

Supplementary Information File (SIF) accompanying the article #PolarizedFeeds:
Two experiments on polarization, framing, and social media

Antoine Banks
abanks12@umd.edu
University of Maryland

Ernesto Calvo
ecalvo@umd.edu
University of Maryland

David Karol
dkarol@umd.com
University of Maryland

Shibley Telhami
sadat@gmail.com
University of Maryland

June /2020

Section A: Sample Balance between Treatments, Experiments 1 and 2

Table A1: Balance between Treatments, both experiments

Experiment 1	Trump Tweet			Clinton Tweet			Control Group		
	N	Mean	SD	N	Mean	SD	N	Mean	SD
Polarization	338	3.485	1.361	336	3.500	1.393	337	3.315	1.430
Hillary Vote	315	0.517	0.500	316	0.509	0.501	311	0.463	0.499
Ideology	346	3.934	1.716	346	3.951	1.738	347	4.138	1.705
Woman	347	0.473	0.500	348	0.537	0.499	347	0.447	0.498
Age	347	2.262	0.781	348	2.293	0.771	347	2.219	0.789
White Democrat	347	1.870	0.336	348	1.876	0.330	347	1.873	0.333
Experiment 2	AP Tweet			Fox Tweet			NYT Tweet		
	N	Mean	SD	N	Mean	SD	N	Mean	SD
Polarization	690	3.583	1.541	686	3.599	1.590	700	3.534	1.603
Ideology	699	3.950	1.812	697	4.024	1.716	714	4.003	1.800
PartyID	703	1.750	0.660	712	1.751	0.686	723	1.743	0.660
Race: Native American	700	0.013	0.113	706	0.016	0.124	715	0.011	0.105
Race: Caucasian	700	0.803	0.398	706	0.800	0.400	715	0.803	0.398
Race: Asian	700	0.036	0.186	706	0.025	0.158	715	0.022	0.148
Race: Multi-racial	700	0.043	0.203	706	0.031	0.174	715	0.048	0.213
Race: Other	700	0.046	0.209	706	0.064	0.244	715	0.055	0.227
Internet: Several Times aWeek	700	0.103	0.304	706	0.085	0.279	715	0.083	0.275
Internet: Weekly	700	0.107	0.310	706	0.125	0.331	715	0.113	0.317
Internet: Not often	700	0.409	0.492	706	0.377	0.485	715	0.378	0.485
Internet: Never	700	0.283	0.451	706	0.331	0.471	715	0.312	0.464
TimeExposed (LN)	702	2.853	0.802	711	2.600	0.670	723	2.812	0.821
Action: Like	703	0.174	0.379	712	0.167	0.373	723	0.152	0.359
Action: Retweet	703	0.060	0.237	712	0.024	0.153	723	0.068	0.252
Action: Reply	703	0.085	0.280	712	0.073	0.260	723	0.089	0.284
Age	703	4.114	1.624	712	4.097	1.550	723	4.050	1.601
Education	703	3.275	0.884	712	3.206	0.875	723	3.201	0.907
Income	703	3.349	1.586	712	3.279	1.518	723	3.245	1.570
Woman	703	1.506	0.500	712	1.494	0.500	723	1.484	0.500

Note: Summary values for treatments and variables in Table 1 and Table 2.

Section B: Supplementary information on the Sally Yates Experiment

The Sally Yates experiment, collected between April 12 and 17 of 2017, was designed to be deployed in three different screens. The sample included 2138 adult respondents matched to the U.S. population on age, gender, income, education, race, and geographic region using benchmarks from the U.S. Census.

After randomly assigning respondents to one of three groups, the first screen of the experiment showed one of the three tweets published on January 30th by the New York Times, Fox News, or AP (Figure B.1). The tweet was published full size in the online page. Once users click to move forward, a new screen showed the question: “Thinking back to the tweet, if posted in your media feed, would you...?”, with the options to “like”, “retweet”, “reply”, and “ignore”. Finally, a third screen opened, showing the question: “Thinking back to the tweet, do you feel...?”, with the options “Joyful”, “Angry”, “Fearful”, “Saddened”, “Disgusted”, and “Stressed”. Each of the three pages also measured the total length of time that that the user spent on it as well as the time-to-click each of the responses.

After the treatment was administered to users, we presented them with questions for ideological self-placement as well as for the placement of the parties.

Figure B.1: Alternative treatments.



Response to the treatment

Responses to the questions that followed the treatments are shown in Tables B.1 and B.2. As expected, engagement with the tweets of Sally Yates was higher among republicans and lower among democrats. The most common engagement response among republicans was “like” while among democrats was “reply”. The rates of engagement in the survey are higher than in the observational data, which is common in experimental treatments that single out a publication and seek to elicit a response.

The most common affective response among republicans after being exposed to the tweets was “joyful” and the second one was “disgusted.” Among democrats, the most common affective response was “disgusted” followed by “saddened.” Descriptive information of responses to the second and third screen shown in Table B.1 and B.2.

Table B1: Response to Question “Thinking back to the tweet, if posted in your media feed, would you....?”

		News Treatments, All Data				News Treatments, Republicans				News Treatments, Democrats			
		AP	FOX	NYT	Total	AP	FOX	NYT	Total	AP	FOX	NYT	Total
Like	N	122	119	110	351	82	101	76	259	29	7	20	56
	%	17.6	17	15.45	16.67	31.66	37	28.25	32.33	8.26	2.12	5.62	5.4
Retweet	N	42	17	49	108	8	4	12	24	33	11	33	77
	%	6.06	2.43	6.88	5.13	3.09	1.47	4.46	3	9.4	3.33	9.27	7.43
Reply	N	60	52	64	176	4	12	7	23	53	34	52	139
	%	8.66	7.43	8.99	8.36	1.54	4.4	2.6	2.87	15.1	10.3	14.61	13.4
Ignore	N	469	512	489	1470	165	156	174	495	236	278	251	765
	%	67.68	73.14	68.68	69.83	63.71	57.14	64.68	61.8	67.24	84.24	70.51	73.77
Total	N	693	700	712	2105	259	273	269	801	351	330	356	1037
	%	100	100	100	100	100	100	100	100	100	100	100	100

Note: Responses by self-identified democrats, republicans, and independents.

Table B2: Response to Question “Thinking back to the tweet, do you feel...?”

		News Treatments, All Data				News Treatments, Republicans				News Treatments, Democrats			
		AP	FOX	NYT	Total	AP	FOX	NYT	Total	AP	FOX	NYT	Total
Joyful	N	129	148	115	392	110	120	98	328	12	7	6	25
	%	19.97	22.53	17.29	19.92	48.25	49.18	41.7	46.39	3.48	2.14	1.69	2.44
Angry	N	80	60	73	213	15	13	15	43	60	46	50	156
	%	12.38	9.13	10.98	10.82	6.58	5.33	6.38	6.08	17.39	14.07	14.12	15.2
Fearful	N	29	27	39	95	6	7	6	19	20	15	31	66
	%	4.49	4.11	5.86	4.83	2.63	2.87	2.55	2.69	5.8	4.59	8.76	6.43
Saddened	N	112	118	138	368	39	44	35	118	61	50	82	193
	%	17.34	17.96	20.75	18.7	17.11	18.03	14.89	16.69	17.68	15.29	23.16	18.81
Disgusted	N	255	236	233	724	48	38	57	143	169	172	153	494
	%	39.47	35.92	35.04	36.79	21.05	15.57	24.26	20.23	48.99	52.6	43.22	48.15
Stressed	N	41	68	67	176	10	22	24	56	23	37	32	92
	%	6.35	10.35	10.08	8.94	4.39	9.02	10.21	7.92	6.67	11.31	9.04	8.97
Total	N	646	657	665	1,968	228	244	235	707	345	327	354	1,026
	%	100	100	100	100	100	100	100	100	100	100	100	100

Note: Responses by self-identified democrats, republicans, and independents.

Effect of Processing Time, Engagement Time, and Emotion Time on Perceived Polarization

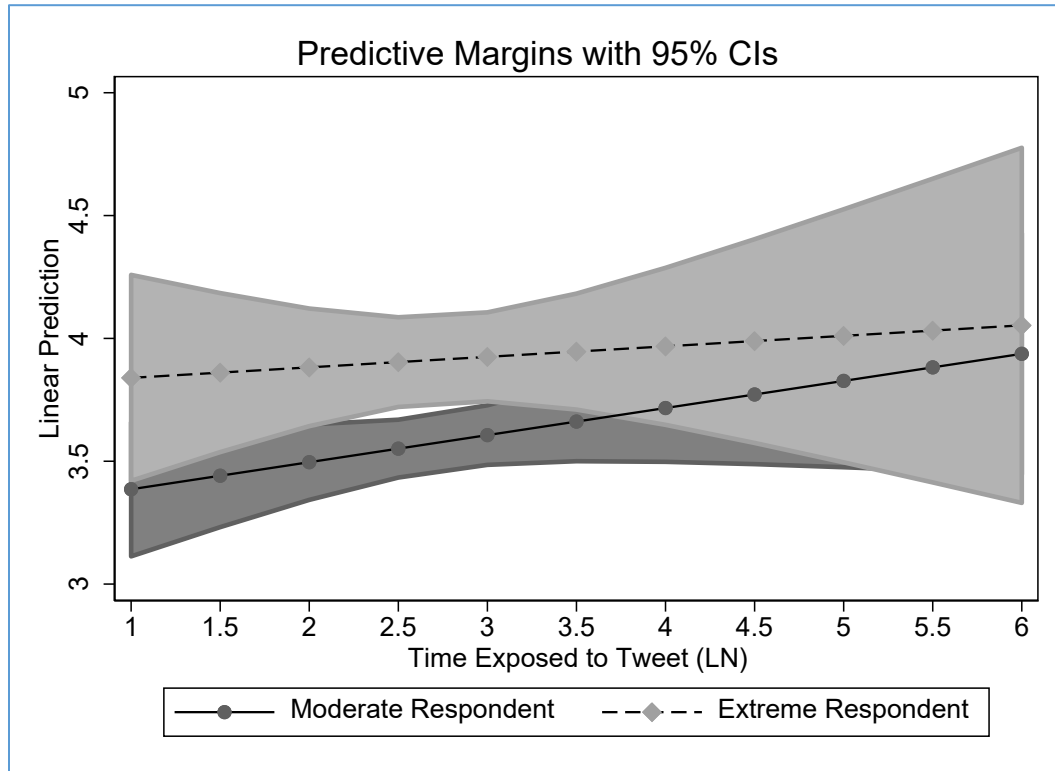
The length of time that users were exposed to the tweet has, as described in the article, a positive effect on perceived polarization. There is no effect for the length of time users spent on the engagement responses (“Like”, “Retweet”, “Reply”, “Ignore”), but there are positive effects the length of time spent on the emotional response. We also find positive increases in perceived polarization among respondents that “like” the Sally Yates’ tweets. Figure B.2 provides further evidence that processing time has a larger effect among moderate respondents than among extremists (measured by the distance to the median respondent).

Table B.3: Perceived Polarization with Follow Up Questions.

VARIABLES	(1) Perceived Polarization	(2) Perceived Polarization	(3) Perceived Polarization
Processing time (Screen 1)	0.0982* (0.0428)	0.0914* (0.0430)	0.0932* (0.0432)
Engagement Time (Screen 2)	-0.0832 (0.0568)	-0.0799 (0.0579)	-0.0883 (0.0582)
Emotion Time (Screen 3)	0.174** (0.0611)	0.179** (0.0615)	0.203** (0.0623)
Like		0.162 (0.0876)	0.196* (0.0919)
Retweet		0.180 (0.148)	0.161 (0.148)
Reply		0.00731 (0.120)	-0.0112 (0.121)
Self-ideological Placement			-0.0762 (0.0897)
Self-ideological Placement ²			0.00586 (0.0111)
Constant	3.225** (0.190)	3.188** (0.190)	3.334** (0.242)
Observations	2,079	2,079	2,071
LogLik	-3745	-3743	-3727

Note: Dependent variable is the distance between the user reported ideological position of the Democratic and Republican Parties. Standard errors in parentheses. ** $p < 0.01$, * $p < 0.05$

Figure B2: Extremism, Processing Time, and Perceived Polarization



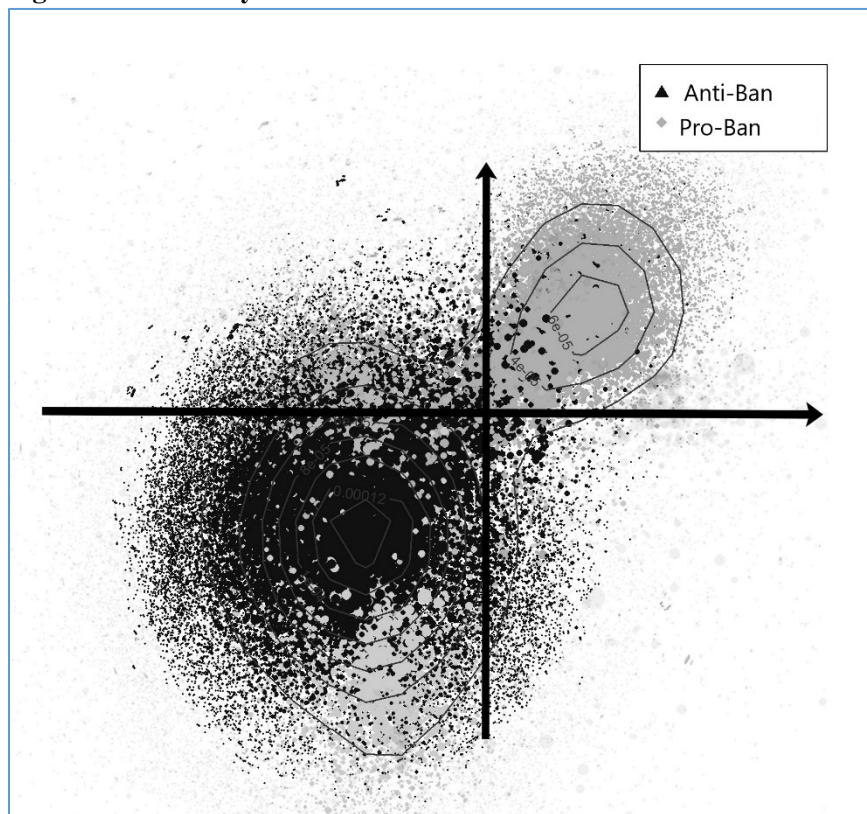
Note: Extremism is measured by the maximum distance between respondents and the median of the ideological distribution.

Section C: Supplementary information on the #TravelBan Network observational data

On January 27, 2017, president Donald Trump Jr. signed into effect the Executive Order *13769*, titled *Protecting the Nation from Foreign Terrorist Entry into the United States* and widely referred to as the Travel Ban. On January 28, 2017, the acting United States Attorney General Sally Yates announced that she considered Order 13769 unlawful and, consequently, that her office would not enforce it. Two days later, on January 30, the administration dismissed Yates as Attorney General and replaced her with Dana Boente.

From Monday January 30 at 8:45 PM to Tuesday January 31 at 9:35PM, we collected 4,374,108 tweets that included the character string “trump” using the filter API provided by Tweeter. We then proceeded to collect all retweets in the dataset 3,211,765 (73.4% of the data), eliminated users with less than two occurrences (i.e. an out-degree<3), and collected the primary connected cluster which included 241,271 users and 2,031,518 tweets.

Figure C1: Primary connected network of the #TravelBan network.



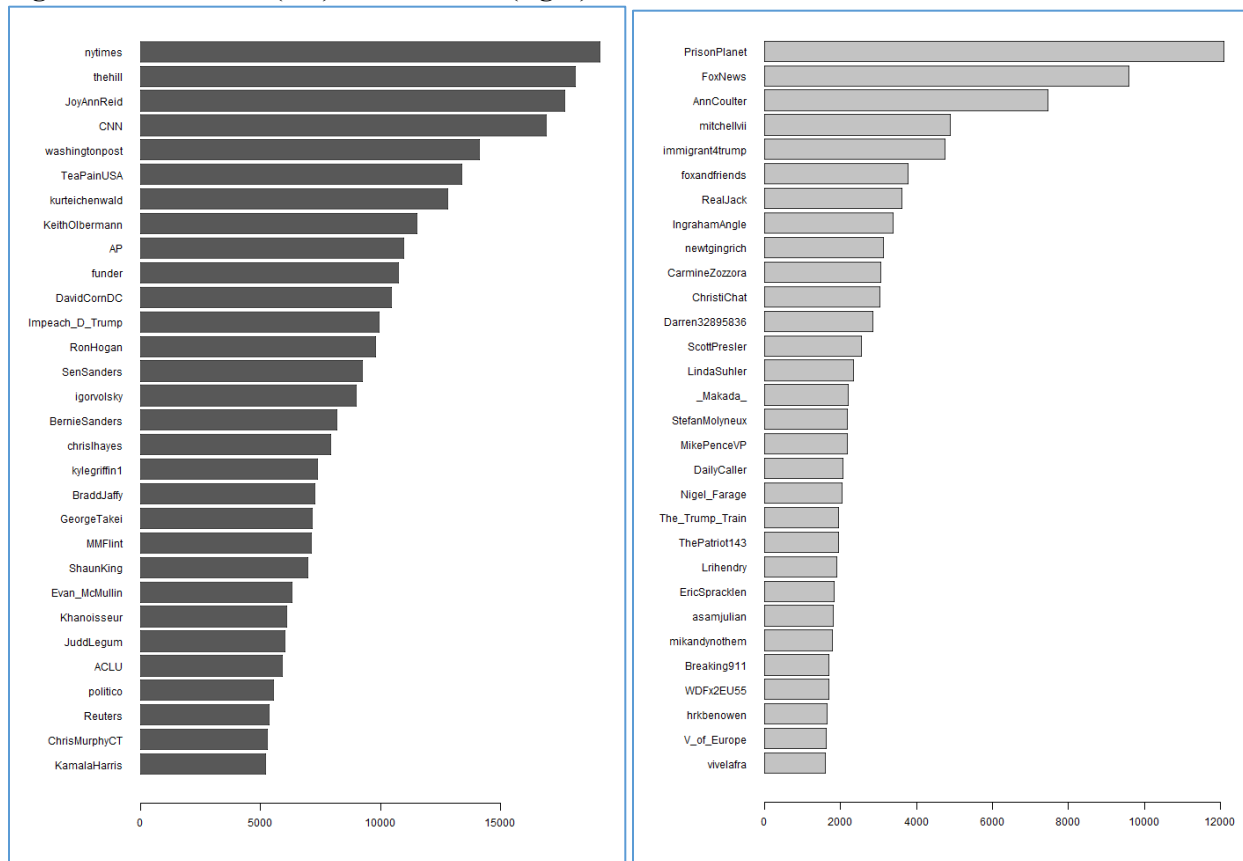
Note: TravelBan layout with nodes placed using the Fruchterman-Reingold Layout algorithm in R 3.5 and nodes colored by the *walktrap.community* detection algorithm, igraph 1.0.

Layout and Community Detection

Using igraph 1.0 in R 3.5 we implemented estimated a latent location of the network nodes using the Fruchterman Reingold algorithm in igraph 1.0 and classify community memberships using the

walktrap.community detection algorithm. The largest community (blue), included 137,858 users in the primary connected network, representing 57% of the network. The second largest community (red), included 41,181 users, representing 17% of the network. The top authority (highest in-degree) in the anti-Ban community was the New York Times, which was retweeted 20,612 times. The second authority in the pro-Ban community was Fox News, which was retweeted 11,918 times. The ninth most retweeted authority in the anti-Ban community was AP, which was retweeted 13,343 times. Figure D.1 presents the top authorities of the two largest communities, classified by the *walktrap.community* detection algorithm.

Figure C2: Anti-Ban (left) and Pro-Ban (right) Communities



Note: Accounts ordered by in-degree (horizontal axis) in both communities.

Selection of Tweets

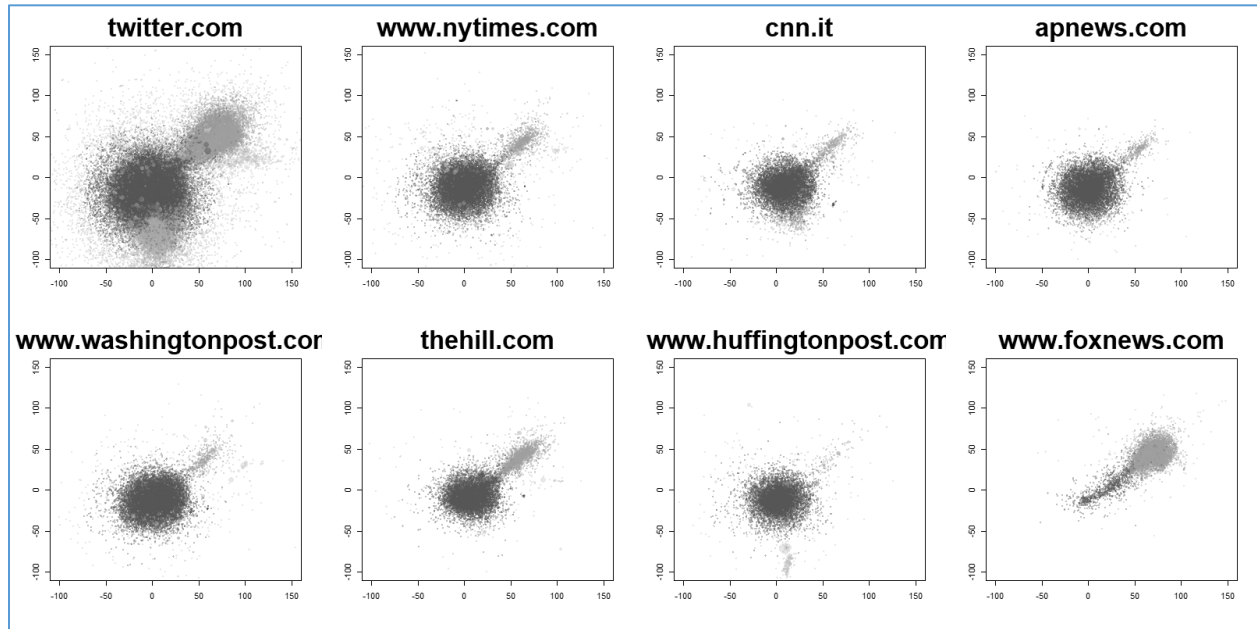
For our experiments, we recovered the most retweeted publications by the NYT, Fox News, and AP. Visual inspection of the accounts that included hyperlinks to each of the news organizations showed that almost 93% of the users that retweeted publications by the NYT were classified as part of the anti-TravelBan community. By contrast, almost 80% of the users that retweeted publications by Fox News were classified as part of the pro-TravelBan community. Retweets that included hyperlinks to AP were 82% in the anti-TravelBan community while less than 8% were in the pro-TravelBan community.

Table C1: Hyperlinks to AP, Fox News, and the NYT by latent community

	Blue	M.2	Red	M.4	M.5	M.6	M.6
AP	10,962 82.16%	13 0.10%	1,055 7.91%	209 1.57%	991 7.43%	113 0.85%	13,343 100%
FOX	1,788 15.00%	56 0.47%	9,596 80.52%	163 1.37%	288 2.42%	27 0.23%	11,918 100%
NYT	19,134 92.83%	22 0.11%	348 1.69%	302 1.47%	569 2.76%	237 1.15%	20,612 100%

Note: *Walktrap.community* detection algorithm in Igraph 1.0.

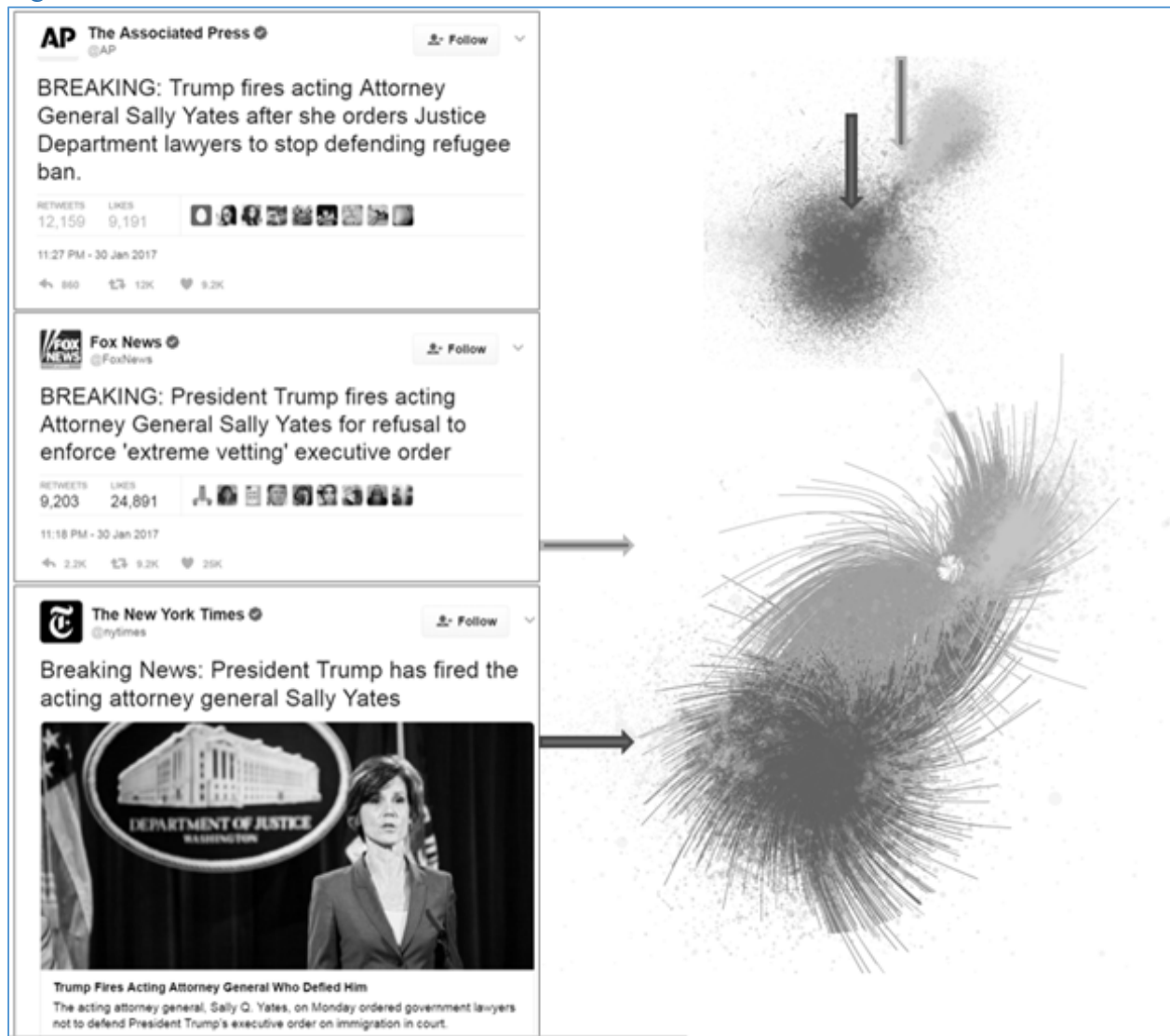
Figure C3: Activation of News (hyperlinks) in the Anti-Ban (blue) and Pro-Ban (red) Communities



Note: Figure describe the nodes (users) that retweeted tweets with links to each media outlets.

Therefore, for our second experiment, we selected the most frequently retweeted post by the top news authority (highest in-degree) in each community. Those are identified in Figure 6 of the article which is reproduced below as D.3. The number of retweets in the selected images is larger than in our data, as those images were retrieved days after data collection.

Figure C4: 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 30st and February 1. The primary connected network included 241,271 users and posted 2,031,518 tweets. The largest community (blue), included 137,858 users in the primary connected network, representing 57% of the network. The second largest community (red), included 41,181 users, representing 17% of the network. In the blue community, the account of the NYT was the most retweeted authority. In the red 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% of FoxNews retweets by supporters of the #TravelBan and 92% of NYT retweets by opponents of the #TravelBan. Differences are the result of selective attention by users and different activation of contents among supporters (red) and opponents (blue) of the Travel Ban. See Section D of the Supplementary Information File for further details.

Section D: Argentine Replication of the Study 1

As described in our article, the survey in Argentina recruited 2,105 adult respondents using Qualtrics' standing Argentine panel, with survey questionnaires fielded September 18-20, 2017, two months prior to the 2017 midterm election. For the Argentine replication, we randomly assign respondents to the @Lanataenel13 tweet, published on July 14, 2016 and to the @robnavarro tweet published on July 17, 2016. Both of those tweets were among the most circulated posts during the Tarifazo protests in Argentina (Calvo and Aruguete, 2018). The survey was carried out in collaboration with CIPPEC-Argentina, to evaluate the effect of social media on Polarization during the 2017 campaign, following the same guidelines used in the Study 1 in the United States.

The @lanataenel13 tweet read: "And you are fighting to pay the gas bill..." with a link to a TN news that stated "Florescia Kirchner [daughter of former President Cristina Fernandez de Kirchner] withdrew over one million dollars from her [bank] account last march". The @robnavarro tweet stated: "The friends/partners of [President] Macri that kept to themselves the energy companies and earn thousands of millions with hikes. @EPoliticaC5N, 21 hours, #TheyTakeYouForAnDumbAss". The hashtag #TheyTakeYouForAnDumbAss was among the most circulated hashtags by opposition users.

Figure D1: Tweets by @lanataenel13 (left) and @robnavarro (right)



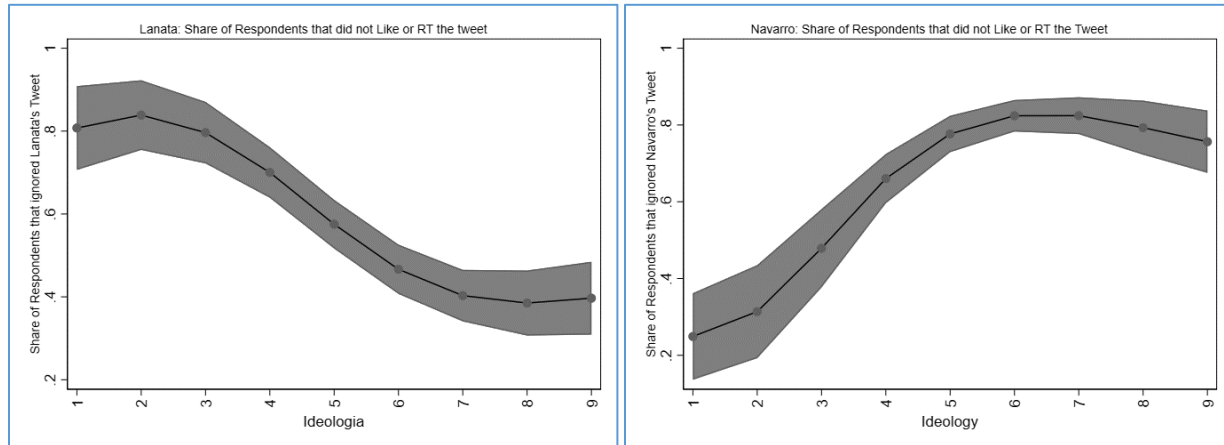
Table A.1 shows the mean of all socio-demographic variables used in the study, showing good balance between the three random samples. A total of 1,360 respondents with non-missing observations for ideological self-placement, Macri ideology, and Fernandez ideology are reported in the results in Figure 10 of the article.

Table D1: Balance between Treatments, both experiments

Argentine Replication	Lanata Tweet			Navarro Tweet			Control Group		
	N	Mean	SD	N	Mean	SD	N	Mean	SD
Polarization	452	4.137	2.69	438	4.064	2.56	470	3.636	2.710
Macri Vote	519	0.615	0.487	502	0.647	0.478	541	0.595	0.491
Ideology (8-point scale)	519	5.514	1.68	502	5.430	1.560	541	5.386	1.549
Woman	519	0.472	0.500	502	0.536	0.499	541	0.521	0.500
Age	518	44.62	14.01	502	44.03	14.17	541	44.45	14.97
Education (7-Categories)	516	5.16	0.977	498	5.177	1.069	538	5.212	1.048

Visual inspection of the relationship between ideology and the decision not to “like” or “RT” the tweets of @lanataenel13 (Left) or @robnavarro (right) show clear associations with the preferences of each community.

Figure D2: Relationship with ideology and decision to “ignore” the Tweets of Lanata and Navarro.



Note: Logistic models with splines used to evaluate the effect of ideology on the decision to ignore (not like or RT) each of the tweets.

The effect of the treatment (exposure to tweet) is reported in the table below, replicating on the Argentine data Models 1 and 4 of Table 1 in the article.

Table D2: Effect of the treatment (exposure to tweet) on perceived polarization.

VARIABLES	(1) Polarization	(2) Ln(Polarization)	(3) Ln(Polarization)	(4) Ln(Polarization)
Treated	0.403* (0.171)	0.0985* (0.0432)	0.0892* (0.0418)	0.200* (0.0864)
Macri Voter			0.386** (0.0468)	0.482** (0.0802)
Treated*Macri Voter				-0.145 (0.0987)
Constant	4.187** (0.140)	1.367** (0.0355)	1.074** (0.0494)	1.002** (0.0698)
Observations	1,087	983	983	983
LogLik	-2604	-945.2	-912.1	-911.1

Note: Standard errors in parentheses. ** p<0.01, * p<0.05