Politics in the Facebook Era
Evidence from the 2016 US Presidential Elections

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Motivation

- ▶ The way we access news and, with it, political communication have radically changed since the advent of social media.

- ▶ Social media allow candidates to :
  - ▶ tailor messages (political micro-targeting)
  - ▶ conduct campaigns with *no* regulation constraint
  - ▶ and much more (networks, real time feedback, . . .)

- ▶ Facebook growing source of political information:
  - ▶ 2012 ⇒ 12% of Americans read political news on FCBK
  - ▶ 2016 ⇒ this up to 62% and FCBK ranked as the third-most-cited "main source" of political information (PEW)
  - ▶ 2016 ⇒ 40% of Europeans use social media daily, for 16 % the main source of information (Eurobarometer) .
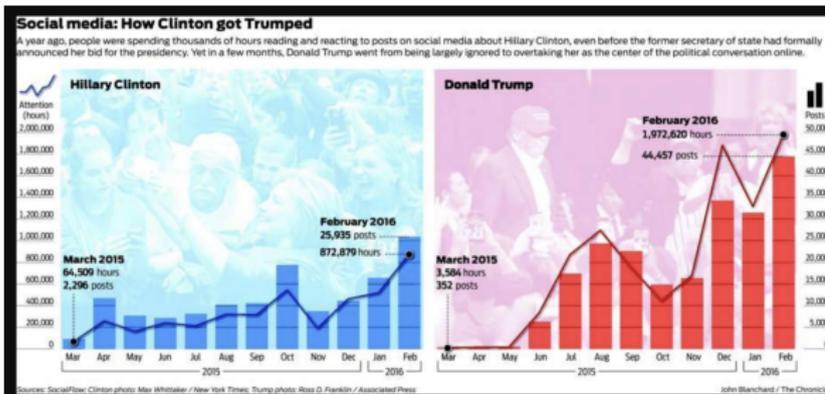
Background/1

- Debate on role of social media in shaping political views (*echo-chambers*)

- Many fear that this new way of campaigning may:
    - facilitate political polarisation, populism and extremism;
    - undermine democracy (e.g. Cambridge Analytica and Russian fake news scandals);
    - affect elections:(e.g. Brexit, Catalonia, Italy, Trump victory)

Background/2

- Many think FCBK and Twitter had a significant impact on Trump's victory in the 2016 elections. (Independent, Wired, Guardian, WashPost, ...)

- In few months Trump went from being largely ignored to overtaking Clinton as the centre of the online political conversation.

Social media: How Clinton got Trumped

A year ago, people were spending thousands of hours reading and reacting to posts on social media about Hillary Clinton, even before the former secretary of state had formally announced her bid for the presidency. Yet in a few months, Donald Trump went from being largely ignored to overtaking her as the center of the political conversation online.

Background/3

- Donald Trump campaign's heavy relied on social media (Facebook and Twitter).
  - Spending 44 million on Facebook and running 175,000 variations of political adverts.

- Hillary Clinton relied more heavily on traditional media (TV, press)
  - Spending 28 million dollars on social media.

Literature : effect of media (campaign) on voting

Three effects of media political campaigning:

- ▶ Participation:
  Internet access negative effect (*Falck et al., 2014*); TV ads strong effect
  (*Gerber et al., 2010*); no effect (*Krasno & Green, 2008*); no effect
  (*Huber and Arceneaux, 2007*); Fox News positive effect (*DellaVigna & Kaplan, 2007*).

- ▶ Persuasion:
  TV ads strong (short lived) effect (*Freedman, Franz, Goldstein, 2004*);
  persuasive effect (*Huber and Arceneaux, 2007*); Fox News positive effect
  for Republican (*DellaVigna & Kaplan, 2007*).

- ▶ Polarisation:
  Internet and social media contribute to voters' political polarization
  (*Sunstein, 2001, 2009 and 2017; Pariser, 2011; Gabler, 2016*); no effect
  (*Boxell, Gentzkow, and Shapiro, 2017*) .

Literature on Social Media and Politics is recent and very limited (*Bond
et al. 2012, Petrova et al. 2016, Allcott et al. 2017, Müller and Schwarz 2018*)

This paper: Research Questions

What is the role played by micro-targeting on social media in shaping electoral outcomes?

Two (empirical) contributions:

1. measure the intensity of political micro-targeted campaigning conducted on FCBK and identify effective targeting dimensions (gender, age, race, education);

2. estimate the effect of these campaigns on the behaviour of voters who relied on FCBK to gather political information.

Our study applies to the 2016 US Presidential elections.

Research Design

GOAL→ **Estimate the effect of social media campaigning on voting behaviour (participation and persuasion).**

Ideally we would compare decisions taken by the same individual when exposed and not exposed to social media campaigns, while suppressing exposure to other media.

Issue 1, MEASURABILITY: social media campaigns are not observed (externally), there is no measure for their distribution among internet users and for their intensity.

Issue 2, IDENTIFICATION: at best, a quasi-experimental approach is possible, because individuals vote only once. Moreover, they are exposed to multiple campaigns distributed via different media.

MEASURABILITY: 2-Step Approach

We need two different measures:

INTENSITY: how intensely/aggressively an **audience** was *micro-targeted* by political campaigns during the electoral period

→ propose a measure based on **daily prices (CPM) of FCBK ads micro-targeted at US audiences** (by political ideology, gender, age, race, education level and location).

→ build similar indicators for TV, Newspapers and Radio campaigns (Nielsen Ad Data)

EXPOSURE: how great the exposure to social media campaign was across **individuals** belonging to a given political audience,

→ use **self-reported media and FCBK usage** for respondents of the 2016 American National Election Survey (ANES).

IDENTIFICATION

Match ANES respondents to a political audience by **demographics** (gender, age, race, education), **location** (US state) and **political ideology**.

For all **individuals** belonging to the **same political audience** exploit variation across

- **intensity** of Social Media Political Campaign
  (randomly assigned interview date)

- **exposure** to Social Media Usage
  (predetermined and time invariant)

to estimate model of turnout and candidate preferences ...

while controlling for exposure to all media types and trend in CPM of politically aligned programs .

1.
A new Measure for the Intensity
of social media Political Campaigning

Measuring the Intensity of Political Campaign

We argue that variations in prices across audiences with different political ideologies are due to Political micro-targeting.

$\rightarrow$ Political Candidates (temporarily) enter online ad auctions during campaign periods. Price they are willing to pay reflects the impact selected audiences can have on their winning probability (Moshary, 2017).

$\rightarrow$ Prices convey information about candidates' strategies, and about the intensity of the competition to reach different types of voters in different states at different points in time.

Graphical illustration

The platform supplies an **inelastic** quantity of ads ($\bar{q}$). ◀ Evidence
Two States of the World $i = \{0, E\}$, depending on Elections (E).
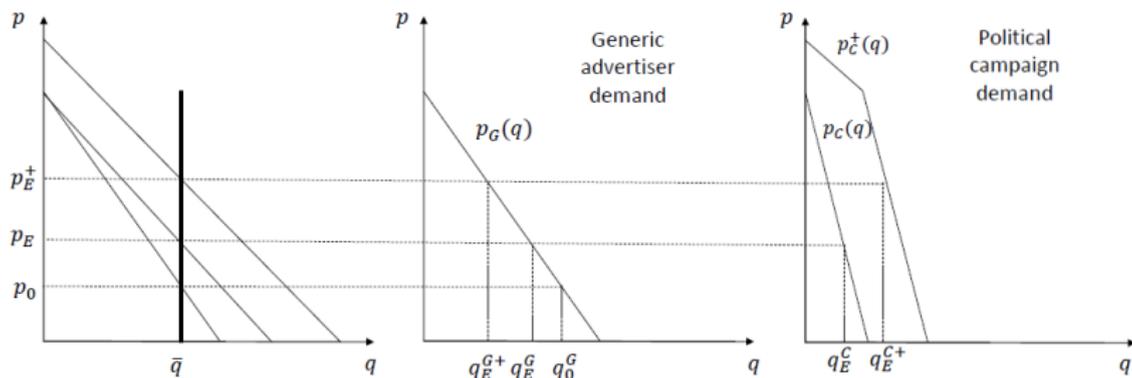
- In state 0 ads are demanded only by Generic (G) Advertisers.
- In state E, Political Advertisers (P) enter the auction determined to win a piece of the pie. **The equilibrium price (p_E) increases and the quantity assigned to generic advertiser (q_E^G) decreases** .

Metrics for the Intensity of Social Media Campaign

Intensity by audience type
(defined by State, s, Characteristics, c, and Political Ideology, p)

Relative CPM: $p_{scp} = \mathrm{P}_{scp}/\mathrm{P}_{sc}$

Relative CPM Ratio: $r_{scp,w} = p_{scp,e}/p_{scp,w}$

Test I: Entrance and Exit of Political Candidates

CPM fluctuations during "fair" elections held worldwide (2015-2017):
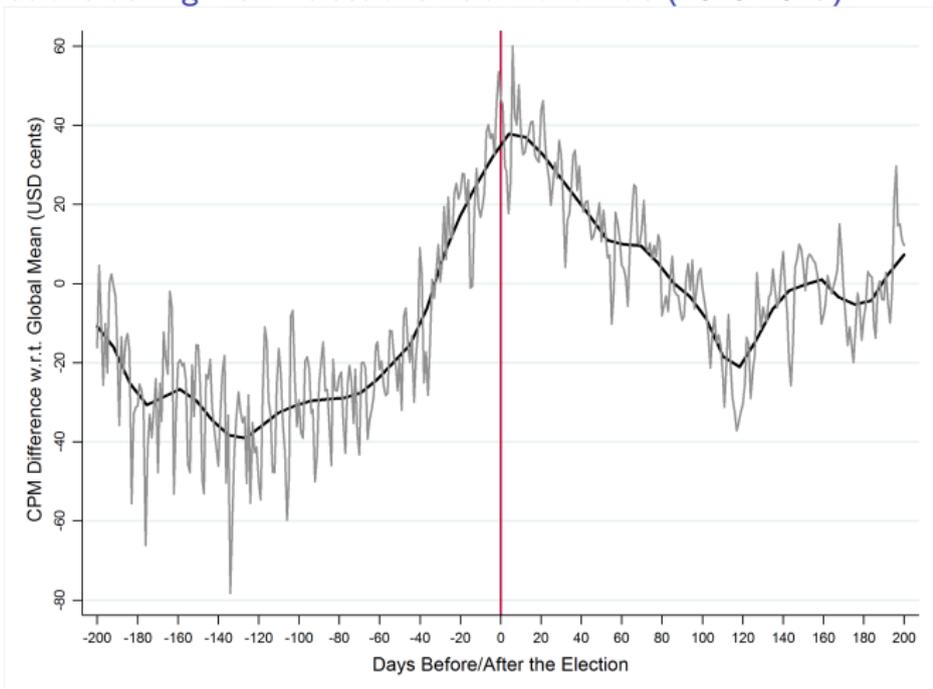
Facebook CPM Median daily prices for Country-Specific Audiences. Prices are expressed as difference from global trend, and conditioned on country-specific and time fixed effects. Sample covers all 45 Fair Elections that took place between July 2015 and February 2017. Free Elections defined on the basis of the Freedom House Electoral Democracy rating.

◂ BlackFriday

Test II: Prices and Election Winning Probabilities

CPM Fluctuations proportional to distance in candidates winning probability

Daily State-specific Facebook Ad prices respond to variations in **Daily State-specific winning probability**[1], during the three months preceding the elections (8th August - 8th of November 2016).

Dep. Variable: State CPM Median	Republican Partisan States	Democrat Partisan States	Swing States
Lag of CPM median	0.533**	0.545**	0.502**
	(0.031)	(0.026)	(0.042)
Abs. Value of Difference in Winning Prob	-2.887**	5.814**	1.687**
	(0.640)	(0.907)	(0.508)
Abs. Value of Difference in Winning Prob $\times 1[T > C]$			-2.390**
			(0.921)

Model is $cpm_{s,t} = \alpha cpm_{s,t-1} + \beta_1 PDIFF_{s,t-1} + \beta_2(PDIFF_{s,t-1} \times TADV_{s,t-1}) + e_{s,t}$, with $PDIFF_{s,t} = |(P_{s,t}^T - P_{s,t}^C)|$, and $P_{s,t}^T$ and $P_{s,t}^T$ indicate the winning probability of Trump and Clinton, respectively. $TADV_{s,t}$ is an indicator variable with value 1 for all cases where Trump has the lead on the election forecast. Model also controls for cyclical fluctuations in Internet usage (day of the week dummies) and for a time trend (week of the year dummies).

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[1]Source: **FiveThirthyEight 2016 Election Forecast**, Chance of Winning estimated using the "Polls-plus forecast" model, which combines polls, the economy and historical data.

Intensity of Political Campaign - example
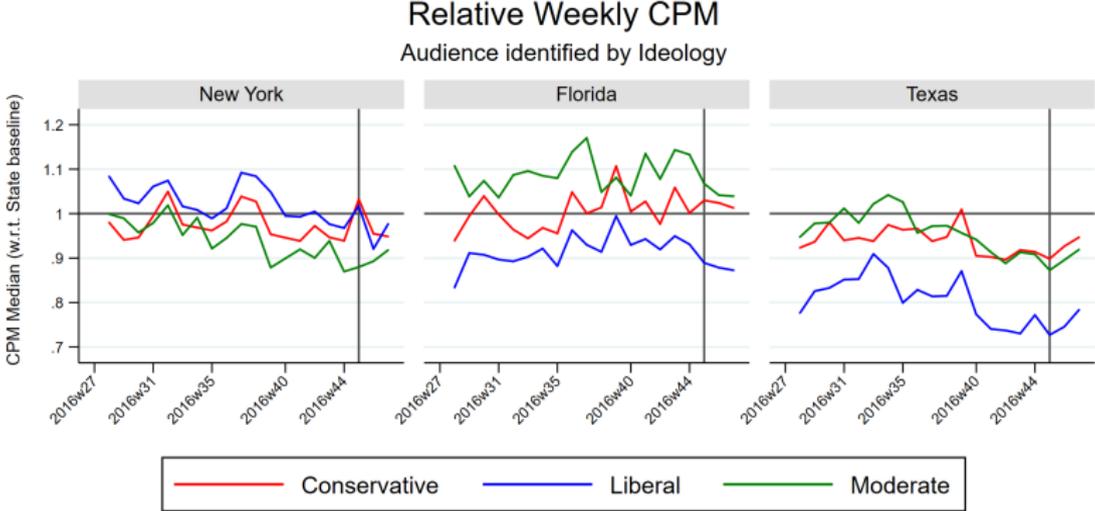
2.
Estimating the effects
of social media Political Campain on voting outcomes

Effect of FCBK campaigns on Voters Behaviour
Combining FCBK price data with the ANES 2016 Survey

For the effect of FCBK campaigns on voters behaviour, we observe:

- individual exposure to the political campaign:
match ANES' individual respondents to a Facebook Audience, use their media and FCBK habits to proxy for individual exposure;

- individual ideology and voting decisions:
use ANES political ideology and participation in 2012 and 2016 Elections as individuals preferences and voting decisions.

- trend of political campaigns on other media:
use CPM for TV programs, Newspapers, Radio, major US internet sites and favorite TV shows

Identification: the intensity assigned to two individuals, within same audience, differs according to their random assignment into two different interview dates, and to their pre-determined individual exposure.

Effect of FCBK campaigns on Voters Behaviour

For the 2,426 respondents of the 2016 ANES, estimate

$$Y_{iat} = \alpha EXP_i + \beta INT_{at} + \gamma EXP_i \times INT_{at} +$$
$$\delta_1 X_i + \delta_2 TrM_i \times TrCPM_{it} + D_s + D_p + DOW_t + MOY_t + \epsilon_{iat}$$

with $Y_{iat} =$(Turnout, Trump Vote, Clinton Vote, Vote Change).

- ▶ Respondent i matched to FCBK Audience (a) based on State (s), Political Ideology (p) and demographic characteristics.

- ▶ Intensity of Political Campaign (INT_{at}) at audience-day level, and Exposure to social media (EXP_i) at individual level.[2]

- ▶ Exposure to traditional media (TrM_i) and CPM for their (generic) advertising campaigns ($TrCPM_{it}$).

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[2](1) if uses Facebook frequently, and (0) if he has no Facebook account.

Effect of FCBK campaigns on Voters Behaviour

An example: Political Microtargeting by State/Ideology/Gender

Price Ratio between Interview and Election		
Political Ideology	Male	Female
Liberal - very strong	0.988	0.990
Liberal - strong	0.978	0.986
Liberal - mild	0.977	0.978
Moderate	1.041	1.004
Conservative - mild	1.024	1.001
Conservative - strong	1.029	1.004
Conservative - very strong	1.013	1.003

Results: Political Micro-Targeting

We find two general results:

1. Political Micro-Targeting has significant effects when based on geographical location, ideology and *gender* or *race*, but not on *age*. ◄ Ineffect. channels

2. Social-Media Political Campaigns have strong significant effects on those ANES respondents for whom the intensity of the campaign was the highest (relative $CPM > 1.2$)

Results: US Elections

The least valuable (and less targeted) audiences see their relative price drop by about 15% by the time of the election, whereas the most valuable (and most targeted) audiences see theirs raise by up to 35%.

1. Effects on change in Voter Behavior `◄ VChange`

2. Effects on Trump Support `◄ Trump`

3. Effects on Clinton Support `◄ Clinton`

4. Effects on Vote Turnout `◄ Turnout`

Effect of FCBK campaigns on Change in Voter Behaviour

An increase of 10% in the relative CPM between the interview and the election week reduces the likelihood of changing one's vote, compared to stated intentions, by 3.9%. This effect is almost double in size for Men and for Conservative voters.

Dep. Variable: Change in Voter Behavior	All (1)	Women (2)	Men (3)	Lib. (4)	Swing (5)	Cons. (6)	Dem 2012 (7)	Rep 2012 (8)	Clint Int (9)	Trump Int (10)	White (11)	Eth. Min. (12)
News Access on FCBK (Exposure)	0.417*	0.225	0.648**	-0.335	0.724	0.631**	0.492	0.0519	0.241	0.259	0.342	1.251**
	(0.213)	(0.306)	(0.330)	(0.403)	(0.467)	(0.320)	(0.333)	(0.317)	(0.285)	(0.278)	(0.231)	(0.599)
CPM runup (Intensity)	0.0987	0.0496	0.154	-0.124	0.274	0.581**	0.219	-0.0876	-0.0491	-0.00479	0.0116	0.945*
	(0.161)	(0.236)	(0.238)	(0.330)	(0.345)	(0.261)	(0.270)	(0.260)	(0.217)	(0.240)	(0.177)	(0.485)
FCBK Exposure x Intensity	-0.390**	-0.228	-0.598*	0.277	-0.657	-0.609**	-0.454	-0.0227	-0.218	-0.219	-0.316	-1.185**
	(0.197)	(0.282)	(0.305)	(0.373)	(0.435)	(0.293)	(0.308)	(0.292)	(0.262)	(0.251)	(0.212)	(0.559)
Observations	2,076	1,147	929	568	817	687	1,031	688	944	742	1,537	539
R-squared	0.134	0.164	0.202	0.288	0.199	0.238	0.172	0.216	0.220	0.256	0.157	0.283

Note: the dependent variable 1 if the respondent changed her voting behaviour, compared to the intentions revealed at the pre-election interview. This pertain any change in turnout or presidential vote. The CPM runup is measured as the difference between the relative CPM price at the election week and the relative CPM price at the week of the pre-electoral interview. All models include Income Class FE, State FE, Day of the Week FE and Weekly FE. They also control for exposure to other media (TV, Internet, Radio, Talk Show, Newspaper), CPM for TV ads, Political Ideology, Turnout and Vote at the 2012 Elections, party registration, vote at the Primary, gender, religion, age, marital status, education, race, number of children, employment status, home ownership and gun ownership status.

Effect of FCBK campaigns on Change in Trump Vote

An increase of 10% in the relative CPM between the interview and the election week reduces the likelihood of changing one's vote on Trump, compared to stated intentions, by 4.5%.

Dep. Variable: Change in Trump Voting	All (1)	Women (2)	Men (3)	Lib. (4)	Swing (5)	Cons. (6)	Dem 2012 (7)	Rep 2012 (8)	Clint Int (9)	Trump Int (10)	White (11)	Eth. Min. (12)
News Access on FCBK (Exposure)	0.495***	0.539*	0.460*	-0.0911	0.629*	0.806**	0.415**	0.693*	0.0216	0.712**	0.489**	0.452
	(0.184)	(0.283)	(0.276)	(0.140)	(0.336)	(0.378)	(0.209)	(0.385)	(0.136)	(0.342)	(0.225)	(0.305)
CPM runup (Intensity)	0.338**	0.388	0.259	0.0722	0.121	0.995***	0.284*	0.511	-0.0389	0.661**	0.278*	0.413
	(0.133)	(0.247)	(0.197)	(0.112)	(0.218)	(0.296)	(0.152)	(0.313)	(0.111)	(0.288)	(0.158)	(0.265)
FCBK Exposure x Intensity	-0.447***	-0.498*	-0.416	0.0740	-0.537*	-0.764**	-0.376*	-0.620*	-0.0122	-0.641**	-0.441**	-0.420
	(0.173)	(0.265)	(0.261)	(0.131)	(0.315)	(0.351)	(0.196)	(0.358)	(0.127)	(0.316)	(0.209)	(0.293)
Observations	2,076	1,147	929	568	817	687	1,031	688	944	742	1,537	539
R-squared	0.120	0.165	0.177	0.278	0.193	0.232	0.178	0.189	0.150	0.262	0.143	0.339

Note: Note: the dependent variable is 1 if the respondent changed her voting intention wrt to Trump, compared to the intentions revealed at the pre-election interview. This pertain any change in turnout or presidental vote. The CPM runup is measured as the difference between the relative CPM price at the election week and the relative CPM price at the week of the pre-electoral interview. All models include Income Class FE, State FE, Day of the Week FE and Weekly FE. They also control for exposure to other media (TV, Internet, Radio, Talk Show, Newspaper), CPM for TV ads, for Political Ideology, Turnout at the 2012 Elections, party registration, vote at the Primary, gender, religion, age, marital status, education, race, number of children, employment status, home ownership and gun ownership status.

◂ More on vote change

Heterogeneous effect of political campaign

The effect of FCBK on **Trump Vote**: Political uninterested/uninformed voters and voters with low levels of educations who read political news on FCBK are more likely to vote for Trump.

	All All	Female Voters	Male Voters	Liberal Voters	Uninterested & Moderate Voters	Conservative Voters	Low Education	High Education
News Access on Facebook (Exposure)	-0.395*	-0.412	-0.438	0.0517	-1.101***	0.192	-2.127**	-0.575
	(0.216)	(0.320)	(0.333)	(0.189)	(0.398)	(0.443)	(0.989)	(0.512)
CPM runup (Intensity)	-0.319**	-0.418	-0.235	-0.000559	-0.623**	-0.122	-0.717	-0.747*
	(0.154)	(0.271)	(0.253)	(0.138)	(0.269)	(0.334)	(0.699)	(0.418)
FCBK Exposure x Intensity	0.389*	0.423	0.411	-0.0405	1.057***	-0.153	1.995**	0.527
	(0.202)	(0.297)	(0.312)	(0.179)	(0.371)	(0.408)	(0.912)	(0.470)
Observations	1,913	1,054	859	530	743	638	224	615
R-squared	0.544	0.595	0.541	0.335	0.450	0.407	0.680	0.617

Note: Intensity is measured as Ratio of Relative CPM during Election Week to Relative CPM during Interview Week. All specifications include Income Class FE, State FE, Day of Week FE and Weekly FE. They also control for Political Ideology, Turnout at the 2012 Elections, Vote at the 2012 Election, party registration, vote at the Primary, gender, religion, age, marital status, education, race, children, employment status, home ownership and gun ownership.

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Effect of FCBK campaigns on Trump Vote: Ideology

Ideology Differences in the Effects of Campaign Intensity of Trump Vote

Notes. Predicted Probabilities of Trump Vote, conditional on Exposure and Campaign Intensity

Ideology Differences in the Effects of Campaign Intensity of Trump Vote

Notes. Average Marginal Effects of Exposure, conditional on Campaign Intensity

Effect of Education Targeting on Trump Vote

Education Differences in the Effects of Campaign Intensity of Trump Vote

Notes. Predicted Probabilities of Trump Vote, conditional on Exposure and Campaign Intensity

Education Differences in the Effects of Campaign Intensity of Trump Vote

Notes.Average Marginal Effects of Exposure, conditional on Campaign Intensity

Heterogeneous effect of political campaign

The effect of FCBK on **<u>Clinton Vote</u>**: Men and voters with low levels of education who read political news on FCBK are less likely to vote for Clinton.

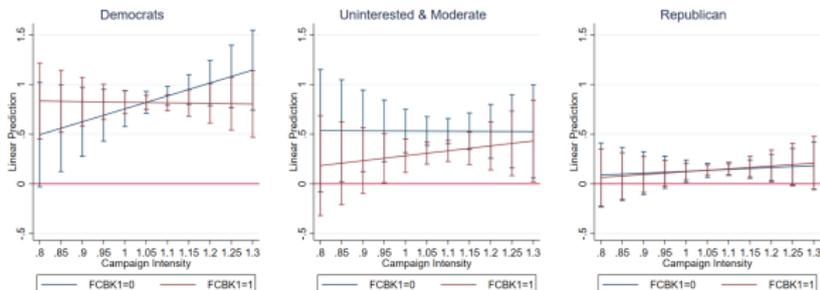|	All All	Female Voters	Male Voters	Liberal Voters	Uninterested & Moderate Voters	Conservative Voters	Low Education	High Education
News Access on Facebook (Exposure)	0.644	0.330	1.408**	1.427	-0.197	-0.105	2.006**	0.231
	(0.426)	(0.603)	(0.678)	(1.121)	(0.757)	(0.833)	(0.942)	(0.550)
CPM Price Ratio	0.561*	0.602	0.501	1.299	0.0292	0.188	1.215*	0.384
	(0.311)	(0.467)	(0.454)	(0.915)	(0.526)	(0.555)	(0.616)	(0.410)
News Access on Facebook x CPM Price Ratio	-0.632	-0.342	-1.368**	-1.361	0.130	0.101	-1.867**	-0.255
	(0.392)	(0.558)	(0.627)	(1.031)	(0.694)	(0.774)	(0.873)	(0.504)
Observations	1,913	1,054	859	530	743	638	224	615
R-squared	0.597	0.648	0.674	0.661	0.619	0.659	0.704	0.645

Note: Intensity is measured as Relative CPM, as measured during the week of the Interview, based on political and education targeting. All specifications include Income Class FE, State FE, Day of Week FE and Weekly FE. They also control for exposure to other media (TV, Internet, Radio, Talk Show, Newspaper), CPM for TV ads, Political Ideology, Turnout at the 2012 Elections, Vote at the 2012 Election, party registration, vote at the Primary, gender, religion, age, marital status, education, race, children, employment status, home ownership and gun ownership.
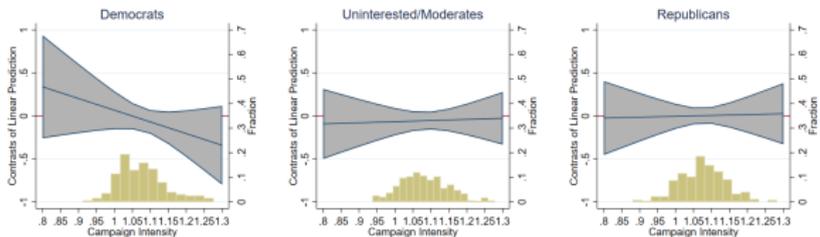
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Effect of FCBK campaigns on Clinton Vote: Gender

Gender Differences in the Effects of Campaign Intensity of Vote Turnout

Notes. Predicted Probabilities for Exposure, conditional on Campaign Intensity

Gender Differences in the Effects of Campaign Intensity of Clinton Vote

Notes. Average Marginal Effects of Exposure, conditional on Campaign Intensity

Effect of FCBK campaigns on Clinton Vote: Ideology

Ideology Differences in the Effects of Campaign Intensity of Clinton Vote

Notes. Predicted Probabilities of Trump Vote, conditional on Exposure and Campaign Intensity

Ideology Differences in the Effects of Campaign Intensity of Clinton Vote

Notes. Predicted Probabilities of Trump Vote, conditional on Exposure and Campaign Intensity

◀ Back

Effect of FCBK campaigns on Voter Behaviour: Turnout

Heterogeneous effects of FCBK on **Voter Turnout**: Men and politicallz uninterested/uninformed voters who read political news on FCBK are more likely to vote.

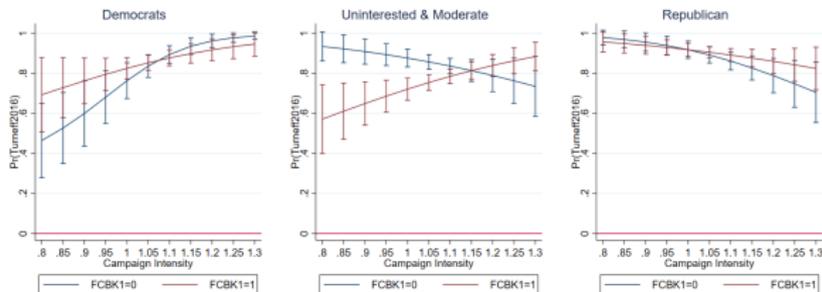|	All All	Female Voters	Male Voters	Liberal Voters	Uninterested & Moderate Voters	Conservative Voters	2012 Dem. Voters	2012 Rep. Voters
News Access on Facebook (Exposure)	-0.381*	-0.265	-0.481	0.108	-0.963***	-0.224	-0.176	-0.470
	(0.197)	(0.285)	(0.322)	(0.354)	(0.371)	(0.337)	(0.258)	(0.335)
CPM Price Ratio	-0.238	-0.205	-0.421*	0.0613	-0.303	-0.425	-0.0249	-0.326
	(0.148)	(0.259)	(0.230)	(0.286)	(0.265)	(0.268)	(0.196)	(0.272)
News Access on Facebook x CPM Price Ratio	0.334*	0.259	0.400	-0.0998	0.837**	0.234	0.148	0.398
	(0.183)	(0.262)	(0.303)	(0.332)	(0.346)	(0.307)	(0.240)	(0.306)
Observations	1,918	1,056	862	530	746	639	949	639
R-squared	0.186	0.238	0.236	0.258	0.286	0.274	0.183	0.259

Note: Intensity is measured as Ratio of Relative CPM during Election Week to Relative CPM during Interview Week. All specifications include Income Class FE, State FE, Day of Week FE and Weekly FE. They also control for Political Ideology, Turnout at the 2012 Elections, Vote at the 2012 Election, party registration, vote at the Primary, gender, religion, age, marital status, education, race, children, employment status, home ownership and gun ownership.

Effect of FCBK campaigns on Turnout: Gender

Gender Differences in the Effects of Campaign Intensity of Vote Turnout

Notes. Predicted Probabilities for Exposure, conditional on Campaign Intensity

Gender Differences in the Effects of Campaign Intensity of Vote Turnout

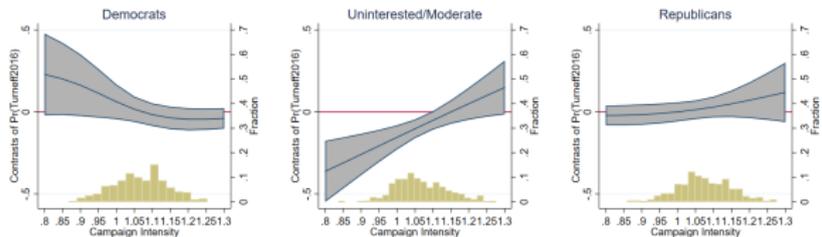Notes. Average Marginal Effects of Exposure, conditional on Campaign Intensity

Effect of FCBK campaigns on Turnout: Ideology

Ideology Differences in the Effects of Campaign Intensity of Vote Turnout

Notes. Average Marginal Effects of Exposure, conditional on Campaign Intensity

Ideology Differences in the Effects of Campaign Intensity of Vote Turnout

Notes. Average Marginal Effects of Exposure, conditional on Campaign Intensity

Conclusions

▶ Online advertising prices for politically relevant audiences can be used to proxy for the intensity of micro-targeted political campaigns conducted on social-media.

▶ Political micro-targeting based on users Gender/Education, Geographical Location and Political Ideology is effective on Turnout, Trump's Vote and Vote Change, but not on Clinton's Vote.

▶ The effect of political micro-targeting on Trump's Vote is most effective among moderate voters and voters with low educational level.

THANK YOU!

Measuring the intensity of political campaigns

Targeting Political Audience on Facebook

We scrape **Daily Prices** for **State/Ideology specific Audiences**. We extract both CPM (Cost per Mille Impressions) and CPC (Cost per Click). We further do this for Age, Gender, Race and Education State/Ideology specific audiences.

"The bid range shows a spectrum of bids that are currently winning auctions to reach the same audience you're targeting." ◀ Go Back

Inelastic Ads Supply - Evidence
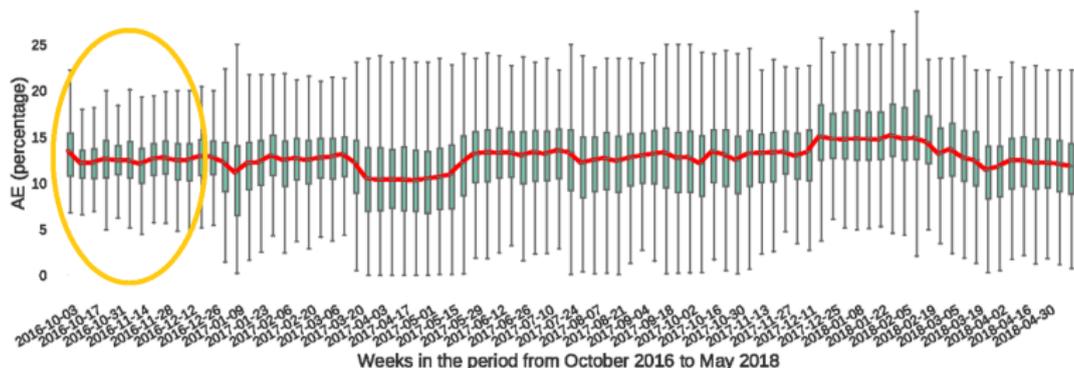
Fig. 5: Evolution of the metric $AE = \frac{\#ads}{\#posts + \#ads}$ in the period October 2016 - May 2018 per week. Each week presents a boxplot of the metric that includes the distribution of the AE across all the users with active sessions in each week. Note AE is represented as percentage rather than portion in this figure.

Source: Arrate et al. (arXiv:1811.10921)

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Test I - Robustness

Price Fluctuations around the 2015 Black Friday
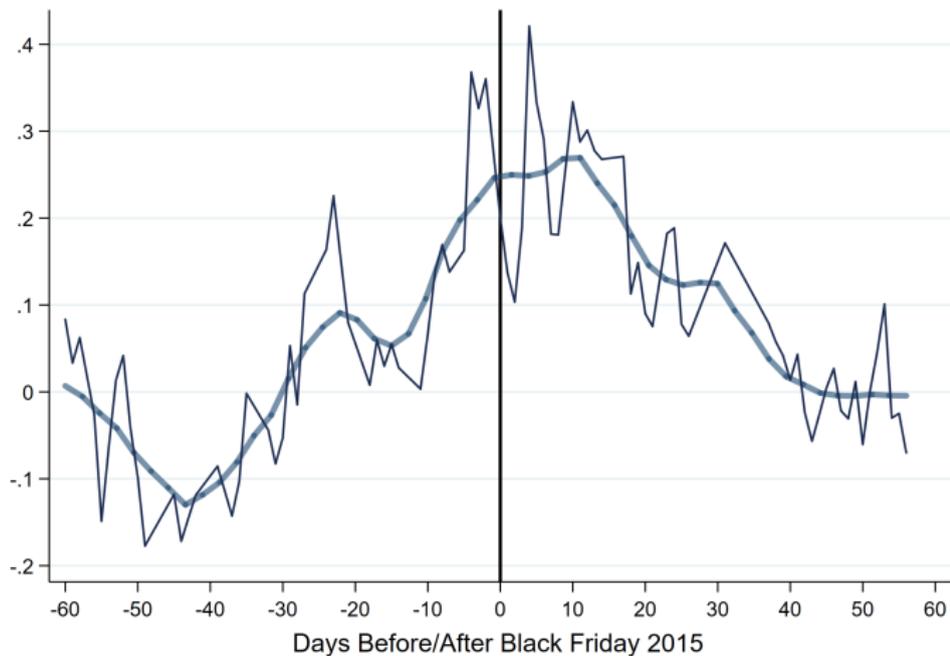
Days Before/After Black Friday 2015

Politcs on FCBK: the 2016 US Presidential Elections

Trends of Prices for Ideology Specific Audiences

Politcs on FCBK: the 2016 US Presidential Elections
Trends of Prices for Ideology Specific Audiences

Relative Weekly CPM
Audience identified by Ideology

Test II: Prices and Election Winning Probabilities
CPM Fluctuations proportional to distance in candidates winning probability

Daily State-specific Facebook Ad prices respond to variations in **Daily State-specific winning probability**[3], during the three months preceding the elections (8th August - 8th of November 2016).

Dep. Variable: State CPM Median	Republican Partisan States	Democrat Partisan States	Swing States
Lag of CPM median	0.533**	0.545**	0.502**
	(0.031)	(0.026)	(0.042)
Abs. Value of Difference in Winning Prob	-2.887**	5.814**	1.687**
	(0.640)	(0.907)	(0.508)
Abs. Value of Difference in Winning Prob $\times 1[T > C]$			-2.390**
			(0.921)

Model is $cpm_{s,t} = \alpha cpm_{s,t-1} + \beta_1 PDIFF_{s,t-1} + \beta_2 (PDIFF_{s,t-1} \times TADV_{s,t-1}) + e_{s,t}$, with $PDIFF_{s,t} = |(P_{s,t}^T - P_{s,t}^C)|$, and $P_{s,t}^T$ and $P_{s,t}^T$ indicate the winning probability of Trump and Clinton, respectively. $TADV_{s,t}$ is an indicator variable with value 1 for all cases where Trump has the lead on the election forecast. Model also controls for cyclical fluctuations in Internet usage (day of the week dummies) and for a time trend (week of the year dummies).

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[3]Source: **FiveThirthyEight 2016 Election Forecast**, Chance of Winning estimated using the "Polls-plus forecast" model, which combines polls, the economy and historical data.

Intensity of Political Campaign - example

Relative Weekly CPM
Audience identified by Ideology
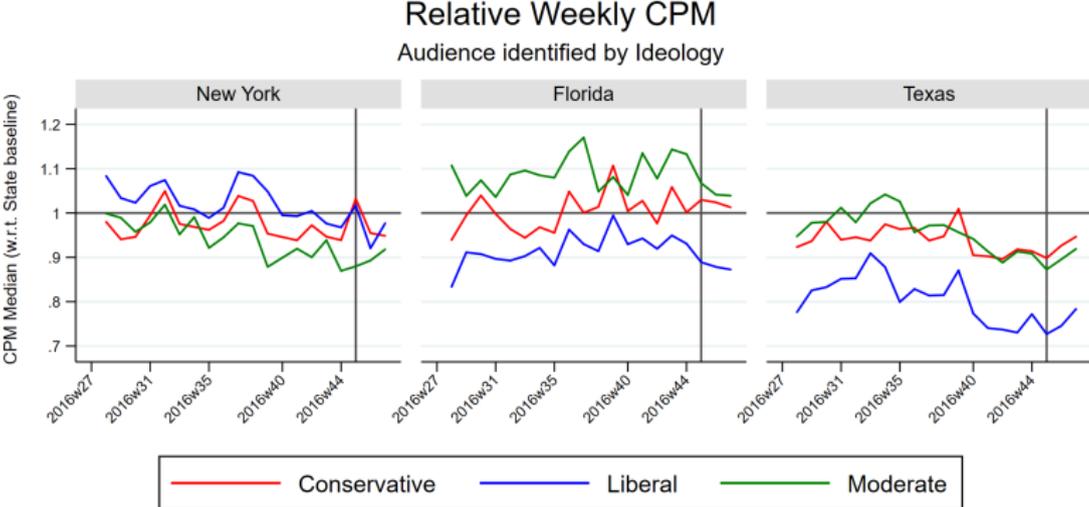
Effect of FCBK campaigns on Voter Behaviour: Trump

Targeting Type:	Political Ideology only (1)	Political Ideology & Gender (2)	Political Ideology & Education (3)
News Access on Facebook (Exposure)	-0.0933	-0.395*	-0.946**
	(0.192)	(0.216)	(0.409)
CPM Price Ratio	-0.0992	-0.319**	-0.666**
	(0.147)	(0.154)	(0.323)
News Access on Facebook x CPM Price Ratio	0.106	0.389*	0.873**
	(0.176)	(0.202)	(0.376)
Internet Access	0.0284	0.0239	-0.197
	(0.114)	(0.114)	(0.163)
TV CPM	0.00995	0.0112	0.00169
	(0.0510)	(0.0508)	(0.0749)
Observations	1,913	1,913	839
R-squared	0.543	0.544	0.584

Note: model estimates use Ratio of Relative CPM during Election Week to Relative CPM during Interview Week. All specifications include Income Class FE, State FE, Day of Week FE and Weekly FE. They also control for Political Ideology, Turnout at the 2012 Elections, Vote at the 2012 Election, party registration, vote at the Primary, gender, religion, age, marital status, education, race, children, employment status, home ownership and gun ownership.

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Measuring the effect of political campaign: Change in the behavior between pre and post elections interviews

Targeting Type:	Political Ideology only (1)	Political Ideology & Gender (2)	Political Ideology & Education (3)
News Access on Facebook (Exposure)	0.0519	0.248**	0.387**
	(0.0740)	(0.100)	(0.150)
CPM Price Ratio	-0.0255	0.131*	0.230*
	(0.0555)	(0.0681)	(0.121)
News Access on Facebook x CPM Price Ratio	-0.0472	-0.231**	-0.365**
	(0.0673)	(0.0940)	(0.142)
Internet Access	-0.0553*	-0.0570**	-0.0700*
	(0.0286)	(0.0285)	(0.0420)
TV CPM	-0.0215	-0.00373	-0.0432
	(0.124)	(0.124)	(0.200)
Observations	1,918	1,918	841
R-squared	0.072	0.075	0.181

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Note: Top panel uses Relative CPM, as measured during the week of the Interview. Bottom Panel uses Ratio of Relative CPM during Election Week to Relative CPM during Interview Week. All specifications include Income Class FE, State FE, Day of Week FE and Weekly FE. They also control for Political Ideology, Turnout at the 2012 Elections, Vote at the 2012 Election, party registration, vote at the Primary, gender, religion, age, marital status, education, race, children, employment status, home ownership and gun ownership.

Heterogeneous effect of political campaign

The effect of FCBK on **Vote Change**: Men, Conservative Voters and Voters with low education who read political news on FCBK are less likely to vote for Clinton.

	All All	Female Voters	Male Voters	Liberal Voters	Uninterested & Moderate Voters	Conservative Voters	Low Education	High Education
News Access on Facebook (Exposure)	0.248**	0.201	0.320**	0.0401	0.248	0.402**	0.693	0.455**
	(0.100)	(0.151)	(0.149)	(0.0795)	(0.202)	(0.175)	(0.496)	(0.208)
CPM Price Ratio	0.131*	0.188	0.0497	-0.0462	0.132	0.252*	0.0174	0.428**
	(0.0681)	(0.132)	(0.0912)	(0.0852)	(0.119)	(0.136)	(0.275)	(0.195)
News Access on Facebook x CPM Price Ratio	-0.231**	-0.194	-0.297**	-0.0379	-0.242	-0.370**	-0.626	-0.437**
	(0.0940)	(0.140)	(0.140)	(0.0723)	(0.190)	(0.162)	(0.459)	(0.199)
Observations	1,918	1,056	862	530	746	639	224	617
R-squared	0.075	0.140	0.138	0.205	0.173	0.271	0.540	0.229

Note: Intensity is measured as Relative CPM, as measured during the week of the Interview, based on political and education targeting. All specifications include Income Class FE, State FE, Day of Week FE and Weekly FE. They also control for Political Ideology, Turnout at the 2012 Elections, Vote at the 2012 Election, party registration, vote at the Primary, gender, religion, age, marital status, education, race, children, employment status, home ownership and gun ownership.

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Effect of FCBK campaigns on Polarization: Gender

Gender Differences in the Effects of Campaign Intensity of Vote Change

Notes. Predicted Probabilities for Exposure, conditional on Campaign Intensity

Gender Differences in the Effects of Campaign Intensity on Vote Change

Notes.Average Marginal Effects of Exposure, conditional on Campaign Intensity

Effect of FCBK campaigns on Polarization: Ideology

Ideology Differences in the Effects of Campaign Intensity on Vote Change

Notes. Predicted Probabilities of Trump Vote, conditional on Exposure and Campaign Intensity

Ideology Differences in the Effects of Campaign Intensity of Vote Change

Notes. Predicted Probabilities of Trump Vote, conditional on Exposure and Campaign Intensity

Measuring the effect of political campaign

The effect of FCBK on **Information**: among those who read political news on Facebook do not improve their information level compared to other means

	(1) None	(2) Political Ideology Only	(3) Political Ideology & Gender	(4) Political Ideology & Race	(5) Political Ideology & Age	(6) Political Ideology & Education
News Access on FCBK (Exposure)	0.00996*	0.0249	0.0295	-0.0805*	-0.0120	-0.0450
	(0.00592)	(0.0659)	(0.0640)	(0.0484)	(0.0682)	(0.131)
Relative CPM (Intensity 1)		0.372	0.00297	-0.251	0.436	0.330
		(0.290)	(0.284)	(0.182)	(0.304)	(0.681)
News Access on FCBK x Relative CPM		-0.0208	-0.0255	0.0759*	0.0133	0.0448
		(0.0610)	(0.0597)	(0.0438)	(0.0634)	(0.120)
TV	0.0313	0.0152	0.0161	0.0166	0.0154	0.0631
	(0.0508)	(0.0467)	(0.0467)	(0.0467)	(0.0467)	(0.0770)
Newspapers	0.00873	0.0570*	0.0548*	0.0551*	0.0561*	0.0975*
	(0.0359)	(0.0324)	(0.0324)	(0.0324)	(0.0324)	(0.0549)
TalkShows	0.00193	0.0273	0.0282	0.0273	0.0269	-0.00579
	(0.0399)	(0.0363)	(0.0363)	(0.0364)	(0.0363)	(0.0614)
Internet	0.0967**	0.138***	0.135***	0.137***	0.137***	0.0418
	(0.0419)	(0.0381)	(0.0382)	(0.0381)	(0.0381)	(0.0611)
Radio	-0.0202	-0.00338	-0.00491	-0.00275	-0.00338	0.0493
	(0.0376)	(0.0335)	(0.0334)	(0.0335)	(0.0335)	(0.0569)
Observations	2,191	2,191	2,191	2,191	2,191	938

Note: Top panel uses Relative CPM, as measured during the week of the Interview. Bottom Panel uses Ratio of Relative CPM during Election Week to Relative CPM during Interview Week. All specifications include Income Class FE, State FE, Day of Week FE and Weekly FE. They also control for Political Ideology, Turnout at the 2012 Elections, Vote at the 2012 Election, party registration, vote at the Primary, gender, religion, age, marital status, education, race, children, employment status, home ownership and gun ownership.

Effect of FCBK campaigns on Voter Behaviour: Turnout

Dep. Var.: 1[Voted in 2016 Election]	Political Ideology only (1)	Political Ideology & Gender (2)	Political Ideology & Education (3)
News Access on Facebook (Exposure)	0.0858	-0.311*	-0.0162
	(0.165)	(0.186)	(0.327)
CPM Price Ratio	0.215*	-0.170	0.363
	(0.128)	(0.138)	(0.233)
News Access on Facebook x CPM Price Ratio	-0.0973	0.273	-0.0114
	(0.150)	(0.173)	(0.301)
Internet Access	0.0331	0.0385	0.0700
	(0.0435)	(0.0434)	(0.0700)
TV CPM	-0.0206	-0.0216	-0.0890
	(0.105)	(0.105)	(0.184)
Observations	2,064	2,064	916
R-squared	0.259	0.259	0.346

Note: All specifications include Income Class FE, State FE, Day of Week FE and Weekly FE. New Access on FCBK is a dummy taking value 1 when political news are accessed on Facebook for more than 3 days a week. They also control for Political Ideology, Turnout at the 2012 Elections, Vote at the 2012 Election, party registration, vote at the Primary, gender, religion, age, marital status, education, race, children, employment status, home ownership, gun ownership and consumption of alternative MEDIA.

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Effect of FCBK campaigns on Voter Behaviour: Turnout

Heterogeneous effects of FCBK on **Voter Turnout**: Men and politicallz uninterested/uninformed voters who read political news on FCBK are more likely to vote.

	All All	Female Voters	Male Voters	Liberal Voters	Uninterested & Moderate Voters	Conservative Voters	2012 Dem. Voters	2012 Rep. Voters
News Access on Facebook (Exposure)	-0.381*	-0.265	-0.481	0.108	-0.963***	-0.224	-0.176	-0.470
	(0.197)	(0.285)	(0.322)	(0.354)	(0.371)	(0.337)	(0.258)	(0.335)
CPM Price Ratio	-0.238	-0.205	-0.421*	0.0613	-0.303	-0.425	-0.0249	-0.326
	(0.148)	(0.259)	(0.230)	(0.286)	(0.265)	(0.268)	(0.196)	(0.272)
News Access on Facebook x CPM Price Ratio	0.334*	0.259	0.400	-0.0998	0.837**	0.234	0.148	0.398
	(0.183)	(0.262)	(0.303)	(0.332)	(0.346)	(0.307)	(0.240)	(0.306)
Observations	1,918	1,056	862	530	746	639	949	639
R-squared	0.186	0.238	0.236	0.258	0.286	0.274	0.183	0.259

Note: Intensity is measured as Ratio of Relative CPM during Election Week to Relative CPM during Interview Week. All specifications include Income Class FE, State FE, Day of Week FE and Weekly FE. They also control for Political Ideology, Turnout at the 2012 Elections, Vote at the 2012 Election, party registration, vote at the Primary, gender, religion, age, marital status, education, race, children, employment status, home ownership and gun ownership.

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Effect of FCBK campaigns on Turnout: Gender

Gender Differences in the Effects of Campaign Intensity of Vote Turnout

Notes. Predicted Probabilities for Exposure, conditional on Campaign Intensity

Gender Differences in the Effects of Campaign Intensity of Vote Turnout

Notes.Average Marginal Effects of Exposure, conditional on Campaign Intensity

Effect of FCBK campaigns on Turnout: Ideology

Ideology Differences in the Effects of Campaign Intensity of Vote Turnout

Notes. Average Marginal Effects of Exposure, conditional on Campaign Intensity

Ideology Differences in the Effects of Campaign Intensity of Vote Turnout

Notes. Average Marginal Effects of Exposure, conditional on Campaign Intensity
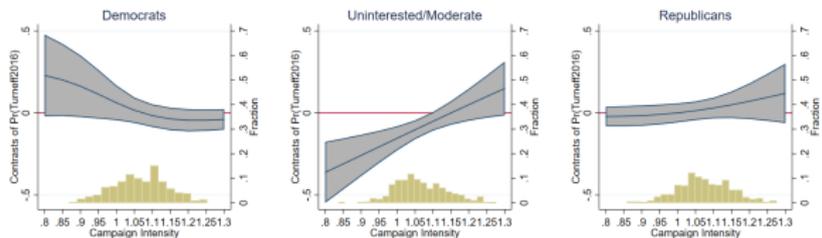
Ineffective Targeting Channels (Age and Race)

	Turnout		Trump Vote		Clinton Vote		Polarization	
	Age	Race	Age	Race	Age	Race	Age	Race
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
News Access on Facebook (Exposure)	0.145	-0.0188	0.0685	-0.116	0.210	-0.298	0.0195	-0.0144
	(0.125)	(0.170)	(0.157)	(0.208)	(0.161)	(0.203)	(0.0548)	(0.0828)
CPM Price Ratio	-0.0133	0.138	0.00855	-0.123	-0.0628	0.126	-0.0196	-0.0344
	(0.0665)	(0.128)	(0.0950)	(0.154)	(0.0950)	(0.147)	(0.0381)	(0.0631)
News Access on Facebook x CPM Price Ratio	-0.151	-0.000598	-0.0434	0.127	-0.236	0.232	-0.0170	0.0142
	(0.113)	(0.156)	(0.143)	(0.192)	(0.146)	(0.186)	(0.0497)	(0.0772)
Internet Access	0.0387	0.0346	0.0304	0.0301	0.0781	0.0715	-0.0555*	-0.0555*
	(0.0434)	(0.0435)	(0.113)	(0.114)	(0.0492)	(0.0495)	(0.0286)	(0.0285)
TV CPM	-0.0155	-0.0220	0.00863	0.0101	-0.00440	-0.0198	0.0588	0.0599
	(0.105)	(0.105)	(0.0514)	(0.0510)	(0.124)	(0.124)	(0.0486)	(0.0491)
Observations	1,913	1,913	1,913	1,913	1,913	1,913	1,913	1,913
R-squared	0.259	0.259	0.543	0.543	0.574	0.574	0.071	0.071

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