes and not participating politically is likely fueling the reinforcing spiral process. But although we find only weak indication for increased political participation as a result of attitude reinforcement, it is still possible that eventually, oppressed political attitudes may lead to much stronger political reactions, such as the surge of populist movements seen across Europe in the aftermath of the 2015 refugee influx.

Notes

1. Of the 13,700 people, 1,700 were also recruited via the pollster's database.
2. Goodness of fit tests were used to test for sample differences between the original sample (N = 9125) and study participants (n = 847) regarding gender (n.s.), age (> 5.1 years, p <.001), political interest (> 0.6, p <.001, Min = 0, Max = 10), mobile Internet use (> 3,2%, p <.001) and social media use (n.s.)
3. To be sure, that reported values are not dependent on the frequency of participation in the diary study, we tested for differences between all respondents who participated 4–7 days (n = 633) and 8–10 days (n = 650). No significant differences exist for offline media sources (M =.40 vs. M =.44, t(1282) = −2.54, p =.06), nonalgorithmic online sources (M =.10 vs. M =.10, t

(1282) = −.29, p =.61), and algorithmic social media sources (M =.13 vs. M =.12, t(1282) =1.42, p =.07).

4. Adding immigration attitude as the original 5-point scale to the same model yields consistent results: Immigration attitude at t1 significantly predicts the same attitude at t2 ($β$ =.761, SE =.023, p <.001)

5. (0 = no reinforcement, 1 = positive reinforcement (n = 34); negative reinforcement excluded from the analysis)

6. (0 = no reinforcement, 1 = negative reinforcement (n = 43); positive reinforcement excluded from the analysis)

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Notes on contributor

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Appendix A

Audio
Where have you heard information about politics today?
On the radio offline
On the radio online
From friends, family or colleagues
Others (please specify)
I haven't heard anything about politics today

Page
Where have you read information about politics today?
In a printed newspaper
On a website of a newspaper
On other websites of media outlets (e.g. DR, TV2)
On other websites, (e.g. blogs)
On social media platforms like Facebook or Twitter
Others
I haven't read anything about politics today

How much of the information you've read online about politics today did you reach following links from social media?
Most of it
Some of it
None of it
I don't remember

What did you read on social media platforms about politics today?
Posts, comments, tweets or links…
   …by parties, politicians, political organizations or political actors
   …by news media
   …by other pages or blogs
   …by friends and followers
Paid ads from parties, politicians, political organizations or political actors
Others

Were the posts or tweets by friends or followers mostly from…
… people you know personally and have a close relationship with (e.g. good friends, family)?
… people you know personally without having a close relationship (e.g. mutual friends)?
… people you don't know personally?

Stream
Where have you watched information about politics today?
On TV offline
On broadcasters' websites (on demand or streamed live)
On other websites (e.g. news pages or video platforms, e.g. YouTube)
On social media platforms like Facebook
Others (please specify)
I haven't watched information about politics today

How much of the information you've watched online about politics did you reach following links from social media?
Most of it
Some of it
None of it
I don't remember

What did you watch on a social media platform about politics today?
Political ads (e.g. suggestions, commercials)
Videos posted by parties, political organizations or candidates
Videos posted by TV or radio stations or newspapers
Videos posted by other pages or profiles (e.g. news pages or blogs)
Videos posted or shared by friends and followers
Others

Were the videos posted or shared by friends or followers mostly from…
… people you know personally and have a close relationship with (e.g. good friends, family)?
… people you know personally without having a close relationship (e.g. mutual friends)?
… people you don't know personally?

Table B. Frequencies of participation in refugee-related activities.

	Percentages
Refugee help	
Donated money or goods to refugees	31.17
Greeted refugees when they arrived in Denmark	2.01
Handed out food or organized primary care	1.18
Initiated a donation or crowdfunding campaign for refugees	0.35
Refugee-related participation	
Expressed your opinion in a post or comment on Facebook or similar social media sites	17.36
Participated in a demonstration or community event with or about refugees	4.96
Signed a petition on paper or on the Internet	4.96
Attended a public political discussion, debate or lecture with or about refugees	3.54
Changed personal information or picture on your social media profile	1.65
Organized a demonstration or community event with or about refugees	0.35
n	847

Table C. Logistic regression model predicting attitude polarization.

	Attitude reinforcement June → October		
	Overall Reinforcement Odds Ratio (Std. Error)	Positive Attitude Reinforcement Odds Ratio (Std. Error)	Negative Attitude Reinforcement Odds Ratio (Std. Error)
Gender (female)	.975 (.243)	1.166 (.432)	.831 (.271)
Age	.994 (.008)	.981 (.012)	1.005 (.011)
Education	.890+ (.057)	.911 (.086)	.877 (.074)
Political Interest	1.056 (.066)	1.267* (.130)	.933 (.072)
Exposure to political information (EPI)			
EPI Offline	1.516 (.810)	.941 (.761)	2.209 (1.526)
EPI Online	1.114 (1.064)	.864 (1.306)	1.266 (1.496)
EPI Social Media	3.639** (1.818)	3.878+ (2.941)	3.417* (2.147)
General political extremity	1.026 (.090)	.985 (.124)	1.057 (.122)
N	837	837	837

Number of respondents that show attitude reinforcement: 77 (positive: 34; negative: 43). Exponentiated coefficients; Standard errors in parentheses.
$^+p < .10$, $^* p < .05$, $^{**} p < .01$, $^{***} p < .001$

Table D. Attitude development over time.

	Immigration is a serious threat to Denmark					
	Wave 5					
Wave 4	(1)	(2)	(3)	(4)	(5)	Total
(1) fully disagree	137	53	21	2	0	213
(2) somewhat disagree	**34**	101	56	16	3	210
(3) either or	6	25	89	57	12	189
(4) somewhat agree	0	11	27	61	**43**	142
(5) fully agree	1	3	4	16	69	93
Total	178	193	197	152	127	847

Note: Negative attitude reinforcement (scale value change from 4 to 5) and positive attitude reinforcement (scale value change from 2 to 1) marked as bold