

POLITICAL ADVERTISEMENT AND COORDINATED BEHAVIOR ON SOCIAL MEDIA IN THE LEAD-UP TO THE 2021 GERMAN FEDERAL ELECTIONS

Nicola Righetti*, Fabio Giglietto**, Azade Esther Kakavand*,
Aytalina Kulichkina*, Giada Marino***, Massimo Terenzi**

* University of Vienna, ** University of Urbino Carlo Bo, *** University of Sassari

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INTRODUCTION

In this study, we analyze organic and paid social media communication from political candidates, parties, and other social media users, in the lead-up to the 2021 German federal election. We document the investment in Facebook advertising of the main parties and their targeting strategies, the engagement they reached organically, and the activity of coordinated networks of Facebook pages and groups dealing with the election.

As in 2019 (Hegelich & Serrano, 2019), the AfD reached an exceptionally high engagement on Facebook, but Die Grünen, instead of CDU, led the standings of the Facebook advertisement investment in 2021. Nonetheless, they were both outrun in the overall number of ad impressions by the FDP, who strategically spent less on a higher number of advertisements.

Considering the area of microtargeting, our findings show that the content of some advertisements was exclusively targeted to women or young generations. They, however, represented just a modest part of the total number of advertisements run by parties and candidates.

We also found large coordinated networks on Facebook (Giglietto, Righetti, Rossi, & Marino, 2020) spreading anti-establishment narratives, as well as anti-lockdown and anti-COVID19 policies messages. In these networks, harsh comments against opponents and a wide range of sources that shared disinformation (NewsGuard, 2021) during the elections were common.

The analyses herein conducted quickly ran into limitations in data access. In particular, the lack of Facebook data on the activity of individual users prevented exploring the possible use of bots to quickly cross-post content in public groups and inflate engagement metrics. The lack of data on Facebook comments prevented the analysis of coordinated strategies aimed at staying under the radar of fact-checkers and platforms censoring. The lack of fine-grained data on advertising also prevented us from investigating microtargeting strategies besides general cases related to gender and age.

CONTEXT AND RELEVANCE OF THE STUDY

The 2021 German federal election held on 26 September 2021 was characterized by unprecedented political uncertainty. Angela Merkel, who has dominated German politics for 16 years as chancellor, did not run for office again. The two major parliamentary parties that were leading the government in the “grand coalition,” the SPD and the CDU/CSU or their candidates, faced several scandals, leading to fluctuating polls. But also, die Grünen, who profited from a timely and smooth nomination of their candidate, faced criticism for incorrectly stating extra income and inaccuracies in the candidate’s CV. Still, with an agenda of massive public investment to launch a “social-ecological transformation,” they had a chance to lead a national government for the first time in their 40-year history (Baasner & Seidendorf, 2021). Starting from a different ideological perspective, the far-right party Alternative für Deutschland (AfD), founded in 2013, established itself in national and local politics. In the national elections in the same year, they reached 4.7% of the votes, almost passing the five percent threshold. In 2017, they became the third biggest party with 12.6% of the votes.

The 2021 national election was moreover taking place in the extraordinary context of the COVID-19 pandemic. Along with the transformation in political communication which put digital media at the forefront of electoral campaigns, the social distancing measures have hindered non-mediated forms of campaigning and further increased the importance of long-distance traditional and especially digital communication. In the media, the balance of power emerging from the polls can radically change, favoring parties with the resources and the capability to build and spread persuasive messages and, with regards to online communication, to exploit the affordances of social media to spread their messages online virally. For instance, several studies conducted across Europe (Engesser, Fawzi, & Larsson, 2017; Ernst et al., 2017; Giglietto et al., 2018) have shown how anti-EU, populist, and right-wing parties (Neudert, Kollanyi, & Howard, 2017; Serrano et al., 2019), can be particularly effective in campaigning through social media.

Social media also paves the way for a range of information operations aimed at manipulating the traditional media and public opinion (Marwick & Lewis, 2017). It empowers native and foreign political actors to run micro-targeted online advertisements to influence specific cohorts with distinct messages (Hegelich & Serrano, 2019). Microtargeting strategies on social media can potentially spread particular messages tailored to explicit categories of citizens, potentially distorting the perception of the issues at stake, giving a partial knowledge of the parties' programs, and increasing the division and polarization of the civil society.

Besides the "earned attention," influence operations also exploit the socio-technical vulnerabilities of contemporary media ecosystems to amplify their messages and reach unaware audiences. This is the case with "coordinated inauthentic behavior", which employs fake accounts and bots (Neudert, Kollanyi, & Howard, 2017), and/or networks of social media pages and groups (Giglietto et al., 2020) to communicate in a way that misleads others about the source of the message and its real intention (Gleicher, 2018). Such coordinated activities can artificially increase the popularity and reach of political content and deceive citizens by amplifying the perception of widespread grassroots support for specific ideas (Keller et al., 2020). The use of coordinated strategies has been widely documented ahead of many elections worldwide – such as in Italy (Giglietto et al., 2020), South Korea (Keller et al., 2019), the UK (Nizzoli et al., 2019), and many other countries around the world, as detailed by reports from Facebook¹ and Twitter² – attracting the attention of researchers and social media platforms. This strategy has also been linked to mis/disinformation during electoral campaigns (Giglietto et al., 2020).

These kinds of political communication strategies on social media have the potential to significantly impact the political and democratic debate. Indeed, although a concrete causal effect on the shift of citizens' political opinions and election outcomes is not yet established, the existence of these strategies itself is questionable as they challenge the trust of citizens and the principle of transparency that should guide democracy and electoral debates. Therefore, it is important to direct specific attention to these strategies, especially in the lead-up to important events like the 2021 German federal election, in order to measure and understand their extent and use.

RESEARCH QUESTIONS

This study tackled three main research questions. The first one is related to paid advertising, while the other two concern organic communication on social media:

1. What are a) costs and volume of advertising per party, b) the demographic characteristics of the targets, and c) the evidence of micro-targeted political advertising? How have they changed compared to what was found by previous research conducted in the context of the 2019 European election in Germany (Hegelich & Serrano, 2019)?
2. What is the volume, content, engagement of the communication related to the election organically circulating on social media and the main actors involved? How do they compare to the investment in social media advertising?
3. Is there evidence for networks involved in coordinated and inauthentic behavior (Giglietto, Righetti, Rossi, & Marino, 2020) to boost politically relevant content in the lead-up to the 2021 German elections? If yes, what are their characteristics in terms of strategies (including cross-platform strategies), the content they share (including problematic information), and political affiliation?

1 Facebook Election Integrity: <https://about.fb.com/news/category/election-integrity/>. For instance, see the "April 2021 Coordinated Inauthentic Behavior Report"

<https://about.fb.com/news/2021/05/april-2021-coordinated-inauthentic-behavior-report/>

2 Twitter Civic Integrity: <https://about.twitter.com/en/our-priorities/civic-integrity#data>. For instance, see "Information operations directed at Hong Kong" https://blog.twitter.com/en_us/topics/company/2019/information_operations_directed_at_Hong_Kong

OVERVIEW OF DATA AND METHODS

Starting from July 2021, we identified the Facebook, Instagram, and Twitter social media accounts of the seven main parties (AfD, CDU, CSU, DIE LINKE, FDP, DIE GRÜNEN, and SPD) and their candidates, relying on the official websites of the parties and the lists of "Direktkandidaten" and "Listenkandidaten" published in the lead up to the elections. We also compiled a list of 450 political-related keywords, updating the lists used by GESIS to monitor previous elections in Germany (Kaczmirek et al., 2014; Stier et al., 2018), to collect posts published on Facebook, Twitter, and Instagram.

We collected all social media posts that matched the keywords or were posted by the monitored accounts in the six weeks leading up to the elections (August 16 – September 26, 2021) using CrowdTangle (CrowdTangle Team, 2021) and Twitter API v2. We used the same list of accounts and keywords to collect all advertisements through the Facebook Ad API. The final dataset included 4,561 social media accounts of parties and candidates and 281,830 social media accounts sharing political content, for a total of 668,032 Facebook posts, 129,317 Instagram posts, 20,703 Facebook advertisements, and 1,820,156 Twitter posts. Table 1 details the number of monitored accounts by social media platform and party.

Figure 1. Total number of social media accounts included in the final dataset.

MONITORED SOCIAL MEDIA ACCOUNTS

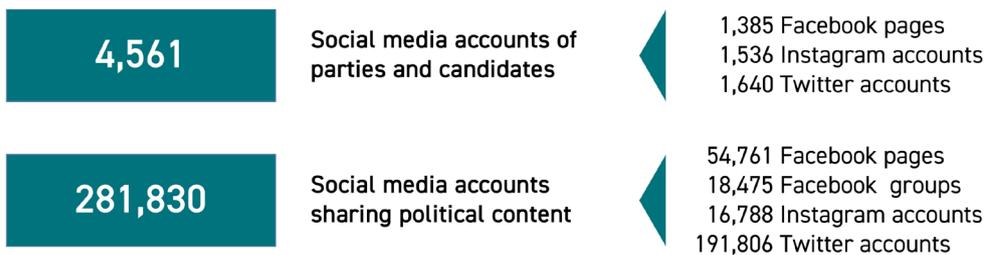


Figure 2. Total number of social media posts included in the final dataset.

NUMBER OF COLLECTED SOCIAL MEDIA POSTS

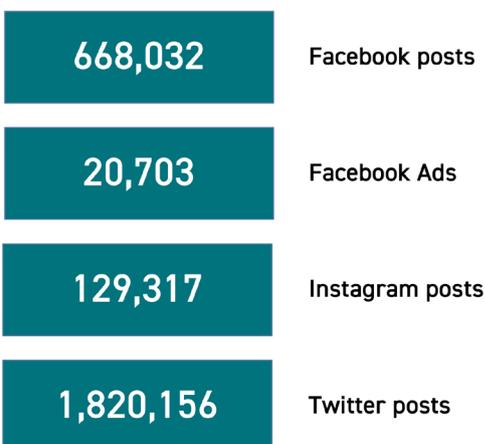


Table 1. Number of social media accounts per party.

Party	Facebook (candidates)	Facebook (parties)	Instagram (candidates)	Instagram (parties)	Twitter (candidates)	Twitter (parties)
AfD	169	17	91	17	121	17
CDU	235	16	252	15	244	16
CSU	42	1	49	1	59	1
CDU/CSU	-	1	-	1	-	1
Die Grünen	171	17	312	17	327	17
Die Linke	147	17	169	17	194	17
FDP	227	17	240	17	252	17
SPD	291	17	321	17	290	17
Gesamt	1282	103	1434	102	1537	103

We used various computational data mining approaches implemented through the R statistical software and qualitative methods to examine the data in-depth. A specific dataset of web domains that shared misinformation during the electoral campaign also informed our analysis. This dataset was provided by NewsGuard, who tracked misinformation about the German federal elections and the websites spreading them (NewsGuard, 2021).

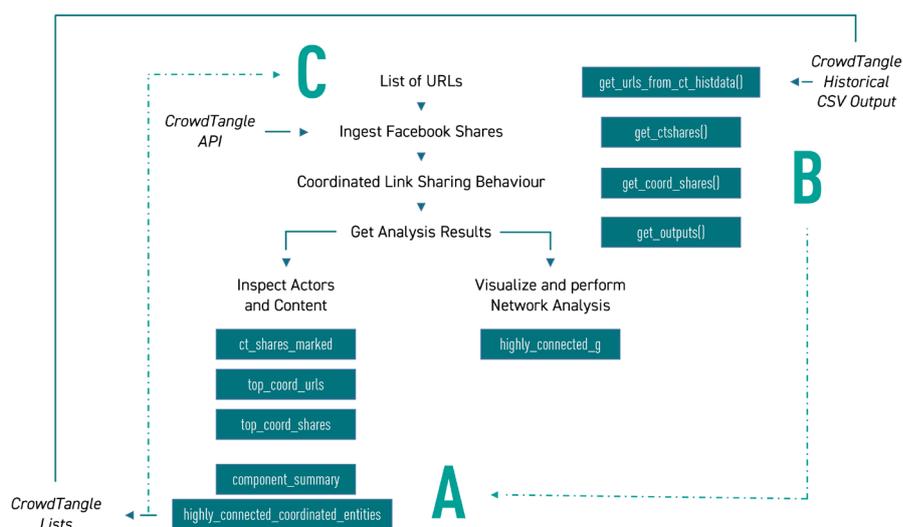
To identify networks of coordinated link sharing accounts on Facebook and Instagram (Giglietto et al., 2020a), we employed CooRnet, a library running on the R software environment for statistical computing and graphics³ (Giglietto, Righetti, & Rossi, 2020). CooRnet uses social media data to detect coordinated networks of accounts repeatedly sharing the same content online in a very short amount of time with particular attention to URLs (links) and images. It has been extensively used and increasingly adopted by international scholars and research centers specialized in the detection and analysis of coordinated behaviors on social media and mis/disinformation, providing results capable of linking coordination to the spread of political information and misinformation during electoral periods and other circumstances (e.g., Ayers, Chu, and Zhu, 2021; Broniatowski, 2021; DFRLab, 2020; Giglietto et al., 2019; Giglietto et al., 2020).

In particular, the CooRnet software operationalizes and innovates the ABC framework (François, 2019), which recommends an integrated approach to the spread of information and mis/disinformation online by zeroing in on the three main vectors that characterize it: actors (A), behaviors (B), and content (C). Starting from this approach, CooRnet can be applied in a cyclic and recursive manner to progressively detect new coordinated actors and new problematic content by starting from an initial list of already known problematic sources and content, usually expressed as URLs (e.g., a list of links to online news rated as false by fact-checking organizations)⁴. In this way, the method circumvents the limitations related to the simple and simplistic use of lists of “fake news sources” provided by fact-checkers who measure and monitor the spread of mis/disinformation. While these lists are helpful, they are also inevitably limited and cannot keep pace with the ever-changing landscape of political mis/disinformation and strategies of “bad actors” (Giglietto, Righetti, & Rossi, 2021). By implementing a recursive methodology, CooRnet can detect actors spreading already known mis/disinformation, which can, in turn, point to previously unknown problematic content spread by other networks, and so on. The CooRnet algorithm requires an initial list of URLs. We collected the URLs from the posts matching our political keywords and from those published by the political account we monitored on Facebook, Instagram, and Twitter. The analysis of coordination was then performed on Facebook and Instagram.

³ R software environment for statistical computing and graphics: <https://www.r-project.org>

⁴ {{CooRnet}} and the A-B-C Cycle: an IFCN COVID-19 Dataset Case Study: <http://coornet.org/abc.html>

Figure 3. The ABC cycle, implemented in the R library CooRnet (Giglietto, Righetti, & Rossi, 2021).



FACEBOOK ADVERTISEMENTS

The data collection was done through the Facebook Ad Library API. The initial datasets consisted of 20,703 advertisements totaling more than 475,000,000 impressions, published from 16/08/2021 to 26/09/2021 from 622 funding entities. The focus of the analysis was restricted to 13,707 advertisements totaling more than 413,000,000 impressions, which were sponsored by 233 funding entities directly connected to the seven main political parties (i.e., national and regional pages of the parties).

According to the data retrieved from the Facebook Ad Library API, the seven main parties running for the federal elections spent between 2,454,700 EUR and 4,191,493 EUR (Figure 4). It is important to note that the Facebook Ad Library API does not release exact measures of investments or visualizations, but only intervals of values that include the actual value. The Facebook Ad Library Report section also provides information on spending, but only for a limited range of date intervals (i.e., last day, last seven days, last 30 days, last 90 days). While imposing restrictions regarding the time frame of the analysis, the Facebook Ad Library Report seems to provide more precise values regarding spending. We compared the spending data provided by the Facebook Ad Library API and derived a point estimate by averaging the lower and upper bounds of the spending range with those offered by the Facebook Ad Library Report and verified a substantial correspondence between the two sources.

The analysis of the Facebook advertisements had three main objectives:

- 1) Provide descriptive data
- 2) Ascertain possible differences in targeting
- 3) Explore strategies based on specific characteristics of messages and targets ("microtargeting")

The analysis showed that Die Grünen was the first party in spending on advertising (Figure 4). In contrast to the 2019 European election (Hegelich & Serrano, 2019), Die Grünen spent more than the CDU and the SPD in 2021. Despite, on average, there is a strong correlation between expenditures on advertising and the number of impressions (Pearson's $r = 0.75$), this is not the only factor explaining the number of impressions, as proven by the great variability between parties (Figure 7). In other terms, the more money spent, the higher the impressions, but some parties were able to reach more impressions despite spending less than others. This is the case with the FDP, which was the party that ran the highest number of advertisements (Figure 5), reaching the highest number of impressions (Figures 6 and 7), even though it spent less than Die Grünen and the CDU overall. It can also be observed that, in contrast to the CDU in 2019 (Hegelich & Serrano, 2019), this time, the FDP was the party that spent less, on average, per ad (Figure 8). This (Hegelich & Serrano, 2019) might be an indicator of a possible microtargeting strategy. While this is a possibility, this information alone does not permit firm conclusions.

Figure 4. Facebook advertising spending per party in the six weeks up to the elections. Despite the large confidence intervals of the data provided by the Facebook Ad Library API, the overall ranking of parties by spending is substantially corroborated by the more punctual estimates provided by the Facebook Ad Library Report.

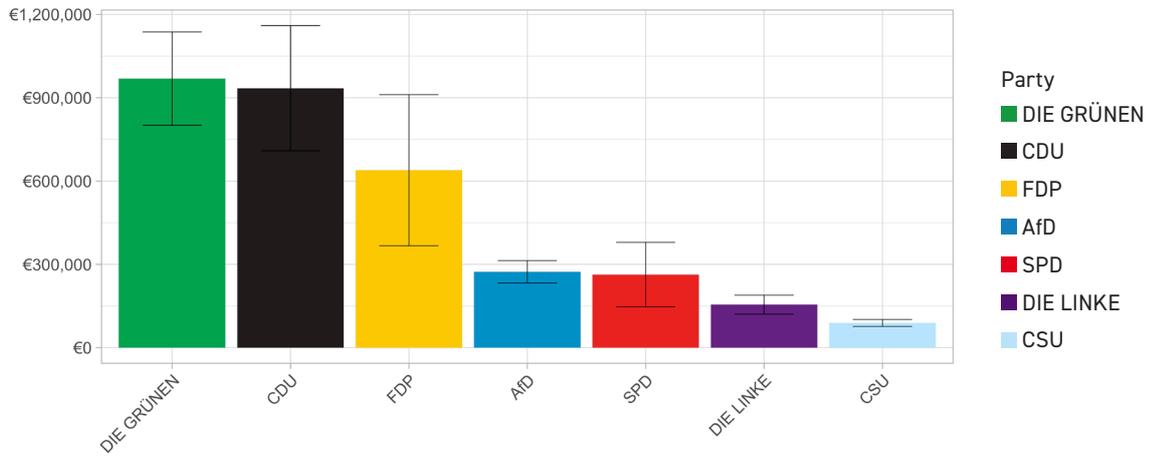


Figure 5. Number of Facebook advertisements per party.

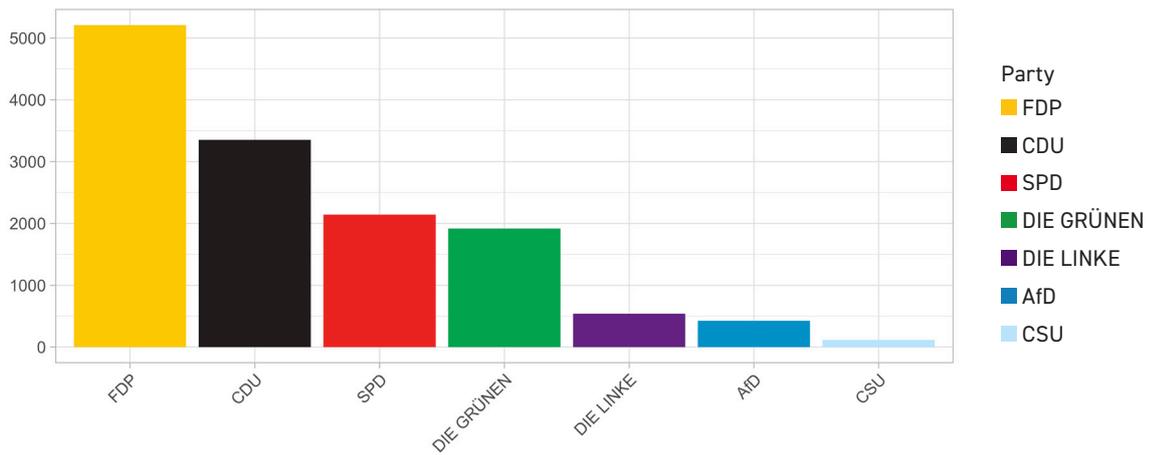


Figure 6. Impressions per party.

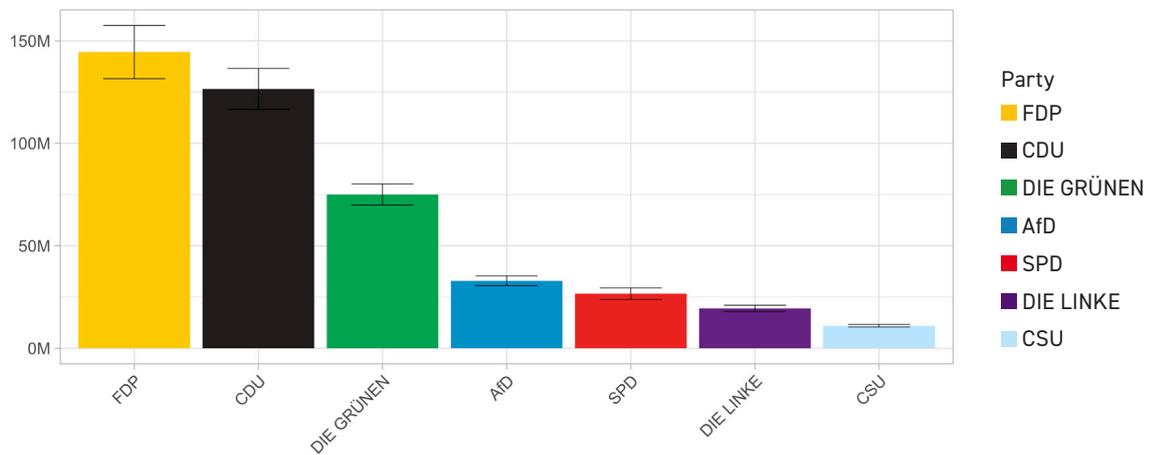


Figure 7. Relation between the amount spent for each Facebook advertisement and the quantity of impressions.

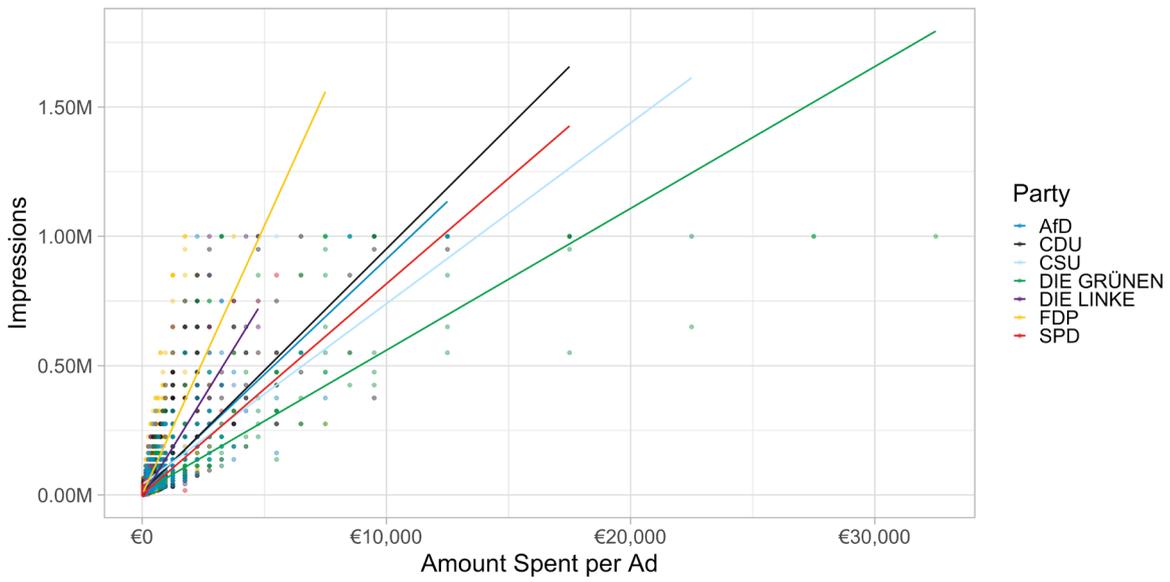
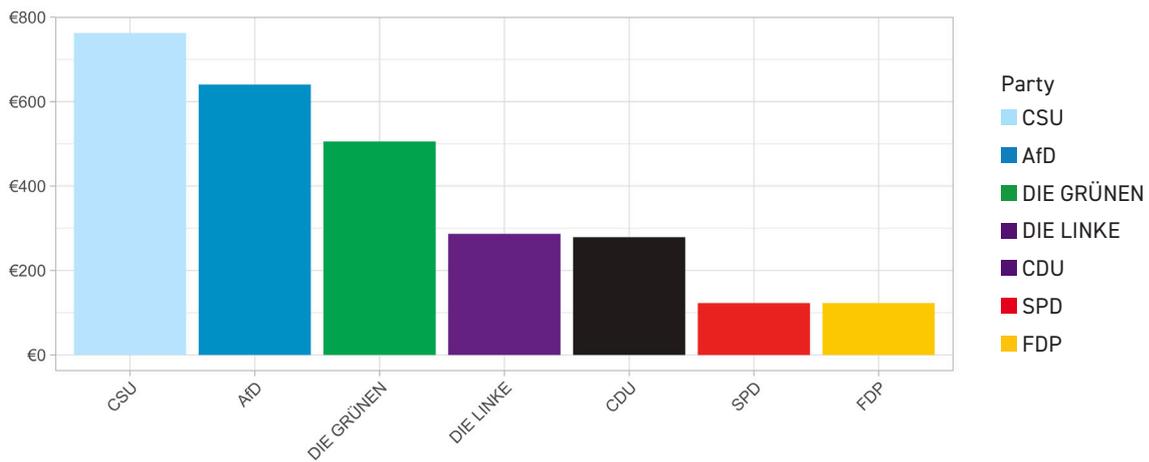


Figure 8. Average amount spent per ad by party.



Regarding the geographical distribution, as expected due to the importance of these states, the highest number of advertisements appeared to be run in Berlin and North Rhine-Westphalia, with the most increased spending and impression in the latter (Figure 9, 10, and 11).

Figure 9. Number of advertisements by state and party.

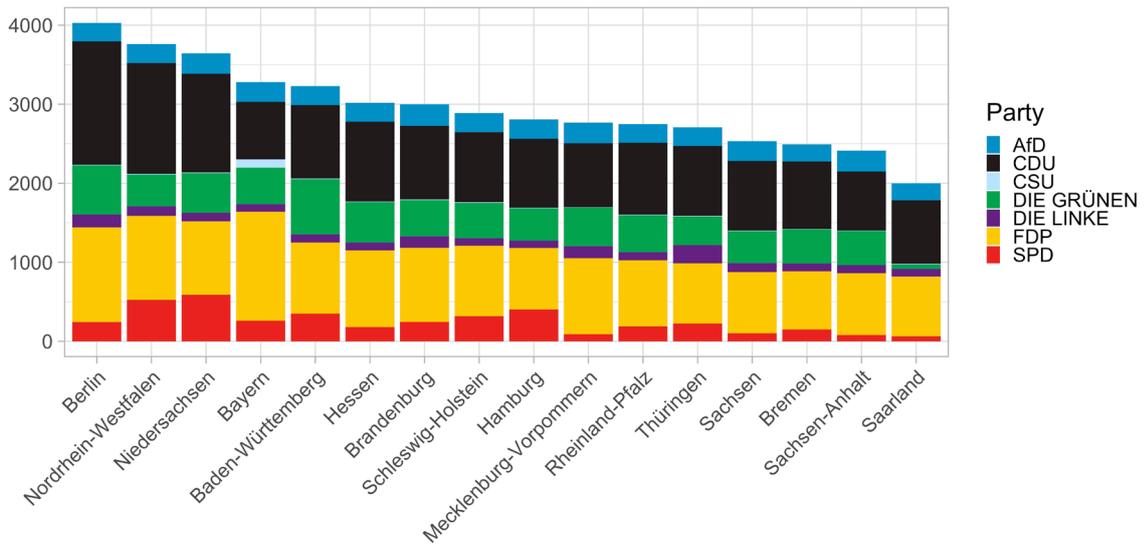


Figure 10. Spending (average) by state and party.

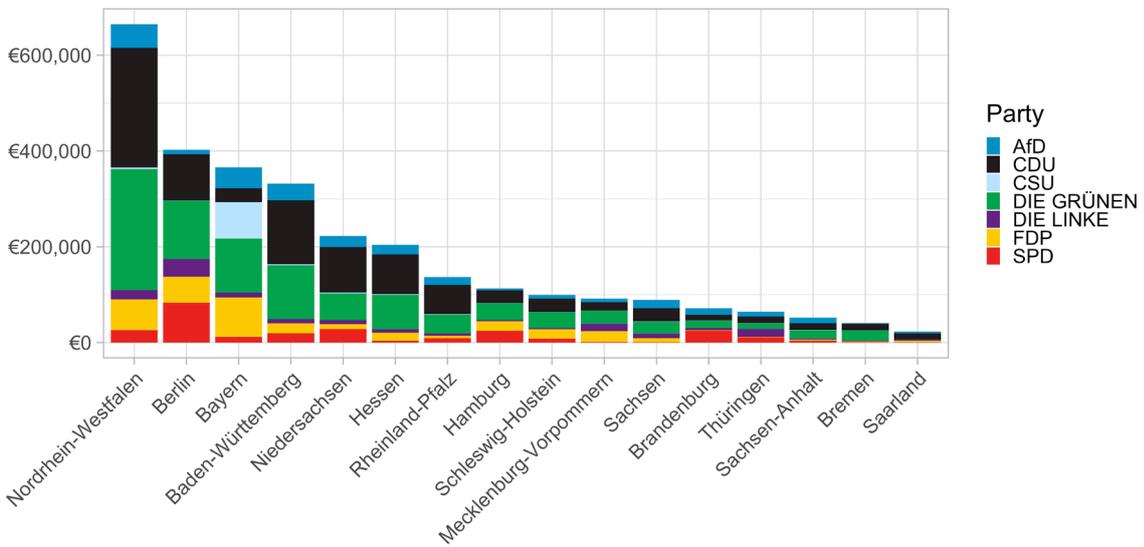
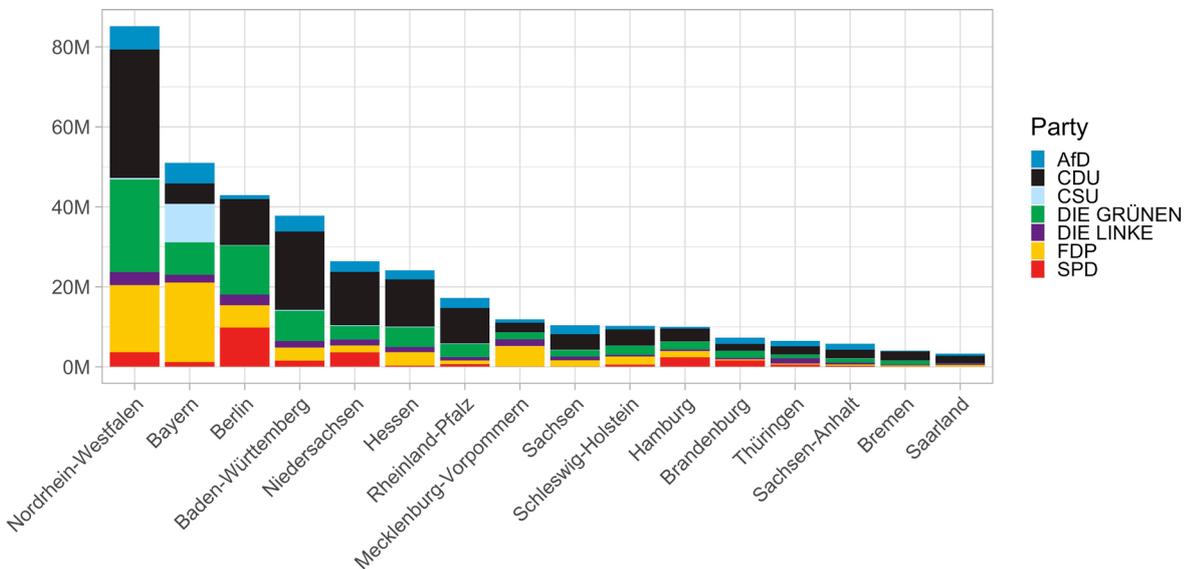


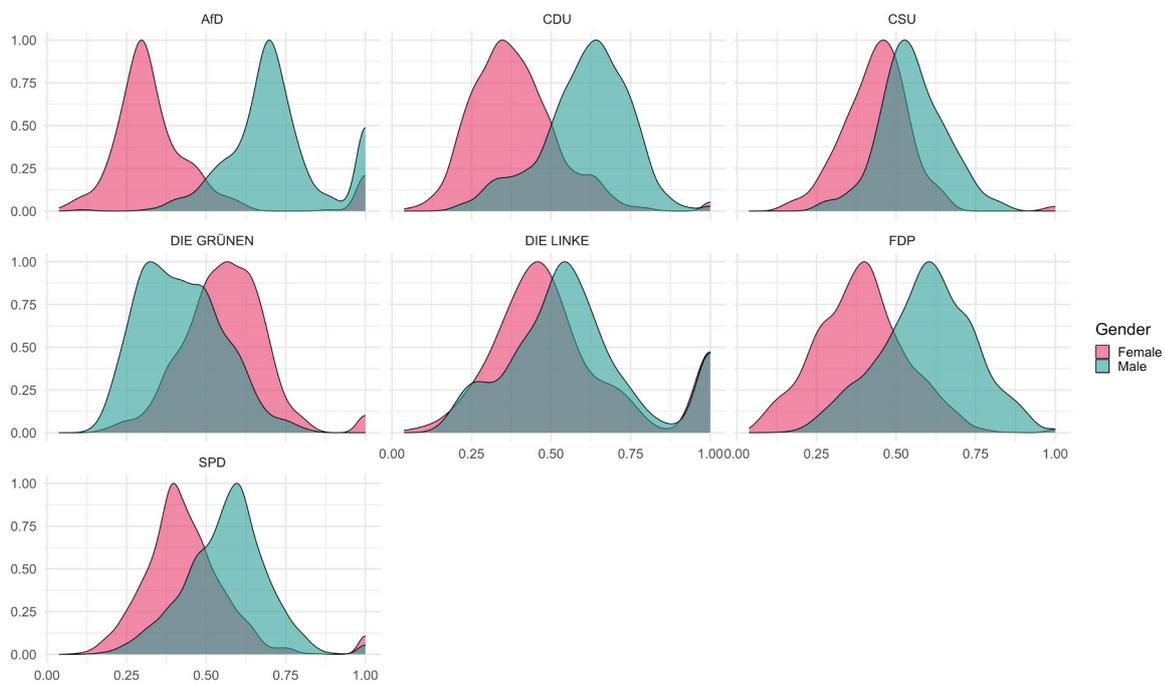
Figure 11. Impressions by state and party.



The Facebook Ad Library API also returns the proportion of impressions by age classes and gender. Impressions measure how often advertisements were on screen for the target audience⁵. Sociodemographic characteristics of people who saw the advertisements give some hints regarding the targeting strategies of advertisers, but only partially, in that, they depend both on the targeting strategies of advertisers and the optimization algorithm of Facebook. Moreover, age and gender are just two of several and more fine-grained targeting options available to advertisers to reach the desired public, which includes, for instance, education, job title, consumer behaviors such as prior purchases and device usage, interests and hobbies, connections to Facebook pages or events⁶.

The analysis of average proportions of visualization by party, age, and gender, are consistent with the results from the 2019 elections (Hegelich & Serrano, 2019). They show greater attention to females for Die Grünen, and older men for the AfD (Figure 12 and 13).

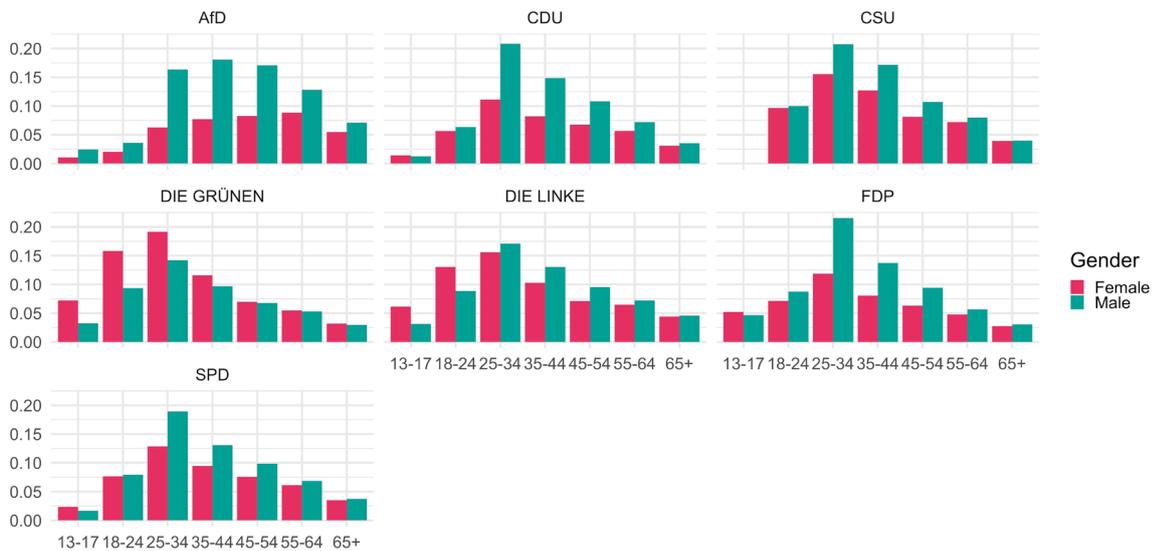
Figure 12. Average proportion of impressions by gender and party. The curves represent the average proportion of males (turquoise) and females (pink) who visualized Facebook advertisements run by each party. A turquoise (or pink) curve shifted on the right (or on the left) means that, on average, a party reached more (or less) visualization by males (or females). For instance, AfD and CDU advertisements were viewed, on average, by more males, while those by Die Grünen were viewed by more females than males.



⁵ <https://www.facebook.com/business/help/675615482516035>

⁶ <https://www.facebook.com/business/ads/ad-targeting>

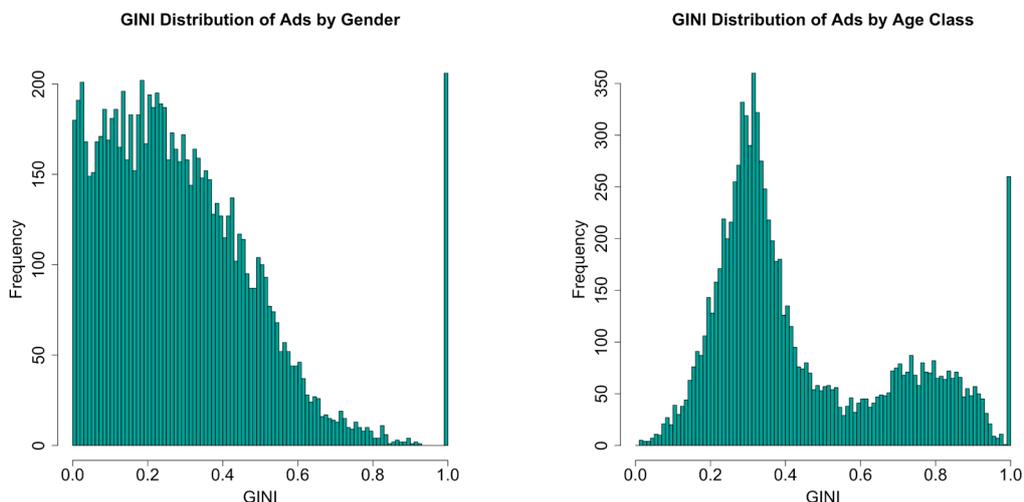
Figure 13. Average proportion of impressions by gender, age, and party. The columns represent the average proportions of males (turquoise) and females (pink) of different ages who were reached by the Facebook advertisements run by each party. The higher the bar, the higher the average proportion of people of that gender and age class who visualized the advertisements of a party.



To explore possible cases of microtargeting in more detail, we looked for instances of “extreme” types of targeting, that is, advertisements 100% targeted to a certain gender or age class. To this aim, we used the Gini coefficient, a popular measure of statistical dispersion, especially used for analyzing inequality or concentration. It varies between 0 (no inequality/concentration) and 1 (complete inequality/concentration). Applied to this case, a coefficient equal to 0 expresses a perfectly equal distribution between demographic categories (i.e., the advertisements have been equally shown to all gender and age categories). In contrast, a coefficient of 1 expresses full inequality (the advertisements have been shown only to a specific gender or age category).

The overall distributions (Figure 14) do not indicate a strongly unequal distribution in impressions by gender and ages (the average Gini coefficient for gender and age categories is 0.29 and 0.48, respectively), but there are exceptions (the peaks of 1 in the Gini distribution). In particular, there are advertisements that targeted only women or young people (15-34 years old).

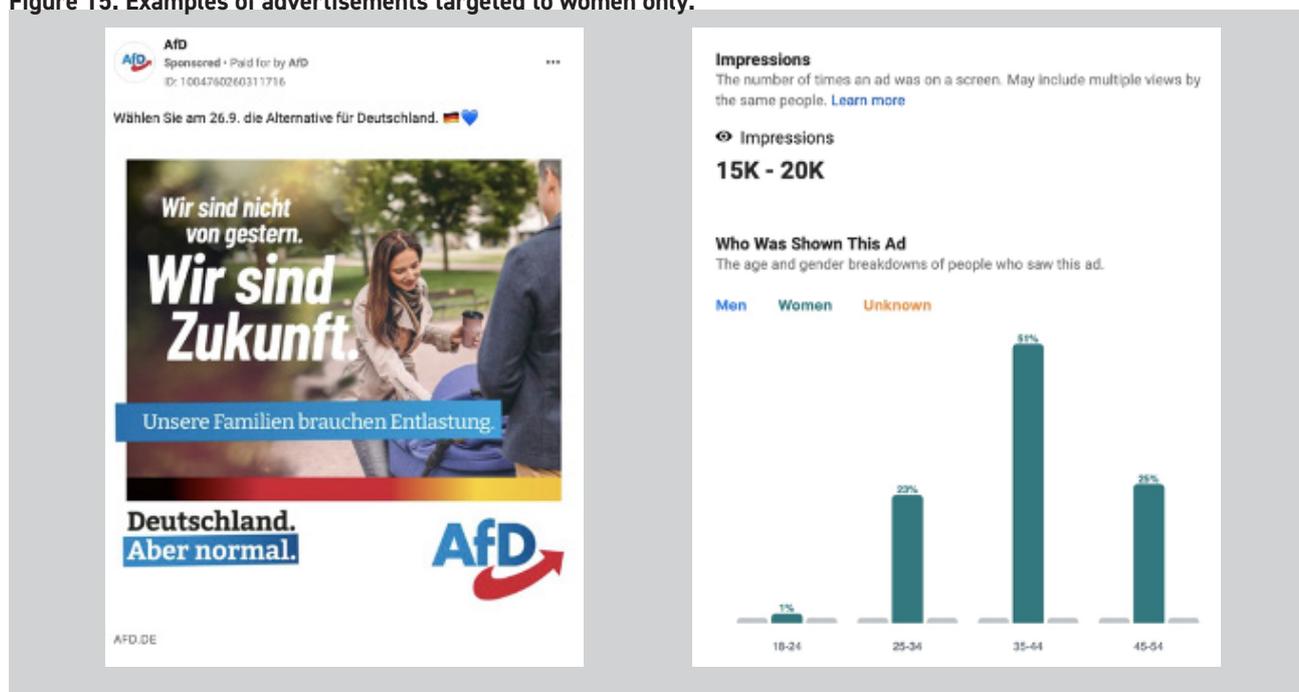
Figure 14. Inequality in the distribution of advertisements by targets, measured through the Gini coefficient. The overall distributions do not indicate a strongly unequal distribution in visualizations, with the exception of some advertisements targeted just to a specific gender (the peak on 1 in the Gini scale), and age categories (13-34 years old).



These peaks lead to wondering about the possible use, although marginal, of micro-targeted strategies. We therefore inspected and coded all advertisements with this extreme type of targeting to ascertain if their content was clearly and unequivocally targeted to women or young people, under the assumption that a microtargeted ad is probably a message which content is tailored to the target. Therefore, we looked for references to either young people or women in the textual or visual content of the advertisements. The analysis showed that only part of these advertisements (66% of ads targeted at young people, and 25% of ads targeted at women) included content clearly tailored to the targeted categories (a couple of examples of advertisements targeted at women only can be found in Figure 15).

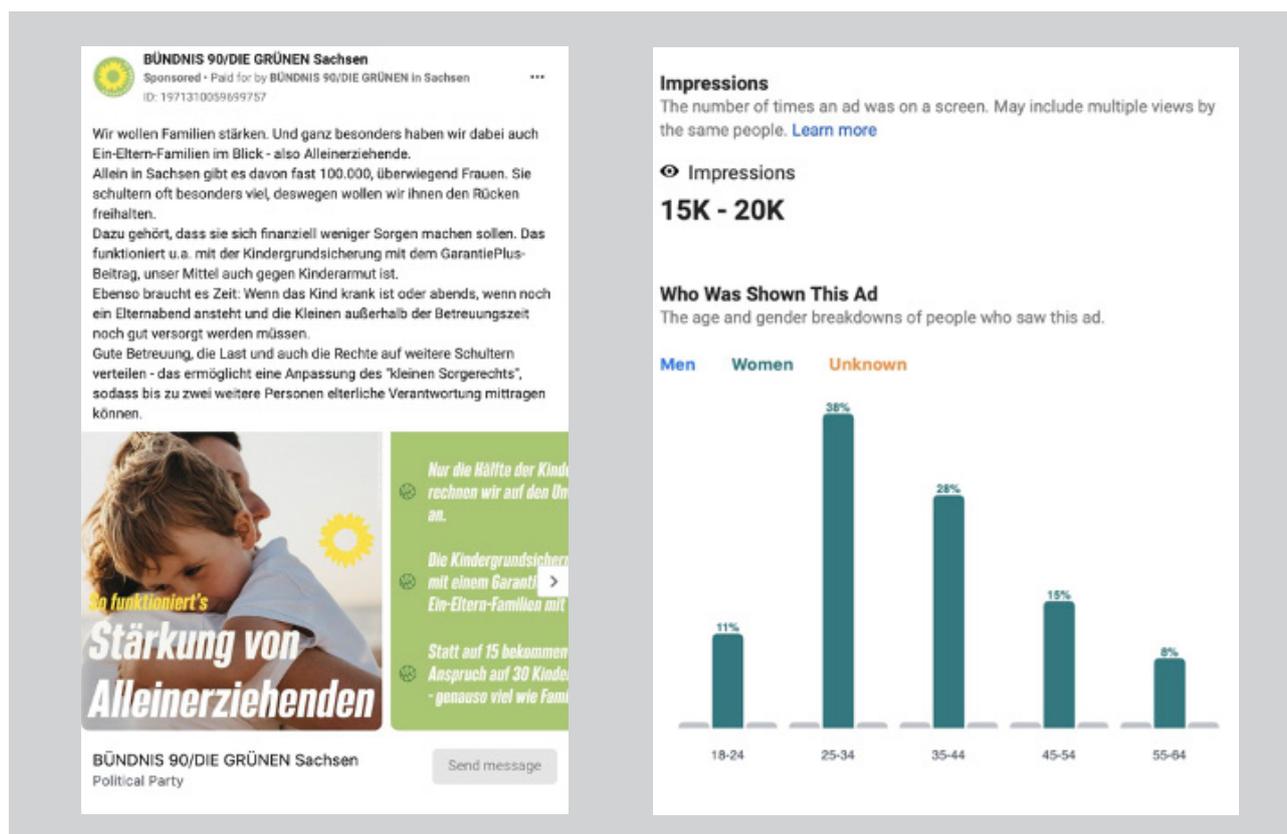
These results might suggest that micro-targeting strategies are not a very common tool of German parties. However, firm conclusions can hardly be reached due to the limitations of available data. Indeed, Facebook provides advertisers with several sophisticated targeting options that can be effectively used for micro-targeting, but the employed targeting (or micro-targeting) strategies cannot be inferred from the data made available. To get an overall idea of the degree of sophistication of the Facebook advertising options, it can be considered that Facebook currently allows advertisers to target users based on three types of audience-building strategies, they call “Core”, “Custom”, and “Lookalike Audience”⁷. With “Core Audiences”, Facebook promises advertisers the opportunity to adjust their desired target audience “to be as broad or well-defined as you like”, based on criteria like “Location” and “Demographics” (which includes not only age and gender, but also other criteria like education and job title); “Interests” (which includes a long list of possible interests and hobbies of the people to reach, “from organic food to action films – and make your targeted ads more relevant”); “Behavior” (consumer behaviors “such as prior purchases and device usage”); “Connections” (to include people who are connected to the advertiser’s Facebook Page or event, or exclude them to find new audiences). Based on this first type of targeting options, it should be already evident that the information provided by the Facebook Ad Library are very limited: it only provides estimates of the age and gender of the users reached by ads, but these are only two of several and potentially very detailed targeting options. And this is not all, since there are also other possibilities: “Custom Audience” allows advertisers to target a specific group of people, for instance by tracking who has visited their websites, or even by uploading a list of their identifiers (such as emails, phone number, etc.), to search and target them on Facebook and Instagram. “Lookalike Audience” instead permits advertisers to search for people who are similar to those already identified: “All you need to do is

Figure 15. Examples of advertisements targeted to women only.



⁷ <https://www.facebook.com/business/ads/ad-targeting>

Figure 15. Examples of advertisements targeted to women only.



create a source audience of people you know. Your ads will then reach people with common interests and traits". It is therefore evident that Facebook enables microtargeting strategies through very sophisticated targeting options, and that the public information currently made available does not allow researchers nor society at large to precisely understand the strategies employed to spread political advertisement in the lead up to elections.

ENGAGEMENT

We analyzed the activity of 1,385 Facebook pages, 1,536 Instagram accounts, and 1,640 Twitter accounts of candidates and parties from August 16, 2021, until the election day, on September 26, 2021.

We found that the SPD was the party with the highest number of accounts on both Facebook and Instagram, and the second one for number of accounts on Twitter (see Table 1). It was also the most prolific regarding the number of posts shared on Facebook – where SPD published about 14,500 posts, followed by the CDU (about 12,800 Facebook posts), the AfD (7,900 posts), and the other parties' accounts – and on Instagram, where the SPD published about 10,400 posts, followed by the CDU (about 9,000), Die Grünen (7,100 posts), and the other parties.

On Twitter the most prolific party was DIE GRÜNEN (about 38,600 posts), followed by Die Linke (23,700), SPD (23,400), FDP (21,000), CDU (14,100), AfD (11,100), and CDU/CSU (1,300). DIE GRÜNEN was also the party that reached the highest engagement on Twitter, with about 10,700,000 interactions and with the highest average engagement. The most engaging account on Twitter was the one of Karl Lauterbach (SPD), with 1,512,463 interactions on 368 tweets, but that of Annalena Baerbock, the chancellor candidate of DIE GRÜNEN, is the one that reached the highest average engagement. Also, from DIE GRÜNEN are 7 out of 10 most engaging accounts on Twitter.

The number of published posts does not equal the level of interactions on Facebook and Instagram. The party with the most interactions is the AfD, with about 6,400,000 interactions on Facebook, nearly five times the number

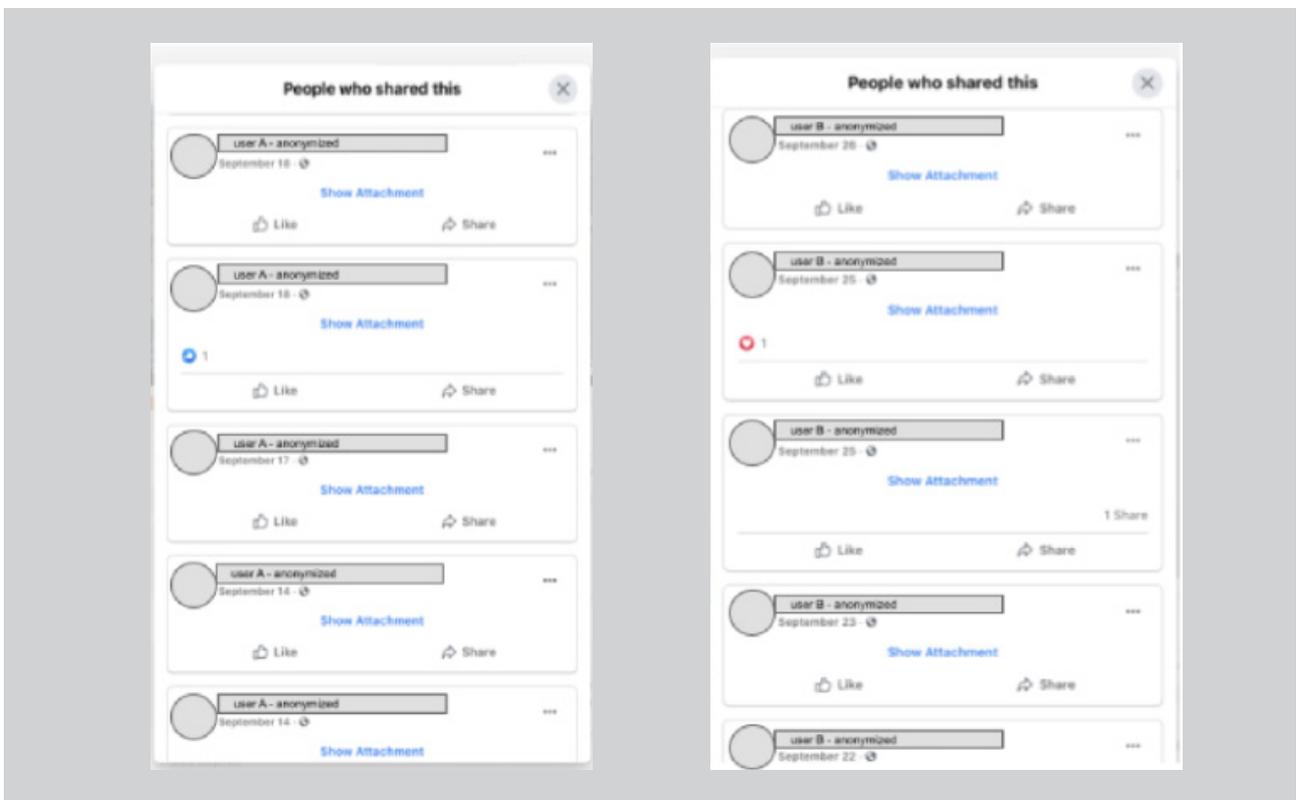
of interactions reached by the more active accounts of the SPD and the CDU. The AfD is also the party that grew the most in the number of “likes” on its pages. The results confirm the superiority of the AfD on Facebook already shown by previous studies (Serrano et al., 2019). However, the AfD is much less successful on Instagram, where BÜNDNIS 90/DIE GRÜNEN generated the highest level of interaction overall (2,200,000) and grew the most in the period leading to the elections.

When it comes to organic engagement, it is clear that the AfD shows a remarkable engagement on Facebook, the highest among the parties. The top three pages by engagement in the six weeks up to the election are all from this party and include, by order: the page of the chancellor candidate Alice Weidel (about 1.94M interactions), the official page of the AfD (1.67M), and the AfD MdB Martin Sichert (about 500k)⁸. Detailed interactive reports of the engagement by Facebook and Instagram accounts and parties can be found on dashboards at the following links:

- Facebook Dashboard <https://datastudio.google.com/reporting/8e5948bc-750f-43ad-8fb6-a18421170172>
- Instagram Dashboard <https://datastudio.google.com/reporting/336b53c2-1a44-40dc-82c4-fcb462b3c78e>

Previous studies raised questions about the authenticity of the engagement of the AfD on social media (Serrano et al., 2019). But inauthentic interactions may also favor all other parties. Unfortunately, it is difficult to detect authentic or inauthentic activity due, for instance, to the use of automated accounts (bots) to increase the engagement metrics and spread the content in an apparently organic way. Exploring the sharing activity under political posts, we found users that shared the same posts about 20 times (see Figure 16), which seems like a very unusual behavior for an ordinary user. However, the limitation in data access does not permit the analysis of unusual sharing activity by hyperactive users, nor systematically evaluating if this kind of activity affects the engagement of the content shared by political parties and candidates.

Figure 16. Example (anonymized) of two users who shared multiple times (about 20 times) the same posts.



⁸ Source <https://www.crowdtangle.com/>.

COORDINATED BEHAVIOR

While it is not possible to monitor the activity of individual users, it is possible to track the activities of public pages and groups. Previous research on “Coordinated Link Sharing Behavior” (Giglietto et al., 2020) showed that Facebook hosts networks of pages and groups that repeatedly share the same links within the same, very short, period of time. More precisely, Coordinated Link Sharing Behavior is a strategy employed by networks of social media actors to maximize the reach of their content by simultaneously posting the same link from all accounts controlled by the network (Giglietto et al., 2020a). While sharing the same link a few times in a few seconds from each other can be due to chance, doing so repeatedly is a clear sign of coordination, intended to increase the reach and engagement of specific content. During electoral campaigns, this kind of organized activity could favor the spread of certain ideas instead of others.

To ascertain the presence of coordinated networks sharing the same content in the lead-up to the German Federal elections, we collected the URLs posted on Facebook, Instagram, and Twitter during the six weeks leading up to the election day by the political accounts we monitored and through keywords we used to retrieve political posts published on these social media. We retrieved a total of about 1,850,000 URLs. Next, we collected the posts by Facebook and Instagram public accounts that shared these links, including all public pages, groups, and accounts monitored by CrowdTangle, thus not limiting the search to the list of initial accounts. We then identified the networks of accounts that repeatedly shared these links in a very short amount of time (maximum 20 seconds from each other) with unusual frequency, relying on the algorithm detailed in Giglietto et al. (2020). As a result, we found 130 coordinated networks composed of a total of 593 accounts, most of which were from Facebook (564) and to a lesser degree from Instagram (29). The difference of accounts from the platforms is also due to the specificity of the detection method employed, which leverages links (URLs), which are shared more frequently on Facebook than Instagram.

The analysis showed that most of the parties running for election relied on some form of coordinated link sharing, and some established publishers have also used the same technique (e.g., Focus Magazine, Tag24). The analysis also revealed that Coordinated Link Sharing was particularly used by anti-establishment networks to increase the reach of content ranging from anti-vaccination and Covid-19 regulations, anti-climate protection, and, more generally, far-right content. The anti-establishment network is the biggest we were able to detect (Figure 17). It consists of the high-est number of accounts (130 entities), the most intense coordinated activity (3,765 detected coordinated shares, the highest number among all the networks), one of the largest potential reach (400,000 subscribers, a number second just to mainstream and established editorial networks), and an exceptionally high engagement (more than 3,000,000 interactions during the six weeks leading up to the election, including 822,000 shares, a number even higher than the one reached by mainstream news media like Focus).

Table 2. Coordinated networks detected in the research (networks composed of at least three accounts and with more than 10,000 subscribers are shown). Names are given based on a qualitative inspection of the accounts and the content shared. The number of subscribers may change over the period of observations (six weeks up to the elections) so the average value was considered.

Network Name	Total Accounts	AVG Subscribers (SUM)	Coordinated Shares (SUM)	Total Interactions (SUM)
ANTI-ESTABLISHMENT + AFD FAN GROUPS	130	398,810	3,765	3,004,481
FOCUS	48	5,664,876	1,884	3,929,544
TAG24	19	519,849	1,263	509,175
ENERGIE & MANAGEMENT	3	23,358	335	88,796
EPOCH TIMES	3	906,324	308	404,148
RTL	6	4,033,705	304	2,875,323
NOZ.DE	9	212,001	272	104,507
CLIMATE	15	23,961	235	120,664
FRIEDRICH MERZ	3	38,561	165	401,928
CORONAVIRUS NEWS (DR. DROSTEN)	11	38,761	117	274,005
AFD	21	51,038	89	60,572
MIMIKAMA	3	948,114	68	335,331
WORLD SOCIALIST WEBSITES	7	128,042	62	16,202
MIXED NEWS	4	29,080	54	53,309
AFD	20	42,120	42	15,924
AFD	7	32,620	32	26,338
SURVEYS	9	73,016	31	12,823
WESTDEUTSCHE ZEITUNG	6	88,387	30	74,385
LK NEWS	4	28,949	27	75,577
RUSSIAN WEBSITES	3	73,410	18	23,426
ANIMAL RIGHTS	5	41,990	18	235,391
ANTI-ESTABLISHMENT + CONSPIRACY	7	15,720	16	2,492
REGIONAL (AK-KURIER.DE)	5	10,264	16	2,464
NURBERGER ZEITUNG	3	276,886	14	365,130
FLENSBURG	3	31,959	14	37,644
DIE ZEIT	3	1,868,184	11	788,261
NRZ.DE	5	33,194	11	19,090
ENVIRONMENT AND CLIMATE	5	68,561	10	14,939
HELP FOR FLOODS	3	51,569	10	245,847
ITALIANS IN GERMANY	3	23,182	6	7,436

Also, due to the specific content that is shared, it is characterized by interconnections with a network of pages and groups supporting the AfD (the network of AfD fan groups in Figure 17). The AfD also coordinates local networks of official regional accounts, such as AfD groups in Rosenheim (Bavaria) and North-Rhine Westphalia. While the other parties also used this kind of coordinated activity, their networks, as far as we could detect them, appeared to be relatively more minor (Table 3).

Figure 17. Map of the coordinated networks detected in the six weeks leading up to the elections.

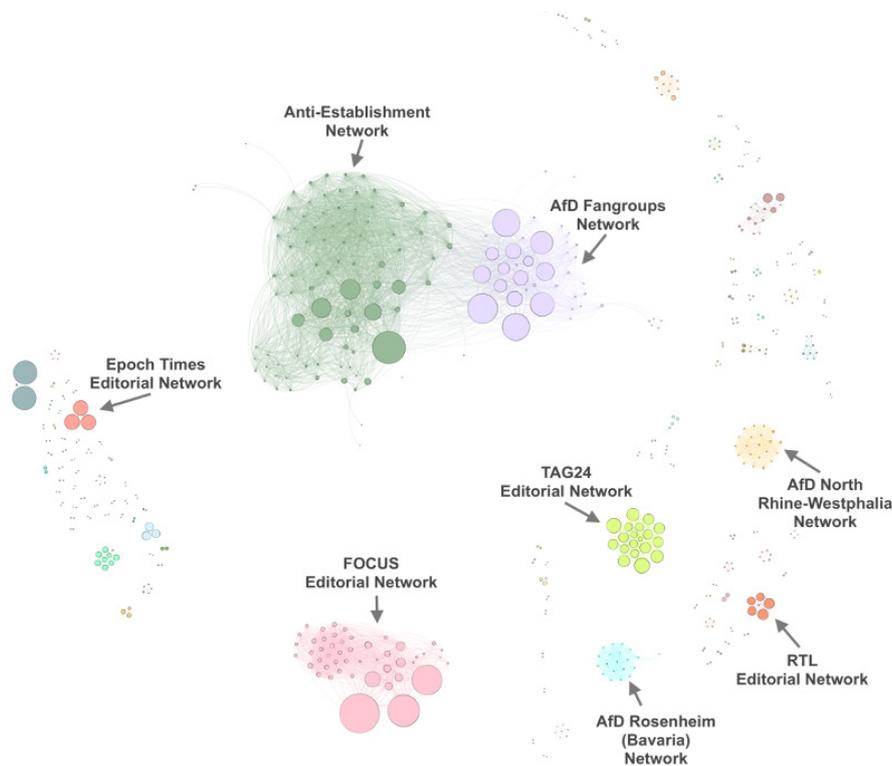
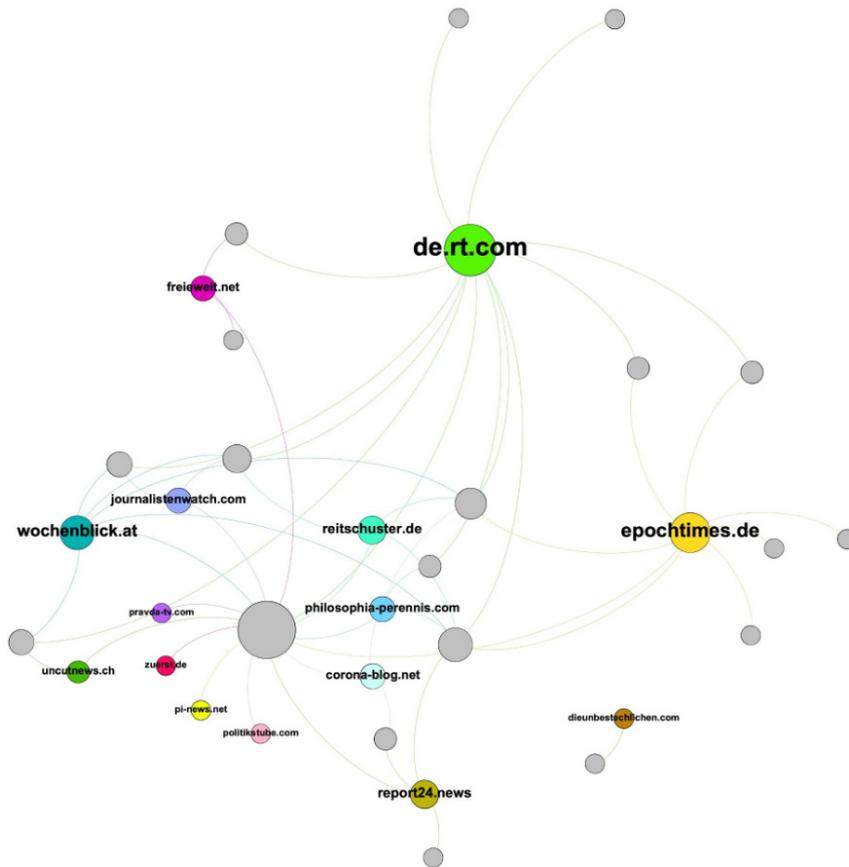


Table 3. Coordinated networks directly connected to parties. Names are given based on qualitative inspection of the accounts and the content shared. The number of subscribers may change over the period of observations (six weeks up to the elections), so the average value was considered. Metrics are the sum of values for the networks. Networks composed of mixed accounts are kept distinct (they are the Anti-Establishment plus AfD network, Die Grünen plus Die Linke and Die Partei network, and Die Linke plus Anti-Establishment network)

Network Name	Number of Networks	Total Accounts	AVG Subscribers (SUM)	Coordinated Shares (SUM)	Total Interactions (SUM)
ANTI-ESTABLISHMENT + AFD FAN GROUPS	1	130	398,810	3,765	3,004,481
AFD	13	72	200,494	248	179,404
SPD	14	34	35,000	149	37,934
FDP	8	16	13,056	92	10,600
DIE LINKE	6	14	25,741	78	97,012
CDU	6	12	16,135	26	12,113
DIE GRÜNEN	2	4	3,883	16	1,250
DIE GRÜNEN + DIE LINKE + DIE PARTEI	1	4	2,831	8	15,205
DIE LINKE + ANTI-ESTABLISHMENT	1	2	2,694	5	11,289
Grand Total	52	288	698,645	4,387	3,369,288

The anti-establishment network also shared the highest number of sources that NewsGuard flagged for spreading misleading and false information before the elections (14 out of the 18 misinformation domains indicated by NewsGuard, Figure 18).

Figure 18. Relations between coordinated networks (grey nodes) and misinformation domains they shared (colored and named nodes). The size of the coordinated network node indicates the number of different problematic news sources shared by the network. The Anti-Establishment network on the bottom left is the biggest one because it has the highest number of connections with different misinformation websites. Considering the domains, the biggest ones are Russia Today (de.rt.com) and epochtimes.de. Their size indicates they are among the most commonly shared domains by the coordinated networks. They are also the domains with the highest number of URLs in the dataset.



The analysis shows that the coordinated networks shared URLs from 15 out of 18 domains. We did not find instances of only three domains mentioned by NewsGuard: “kenfm.de,” “n23.tv,” and “anonymousnews.ru.” Regarding the last one, however, we found a connected website shared by the coordinated networks, namely “anonymousnews.org,” for which our analysis indicates that it is most probably run by the same people.

In general, coordinated entities are significantly more likely (+32%) to share these domains. This result confirms our analysis of the 2018 and 2019 Italian elections (Giglietto et al., 2020a).

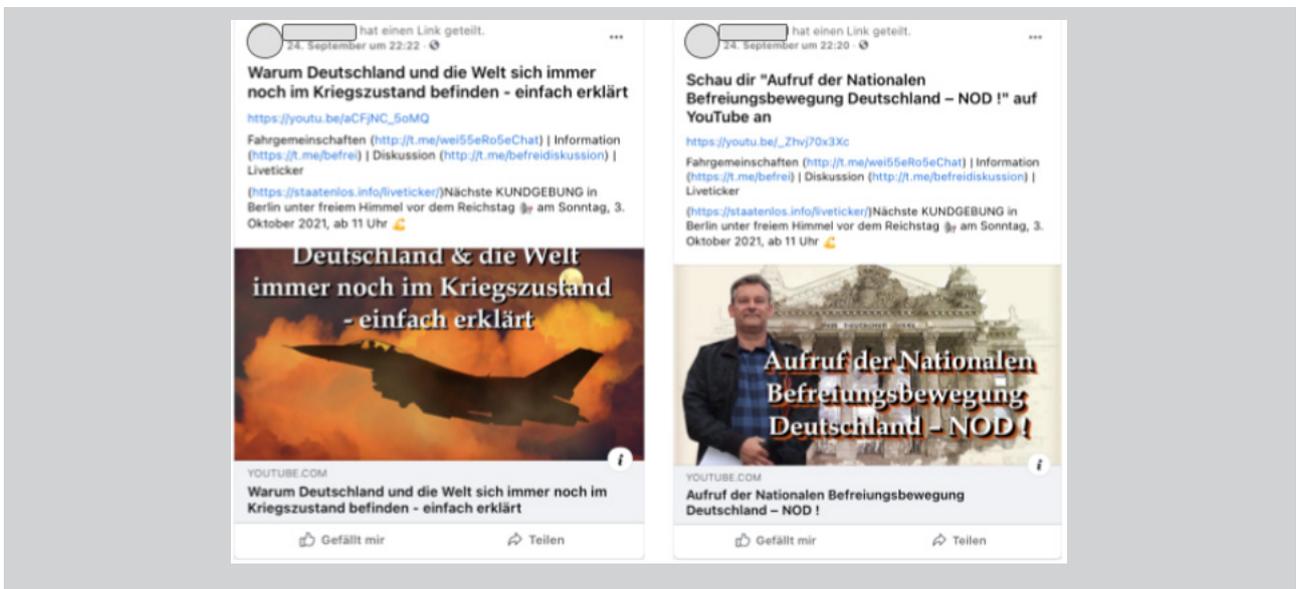
9 NewsGuard tracked misinformation in the lead up to the German election (NewsGuard, 2021) and provided us with a dataset of domains that spread false claims.

Figure 19. Some examples of content that can be found on the pages and groups of the anti-establishment network. On the left, a post from the Group “Ich misstraue der Regierung” that questions the usefulness of COVID-19 testing, on the right, a post of the group “Wir sind keine Nazis, aber selbstdenkende Patrioten” that advocates a narrative of the “Reichsbürger” conspiracy theory.



Coordinated networks also include inauthentic pages that spread conspiracy theories by circulating links from YouTube and news media that spread false information during the electoral campaign. A small amount of groups stand out because they use neutral names, such as “Aktion Zukunft für Wittenburg & Wittendörp Mecklenburg-Vorpommern” and “Landkreis Ludwigslust Parchim - Raum für Zukunft in Mecklenburg-Vorpommern”, but actually spread conspiracy content. The content that mainly consists of YouTube links contains videos propagating views of the Reichsbürger conspiracy theory (people who are convinced that either the second or third German Reich never stopped existing and the German government is a company or dictatorship without legitimation) and suggests that Fridays for Future is a “regime-controlled NGO” (Figure 20).

Figure 20. Groups “Aktion Zukunft für Wittenburg & Wittendörp Mecklenburg-Vorpommern” and “Landkreis Ludwigslust Parchim - Raum für Zukunft in Mecklenburg-Vorpommern”: The groups contain conspiracy content about the unlawfulness of Germany as a state



Coordinated behavior has also been found in the activities of a few questionable editorial networks, including news media listed by fact-checking organizations for having spread mis/disinformation, such as Epoch Times and Russia Today (de.rt.com). Their content is also shared by other small networks composed of questionable editorial pages, such as self-defined news media sites "Brd-West News" and "Volks-News" (Figure 21 and 22), and DieUnbes-techlichen.com, linked to the correspondent blog by author and conspiracy theorist Jan van Helsing. The content they share consists of a high amount of re-shares of Russia Today (RT DE) content, disinformation, different conspiracy narratives, anti-vaccination narratives, anti-establishment narratives, and comments containing threats of violence and hate speech mostly directed at politicians or foreigners.

Figure 21. Page "Volks-News": The post contains a news article from RT DE saying "Filmed with a hidden camera: Johnson & Johnson scientists advise against using their own vaccine"

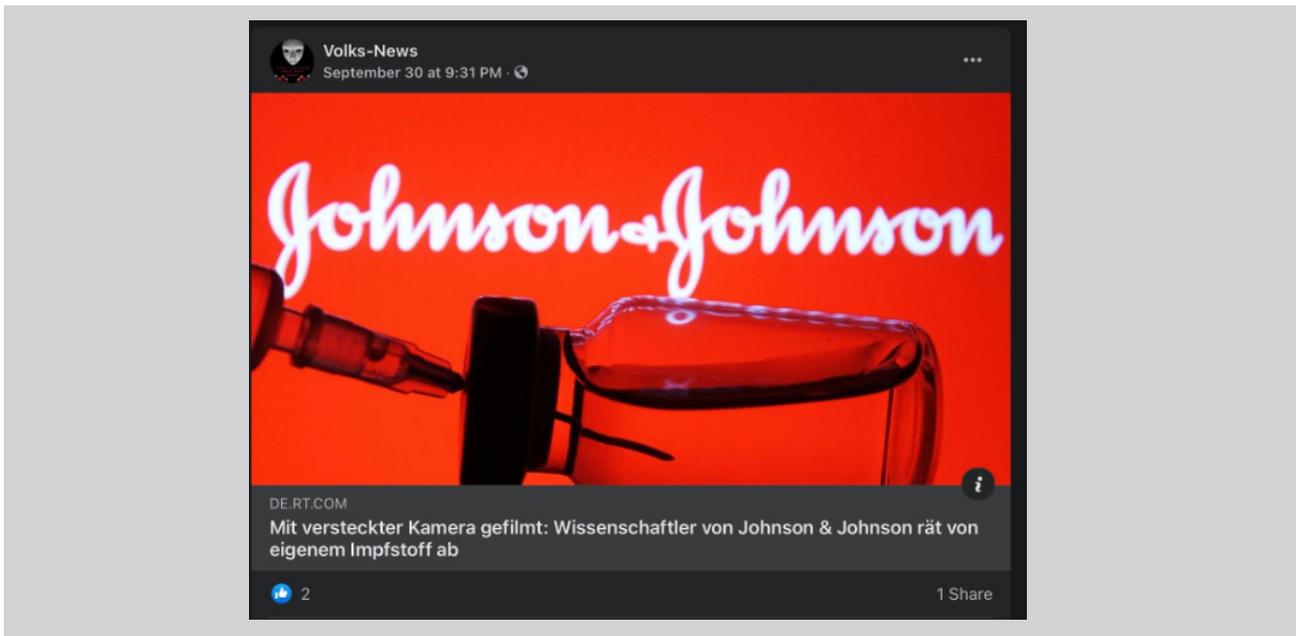
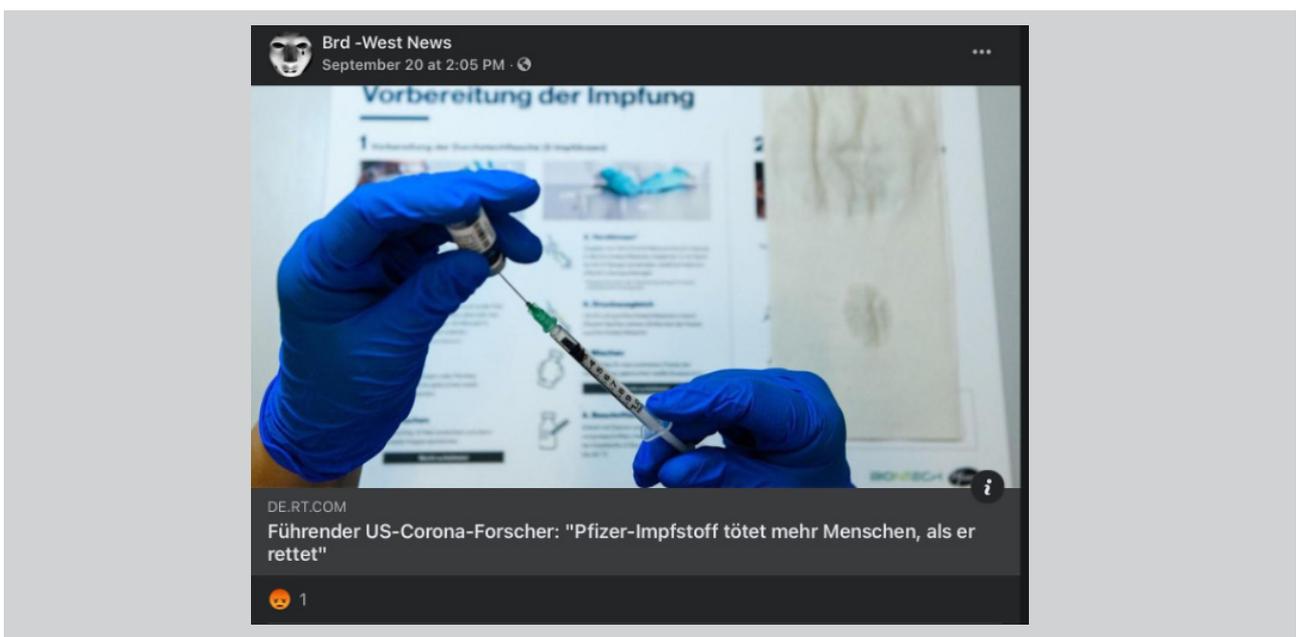


Figure 22. Page "Brd-West News": The post features an article from RT DE saying "US corona researchers in front of the FDA: 'Pfizer vaccine kills more people than it saves'"



DISCUSSION AND CONCLUSIONS

Results from this research are consistent with what was found in previous analyses of social media communication in the lead-up to elections in Germany (Hegelich & Serrano, 2019), especially regarding the characteristic of the population representing the target of social media advertisements of certain parties (the AfD tends to target older males and Die Grünen females), and the exceptionally high engagement reached by the AfD on Facebook where it invests in sponsored messages much less than other parties. Concerning the European Elections of 2019 (Hegelich & Serrano, 2019), also some minor differences emerge, like the ranking of parties that spent the most on Facebook advertisements (in 2021 Die Grünen, in 2019 the CDU), and the average amount spent per ad (the FDP in 2021, in contrast to the CDU in 2019), which has been pointed out as a possible sign of microtargeting strategy. Regarding microtargeting, we showed the presence of advertisements targeted specifically to very explicit demographic targets, like women or young people. Still, the qualitative analysis of these advertisements also revealed that just in some cases they included content clearly addressed at those social categories. The findings regarding microtargeting are therefore not conclusive. Unfortunately, it is hard to conclude anything certain about microtargeting strategies based on the data made available by Meta regarding the advertising on Facebook and Instagram. Although the Facebook Ad Library provides researchers and journalists with important data about spending, impressions, and the demographic characteristics of ad viewers, the data are insufficient to shed light on the issue of microtargeting. Besides providing data in the imprecise form of a range of values within which resides the true value of spending and impressions, the data made publicly available regarding users that visualize the advertisements are only about gender, age classes, and geography. However, these are only the roughest targeting options provided by Meta, which also include, for instance, education, job title, consumer behaviors such as prior purchases and device usage, interests and hobbies, connections to Facebook pages, or events. Since microtargeting is based on tailored messages to specific audiences, without detailed information on the audience, it is unlikely to be able to detect these strategies and their possible implications for the user that has been targeted.

Besides microtargeting, we showed that coordinated activities were not unusual in the lead-up to the elections. We found several coordinated networks spreading the same content on multiple pages and groups simultaneously, a strategy that increases the reach of content and the potential engagement with it. We found that Coordinated Link Sharing Behavior was employed by legitimate and mainstream news outlets and more or less by all parties. However, the biggest and most active networks were composed of anti-establishment pages and groups posting various types of problematic content, ranging from attacks on politicians, anti-establishment narratives at large, as well as anti-lockdown and anti-COVID19 policies messages. Our findings also clearly showed that this kind of strategy is linked to the spread of mis/disinformation. Indeed, coherently with previous research on Coordinated Link Sharing Behavior (Giglietto et al., 2020), the accounts employing this type of strategy were more closely associated with the spread of domains flagged by fact-checking organizations for having spread misinformation, compared with the accounts that did not employ this strategy (+32%).

The analysis of public pages, groups, and accounts used in the analysis of Coordinated Link Sharing Behavior, suffers from less restriction than that on personal accounts. It is, in fact, not possible to monitor the activity of personal accounts, even in anonymized form, which hinders the possibility to detect unusual activity such as those of bots that can be used, for instance, to artificially boost the engagement of posts. But also the investigation of more sophisticated content sharing strategies aimed at staying under the radar of fact-checkers and platforms censoring, although enacted by public pages, groups, and accounts, is prevented by limitations in data access. Our previous experiences with Coordinated Link Sharing Behavior on Facebook, for instance, pointed out networks that adapted their strategies by adding an external link as the first comment on a post instead of the post itself (Giglietto et al., 2020b). We discovered this strategy by analyzing already detected networks. However, the lack of data on the posts' comments hinders the detection of unknown networks operating through this new practice. When it comes to groups, a coordinated network is often surfaced as the result of single users that systematically and rapidly share the same link on multiple groups. Depending on the frequency and speed of these posts, this behavior resembles those of technically manipulated accounts. A systematic analysis of the veracity of these accounts is prevented by the lack of data on users posting in public groups.

Despite these limitations, this research clearly pointed out that political communication on social media, especially during electoral periods, is characterized by a wide range of phenomena that are not always transparent and are strictly intertwined with the technical affordances of social media platforms. Doubts on strategies and forms of engagement can be clarified only through research that is informed by punctual information. Unfortunately, this is currently accessible only by social media companies. Despite important efforts currently made by social media companies to provide researchers with data access necessary to surface problems at the intersection of social media communication and democracy, new forms of collaboration between researchers, public agencies devoted to monitoring and regulating public communication, and social media companies, are necessary.

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info@medienanstalt-nrw.de
www.medienanstalt-nrw.de

In cooperation with the Bavarian regulatory authority for new media (BLM), the Berlin-Brandenburg Media Authority (mabb), and the State Media Authority of Rhineland-Palatinate

Project Manager:

Dr. Tobias Schmid (Director of the Media Authority of North Rhine-Westphalia)
Dr. Thorsten Schmiege (President of The Bavarian regulatory authority for new media (BLM))
Dr. Eva Flecken (Director of the Berlin-Brandenburg Media Authority (mabb))
Dr. Marc Jan Eumann (Director of the State Media Authority of Rhineland-Palatinate)

Coordination and Content Support:

Dr. Meike Isenberg (Head of Research, Media Authority of North Rhine-Westphalia)
Sabrina Nennstiel (Head of Communications), Media Authority of North Rhine-Westphalia)

Authors:

Nicola Righetti, Azade Esther Kakavand, Aytalina Kulichkina
(University of Vienna)
Fabio Giglietto, Massimo Terenzi
(University of Urbino Carlo Bo)
Giada Marino
(University of Sassari)

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