Article

#PolarizedFeeds: Three Experiments on Polarization, Framing, and Social Media

The International Journal of Press/Politics
1–26

DOI: 10.1177/1940161220940964
journals.sagepub.com/home/hij
SAGE

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Abstract

Does exposure to social media polarize users or simply sort out like-minded voters based on their preexisting beliefs? In this paper, we conduct three survey experiments to assess the direct and unconditioned effect of exposure to tweets on perceived ideological polarization of candidates and parties. We show that subjects treated with negative tweets see greater ideological distance between presidential nominees and between their parties. We also demonstrate that polarization increases with processing time. We demonstrate a social media effect on perceived polarization beyond that due to the self-selection of like-minded users into different media communities. We explain our results as the result of social media frames that increase *contrast* effects between voters and candidates.

Keywords

social media, polarization, political polarization, framing, Twitter

Is exposure to social media increasing perceptions of candidate polarization among voters?[1] This question could not be more important and timely given the pervasive use of social media in campaigns and elections (Bhattacharya et al. 2016; Gainous and Wagner 2014; Kruikemeier 2014). As Lelkes et al. (2017) note, social networks today form the "backbone of many Americans' daily information environment," where "even the politically disinterested are exposed to nontrivial doses of partisan news" (Lelkes et al. 2017: 6). Increasing news consumption through social media platforms

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has also been extensively documented across the world, both when consumption is incidental (Boczkowski et al. 2018; Fletcher and Nielsen 2018) and when voters seek out political information (Kalogeropoulos et al. 2017; Vaccari 2013). In this article, we report the results of three survey experiments measuring the effect of exposure to tweets on perceived ideological distances between candidates in the United States. The results provide evidence of increased perceived polarization among randomly assigned respondents that have not sorted themselves into groups of like-minded users (Mason 2015; Stroud 2010). We explain the increase in polarization as the result of framing effects that increase *contrast*[2] between the candidates and the user (Merrill et al. 2003; Milton et al. 1995; Sherif and Hovland 1961).

As defined by Entman (1993),

> To frame is to select some aspects of a perceived reality and make them more salient in a communicating text, in such a way as to promote a particular problem definition, causal interpretation, moral evaluation and/or treatment recommendation for the item described. (p. 5)

In this research, we focus on a particular type of frame, *procedural or generic frame*, which alters the perceived legitimacy of an actor (Entman 1993) or event (Iyengar 1994). Generic frames that place a negative light on the moral traits of a candidate, or on the legitimacy of an event, alter the perceived ideological position of candidates and increase polarization, even when the issue-positions associated with the candidates remain unchanged.

To test the proposed argument, we implement an experimental survey design, with respondents randomly assigned to different framing treatments. We ensure "experimental realism" (McDermott 2002) by selecting tweets from observational data while maintaining internal validity via randomization.[3] In the spirit of Lecheler and De Vreese (2013), we implement a competing frames approach that models exposure to tweets as well as the time of exposure. Two different strands of research highlight the importance of exposure time and attention to media frames. First, an extensive literature in cognitive psychology shows that cognitive congruence and dissonance can be experimentally modeled through latency measures. In political psychology, Huckfeldt et al. (1999) and Petersen et al. (2013) find a relationship between response time and the strength of partisan heuristics. Second, more recently, a burgeoning literature is modeling attention in social media browsing by evaluating attention to embedded cues through eye-tracking technology. Vraga et al. (2016), for example, provide evidence of significant differences between self-reported attention to publications and attention measured by the time they spent observing different types of publications. In a similar vein, we consider latency (the time spent reading a social media post) to measure attention to our experimental frames.[4]

Our first two experiments demonstrate the effect of social media frames on polarization in the United States. In the first experiment, we show that subjects treated with negative campaign tweets perceive Donald Trump and Hillary Clinton to be further apart ideologically, even when the tweets have no associated policy content. Although

no new information is provided about the candidates' stands, frames that reflect negatively on the moral character of the candidates affect how voters scale them ideologically. In a second experiment on the dismissal of acting Attorney General Sally Yates, we show that longer exposure to negative tweets, which challenge the legitimacy of a political decision, alters the ideological placements of parties and increases perceived polarization. Finally, we replicate experiment number one in Argentina, with similar results to those of the United States.

The organization of this article is as follows. First, we review the literature on social media and perceived polarization. We justify the choice of *perceived ideological polarization* as our dependent variable and define the scope conditions of our study. In the second section, we introduce our experimental designs, one of them focusing on messages from presidential candidates and the second one focusing on messages from traditional media outlets (*New York Times* [NYT], Fox News, and The Associated Press). In the third section, we present experimental results showing that (1) exposure to tweets increases perceived polarization and the (2) perceived polarization increases along with time spent processing tweets. The "Extension: A Replication of Study 1 in Argentina" section provides a replication of Study 1 on a sample of adult respondents in Argentina, with findings that are substantively and statistically similar to those of the United States. We conclude in the "Discussion" section.

Perceived Polarization as a Framing Problem

American social media users are politically polarized, but does the use of social media polarize them further? In the last few years, a consensus has emerged that voters read and share political information in segregated social media communities (Bakshy et al. 2015; Barberá 2015; Bhattacharya et al. 2016; Del Vicario et al. 2016; Vaccari et al. 2013; Yardi and Boyd 2010). As news consumption becomes more closely associated with network behavior, it becomes relevant to distinguish the unconditioned effect of social media messages from that of network exposure.

Political polarization may describe a variety of features that separate candidates, such as increases in the affective distances or in the performance gaps reported by voters. In this article, we follow a long line of research concerned with the effect of ideological cues on voter choice and argue that changes in *perceptions* of policy polarization may stem not from policy or ideological preferences, but rather from the way politicians' actions are communicated. Related results were found in early studies of talk radio and cable news, with higher levels of partisanship and polarization among exposed voters (Arceneaux and Johnson 2013; Hopkins and Ladd 2014; Iyengar and Hahn 2009; Levendusky 2013; Prior 2006; Sobieraj and Berry 2011).

There are, of course, limitations to the choice of ideological distance for the study of candidate polarization. Bawn et al. (2012) posit a large "blind spot" in the policy space where elected officials may take stands and implement policies without voters noticing. Sood and Iyengar (2018) find that elected officials' issue positioning shapes voters' assessments in asymmetric ways, affecting independents and the other party's voters while their co-partisans remain unaffected. Still, ideological distance remains

the single most common variable in existing vote models, with ideological cues figuring prominently in the voters' decisions.

While the self-sorting of individuals into online communities may increase the share of political content users see that aligns with their beliefs, we have little evidence of direct and unconditioned social media effects on perceived polarization. Indeed, the high segregation of users in social media provides researchers with excellent left–right discrimination in observational data, but makes it more difficult to measure a direct causal link from social media exposure to polarization (Barberá et al. 2018; Lansdall-Welfare et al. 2016).

In this article, we test the hypothesis that changes in the perceived ideological distance between candidates may result from framing in social media. Two mechanisms may underlie the effect of framing on perceived polarization: First, candidates may be perceived as being ideologically distant from each other on some issues. For example, Donald Trump and Hillary Clinton may be perceived as being more polarized on health policy yet less differentiated on foreign policy. Therefore, priming respondents on health issues may increase perceived polarization in the survey data. High levels of polarization on Twitter may then simply reflect attention to different issues rather than true changes in preferences. Second, changes in ideological distances may also take place through heightened *contrast* effect, in which posts that highlight negative traits of a candidate induce a psychological response heightening respondents' perceptions of candidates as ideologically distant. Generic frames that alter the positive or negative assessments of candidates will then increase perceived polarization.

Two studies provide evidence of social media polarization as an issue-specific framing problem (Bakshy et al. 2015; Barberá et al. 2015). In these studies, the same users appear to be polarized on partisan events and not polarized on social and cultural ones (i.e., Oscars, National Football League, etc.). As users share political content with co-partisans and non-political content with a wider network of peers, measures of social media polarization may simply describe data selection rules by researchers rather than true changes in political attitudes.

Less attention has been given to a different type of mechanism, in which *procedural* or *generic* frames change the reported valence of candidates and increase perceived ideological distances on non-positional issues.

Generic Frames and Negative Messages in Social Media

Stokes (1963) posited that valence-issues are different from position-issues, as they reflect goals shared by voters across partisan and ideological lines like peace, prosperity, and good government. Candidates, he argued, are not simply selected because they advance the ideological preferences of constituencies but also because they are considered more competent, more knowledgeable, or less corrupt (Stokes 1963). Valence-issues and position-issues, however, are not neatly separated in the minds of voters. Models of *assimilation* and *contrast* show that positive or negative valence shocks often induce changes in the perceived issue-positions of candidates and parties.

In political communication, De Vreese et al. (2001) describe generic frames that differ from "in-depth, information rich, 'issue framed' news." *Episodic* (Iyengar 1994), *strategic* (Jamieson 1993), or *procedural* (Entman 1993) frames inform valence assessments that are frequent in political and economic discourse. A *strategic* frame, for example, "(1) focuses on winning and losing, (2) includes the language of war, games, and competition, (3) contains 'performers, critics and audiences,' (4) focuses on candidate style and perceptions, and (5) gives weight to polls and candidate standings" (De Vreese 2005: 55).

Generic frames that direct the attention of voters to the positive or negative valance traits of candidates have implications for positional issues as well. Studies show that respondents see parties they support as ideologically closer (*assimilation*) and parties they oppose as being further away (*contrast*). The differences in these perceived locations are not solely policy related but, instead, reflect a psychological mechanism whereby individuals transfer positive or negative valence charges to the perceived policy positions of parties (Merrill et al. 2003; Milton et al. 1995). In social media posts, messages are often designed to alter the perceived personal qualities of the candidates (valence), thereby increasing or decreasing the perceived distance between users and candidates.

Our experiments randomly expose users to negative valence-issues that reflect poorly on the candidates but have no direct policy content. We consider tweets with negative frames that focus on differences between Trump and Clinton exclusively in terms of character, with the former presented as a disrespectful misogynist and the latter as corrupt. Given that valence-issues should not affect the perceived ideological location of candidates, the design allows us to measure attitude change driven by negative valence frames that carry no explicit policy content. Our results show that negative valence frames affect the perceived ideological distances between candidates.

We also expect negative frames to have more pronounced effects as exposure increases. As researchers find stronger treatment effects among respondents who are more cognitively engaged with political stimuli (Berinsky et al. 2014; Chaiken 1980), our second experiment finds the time respondents spend reading a tweet increases perceived polarization.

Assimilation and Contrast: How Changes in Negative Valence Frames Alter Perceived Polarization

Assimilation and *contrast* effects are prevalent in survey data. Figure 1, for example, uses responses from the 2016 U.S. presidential election to describe *assimilation* and *contrast* effects among voters. In Figure 1, the horizontal axis describes the left–right self-placement of the respondent, and the vertical axis describes the ideological location of the candidates. Large and significant *assimilation* and *contrast* effects shape the respondents' perceived distance from the candidates, with positive slopes indicating *assimilation* (voters on the right see the preferred candidate shifted to the right) and negative slopes indicating *contrast* (voters on the right perceive the disliked candidates as shifted to the left).

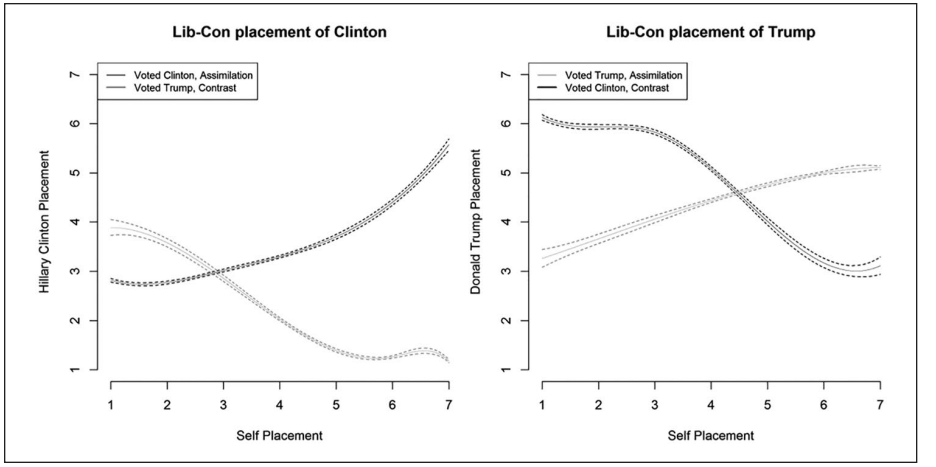

Figure 1. Assimilation and contrast in the 2016 presidential election, The American National Election Study (2016).

Note. Positive slopes describe *assimilation*, where voters report an ideological location that is shifted in the direction of their own ideological preferences. Negative slopes describe *contrast* effects, where respondents perceive the candidate as further away from their own ideological preference. Our estimation from the Cooperative Congressional Election Study, 2016 data, Ansolabehere and Schaffner (2017).

Figure 1 illustrates the relationship between self-placement and the reported ideological location of Hillary Clinton. A very liberal respondent (a 1 in the horizontal scale) perceives Hillary Clinton as a moderate liberal (3) when voting for her and as a centrist (4) when voting against her. Meanwhile, a very conservative respondent (a 7 in the horizontal axis) perceives Clinton as a conservative when voting for her and as extremely liberal when not voting for her.

As shown in Figure 1, in the particular case of the United States, very conservative voters display higher levels of *assimilation* and *contrast* than liberal ones.[5] As a result, very conservative voters perceive the ideological distance that separates Clinton and Trump as greater than moderate or liberal voters do. As described by Calvo et al. (2014), policy and non-policy information can be used to model these effects, altering the perceived distance between users and parties. Positive valence frames augment *assimilation* while negative ones increase *contrast*, thereby producing increased perceived polarization.

Hypothesis 1: Negative valence frames that reflect poorly on the candidate will increase contrast effects, thereby increasing the perceived ideological distance between candidates.

As creators of social media posts "select some aspects of a perceived reality and make them more salient" (Entman 1993), they cause shifts in perceived ideological distances. Therefore, longer exposure to negative frames will increase the perceived

distance between the user and each candidate and, in consequence, the relative distance between them. This is certainly true for all users that are located in-between candidates, given that any increase in *contrast* will push both candidates away in opposite directions. This will also be true for ideologically extreme users if ideological distances increase above unity (Calvo et al. 2014).

Hypothesis 2: Higher exposure to negative valence frames will increase contrast effects, thereby increasing the perceived ideological distance between the candidates.

This prediction is consistent with a systematic view of persuasion. The more cognitive effort that an individual engages in, the greater the likelihood that the person's opinion will be influenced (Chaiken 1980). In the next section, we describe the design of two experiments that test for the effect of negative valence frames and processing time on perceived polarization.

Study 1: Exposure to Candidate Tweet

The survey was conducted November 18 to 23, 2016, with a panel consisting of a probability-based representative sample. The panel was recruited by Nielsen Scarborough from its larger probability-based national panel, which was recruited by mail and telephone using a random sample of households provided by Survey Sampling International. A total of 1,042 panelists completed the survey. Responses were weighted by age, gender, income, education, race, and geographic region using benchmarks from the U.S. Census. The survey was also weighted by partisan identification. The margin of error is 3.04 percent.

Our first experiment was fielded immediately after the 2016 U.S. presidential election. In this experiment, we randomly assigned subjects to three conditions: a negative campaign tweet sent by Donald Trump, a negative campaign tweet from Hillary Clinton, with the remaining third of respondents as a control—receiving no tweet. Figure 2 displays the tweet by Clinton (left panel) criticizing Trump for disrespecting women. The tweet says, "Donald Trump aggressively disrespects more than half the people in this country." On the right panel is the tweet by Trump that says, "{Crooked Hillary Clinton} created this mess, and she knows it." The purpose of the treatments was to use negative frames to reduce the moral standing of the candidates, with attacks that presented Clinton as corrupt and Trump as insensitive toward women. Respondents in the control group were untreated and not exposed to either tweet.

We use real tweets to increase the external validity of the experiment. This choice has caused us to sacrifice some internal validity, but allows us to increase external validity which is crucial in our study, as it speaks to how users are influenced by social media in the real world.[6] After the treatment, we asked respondents to place themselves and the two candidates on an ideological scale, from 1 (*very liberal*) to 7 (*very conservative*).

In Table A1 of the Supplementary Information File (SIF) to this article, we report balance diagnostics for gender, age, partisanship, and income between both the treated

Figure 2. Tweets of Donald Trump and Hillary Clinton criticizing their opponents.
Note. Tweet posted by Hillary Clinton (Tweet ID: 790606692547452932, left) on October 24, 2016, and by Donald J. Trump (Tweet ID: 789594671387447297, right) on October 21, 2016. Dates of the tweets were not included in the experiment.

and untreated groups. Sample balance in assignments is very good, with small deviations for gender (almost 4 percent fewer women in the untreated group) and in Clinton voters (3 percent fewer than average). Because Clinton voters and women were found to be less polarized than Trump voters and men in the 2016 American National Election Study (ANES),[7] the small deviations work against our hypothesis and should make our results more conservative. All tested specifications yield substantively similar results as reported in Table 1.

The Dependent Variable

The dependent variable is the absolute distance between the reported ideological placement of Donald Trump and that of Hillary Clinton. The average respondent placed Clinton at 2.54 of the 7-point liberal to conservative scale, while the median respondent placed her at 2. The average respondents placed Trump at 5.42, while the median respondent gave him a 6. So, the distributions are skewed to the left (Clinton) and right (Trump). At the individual level, the average distance between the two candidates was 3.44 out of 6, with a median distance of 4.

The upper-left plot in Figure 3 compares individuals treated with a tweet to those untreated. On average, the treated respondents perceived candidates to be 3.48 units away from each other, compared with 3.31 in the control group, a difference of 0.17 (0.09) with a p value of .056, as reported in Model 1 of Table 1. As the data are skewed toward higher polarization values, we also report the log of perceived polarization, with treated respondents reported a 0.056 (0.028), with a p value of .046, as reported in Model 4 of Table 1. Adding controls for vote choice increases significance for the

Table 1. Perceived Polarization with Tweet Treatment and Controls, First Experiment.

	Perceived Polarization	Perceived Polarization	Perceived Polarization	Ln (Perceived Polarization)	Perceived Polarization	Perceived Polarization
Variables	(1)	(2)	(3)	(4)	(5)	(6)
Treated to either tweet	0.178	0.195*	0.191*	.056*		
	(0.0930)	(0.0954)	(0.0950)	(0.028)		
Treated to Trump tweet					0.145	0.151
					(0.109)	(0.108)
Treated to Clinton tweet					0.247*	0.235*
					(0.110)	(0.109)
Voted Clinton		−0.493**	−0.284*		−0.494**	−0.285*
		(0.0904)	(0.135)		(0.0904)	(0.135)
Self-placement, Lib-Cons			−0.413**			−0.409**
			(0.128)			(0.128)
Self-placement, Lib-Cons^2			0.0591**			0.0587**
			(0.0156)			(0.0157)
Female			0.00828			0.00343
			(0.0893)			(0.0895)
Age			0.115			0.114
			(0.0595)			(0.0595)
White Democrat			0.177			0.177
						(0.141)
Constant	3.315**	3.728**	3.527**	1.38**	3.729**	3.525**
	(0.0759)	(0.0919)	(0.443)	(0.022)	(0.0919)	(0.444)
Observations	1,011	796	796	1,011	796	796
R^2	.004	.040	.069	.004	.041	.070
Log likelihood	−1,769	−1,313	−1,301	−1,769	−1,312	−1,300

Note. Estimates are unstandardized OLS coefficients with standard errors in parentheses. OLS = ordinary least squares. *$p < .05$. **$p < .01$.

absolute difference ($p < .05$ in Models 2 and 3 of Table 1). The lower plots compare the untreated group with both tweets separately. They show that individuals treated with either tweet perceived greater ideological distances between the candidates (Models 5 and 6 of Table 1). Increases in perceived ideological distances occur even though the selected tweets provide no policy information to respondents. Instead, tweets framed each candidate based exclusively on valence-issues (corruption and sexism for Clinton and Trump, respectively) causing respondents to rate the candidates further apart ideologically.

An important question is whether respondents who voted for Clinton or Trump reacted differently to the tweet from their less preferred candidate. As Figure 4 shows, we find that Trump voters' perception of polarization increased when treated by tweets from either candidate. Given that the tweets are not identical, we cannot expect the magnitude of the change to be comparable. However, we are able to highlight that the direction of change is exactly the same, showing that Republicans and Democrats exposed to either tweet increased their perceived polarization.

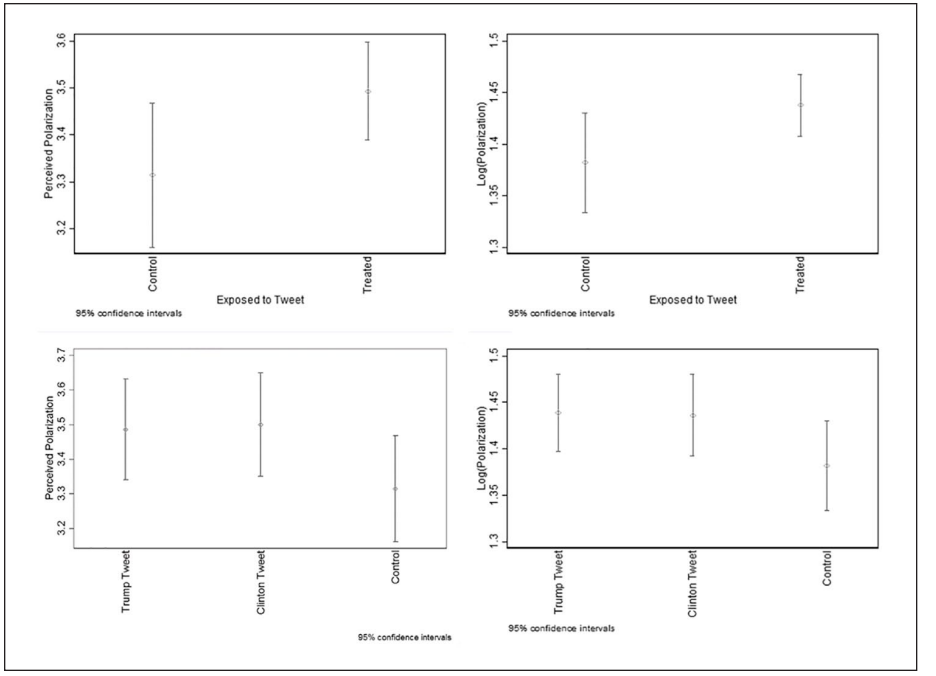

Figure 3. Perceived polarization and tweet exposure, Clinton and Trump.
Note. Perceived polarization describes the difference between the reported placement of Trump and Clinton for each respondent. Figures correspond to Table 1, Models 2 and 4. Point estimates with 95 percent confidence intervals.

Another important consideration in all analyses, however, is a ceiling effect on exposure, as Trump voters perceive Clinton as being on the extreme left (1.6, only 0.6 units away from the minimum of 1) while Democrats also perceive Trump as extreme but on the right (5.9, only 1.1 units away from the maximum of 7). In fact, the median untreated Republican voter placed Clinton as a 1, the most liberal score. Meanwhile, the median Democratic voter placed Trump as a 6. Given that GOP voters already perceive Clinton as extremely liberal and that Democratic voters perceive Trump as being very far to the right, the findings we present in our experiment are conservative and, in our view, noteworthy.

While the samples are balanced, a further test of the results that also provides some information about other sociodemographic variables is provided in Table 1, which includes covariates for vote preference, ideological self-placement, age, and white Democrats. Results were extremely robust to alternative specifications, with treatment effects remaining substantially unchanged with different covariates added. Alternative models with logistic distributions and different population weights can be found in the replication files online. All in all, as expected, model results show that perceived polarization is greater for very liberal and very conservative respondents (Table 1,

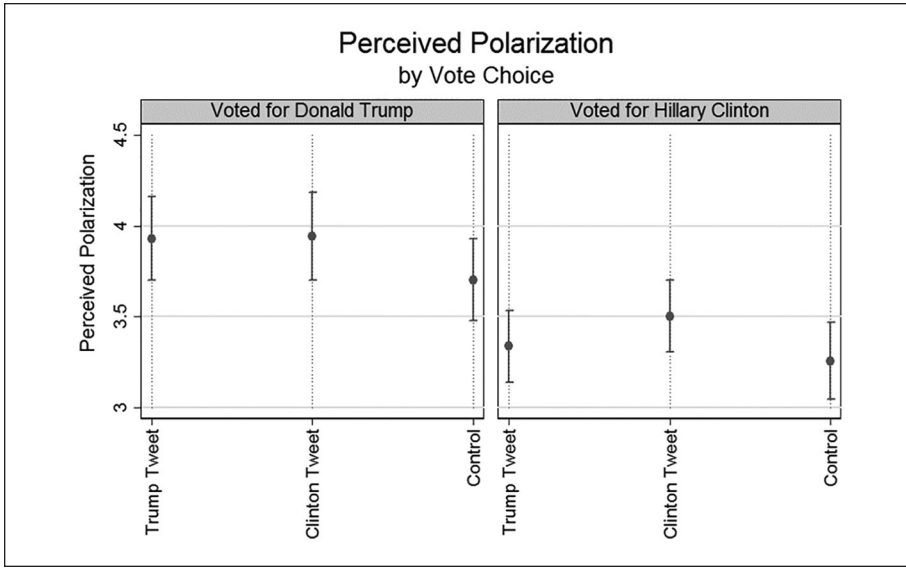

Figure 4. Perceived polarization, tweet exposure, and vote choice.
Note. Perceived polarization describes the difference between the reported placement of Donald Trump and Hillary Clinton for each respondent. Point estimates with 95 percent confidence intervals.

Models 3 and 6) as well as for older respondents. Finally, perceived polarization was similar for male and female voters.

Study 2: Effect of Processing on Perceived Polarization

In this section, we present results from a second experiment that measures the effect of time of exposure to a tweet on perceived polarization. Here, we randomly exposed respondents to three different tweets by NYT, Fox News, and The Associated Press, which report on the 2017 dismissal of acting Attorney General Sally Yates resulting from her decision not to enforce President Trump's executive order known as the "Muslim Ban."[8] Specifically, we treated respondents alternatively with either a liberal media tweet (NYT), a conservative media tweet (Fox News), or an ideologically neutral one (The Associated Press, AP) on the Yates dismissal (Baum and Groeling 2008; Groseclose and Milyo 2005). The NYT condition includes the following tweet: "Breaking News: President Trump has fired the acting attorney general Sally Yates." The Fox News condition tweet is "BREAKING: President Trump fires acting Attorney General Sally Yates for refusal to enforce 'extreme vetting' executive order." The AP condition tweets the following: "BREAKING: Trump fires acting Attorney General Sally Yates after she orders Justice Department lawyers to stop defending refugee ban." These tweets were posted within minutes of each other but circulated in very different regions of the #TravelBan network, the result of selective attention among

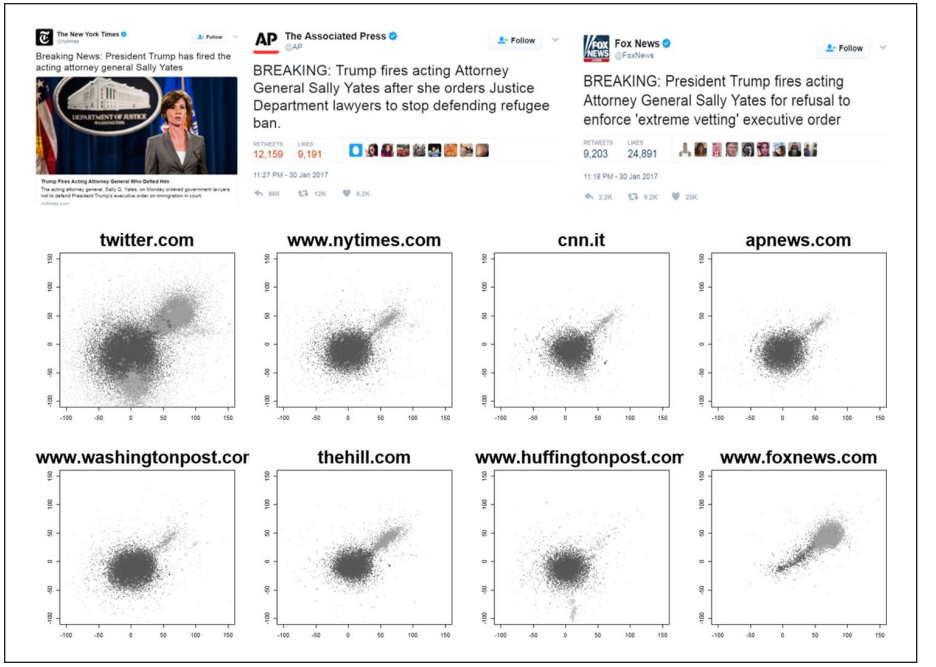

Figure 5. Identification of selected tweets in the observational data of the #TravelBan Network.

Note. Selection of tweets was based on Twitter network analyses collected between January 31 and February 2, 2017. The primary connected network included 241,271 users and posted 2,031,518 tweets. The largest community (anti-ban in dark gray) included 137,858 users in the primary connected network, representing 57 percent of the network. The second largest community (pro-ban in light gray) included 41,181 users, representing 17 percent of the network. In the anti-ban community, the account of the NYT was the most retweeted authority. In the pro-ban community, Fox News was the second most retweeted account, after PrisonPlanet. Tweets of Fox News and the NYT circulated in very different areas of Twitter's social network, with 80.5 percent of Fox News retweets by supporters of the #TravelBan and 92 percent of NYT retweets by opponents of the #TravelBan (see SIF for details). NYT = *New York Times*; SIF = Supplementary Information File.

users and of the different probability of activation (Aruguete and Calvo 2018; Entman 2003) in the Republican and Democratic sub-networks.

Figure 5 shows the location in the #TravelBan network from which we selected each tweet. Details of the #TravelBan network structure and behavior can be found in Section D of SIF.

Processing of Information—Time

In all three conditions, our primary independent variable measured the length of time subjects spent on their assigned tweet. This was measured as the *length of time elapsing between the moment that the tweet was loaded on the screen and the click to close*

the tweet and move to the next screen. Once the tweet was closed, the respondent would move to the reaction treatment (i.e., *like*, *retweet*, *reply*, or *ignore*) and the emotional response treatment. We separated the exposure screen to eliminate problems arising from multiple responses (for alternatives such as *like*, *retweet*, *reply*) and revisions. As a robustness check, we also control for "mean" user response to a battery of survey questions as well as for the "total" time spent on the experiments. Both of those analyses can be found in Section C of SIF. Controls for "mean" time by user make our results stronger but, as with all other analyses in this article, we side with the more conservative findings.

The objective of the second experiment was to test whether respondents who spent a longer amount of time reading the assigned tweet perceived greater ideological distances between Democrats and Republicans. As indicated by Hypothesis 2, we assume that longer exposure to the tweet reinforces the frame effect of the immigration issue, thereby increasing perceptions of polarization.

There are a few noteworthy differences from our first experiment, given that this survey was fielded three months after the 2016 election. First, we test for differences in the perceived polarization of parties rather than the perceived polarization of candidates. Second, in contrast to the first experiment, we measured perceived polarization on both policy issue and in general. One question concerns the distance between Democrats and Republicans in general, while the second one is about policy locations regarding the executive order issuing travel restrictions to citizens from seven Muslim-majority countries.

The survey was conducted April 12 to 17, 2017, with a panel consisting of a probability-based representative sample. The panel was recruited by Nielsen Scarborough from its larger probability-based national panel, which was recruited by mail and telephone using a random sample of households provided by Survey Sampling International. A total of 2,138 panelists completed the survey. Responses were weighted by age, gender, income, education, race, and geographic region using benchmarks from the U.S. Census. The survey was also weighted by partisan identification. The margin of error is 2.12 percent. In our survey experiment, we randomly assigned participants to groups treated with one of the three tweets in Figure 6. These are actual tweets posted on January 31, after President Trump signed the first executive order restricting foreign travel. The signing of the executive order led to the firing of acting Attorney General Sally Yates, who publicly refused to enforce it. From January 31 to February 2, we collected tweets related to the #TravelBan crisis, measuring user behavior in Twitter data such as *likes, retweets, replies*, together with the associated metadata. Through network analysis, we identified the NYT and Fox News tweets as circulating predominantly within Democratic and Republican online communities, respectively. The AP tweet, on the contrary, was centrally located in the network and was retweeted by both pro- and anti-ban users. Again, we use actual tweets on the Yates firing because we are interested in the effect of real tweets on people's political opinions, with experimental stimuli modeled at the level of the tweet rather than across tweets. As in the previous experiment, we sacrifice some internal validity for higher

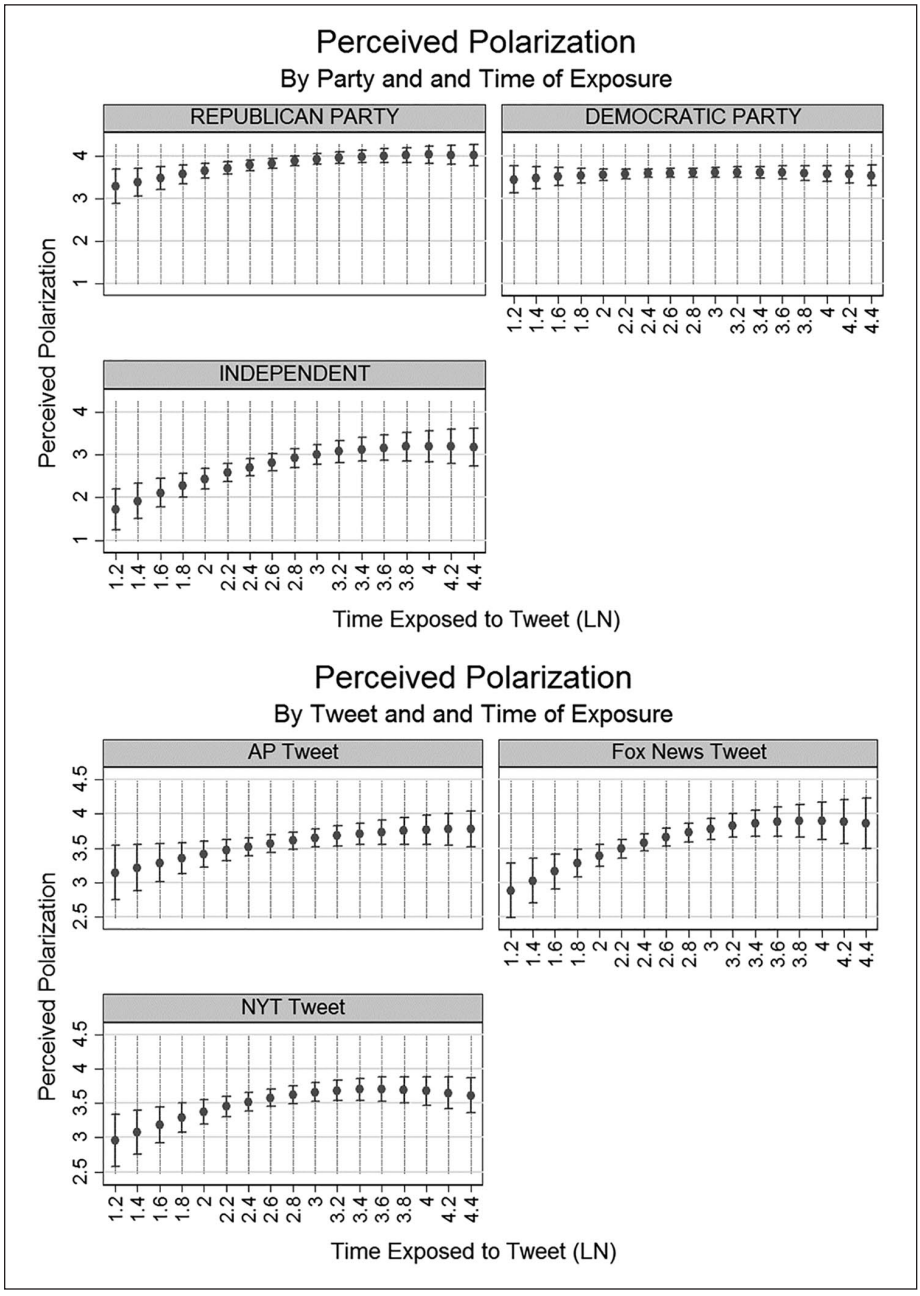

Figure 6. Perceived polarization, time of exposure (attention), and party ID.
Note. Exposure to tweet by party ID and by treatment. Point estimates with 95 percent confidence intervals.

external validity. However, readers will see that we are comparing the effect of processing time (attention) within tweets, which does not require an untreated baseline.

The median time that respondents spent reading tweets was fourteen seconds and the mean was twenty-seven seconds. The data were skewed right, with 90 percent of respondents taking less than forty seconds before moving to the next screen.[9] This second screen asked respondents whether they would "like," "retweet," or "reply" to the tweet. A third set of questions was focused on the emotional response to the tweet by the user. Finally, we asked respondents to place themselves, the political parties, and the parties' positions on immigration on the liberal to conservative scale.

As in the first experiment, we measure perceived polarization as the reported distance between Democrats and Republicans, both in general and on immigration specifically. Respondents perceived the two parties as slightly more polarized overall (3.70 points) than on immigration (3.57). The correlation between the two dimensions was .672, indicating that they are highly related. The level of perceived polarization of parties was slightly higher than that for candidates at the time of the election (3.70 compared with 3.43). This difference in polarization seems to be driven to a large extent by enhanced perceptions of polarization among Democrats, with reported distances increasing from 3.3 to 3.7 in those few months. However, as noted earlier in this article, Republican respondents' perceptions of polarization (3.95) remain significantly greater than those of Democrats (3.71) and independents (2.98).

Figure 6 shows the effect of processing time on perceived polarization on the travel ban, distinguishing by partisanship, first, and by type of treatment, second. The effect of processing on perceived polarization is positive and statistically significant for all treatments, but it is larger for Fox News. The effect of processing is larger for independents and Republicans. Meanwhile, results are not statistically significant when considering Democrats only.

As shown in Figure 7, higher levels of polarization are primarily driven by greater *contrast* effects for the less preferred party. Figure 7 presents estimates of distance between the self-reported position of respondents and their reported assessment of the Democratic and Republican parties' positions. The horizontal axes indicate the length of time that respondents spent reading the original tweets. The vertical axes show the absolute distance between respondents and the Democratic and Republican parties, respectively. Separate plots by party ID show that Republican respondents perceived greater distances between themselves and the Democratic Party when exposed to tweets. Similarly, Democratic respondents perceived greater distances between themselves and the GOP when exposed to tweets.

The greater effect for Fox News is primarily driven by increased psychological contrast among Republicans, who increase the distance between themselves and the Democrats to a greater extent than Democrats did when exposed to the NYT tweet. Meanwhile, among independents, treatment with any tweet led to larger *contrast* and greater perceived distance from both parties. As a result, perceived polarization increased the most among independent voters.

The greater sensitivity of Republicans to the messages from Fox News and AP is displayed in Figure 8, which shows the marginal effect of exposure time on

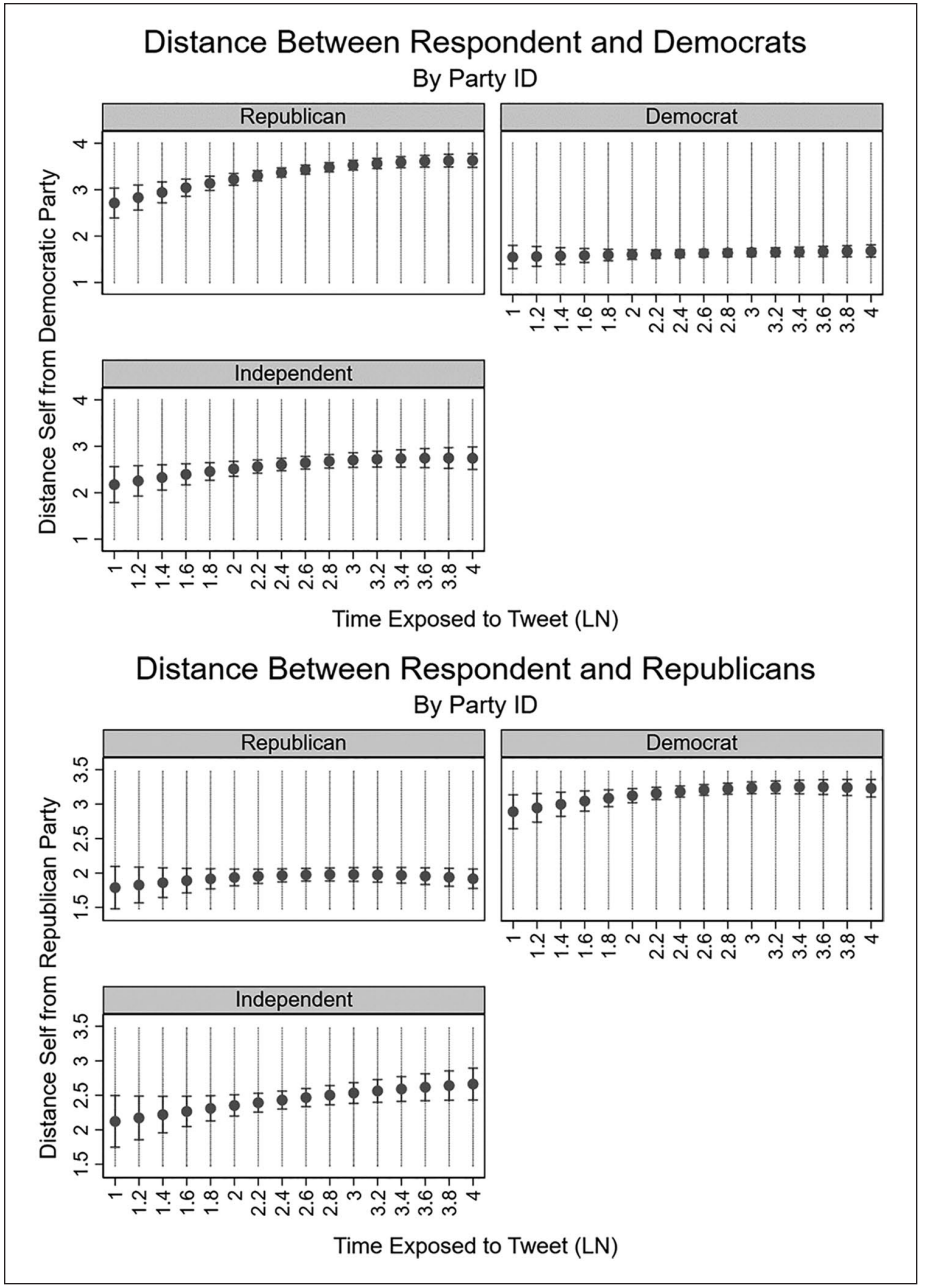

Figure 7. Distance from Democrats and Republicans by party ID and tweet exposure.
Note. Exposure to tweet by party ID and by treatment. Point estimates with 95 percent confidence intervals.

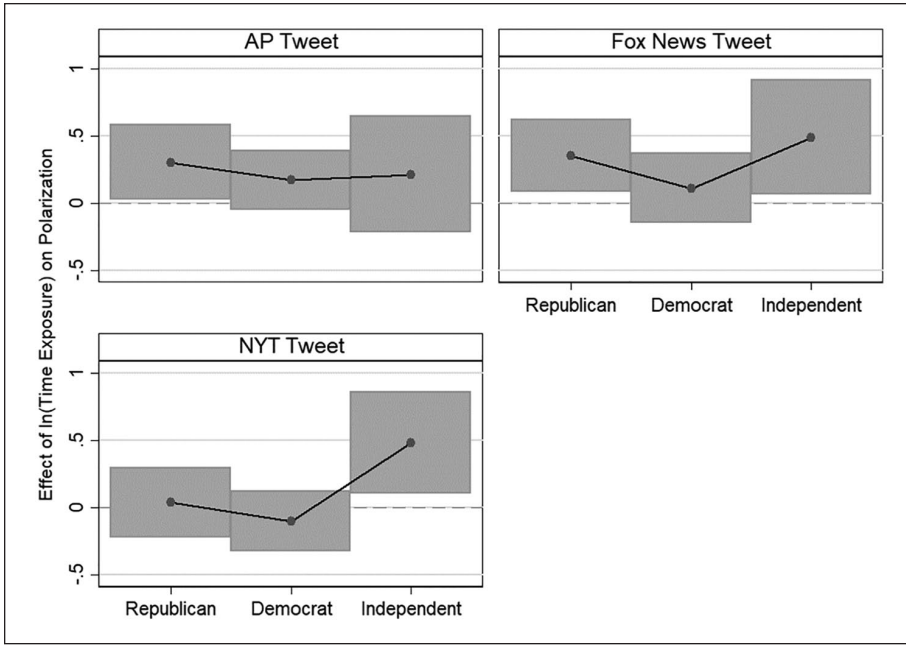

Figure 8. Marginal effect *(dy / dx)* of time of tweet exposure on perceived ideological polarization, by treatment and party.
Note. Results describe the marginal effect (slope) of time of exposure on polarization, conditional on the party of the respondent and the news organization of the tweet.

polarization and is conditional on the media source and the party. As one can see, the more time spent processing the Fox News and AP tweets, the greater the perceived polarization. That is, alignment with the source of the message increased *contrast* with the opposing party, leading to more polarization. Among independents, the tweets by both Fox News and NYT increased *contrast* with both parties and increased perceived polarization. Meanwhile, as noted before, there was no statistically significant effect on Democrats.

Taken together, Figures 7 to 9 provide evidence that greater processing of the tweets increases polarization through heightened ideological *contrast* rather than through *assimilation*. In the case of independents, Twitter messages have the largest effect, as they increase contrast with both parties. In the case of Republicans, polarization is driven by increased contrast with the Democratic Party, which is perceived as being further to the left. While the effect is positive and significant among Democratic voters when taken together, results fail to achieve statistical significance when considering the smaller samples of the three treatments.

Table 2 includes results with an extensive set of controls, including socioeconomic variables such as age, income, education, gender, race, as well as controls for the frequency of use of social media on the Internet. Consistent with prior survey findings,

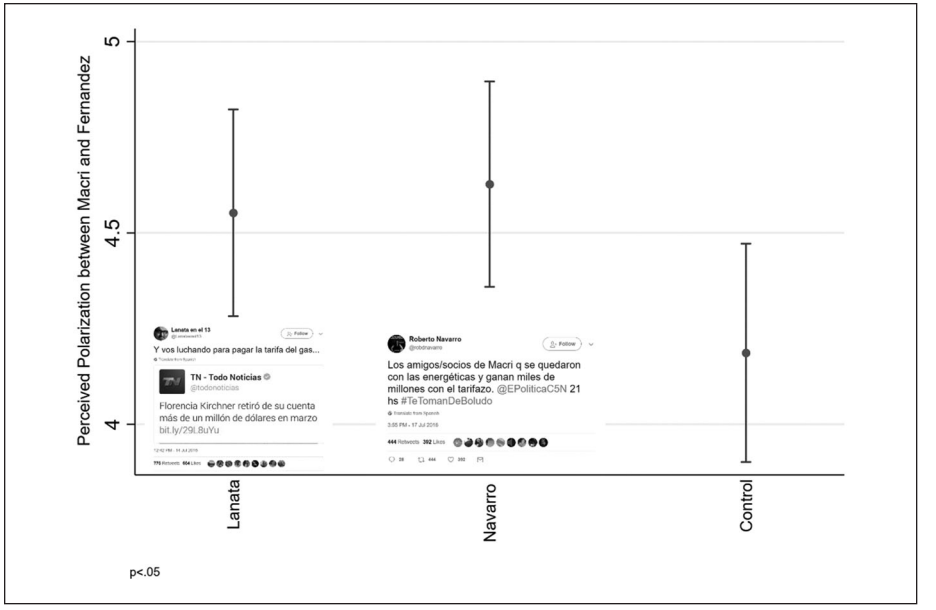

Figure 9. Perceived polarization and tweet exposure, Mauricio Macri (president) and Cristina Fernandez de Kirchner (former president).
Note. Perceived polarization describes the difference between the reported placement of Mauricio Macri (president) and Cristina Fernandez de Kirchner (former president) for each respondent. Three groups, one exposed to a tweet by Lanata (journalist aligned with Macri), another group exposed to a tweet by Navarro (journalist aligned with Fernandez), and a control group.

polarization increases with age, income, and education. Controlling for those factors, both experimentally and through covariates, we find evidence of a direct effect of social media exposure on perceived polarization. This increase in perceived polarization, we show, is primarily driven by contrast effect, where the opposing party is viewed as more extreme when respondents were shown tweets. These effects were more pronounced when the source of the message was aligned with the preferences of the respondent.

Extension: A Replication of Study 1 in Argentina

An important question left unanswered is the extent to which our results can be generalized to countries other than the United States. In this section, we present a replication of Study 1 conducted in Argentina. For this study, we recruited 2,105 adult respondents using Qualtrics' standing Argentine panel, with survey questionnaires fielded September 18 to 20, 2017, two months prior to the 2017 midterm election.

Argentina provides an excellent test case to validate our findings. As is the case in the United States, Argentina's partisan environment has been significantly polarized

Table 2. Perceived Polarization and Attention, Second Experiment.

Variables	(1) Polarization (Policy)	(2) Polarization (Policy)	(3) Polarization (Policy)	(4) Polarization (Ban)	(5) Polarization (Ban)	(6) Polarization (Ban)
Self-ideological placement	−0.0976**	−0.0985**	−0.0862**	−0.0810**	−0.0826**	−0.0671*
	(0.0264)	(0.0264)	(0.0267)	(0.0283)	(0.0283)	(0.0286)
Party ID: Democratic	−0.515**	−0.456**	−0.387**	−0.454**	−0.404**	−0.330*
	(0.101)	(0.140)	(0.141)	(0.108)	(0.150)	(0.151)
Party ID: Independent	−1.028**	−1.171**	−1.025**	−1.081**	−1.427**	−1.304**
	(0.110)	(0.185)	(0.187)	(0.118)	(0.198)	(0.199)
Time exposure in seconds (LN)	0.0899*	0.637**	0.613**	0.110*	0.625**	0.606**
	(0.0418)	(0.155)	(0.155)	(0.0449)	(0.166)	(0.166)
Time exposure in seconds^2		−0.0822**	−0.0802**		−0.0778**	−0.0745**
		(0.0226)	(0.0226)		(0.0243)	(0.0243)
Treatment: Fox News	−0.110	−0.0966	−0.102	0.0808	0.0873	0.0802
	(0.0772)	(0.122)	(0.123)	(0.0829)	(0.131)	(0.132)
Treatment: NYT	0.0127	0.0380	0.00990	−0.00772	−0.0519	−0.0669
	(0.0758)	(0.122)	(0.123)	(0.0814)	(0.131)	(0.132)
Democrat × Fox News		−0.106	−0.0976		−0.184	−0.166
		(0.163)	(0.163)		(0.175)	(0.176)
Independent × Fox News		−0.0643	−0.0267		0.0231	0.0506
		(0.162)	(0.163)		(0.174)	(0.175)
Democrat × NYT		0.377	0.262		0.722**	0.705**
		(0.248)	(0.248)		(0.265)	(0.266)
Independent × NYT		0.0913	0.0252		0.322	0.263
		(0.252)	(0.252)		(0.270)	(0.271)
Native American			−0.0820			−0.0647
			(0.294)			(0.315)
Caucasian			0.393**			0.401**
			(0.135)			(0.145)
Asian or Pacific Islander			−0.129			0.145
			(0.226)			(0.244)
Multiracial			0.0837			0.154
			(0.199)			(0.215)
Other			−0.0912			−0.143
			(0.186)			(0.200)
Internet usage: × Multiple Times a Week			0.235			0.163
			(0.143)			(0.154)
Internet usage: Weekly			0.289*			0.282*
			(0.135)			(0.145)
Internet usage: Not often			0.191			0.170
			(0.112)			(0.120)
Internet usage: Never			0.265*			0.169
			(0.116)			(0.125)

(continued)

Table 2. (Continued)

Variables	(1) Polarization (Policy)	(2) Polarization (Policy)	(3) Polarization (Policy)	(4) Polarization (Ban)	(5) Polarization (Ban)	(6) Polarization (Ban)
Female	−0.0255	−0.0306	−0.0175	−0.155*	−0.160*	−0.153*
	(0.0644)	(0.0643)	(0.0644)	(0.0693)	(0.0690)	(0.0694)
Age 25–34	−0.197	−0.197	−0.170	−0.303**	−0.293*	−0.296*
	(0.143)	(0.143)	(0.143)	(0.154)	(0.153)	(0.154)
Age 35–44	−0.370*	−0.394**	−0.374*	−0.432**	−0.453**	−0.463**
	(0.151)	(0.151)	(0.151)	(0.161)	(0.161)	(0.162)
Age 45–54	−0.123	−0.158	−0.177	−0.314*	−0.342*	−0.371*
	(0.141)	(0.141)	(0.141)	(0.151)	(0.151)	(0.151)
Age 55–64	−0.0814	−0.125	−0.189	−0.101	−0.140	−0.205
	(0.135)	(0.135)	(0.136)	(0.145)	(0.145)	(0.147)
Age 65+	0.0985	0.0406	−0.0460	−0.0161	−0.0719	−0.159
	(0.137)	(0.138)	(0.140)	(0.147)	(0.148)	(0.151)
Constant	3.578**	2.781**	2.231**	3.565**	2.867**	2.371**
	(0.328)	(0.400)	(0.436)	(0.352)	(0.427)	(0.467)
Education controls	Yes	Yes	Yes	Yes	Yes	Yes
Income controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,073	2,073	2,051	2,065	2,065	2,043
R^2	.097	.105	.124	.093	.103	.117
Log likelihood	−3,637	−3,628	−3,570	−3,768	−3,757	−3,702

Note. Standard errors in parentheses. NYT = *New York Times*.
*$p < .05$. **$p < .01$.

since 2008 (Lupu et al. 2019), with social media playing a prominent role since the election of 2015 (Calvo 2015). Argentina also shares with the United States some critical institutional features, such as being a winner-takes-all presidential system as well as a Congress that includes a Federal Chamber (*Senado*) and a population Chamber (*Diputados*). Different from the United States, Argentina's electoral competition includes many parties, although at the time of this survey most of the vote concentrated on the incumbent coalition Cambiemos, led by President Mauricio Macri, and the Peronist opposition, led by former President Cristina Fernandez de Kirchner.

As in Study 1 in the United States, we randomly assigned Argentine respondents to three conditions: a negative tweet by Lanataenel13, an account supportive of President Mauricio Macri; a negative tweet by Roberto Navarro, an ally of former President Cristina Fernandez; with the remaining third of respondents as a control—receiving no tweet. We again consider generic frames that place a negative light on the moral traits of Macri and Fernandez (Entman 1993). The post by Lanata accuses the daughter of Cristina Fernandez of withdrawing 1 million dollars from her bank account, suggesting that this was money embezzled by her mother. The tweet by Roberto Navarro

accuses close allies of President Macri of gaining ownership control of leading energy companies. Both tweets come from leading accounts that played prominent roles in the 2017 midterm election in Argentina.

As in Study 1 in the United States, the Argentine tweets highlighted negative moral traits of Presidents Macri and Fernandez, accusing both of them of corrupt practices while providing no information about their ideological leanings. We then collect self-reported ideological preferences of the respondents as well as reported ideological positions of Macri and Fernandez on a 10-point scale. Further details of the Argentine replication experiment are in Section D of SIF.

Results in Figure 9 replicate results from Figure 3 of Study 1, this time on the panel of Argentine respondents. Estimates show that exposure to the tweets by Lanata and Navarro increases perceived polarization from 4.2 to 4.6 (10 percent). The average treatment effect for both tweet conditions results in a 0.403 increase in polarization, statistically significant at the .05 level.[10] Similar to Study 1, in the United States, we do not find differences in results when comparing Lanata with Navarro treatments. Rather, as in Study 1, results are driven by increased contrast with both candidates.

Results from the Argentine replication experiment indicate that the findings are not exclusive to the United States. Indeed, the Argentines support the notion of general frames with negative valence treatments as a mechanism that leads to increased perceived polarization. Given that *assimilation* and *contrast* effects have been shown to affect perceptions of ideological placement in a variety of countries, we expect findings to be robust outside of the United States and Argentina.

Discussion

We live in polarized times in both our daily lives and in our media feeds. We are affectively and ideologically polarized, and more partisan than ever. Understanding this development is an important area of research, politically consequential, and theoretically salient. While users in social media are polarized, there is little research showing that social media polarizes users. Results of the two experiments presented in this article demonstrate that exposure to tweets increases perceptions of polarization in the United States. Results of the replication study in Argentina provide supporting evidence that the findings are general, consistent with comparative evidence of *assimilation* and *contrast* effects in a variety of political environments (Adams et al. 2005; Calvo et al. 2014). The effect is statistically significant when exposing respondents to tweets by candidates, as well as when we exposed them to partisan media. We also observe a slightly stronger reaction to the tweets among Trump voters than Clinton voters. It is possible that Republican voters are more motivated to defend their partisan identity than Democratic voters (Theodoridis 2017). As a result, they are more likely to see a greater distance between the parties.

The most important theoretical contribution of this paper comes from bridging the literatures of *framing* with the political psychology studies on *assimilation* and *contrast*. Our results provide a mechanism that explains how negative social media frames may increase perceptions of polarization even if they have no associated policy

content. We explain our findings as the result of generic frames that increase *contrast* effects, with negative valence assessments driving the placement of parties and candidates to more extreme positions. Furthermore, we show that exposure to tweets increases *contrast* both for the candidate that respondents support and for the one they oppose. That is, rather than fostering an *us* versus *them* state of mind, we find that the users exposed to tweets saw all candidates and parties as more extreme. Our experimental findings also show that increasing the time spent reading a tweet has a significant effect on our perceptions of polarization. The effect of processing time increases rapidly in the early seconds, holding steady as time progresses.

There are, however, some important limitations of our study and may hopefully serve as a guide for future research on the relationship between framing and political polarization. The use of competing frames is not versatile enough to address how different types of wording, pictures, and embedded visual cues shape perceptions of polarization. Future research will benefit from experimental manipulation of different frame elements, beyond what competing frame approaches can explain.

Still, the experimental approach to modeling *contrast* effects through competing frames allows us to overcome important difficulties in the study of polarization. Ensuring randomization while preserving "experimental realism" is crucial to studying frame in complex social media environments, where editorial control on political messages is often fragmentary and difficult to evaluate.

The proposed research also has important substantive implications for social media politics. Observers differ over how to respond to the growth in polarization in American politics. Some seek to change attitudes, while others advocate modifying political institutions. In either case, an improved understanding of the sources of polarization and the mechanisms that exacerbate it is indispensable. The findings we report suggest that social media is a contributing factor. While leading social media companies have recently begun efforts to deal with fake news, the effect we find is a more basic one. Social media is not going anywhere and, at least for the near future, neither is polarization.

Acknowledgments

We would like to thank Brittany Kyser, Natalia Aruguete, Mario Riorda, Tiago Ventura, Julia Pomares, Luciano Gallup, Lara Goyburu, Ed Summers, Joan Timoneda, the editor of the International Journal of Press/Politics, as well as the anonymous readers who made extensive suggestions to make this article better. As usual, mistakes are the exclusive responsibility of the authors.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

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Supplemental Material

Supplemental material for this article is available online.

Notes

1. Researchers distinguish among different types of polarization, including *policy polarization* (divergence in the policy proposals of parties), *affective polarization* (the distance in likes–dislikes reported by voters), and *perceived polarization* (the distance between candidates and parties as perceived by voters). In this article, we assess changes in perceived polarization.
2. *Contrast* effects describe the psychological propensity to scale items further away from us (anchor), and beyond their actual location, when respondents dislike key features that characterize them. *Assimilation* is the propensity to scale items closer to the anchor when respondents like key features.
3. For a general discussion of experimental approaches to framing theory, see Chong and Druckman (2007).
4. For an overview of the eye-tracking literature, see Lai et al. (2013).
5. See Grossmann and Hopkins (2016) for an in-depth review of partisan asymmetry in the United States. See Calvo et al. (2014) for a comparative study of *assimilation* and *contrast* effects, where the authors introduce a theoretical model to explain biases in the ideological placement of parties and test the results on fourteen countries.
6. We acknowledge that there are other conditions in which an individual could be exposed to a candidate's tweet on Twitter (e.g., retweet from a user). Yet because we are interested in whether social media (i.e., tweets) polarizes individuals, a more direct test of our prediction would have the tweet coming directly from the candidate rather than another social media user.
7. For a description of the American National Election Study (ANES) and access to the data, see https://electionstudies.org/data-center/2016-time-series-study/.
8. Donald Trump's executive order 13769 banned entry of foreigners from seven Muslim countries—Iran, Iraq, Libya, Somalia, Sudan, Syria, and Yemen. A full description of the order can be found here: https://www.whitehouse.gov/presidential-actions/executive-order-protecting-nation-foreign-terrorist-entry-united-states-2/.
9. A total of 103 respondents (less than 4 percent of the sample) registered times longer than sixty seconds. This is likely the result of respondents taking some type of break. Truncating the sample by excluding respondents with unreasonably long times gives a median time of fourteen seconds and an average time of sixteen seconds spent reading the assigned tweet. Truncated models that eliminate the outliers yield similar results.
10. See Table D2 in the Supplementary Information File (SIF) for the average treatment effect of both tweets.

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