

Freitag, Julian; Kerkhof, Anna; Münster, Johannes

**Working Paper**

## Selective sharing of news items and the political position of news outlets

ECONtribute Discussion Paper, No. 056

**Provided in Cooperation with:**

Reinhard Selten Institute (RSI), University of Bonn and University of Cologne

*Suggested Citation:* Freitag, Julian; Kerkhof, Anna; Münster, Johannes (2021) : Selective sharing of news items and the political position of news outlets, ECONtribute Discussion Paper, No. 056, University of Bonn and University of Cologne, Reinhard Selten Institute (RSI), Bonn and Cologne

This Version is available at:

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# ECONtribute

# Discussion Paper

Selective sharing of news items and the  
political position of news outlets

Julian Freitag   Anna Kerkhof   Johannes Münster

January 2021

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Funding by the Deutsche Forschungsgemeinschaft (DFG, German Research Foundation) under Germany's Excellence Strategy – EXC 2126/1– 390838866 is gratefully acknowledged.

Cluster of Excellence

# Selective sharing of news items and the political position of news outlets\*

Julian Freitag<sup>†</sup>      Anna Kerkhof<sup>‡</sup>      Johannes Münster<sup>§</sup>

September 29, 2020

## Abstract

We present an easy to implement measure for the political position of news outlets based on politicians' selective sharing of news items. Politicians predominantly share news items that are in line with their political position, hence, one can infer the political position of news outlets from the politicians' revealed preferences over news items. We apply our measure to twelve major German media outlets by analyzing tweets of German Members of Parliament (MPs) on Twitter. For each news outlet under consideration, we compute the correlation between the political position of the seven parties in the 19th German Bundestag and their MPs' relative number of Twitter referrals to that outlet. We find that three outlets are positioned on the left, and two of them are positioned on the right. Several robustness checks support our results.

**Keywords:** political media bias; political position; selective sharing; social media; Twitter

**JEL Codes:** H41, L82, L86, P16

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\*Funded by the Deutsche Forschungsgemeinschaft (DFG, German Research Foundation) under Germany's Excellence Strategy - EXC 2126/1-390838866. We thank our editors Luis Aguiar and Kenneth Wilbur, two anonymous referees, Maja Adena, Kai Barron, Felix Bierbrauer, Marcel Garz, Julian Harke, Erik Hornung, Steffen Huck, Ulrich Kaiser, and participants of the 4th Workshop on the Economics of Media Bias at WZB Berlin 2019 for helpful comments and suggestions. Nikola Noske, Sarah Recht, and Leja Riedl provided excellent research assistance. All errors are our own.

<sup>†</sup>E-mail: freitag.julian[at]gmail.com.

<sup>‡</sup>ifo Institute for Economic Research & LMU Munich. E-mail: kerkhof[at]ifo.de.

<sup>§</sup>University of Cologne, Germany. E-mail: johannes.muenster[at]uni-koeln.de.

# 1. Introduction

State-of-the-art research shows that the media have a causal effect on the economic and political choices of individuals (DellaVigna and La Ferrara, 2016). The media are, however, repeatedly accused of being biased towards the political left or right. For instance, six-in-ten US citizens see political bias in the news media<sup>1</sup> and four-in-ten German voters think that the government exerts pressure on the media.<sup>2</sup> Are the media really biased? A growing body of literature addresses these questions by developing methods to assess political biases of news outlets (Groeling, 2013; Puglisi and Snyder, 2016).

Measuring the political position of news outlets is challenging, though. In particular, researchers must find ways to overcome problems of subjectivity and the absence of suitable baselines against which to assess bias (e.g., Groeling, 2013). Existing approaches are based on in-depth content analyses – either by human or by automated coding – or on determining the political position of the news outlets’ audience (Puglisi and Snyder, 2016). Many of these procedures are data demanding, computationally burdensome, and time consuming. Easy to implement methods to assess the political position of news outlets, in contrast, are rare.

We present a novel approach to measure the political position of online news outlets that is based on the selective sharing of news items by politicians on social media.<sup>3</sup> Our central argument is that politicians predominantly share news items that are in line with their own political position, i.e., left-wing politicians prefer to share news items from left-wing news outlets, while right-wing politicians prefer to share news items from right-wing news outlets.<sup>4</sup> Consequently, we can utilize the politicians’ revealed preferences over news items to infer the political position of the news outlets.<sup>5</sup>

Formally, we compute a Spearman rank correlation coefficient for each news outlet under consideration. The Spearman rank correlation coefficient measures the correlation between the rank of the political position of the politicians’ parties (from most left-wing to most right-wing on a one-dimensional scale) on the one hand, and the rank of the politicians’ share of referrals to a particular news outlet – aggregated on the party level – on the other hand. A positive correlation indicates that the news outlet is positioned on the right, a negative correlation indicates that the news outlet is positioned on the left.

Our approach has several advantages. First, it is quick and easy to implement. We infer

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<sup>1</sup>See <https://news.gallup.com/poll/207794/six-partisan-bias-news-media.aspx>, viewed: Feb 2019.

<sup>2</sup>See <https://docplayer.org/43364962-Glaubwuerdigkeit-der-medien-eine-studie-im-auftrag-des-westdeutschen-rundfunks-dezember-2016.html>, viewed: Feb 2019.

<sup>3</sup>Our definition of news items includes every piece of information that news outlets publish (e.g., news and opinion articles, short and breaking news, videos, pictures, illustrations, and press releases). We also report results by newspaper section.

<sup>4</sup>A robustness check to the application of this measure confirms that less than four percent of the politicians’ referrals criticize the news item or the news source.

<sup>5</sup>Note that we do not use the term “media slant.” Media slant typically refers to news outlets’ choice of language as, for instance, in the seminal papers by Groseclose and Milyo (2005) and Gentzkow and Shapiro (2010). Our approach, in contrast, does not distinguish between slanted language and other potential forms of media bias.

the political position of news outlets from the selective sharing of news items by politicians, whose political position is clear. Moreover, since sharing news items on social media is nowadays part of the politicians’ profession, we observe the politicians’ choices over news items in a setting where they have an incentive to reveal their preferences consciously and truthfully. Thus, our approach does not require any elaborate content analysis, but circumvents problems of subjectivity and the absence of suitable baselines against which to assess bias nonetheless. Second, the results from our procedure are straightforward to interpret. The Spearman rank correlation coefficient for a particular news outlet is either positive, negative, or equal to zero, whereby the news outlet can directly be classified as positioned on the left, on the right, or in the center of the political spectrum. Finally, our approach is applicable widely beyond this paper. In particular, while many existing procedures are limited to assessing political media bias in two-party democracies, our approach can also be applied to multi-party democracies, as long as the parties’ political position can be measured on an ordinal, one-dimensional scale.<sup>6</sup> In addition to that, our approach is not data demanding and can thus be applied to small datasets, too.

We apply our procedure to twelve major online news outlets in Germany and consider the selective sharing of news items of German MPs on Twitter. The Spearman rank correlation coefficient is positive for five news outlets, but only statistically significant for two of them (*BILD* and *Welt*). The Spearman rank correlation coefficient is negative for seven further news outlets, and statistically significant for three of them (*Zeit*, *Spiegel*, and *Deutschlandfunk*). Following the above considerations, we conclude that *BILD* and *Welt* are positioned on the right, *Zeit*, *Spiegel*, and *Deutschlandfunk* are positioned on the left, and the remaining seven news outlets are positioned in the center of the political spectrum. Several robustness checks support our main results.

The remainder of the paper is organized as follows. Section 2 discusses the related literature. Section 3 illustrates the application of the Spearman rank correlation coefficient as a measure of the political position of news outlets more closely. In Section 4, we describe the data collection procedure and the data preparation process. Section 5 presents the results of our application and compares them to existing measures of the political position of German news outlets. Section 6 demonstrates the robustness of our results by checking the tonality of the Tweets, excluding extreme parties from the analysis, and by considering different numbers of news outlets. Moreover, we demonstrate that our results hold when we consider Tweets by German MPs from a different time period and when we compute the political position of news outlets based on the selective sharing of news items by German Members of the European Parliament and Members of the German State Parliaments. Section 7 concludes.

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<sup>6</sup>Machine learning techniques, for instance, usually struggle when multiple parties are involved (Colleoni et al., 2014).

## 2. Related literature

Our paper is related to three strands of literature. First, our approach to measure the political position of news outlets contributes to the literature on political media bias (see Groeling, 2013; Gentzkow et al., 2016; Puglisi and Snyder, 2016, for surveys). It is especially close to papers that develop alternative methods to measure political bias of news outlets in the US (e.g., Groseclose and Milyo, 2005; Ho and Quinn, 2008; Gentzkow and Shapiro, 2010) and in Germany (e.g., Dallmann et al., 2015; Dewenter et al., 2016; Garz et al., 2020). We contribute to this literature by presenting a novel approach to determine the political position of news outlets that is easy to implement, straightforward to interpret, and applicable to multi-party democracies and small datasets.

Next, our paper is related to the growing literature on the selective sharing of information on social media. This literature is divided into two fields. One group of papers infers the political position of users *from* their selective sharing of information with a clear political position (e.g., Barberá et al., 2015; Boutet et al., 2012; Colleoni et al., 2014). A second group of papers takes the reverse approach and provides *evidence of* the selective sharing of information by users whose political position is clear. Adamic and Glance (2005), for instance, demonstrate that political bloggers prefer to share hyperlinks that match their own political opinion. In addition, Shin and Thorson (2017) and Aruguete and Calvo (2018) show that Twitter users selectively share messages that are in line with their political position; An et al. (2014) provide analogous evidence for selective sharing on Facebook. Our approach builds on the findings from the latter group of papers, since our measure is based on politicians’ selective sharing of news items that are in line with their own political position.

Finally, we contribute to studies that examine the role of social media in political processes (Luca, 2016, provides a survey on the economic and political impact of social media and user-generated content). The selective exposure to social media content has attracted particularly much attention (e.g., Bakshy et al., 2015; Knobloch-Westerwick and Meng, 2009, 2011; Garrett, 2009a,b). Selective exposure to social media content is conceptually closely related to selective sharing of information; the two are complementary processes (Shin and Thorson, 2017). Related to our approach is the paper by An et al. (2012) who create a one-dimensional map of the political position of US news media based on Twitter users’ subscription and interaction patterns.<sup>7</sup> On top of that, our paper adds to studies on politicians’ usage of Twitter and other social media (Jungherr, 2016), coverage of politicians on Twitter (Jungherr, 2014), and the contribution of social media in political mobilization (Bond et al., 2012) and social movements (Hermida et al., 2014).

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<sup>7</sup>The intuition is that the closer the political position of two media sources, the more their audiences overlap.

### 3. Method

As argued, the idea of the approach is to assess the correlation between the political position of a party and its politicians' number of referrals to a specific news outlet. To avoid over-fitting, we use the *Spearman rank correlation coefficient*, a well known non-parametric measure of the correlation between two ordinal variables.<sup>8</sup>

Regarding our application to the selective sharing of news items of German MPs on Twitter, let  $o, o = 1, \dots, 12$ , denote the twelve news outlets under consideration (see Section 4 for details on the selection process). Moreover, let  $i, i = 1, \dots, 7$ , denote the seven parties in the 19th Bundestag. The political position of party  $i$  is denoted by  $x_i \in \mathbb{R}$ .<sup>9</sup> Let  $n_{io}$  denote the absolute number of tweets from MPs of party  $i$  that contain a reference to outlet  $o$ . These raw counts will depend on the number of MPs belonging to party  $i$  and on how active they are on Twitter, two factors that are not informative about the political position of outlet  $o$ . Therefore, our main measure considers the *relative* number of Twitter referrals by party  $i$  to outlet  $o$ ,

$$y_{io} = \frac{n_{io}}{\sum_{r=1}^{12} n_{ir}}. \quad (1)$$

We observe seven different values  $y_{io}$  – one for each party  $i$  – for each news outlet  $o$ .<sup>10</sup>

Next, the parties' political positions,  $x_i$ , are assigned to integer ranks  $rg(x_i)$ , where rank 1 is given to the most left-wing, and rank 7 is given to the most right-wing party. Moreover, fix a news outlet  $o$  and consider the relative numbers of Twitter referrals  $y_{io}$  by parties  $i = 1, \dots, 7$  to this news outlet  $o$ . Assign integer ranks  $rg(y_{io})$  from rank 1 to rank 7, where the smallest referral share to news outlet  $o$  is given the smallest rank.<sup>11</sup> For outlet  $o$ , let  $\rho_o$  denote the correlation coefficient between  $rg(x_i)$  and  $rg(y_{io})$ . It is given by

$$\rho_o = \frac{\sum_{i=1}^7 (rg(x_i) - \overline{rg(x)})(rg(y_{io}) - \overline{rg(y_o)})}{\sqrt{\sum_{i=1}^7 (rg(x_i) - \overline{rg(x)})^2} \sqrt{\sum_{i=1}^7 (rg(y_{io}) - \overline{rg(y_o)})^2}}, \quad (2)$$

where  $\overline{rg(x)}$  and  $\overline{rg(y_o)}$  denote the average ranks of  $x$  and  $y$  for outlet  $o$  (in our application  $\overline{rg(x)} = \overline{rg(y_o)} = 3.5$ ). In other words, equation (2) gives the Spearman rank correlation coefficient between the political position of a party and the relative number of Twitter referrals from this party mentioning outlet  $o$ .

<sup>8</sup>See Siegel and Castellan (1988), for a detailed discussion on the Spearman rank correlation coefficient.

<sup>9</sup>By aggregating tweets on the party level, we abstract from political heterogeneity within parties. This simplification makes our analysis less data demanding. If the political position of the MPs who share news items on Twitter deviates from the political position of their parties, however, the MPs' selective sharing of news items may not be informative about the political position of news outlets. Appendix B discusses such concerns and shows they are likely of minor importance in our setting.

<sup>10</sup>Of course, considering the relative number of Twitter referrals  $y_{io}$  rather than the absolute numbers  $n_{io}$  involves a loss of information. It is crucial to normalize by the total number of referrals, however, to filter out cross-party differences in Twitter activity. See Section 6 for a discussion of the advantages and disadvantages of using the relative number of Twitter referrals.

<sup>11</sup>Note that the ranks are based on the *population* of all Tweets from a particular time period and not on a sample of Tweets. A potential concern is that the observation period is not representative for other points in time; see Section 6.4 for a discussion.

The values of  $\rho_o$  lie in the interval  $[-1, 1]$ . If  $\rho_o > 0$ , the parties' ranked political position and their respective ranked relative number of Twitter referrals to outlet  $o$  are *positively* correlated. Thus, news items from  $o$  are shared relatively more often by right-wing MPs, which indicates that news outlet  $o$  is positioned on the right of the political spectrum. If, on the other hand,  $\rho_o < 0$ , the parties' ranked political position and their respective ranked relative number of Twitter referrals to outlet  $o$  are *negatively* correlated. Thus, news items from  $o$  are shared relatively more often by left-wing MPs, which indicates that outlet  $o$  is positioned on the left of the political spectrum. Finally, if  $\rho_o = 0$ , the parties' ranked relative number of Twitter referrals to outlet  $o$  is independent from their political position; in this case, news outlet  $o$  is positioned in the center of the political spectrum.

The magnitude of  $\rho_o$  corresponds to the size of the correlation between the parties' ranked political position and their respective ranked relative number of Twitter referrals to news outlet  $o$ , given the parties and the news outlets under consideration. Thus, a positive (negative) value of  $\rho_o$  indicates that items by news outlet  $o$  are shared more often by right-wing (left-wing) parties, and the larger the absolute value of  $\rho_o$ , the more is news outlet  $o$  preferred by right-wing (left-wing) parties. A correlation coefficient equal to 0.1, for instance, would correspond to a small, a correlation coefficient equal to 0.3 would correspond to a medium, and a correlation coefficient equal to 0.5 would correspond to a large effect (Cohen, 1988, Ch.3.2).<sup>12</sup>

We test the statistical significance of  $\rho_o$  against the null hypothesis that  $rg(x_i)$  and  $rg(y_{io})$  are independent, i.e., we test

$H_0$ : *There is no correlation between the parties' ranked political position and their ranked referral shares to outlet  $o$ .*

against

$H_1$ : *There is a correlation between the parties' ranked political position and their ranked referral shares to outlet  $o$ .*

Given the small number of observations per news outlet  $o$  ( $N = 7$ ), we consider the exact  $p$ -values of the Spearman rank correlation coefficients  $\rho_o$ , which we take from Owen (1962).<sup>13</sup> Since we test  $H_0$  for twelve news outlets, we also take multiple hypotheses testing into account with the Bonferroni correction.

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<sup>12</sup>See Section 6.3 for a discussion on why the magnitude of  $\rho_o$  may depend on the selection of news outlets.

<sup>13</sup>The idea of the exact  $p$ -values is as follows (see also Siegel and Castellan, 1988, p.242). For any  $N$ , the Spearman rank correlation coefficient can only take on a discrete number of values. If  $N = 2$ , the Spearman rank correlation coefficient  $\rho$  can take on the values  $+1$  and  $-1$ , both of which have probability  $1/2$  under  $H_0$ . If  $N = 3$ ,  $\rho$  can take on the values  $-1$ ,  $-1/2$ ,  $+1/2$ , and  $+1$ , with probabilities  $1/6$ ,  $1/3$ ,  $1/3$ , and  $1/6$  under  $H_0$ , respectively. For small  $N$ , it is thus possible to obtain the probabilities under  $H_0$  for all possible values of  $\rho$  and to compute the exact  $p$ -values for the observed values of  $\rho$  on that basis. In our application,  $N = 7$  for all news outlets  $o$ , which is sufficiently small to obtain exact  $p$ -values. Note, moreover, that the constant number of observations per news outlet implies that we obtain identical  $p$ -values for identical estimates of  $\rho_o$ .



## 4. Data

To carry out the analysis, we first determine which news outlets to consider. Our approach is based on the assumption that the selective sharing of news items reveals politicians' preferences over the news outlets' content. Hence, a major requirement on the news outlets is that all German MPs can potentially select from all outlets' news items. Local and specialized news outlets (i.e., those that focus on a particular topic such as sports, fashion, or economics) are thus excluded from the analysis.<sup>14</sup> Moreover, we do not consider news aggregators such as Google news or mixed content providers such as e-mail providers. We retrieve the ten largest national online news outlets (by number of visits) from `ivw.de`.<sup>15</sup> Nine out of these ten news outlets meet the requirements discussed above.<sup>16</sup> In addition, we include the online news sites of the two major German public TV broadcasters and the major German public radio news broadcaster into the analysis, such that we end up with twelve national online news outlets.<sup>17</sup>

Next, we collect tweets from all MPs of the seven parties in the 19<sup>th</sup> Bundestag (2017–) who are active on Twitter via the Twitter API. In a first step, we retrieve every Tweet by every MP between Oct 24, 2017 (first session of the newly elected Bundestag), and May 11, 2018.<sup>18</sup> Next, we check which tweets share news items published by one of the twelve selected online news outlets, where news items correspond to every piece of information that news outlets publish, including news and opinion articles, short and breaking news, videos, pictures, illustrations, and press releases. We aggregate the absolute numbers of Twitter referrals on the party level (Table 1).<sup>19</sup> While none of the parties tweets only rarely, Table 1 shows that there are clear differences in the number of tweets across parties. The corresponding relative numbers of Twitter referrals to each outlet for each party are displayed in Table 2.

Finally, for each outlet  $o$ , we assign the ranks 1 to 7 to the seven parties referral shares to  $o$ , where rank 1 is given to the smallest, and rank 7 to the largest referral share. For the ranking of the political parties we rely on Forschungsgruppe Wahlen (2017) who order the parties from left to right in the political spectrum. An overview of all ranks is given in Table 3.

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<sup>14</sup>See Section 7 for a discussion on how to apply the approach to local news outlets.

<sup>15</sup>The IVW (“Information Community for the Assessment of the Circulation of Media”) certifies and audits the circulations of major publications, including newspapers and magazines, within Germany.

<sup>16</sup>We excluded *upday* from the analysis, which is a news aggregator pre-installed on all Samsung mobile devices.

<sup>17</sup>The top ten news outlets by number of visits include all major German national news outlets. Technically, our analysis could be extended to more online news outlets. The smaller the news outlet, however, the less likely it is to meet the requirements.

<sup>18</sup>For our robustness checks in Sections 6.4 and 6.5, we retrieve every Tweet by every Member of Federal Parliament (Bundestag), by every German Member of the European Parliament, and by every Member of one of the sixteen German State Parliaments between Dec 27, 2018, and July 15, 2019. The subsequent steps of the analysis remain the same.

<sup>19</sup>This includes reactions and comments on re-tweets that originally shared news items. Some illustrative examples are displayed in Appendix A.

## 5. Results

### 5.1. Main results

Table 4 and Figure 1 show the results from computing the Spearman rank correlation coefficient  $\rho_o$  for all twelve news outlets. We find that  $\rho_o$  is positive for five news outlets, but only statistically significant for two of them (*BILD* and *Welt*). Moreover, we find that  $\rho_o$  is negative for seven further news outlets and statistically significant for three of them (*Zeit*, *Spiegel*, and *Deutschlandfunk*). Hence, following our considerations from Sections 1 and 3, we conclude that *BILD* and *Welt* are positioned on the right, *Zeit*, *Spiegel*, and *Deutschlandfunk* are positioned on the left, and the remaining seven news outlets are positioned in the center of the political spectrum.<sup>20</sup>

The magnitudes of  $\rho_o$  unveil further insights. While the absolute value of  $\rho_o$  is close to 1 and thereby indicates a close to perfect monotone relationship between the parties' ranked political position and their respective ranked relative number of Twitter referrals for *Zeit*, *BILD*, and *Welt*, the relationship is slightly less pronounced for *Spiegel* and *Deutschlandfunk*. In other words, *Zeit*, *BILD*, and *Welt* are more clearly positioned on the left or right of the political spectrum than *Spiegel* and *Deutschlandfunk*. Note, moreover, that the absolute values of  $\rho_o$  for *Focus* on the right, and for *SZ*, *ARD*, and *ZDF* on the left of the political spectrum are considerable, too ( $\rho_o > 0.5$ ). The lack of statistical significance for these outlets is in part reminiscent of the small number of observations per outlet ( $N = 7$ ); to achieve statistical significance at the 5%-level for *ARD* and *ZDF*, for instance, we would need at least 10 observations (i.e., ten parties) per outlet.<sup>21</sup>

### 5.2. Results by news outlet section

Next, we compute the Spearman rank correlation coefficient  $\rho_o$  by news outlet section.<sup>22</sup> While Section 5.1 presents the average political position of a news outlet, computing the Spearman rank correlation coefficient by news outlet section yields more fine-grained results: the political position of a news outlet may differ between sections; similarly, some sections might not exhibit a political position at all. In particular, we expect our results to be more clear-cut when we focus on referrals to “political” sections such as politics or business, and to be more ambiguous when we focus on “non-political” sections such as feuilleton, sports, and knowledge.

Table 5 shows the results. When we consider only referrals to the news outlets' politics section (row one), we find that  $\rho_o$  is positive for four news outlets and statistically sig-

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<sup>20</sup>Under the Bonferroni correction,  $\rho_o$  is statistically significant (5% level) for three news outlets: *BILD*, *Welt*, and *Zeit*.

<sup>21</sup>Note also that the magnitude of  $\rho_o$  may depend on the selection of news outlets  $o$ ; see Section 6.3 for further discussion.

<sup>22</sup>For ten news outlets, it is possible to infer the section where a news item has been published from its URL (e.g., “[spiegel.de/politik](https://www.spiegel.de/politik)”); *ZDF* and *Deutschlandfunk* publish all articles under their main domain. *Stern* does not have a separate business section, *ARD* does not have separate feuilleton, sports, and knowledge sections. Note that considering a smaller number of news outlets than in Section 5.1 may also affect the Spearman rank correlation coefficient; see Section 6.3 for further discussion.

nificant for two of them (*BILD* and *Welt*). Moreover, we find that  $\rho_o$  is negative for six further outlets and statistically significant for five of them (*Zeit*, *Spiegel*, *SZ*, *Stern*, and *ARD*). Hence, we conclude that the politics sections of *BILD* and *Welt* are positioned on the right, the politics sections of *Zeit*, *Spiegel*, *SZ*, *Stern*, and *ARD* are positioned on the left, and the politics sections of the remaining two outlets are positioned in the center of the political spectrum.<sup>23</sup> The absolute values of  $\rho_o$  remain within the same order of magnitude relative to Section 5.1.<sup>24</sup>

When we consider only referrals to the news outlets' business sections (row two), we find that  $\rho_o$  is positive for four news outlets and statistically significant for three of them (*BILD*, *Welt*, and *F.A.Z.*). Moreover, we find that  $\rho_o$  is negative for five further outlets and statistically significant for three of them (*Spiegel*, *SZ*, and *ARD*). Thus, we conclude that the business sections of *BILD*, *Welt*, and *F.A.Z.* are positioned on the right, the business sections of *Spiegel*, *SZ*, and *ARD* are positioned on the left, and the remaining three business sections are positioned in the center of the political spectrum.<sup>25</sup> The absolute value of  $\rho_o$  decreases for *Zeit* and *Focus* and increases for *F.A.Z.*, while the remaining news outlets are nearly unaffected.

Finally, when we consider only referrals to the news outlets' feuilleton, sports, and knowledge sections (row three)<sup>26</sup>, we find that  $\rho_o$  is positive for six news outlets and statistically significant for two of them (*Welt* and *Focus*). Moreover, we find that  $\rho_o$  is negative for three outlets and statistically significant for two of them (*Zeit* and *Spiegel*). We conclude that the feuilleton, sports, and knowledge sections of *Welt* and *Focus* are positioned on the right, *Zeit* and *Spiegel* are positioned on the left, and the remaining four outlets are positioned in the center of the political spectrum.<sup>27</sup> The absolute value of  $\rho_o$  decreases for the majority of news outlets. A notable exception is *Focus*, whose Spearman rank correlation coefficient is close to 1.

The results by news outlet section are intuitive. When we consider only referrals to the news outlets' politics section, we find that more news outlets exhibit a clear political position than when we consider referrals to the entire outlets as in Section 5.1. Similarly, when we limit our attention to referrals to the non-political sections feuilleton, sports, and knowledge, we find that a smaller number of news outlets exhibits a clear political position than in Section 5.1.<sup>28</sup> Figures 2, 3, and 4 illustrate how the results by news outlet section compare to the main results from Section 5.1.

<sup>23</sup>Under the Bonferroni correction,  $\rho_o$  is only statistically significant (5% level) for *Welt*.

<sup>24</sup>I.e., coefficients that could formerly be classified as "large" according to Cohen (1988) remain large, while the coefficient for *Stern* even increases from "medium" to "large."

<sup>25</sup>Under the Bonferroni correction, no correlation coefficient is statistically significant.

<sup>26</sup>We pooled these sections, because the number of Twitter referrals to each of them is small.

<sup>27</sup>Under the Bonferroni correction, no correlation coefficient is statistically significant at the 5%-level;  $\rho_o$  is only weakly statistically significant (10% level) for *Focus*.

<sup>28</sup>It also matches the public perception of *F.A.Z.* that its business section is positioned on the right on the political spectrum, while its remaining sections are positioned in the center. See, e.g., <https://www.deutschland.de/de/topic/wissen/ueberregionale-zeitungen>. Viewed: March 2020.

### 5.3. Comparison to existing measures

The political position of German news outlets has been measured before; recent approaches include Dallmann et al. (2015), Dewenter et al. (2016), and Garz et al. (2020). In this section, we demonstrate that the results from our novel approach are similar to the findings from these papers, which supports the validity of our analysis.

Using automated text analysis, Dallmann et al. (2015) develop several distinct measures for political media bias in the politics and economics sections of four online news outlets, including three of whom we consider, too. Regarding the amount of coverage, the authors find that *F.A.Z.* tends to favor the more right-wing parties CDU, CSU, and FDP, while the results for *Spiegel* and *Zeit* are ambiguous (p.136). Regarding the usage of key terms from party manifestos, Dallmann et al. (2015) find that the language of *F.A.Z.* is more similar to CDU and FDP, while *Spiegel* and *Zeit* show higher similarities to the left-wing parties SPD, Greens, and Left (p.137). This matches our result that *F.A.Z.* – especially the business section (see Section 5.2) – is more right-wing than *Spiegel* and *Zeit*, and that *Spiegel* and *Zeit* are positioned on the left of the political spectrum and similar in their political position.

Dewenter et al. (2016) introduce a political coverage index (PCI) that is based on human coding of the tonality of media reports about Germany’s two major parties, the center-right CDU/CSU and the center-left SPD.<sup>29</sup> As in our case, values of the PCI lie in the interval  $[-1, 1]$ , where negative values of the PCI indicate a bias to the left and positive values indicate a bias to the right. The analysis by Dewenter et al. (2016) includes nine news outlets that we cover, too.<sup>30</sup> We would not necessarily expect the PCI to be perfectly correlated with our measure, because the PCI is obtained by a different method and relies on a comparison of the two major parties only. Figure 5 shows that the values of the PCI are strongly correlated to our Spearman rank correlation coefficient (correlation of 0.77,  $p = 0.015$ ). Moreover, the measures agree on the direction of biases in eight out of nine cases. The only exception is *Stern*, which we classify as positioned in the center of the political spectrum (but with a negative sign), while Dewenter et al. (2016) find that its position is relatively far on the right.

Garz et al. (2020) construct an index of media outlets’ political position that is based on comparing the language of the Facebook posts of a news outlet with the language of the election programs of Germany’s main political parties. Here, too, the index lies in the interval  $[-1, 1]$ , where negative values indicate a bias to the left and positive values indicate a bias to the right. The analysis by Garz et al. (2020) includes eleven news outlets that we cover, too. Figure 6 shows that the values of their index are strongly correlated to our Spearman rank correlation coefficient (correlation of 0.74,  $p = 0.009$ ). Moreover, the measures agree on the direction of biases in nine out of eleven cases; exceptions are *Stern* and *Welt*. While Garz et al. (2020) also find that *Stern* is positioned in the center of

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<sup>29</sup>The authors use tonality data from MediaTenor.

<sup>30</sup>Dewenter et al. (2016) analyzed two different news sources by ARD and ZDF, respectively. We used the mean values of the PCI for these news outlets to conduct the comparison.

the political spectrum, they obtain a different sign for its position. Moreover, the authors classify *Welt* as positioned in the center of the political spectrum, while the news outlet is clearly positioned on the right of the political spectrum in our analysis.

## 6. Robustness checks

### 6.1. Tonality check

In this section, we probe the robustness of our results. First, our analysis is based on the assumption that politicians share only news items that are in line with their own political position. This assumption would be violated if, for instance, politicians shared news items in order to criticize the item itself or the respective news source, or if they disagreed with a re-tweet that originally shared the news item. To support the plausibility of our assumption, we let two Research Assistants read 2,998 randomly drawn tweets from our dataset.<sup>31</sup> The Research Assistants were asked to determine if a tweet criticizes the shared news item or its outlet, if it criticizes the content of a re-tweet that shared a news item, if it criticizes the news item or its news outlet in a re-tweet, or if it does not contain any of these criticisms. Appendix A displays some illustrative examples of tweets that the Research Assistants classified as criticizing or non-criticizing. In sum, 113 tweets – i.e., 3.8% – were classified as criticizing (inter coder reliability of 99%). This small fraction supports the plausibility of our basic assumption that the MPs share news items via Twitter that are in line with their own political position.

As a further robustness check, we excluded these 113 criticizing tweets from the randomly drawn subsample of 2,998 tweets and computed the Spearman rank correlation coefficient on the basis of the remaining 2,885 tweets. Since the random subsample was drawn proportionally to the entire sample, the referral shares  $y_{io}$  – and thereby the Spearman rank correlation coefficient  $\rho_o$  – can only be affected if these criticizing tweets are unproportionally distributed across parties *and* outlets; otherwise, our results would remain unchanged.<sup>32</sup> The first row of Table 6 shows that although the magnitude of the Spearman rank correlation coefficient underlies small changes compared to the results shown in Table 4, our main results are robust to taking out the criticizing tweets. In addition,  $\rho_o$  is weakly statistically significant (10% level) for two further outlets: *Focus* and *ARD*, where the former is positioned on the right, and the latter is positioned on the left of the political spectrum.

<sup>31</sup>We initially decided that the Research Assistants could code 3,000 tweets within a reasonable amount of time. The random tweets were drawn proportionally to the total amount of tweets. E.g., if the Twitter referrals of party  $i$  to news outlet  $o$  constituted 1% of all tweets, we would randomly draw  $1\% * 3,000 = 30$  tweets by party  $i$  to news outlet  $o$  for the Research Assistants to check. Rounding of non-integer numbers of tweets resulted in 2,998 instead of 3,000 tweets.

<sup>32</sup>For instance, if only a particular party criticizes all news outlets, but does so proportionally across outlets such that for all outlets the same fraction of tweets is critical, its relative number of Twitter referrals is not affected when dropping those negative tweets. Similarly, if only a particular news outlet is being criticized, but proportionally so by all parties, the ranking within that outlet would not be affected, either.

## 6.2. Exclude extreme parties

Next, we confirm that our approach does not hinge on the selective sharing of the politically extreme parties, LINKE and AfD, alone. It is, for instance, possible that only these parties follow distinct patterns in their sharing behavior, while the sharing behavior of the more centrist parties is similar and thereby uninformative about the political position of the news outlets.<sup>33</sup> To this end, we exclude (i) LINKE, (ii) AfD, and (iii) LINKE and AfD at the same time from the analysis and compute the Spearman rank correlation coefficient based on the relative number of Twitter referrals by the remaining parties, respectively. Rows two, three, and four of Table 6 show the results. The absolute values of the Spearman rank correlation coefficient underly small changes compared to the results shown in Table 4, but largely remain within the same order of magnitude. Moreover, given the smaller number of observations ( $N = 6$  in rows two and three,  $N = 5$  in row four), our results are less statistically significant. While  $\rho_o$  is statistically significant for *BILD*, *Welt*, and *Zeit* in all three analyses, it is not statistically significant for *Spiegel* and *Deutschlandfunk* when excluding AfD (row three) or both AfD and LINKE (row four).

## 6.3. Relative number of Twitter referrals

Our approach uses the parties' *relative* number of Twitter referrals to each of the twelve news outlets as a basis for their ranking (see Section 4). The major advantage over using the absolute number of Twitter referrals is that the parties who are most active on Twitter are not automatically given high referral ranks for each news outlet, which would undermine the idea of our measure. The main disadvantage of this approach is, however, that the Spearman rank correlation coefficient that we compute for each outlet is dependent on the other news outlets included into the analysis, because a party's referral share to news outlet  $o$  – and thereby its rank – depends on the referrals to all other news outlets that we consider.

We consider this to be a minor disadvantage; three robustness checks support this view. First, we included Twitter referrals to *taz*, which is known to be a very left-wing news outlet, into the analysis (Table 6, row five). News items by *taz* are relatively often shared by left-wing, but not by right-wing parties; as a result, the referral shares to the original twelve outlets change for the left-wing, but not for the remaining parties. Accordingly, we find that  $\rho_o$  decreases for *Zeit*, but is still statistically significant at the 1% level. Moreover,  $\rho_o$  for *taz* itself is negative and also statistically significant at the 1%-level, hence, *taz* is positioned on the left as expected. The results for the remaining news outlets are unaffected.

Second, we successively exclude the Twitter referrals to one of the originally selected

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<sup>33</sup>On the other hand, it has recently been argued that the extremely left-wing and the extremely right-wing parties have become quite similar regarding certain topics such as immigration; see, e.g., <https://www.zeit.de/politik/deutschland/2017-07/afd-linke-rechts-links-waehler-gemeinsamkeiten>, viewed Feb 2019. If this was the case, our main results would even be too conservative.

twelve news outlets and check how the results for the remaining eleven news outlets change.<sup>34</sup> In each case, the magnitude of the Spearman rank correlation coefficient changes slightly, but never switches sign. Moreover, with one exception, the news outlets that are classified as positioned on the political left or right in Section 5.1 remain to be classified as such unless it is their turn to be excluded (the exception is that when we exclude *Welt*,  $\rho_o$  for *Deutschlandfunk* is no longer statistically significant).

Third, we compare our results from Section 5.1 with the results we would have obtained when using the absolute instead of the relative number of Twitter referrals.<sup>35</sup> The most right-wing party AfD – whose members are most active on Twitter – would then be given one of the highest ranks for each news outlet, while the second-most right-wing party CSU – whose members are least active on Twitter – would be given one of the lowest. As a result, the Spearman rank correlation coefficients would be very different from those presented in Table 4 (Table 6, row six). In particular, the magnitude of the coefficients computed based on the absolute number of Twitter referrals is smaller, and none of them is statistically significant.

#### 6.4. Longitudinal analysis

The Spearman rank correlation coefficient is based on the population of Tweets from a particular time period. This would be a concern if the Tweets from the time period under consideration were not representative for the population of Tweets from different points in time. This section shows that our measure remains stable if we consider the Tweets from a subsequent time period. To this end, we retrieve all Tweets from all German MPs between Dec 27, 2018 and July, 15, 2019, which corresponds to a time window that is as long as the time window in the main analysis but does not overlap with it. Row seven in Table 6 shows that the results based on this alternative set of Tweets are very similar to our main results in Table 4. Moreover, Column 1 of Table 7 shows that the measures exhibit a correlation of 0.97; Figure 7 illustrates.

#### 6.5. Selective sharing of Members of the European Parliament and the State Parliaments

The key idea of this paper is to measure the political position of news outlets by selective sharing of news items on Twitter by politicians. A potential concern is that results might unduly depend on which politicians are taken into consideration. Indeed, if we would get very different results when applying the same methodology to a different set of politicians, one might wonder whether the results are more informative about these politicians rather

<sup>34</sup>These results are unreported, but available upon request.

<sup>35</sup>Using the relative number of referrals to a news outlet also distinguishes our approach from a recent study by the Pew Research Center that classifies the political position of a number of US news outlets based on the absolute number of Facebook shares by members of the 114th and 115th US Congresses. See <http://www.people-press.org/2017/12/18/sharing-the-news-in-a-polarized-congress/>, viewed: Feb 2019.

than about the media. In this subsection, however, we demonstrate that our results from Section 5.1 are robust when we study members of other legislative bodies instead of Members of the Federal Parliament.

To this end, we retrieve all Tweets from German Members of the *European Parliament* and from Members of the sixteen German *State Parliaments* between Dec 27, 2018 and July, 15, 2019 (i.e., we use the same time window as in Section 6.4). Rows eight and nine in Table 6 show the results. According to the Twitter referrals of German Members of the European Parliament (row eight), *BILD* and *Welt* are positioned on the right, *Zeit*, *SZ*, and *ARD* are positioned on the left, and the remaining seven news outlets are positioned in the center of the political spectrum. According to the Twitter referrals of Members of the State Parliaments (row nine), *BILD*, *Welt*, *n-tv*, and *Focus* are positioned on the right, *Zeit*, *Spiegel*, *ARD* and *ZDF* are positioned on the left, and the remaining four news outlets are positioned in the center of the political spectrum.

The results are similar to what we find when we consider the selective sharing of news items by German MPs during the same time period. Table 7 shows that the measures based on Tweets from Members of the European Parliaments and Members of the Bundestag exhibit a correlation of 0.85 and the measures based on Tweets from Members of the State Parliaments and Members of the Bundestag exhibit a correlation of 0.89; Figures 8 and 9 illustrate.

## 7. Conclusion

We present a novel and easy to implement measure for the political position of news outlets that is based on the selective sharing of news items by German MPs. Its application to twelve major German online news outlets shows that two news outlets, *BILD* and *Welt*, are positioned on the right, three news outlets, *Zeit*, *Spiegel*, and *Deutschlandfunk*, are positioned on the left, and the remaining news outlets are positioned in the center of the political spectrum. These results are in line with earlier findings on the political position of German news outlets.

Our approach offers a number of advantages over existing measures. First, the data requirements are modest: we determine the political position of news outlets based on MPs’ Twitter referrals, which are quick and easy to obtain from Twitter’s API. Existing approaches, in contrast, are typically based on text analyses that require thousands of full-length news articles along with additional datasets such as party manifestos or pre-built dictionaries. To compute the Spearman rank correlation coefficient, however, we just need the MPs’ party affiliation and the parties’ left-right ranking on an ordinal scale.<sup>36</sup>

Second, our approach solely employs data that is publicly available; in particular, it does not require (costly) access to newspaper databases or archives or any other exclu-

<sup>36</sup>Dallmann et al. (2015), for instance, use more than 130,000 articles with over 62,000,000 words; Garz et al. (2020) downloaded more than two million Facebook posts. Both approaches involve additional information from party manifestos; Garz et al. (2020) also employ a sentiment dictionary for German political language.



sive dataset.<sup>37</sup> Hence, our analysis could be replicated, extended, or adopted to further applications by any researcher at any time.

Third, our analysis is likely to be less computationally burdensome than existing approaches that determine the political position of news outlets. Once the MPs' Twitter referrals are obtained, the Spearman rank correlation coefficient can be computed within minutes (even manually). This computational ease stands in stark contrast to text analysis approaches that face the complexity and high dimensionality of text as data.<sup>38</sup>

Our approach is limited in four respects. First, while our approach can assess whether a news outlet is positioned on the left or on the right, it is agnostic about the type of bias, i.e., whether there is a selection or a distortion bias or both. Similarly, we cannot determine whether the bias is demand or supply driven. Second, the smaller the number of political parties and thereby of observations per news outlet, the smaller the number of values that the Spearman rank correlation coefficient between referral shares and the parties' position can take on. Even for two party democracies, however, our method can be used if reliable data on the political position of individual politicians are available. Third, our approach only works if the MPs who share news items are sufficiently representative of all MPs. Therefore, we caution against using our approach in countries where only few politicians are active on social media. Fourth, our approach is applicable only to online news outlets. Yet, since nowadays every major news outlet also operates online, we do not consider this as an important caveat. Relatedly, the measure cannot be applied to small news outlets whose news items are never shared by politicians. This does not, however, generally preclude the investigation of local news outlets. One could, for instance, study the sharing patterns of *local* politicians to determine the political position of *local* online news outlets, which would be an interesting direction for further research.

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<sup>37</sup>The approach by Dewenter et al. (2016) is, for instance, based on tonality data from MediaTenor.

<sup>38</sup>Gentzkow et al. (2019) provide an overview of the opportunities and challenges of text as data.

## A. Tweet examples (translated from German into English)

### A.1. Examples of non-criticizing tweets

Grüne tweeted:

12.000 plastic particles in one (!) litre arctic ice. We do not only poison the fish in the sea, but everything will end up in our bodies. Time to act. Stop #plasticpollution #plastictax. <http://www.tagesschau.de/ausland/mikroplastik-arktis-101.html>

SPD tweeted:

Civil insurance: Well explained on Spiegel Online. <http://spon.de/ae7kR>

LINKE tweeted:

It is good that @Simone\_Lange opposes #Hartz4 so clearly. Otherwise very sad. @dieLinke is the social alternative and will continue to exert pressure for a fundamentally different policy. <http://m.spiegel.de/politik/deutschland/spd-andrea-nahles-holt-nur-66-prozent-warum-die-partei-nicht-erneuerbar-ist-a-1204209.html>

### A.2. Examples of criticizing tweets

LINKE tweeted:

I also accuse the SPD of playing a waiting game! But it is not correct that the LINKE supports the proposal by the FDP in its current form! #219a must be deleted. Induced abortion has no place in the penal code. <https://www.zeit.de/politik/deutschland/2018-03/werbeverbot-abtreibungen-linke-vorwurf-verzoegerung-ausschuss-groko>

AfD tweeted:

While @PoggenburgAndre is politically “classified”, @DLF of course abstains from doing so for the former secret police collaborator #Kahane. And you really wonder why fewer and fewer citizens trust your reporting? [https://www.deutschlandfunk.de/parlamentarische-anfragen-afd-will-demokratie-vereinen.862.de.html?dram:article\\_id=408111](https://www.deutschlandfunk.de/parlamentarische-anfragen-afd-will-demokratie-vereinen.862.de.html?dram:article_id=408111)

## B. Sample of MPs

Our sample is limited to the selection of MPs who share news items on Twitter. This would be a concern if the political position of these MPs was systematically different from the political position of all MPs of their parties, as it may lead to different rankings of the relative number of Twitter referrals to the news outlets. Four arguments, however, speak against concerns about the nature of our sample.

First, the majority of MPs is active on Twitter. We find that our sample comprises 391 out of 707 MPs; 94 further MPs use Twitter, but do not refer to one of the news outlets under consideration during our observation period. Moreover, our results are not driven by a small number of excessive Twitter users. When we exclude the 10% most active MPs from each party from the analysis, the Spearman rank correlation coefficient remains nearly unchanged (Table 6, row 10).

Second, we study the effect of observable MP characteristics on the intensive and on the extensive margin of Twitter referrals. To this end, we obtain information on the MPs' age, gender, education, and political experience (in terms of election periods in the Bundestag) from [bundestag.de](http://bundestag.de) and estimate

$$Y_i = \alpha_0 + \alpha_1 Age_i + \alpha_2 Female_i + \alpha_3 PhD_i + \alpha_4 Exp_i + \sum_{j=1}^6 \beta_j Party_{ij} + \sum_{j=1}^6 \gamma_j (Age_i * Party_{ij}) + \sum_{j=1}^6 \delta_j (Female_i * Party_{ij}) + \varepsilon_i \quad (3)$$

by OLS. The dependent variable in equation (3) is either a dummy that indicates whether MP  $i$  eventually refers to one of the news outlets under consideration, or it corresponds to the absolute number of Twitter referrals of MP  $i$ .  $Party_{ij}$ ,  $j = 1, \dots, 6$ , is party dummy equal to one if MP  $i$  is affiliated to party  $j$ , with the most left-wing party LINKE as omitted category.

Columns 1 to 5 in Table 8 demonstrate that an MP's probability to eventually refer to one of the news outlets under consideration diminishes in age, but only slightly. According to our estimates, an additional year of age decreases the probability to eventually refer to a news outlet by about one percentage point; a standard deviation increase in age leads to a ten percentage point reduction, which corresponds to 20% of a standard deviation in the dependent variable. To put these numbers into perspective, note that the average MP is 52.5 years old, the average MP who shares news items on Twitter is 50.1, and the average MP who does not share news items is 55.5 years old.<sup>39</sup> Among those MPs who share news items, however, the older share more, and the average Tweet in our data is written by an MP who is 51.5 years old.

The effect of political experience on the MPs' probability to eventually refer to a news

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<sup>39</sup>The average MP who uses Twitter but does not refer to a news outlet during our observation period is 54.5 years old.

outlet disappears once we control for party affiliation; the effect of gender, in contrast, becomes statistically significant in Columns 2 and 3, but vanishes if we allow the effect to differ between parties in Columns 4 and 5. The results are similar when we use a logistic regression instead of a linear probability model.

Columns 6 to 10 in Table 8 show the relation between observable MP characteristics and the extensive margin of Twitter referrals among those politicians who refer at least once to the news outlets under consideration. The coefficients for gender, education, and political experience are statistically insignificant for all specifications. In contrast to Columns 1 to 5, the effect of age on the number of Twitter referrals is ambiguous: the coefficient is positive in Columns 6, 7, and 9, and negative in Columns 8 and 10; moreover, it is weakly statistically significant in Columns 6, 8, and 10. The effect size is small, though: an additional year of age corresponds to less than one referral more (or less); a one standard deviation increase in age leads to a six to nine units change in the number of referrals, which corresponds to less than 10% of a standard deviation in the dependent variable.

Third, because of these indications that age is related to sharing news items, we run an additional analysis where we weight each MP’s Twitter referrals by her inverse probability to eventually refer to one of the news outlets under consideration.<sup>40</sup> MPs with a low probability to eventually refer to a news outlet are given large, and MPs with a high probability to eventually refer to a news outlet are given small weights (see, e.g., Wooldridge, 2007).

To this end, we obtain the MPs’ predicted probabilities from equation (3), where we use the logit specification to ensure nonnegative probabilities, and the full set of controls. Row 11 of Table 6 shows that for the majority of news outlets, the Spearman rank correlation coefficients based on the weighted referral shares are identical to our main results. In particular, our main finding that *BILD* and *Welt* are positioned on the right, and *Zeit*, *Spiegel*, and *Deutschlandfunk* are positioned on the left of the political spectrum is unaffected.

As a fourth argument against concerns about the nature of our sample, we demonstrate that the political behavior of MPs who share news items on Twitter is similar to the political behavior of MPs who do not share news items. To this end, we obtain information on all roll-call votes during our observation period from [bundestag.de](http://bundestag.de).<sup>41</sup> Although German MPs often vote along the party lines (e.g., Sieberer, 2010), they are not obliged to do so – in fact, the enforcement of a strong party discipline is against the German Constitution.<sup>42</sup> Hence, the roll-call votes from the Bundestag allow us to check if the average political position of MPs who share news items on Twitter deviates from the average political position of MPs who do not share news items.

There were 22 roll-call votes during our observation period. MPs could vote “yes” or “no”, explicitly abstain from voting, or not cast a vote at all, where we code “yes” as 1, “no” as  $-1$ , and the remaining outcomes as 0. Based on this coding, we compute the

<sup>40</sup>Cornesse et al. (2020) review inverse probability weighting for nonprobability samples.

<sup>41</sup>Roll-call votes are often used to put the political position of MPs on the public record (e.g., Sieberer et al., 2020).

<sup>42</sup>See Article 38, (1), Sentence 2.

average outcome for each roll-cast vote for each party and for MPs who share news items on Twitter and for MPs who do not share news items.

Figures 10 to 16 illustrate our results. For each of the seven parties in the Bundestag, we plot the average outcome of each roll-call vote of MPs who share news items on Twitter on the  $y$ -axis against the average outcome of MPs do not share news items on the  $x$ -axis. Most observations (small deviations on behalf of the Greens) are close to the 45 degree line, which indicates that the political position of MPs who share and who do not share news items on Twitter is similar.

In addition to that, we use the roll-call votes to check whether MPs who share news items on Twitter are generally more likely to deviate from the party line than MPs who do not share news items. To this end, we determine how the majority of each party voted on each roll-call vote. Then, we check for each MP if he or she has voted along or against the party line. Table 9 displays the average shares of MPs who voted in accordance with their parties. In line with the evidence from Figures 10 to 16, we find that the conformity in voting behavior is large for all parties and, in particular, that the difference between MPs who share and who do not share news items on Twitter is negligible.

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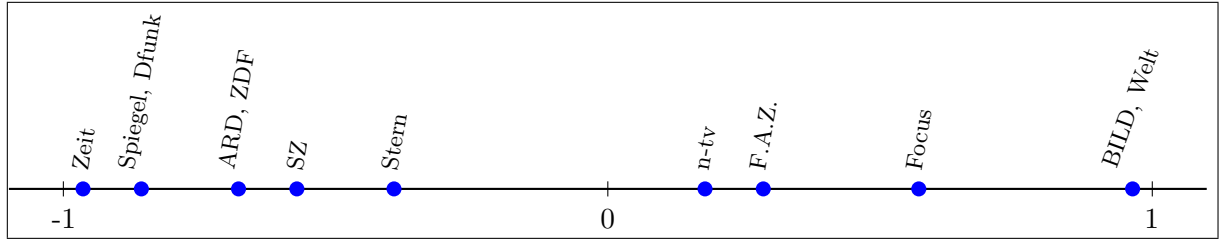


Figure 1: Main results: The Spearman rank correlation coefficient for each news outlet under consideration.

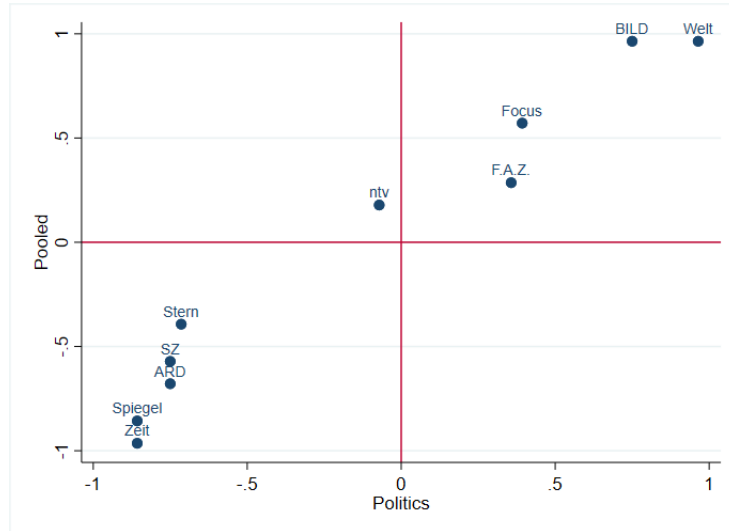


Figure 2: Comparison of the Spearman rank order coefficient for the entire news outlets to their politics section.

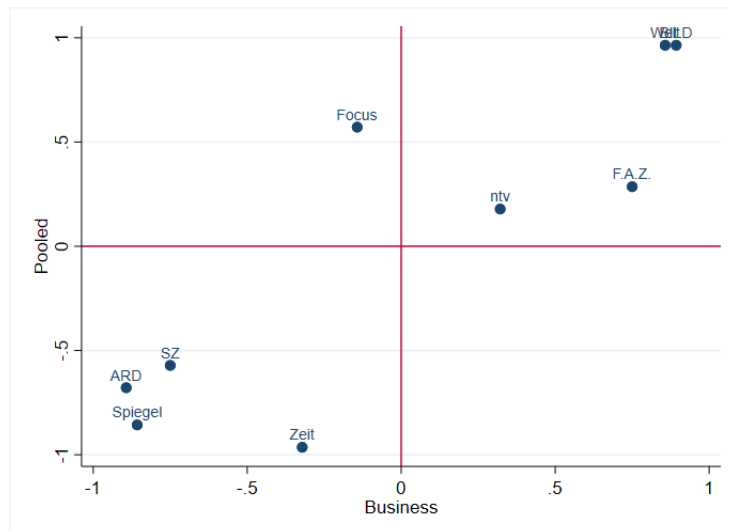


Figure 3: Comparison of the Spearman rank order coefficient for the entire news outlets to their business section.



Figure 4: Comparison of the Spearman rank order coefficient for the entire news outlets to their feuilleton, sports, and knowledge section.

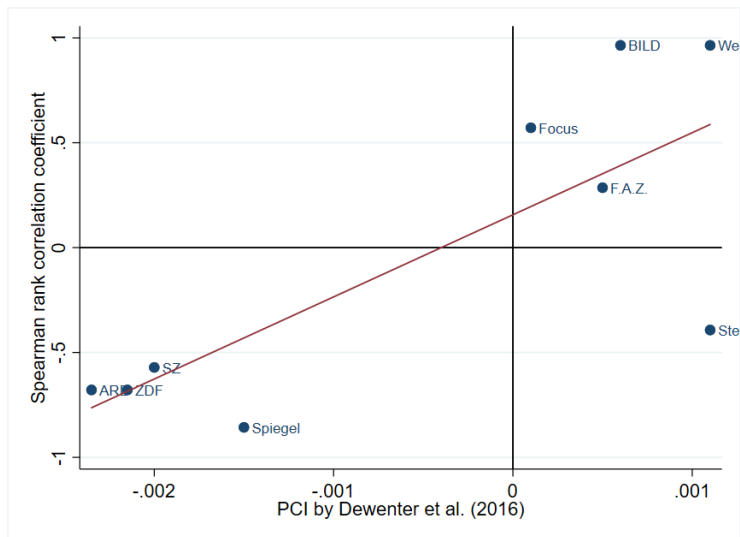


Figure 5: Comparison of the Spearman rank order coefficient to the weighted PCI by Dewenter et al. (2016).

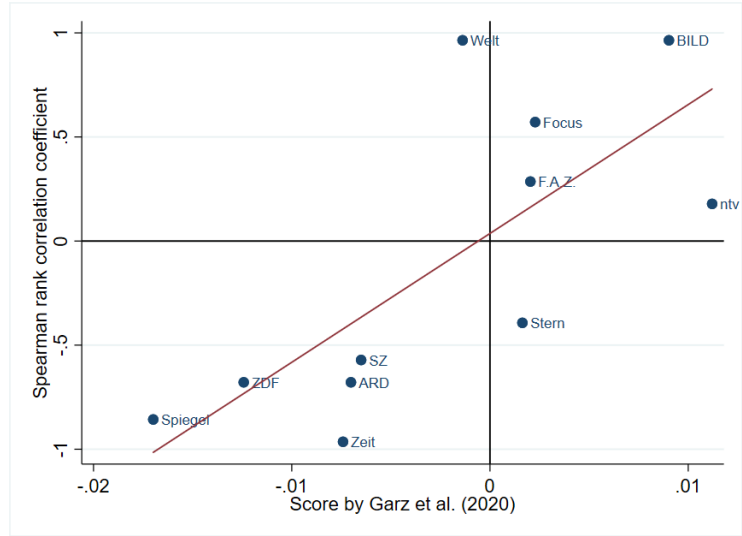


Figure 6: Comparison of the Spearman rank order coefficient to the score by Garz et al. (2020).

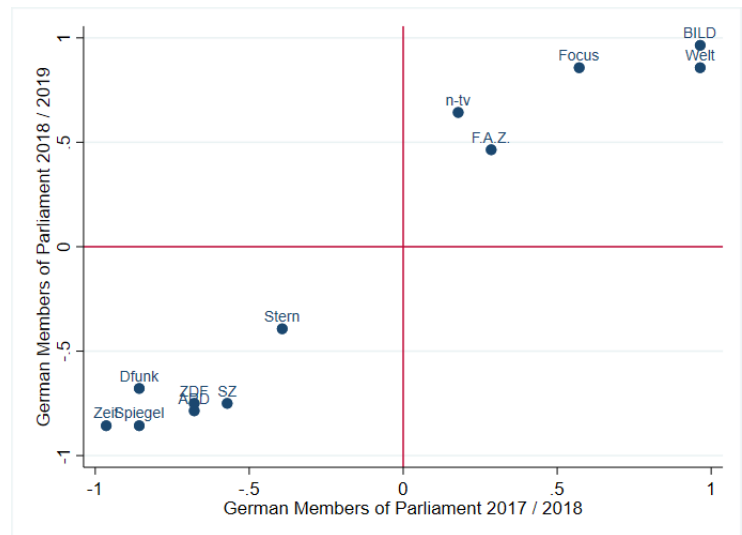


Figure 7: Comparison of the Spearman rank order coefficients from German Members of Parliament in the time period from Dec 2018 to July 2019 to the time period from Oct 2017 to May 2018.

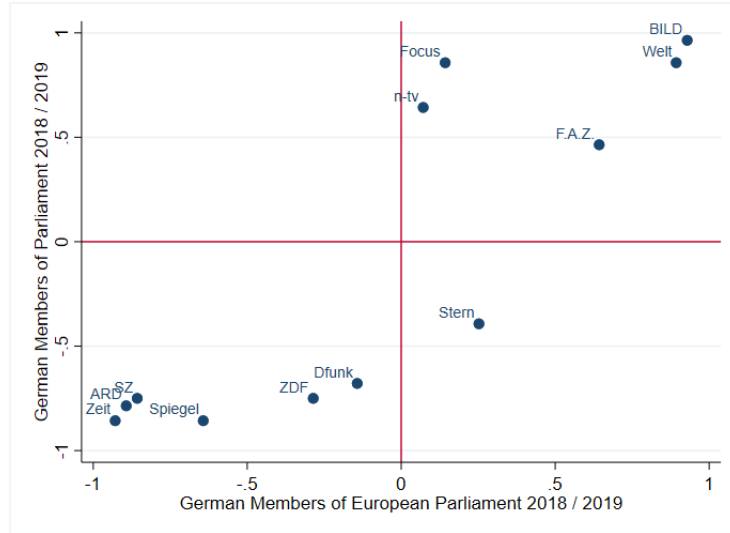


Figure 8: Comparison of the Spearman rank order coefficient from German Members of Parliament to German Members of the European Parliament in the time period from Dec 2018 to July 2019.

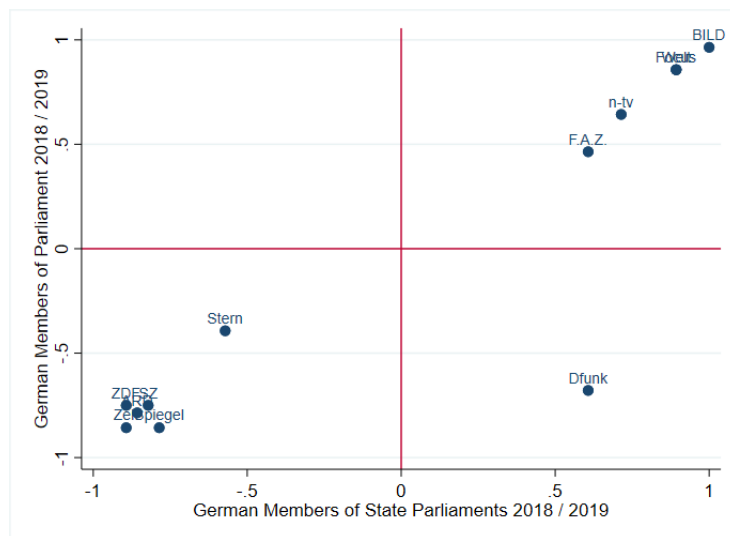


Figure 9: Comparison of the Spearman rank order coefficient from German Members of Parliament to German Members of the sixteen State Parliaments in the time period from Dec 2018 to July 2019.

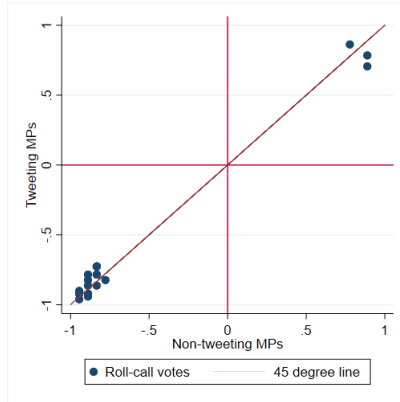


Figure 10: Comparison of the average roll-call votes of MPs who share and who do not share news items on Twitter during our observation period for LINKE.

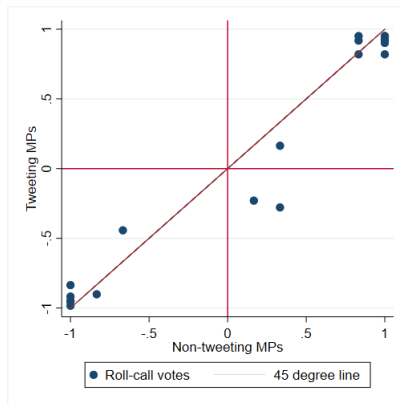


Figure 11: Comparison of the average roll-call votes of MPs who share and who do not share news items on Twitter during our observation period for Greens.

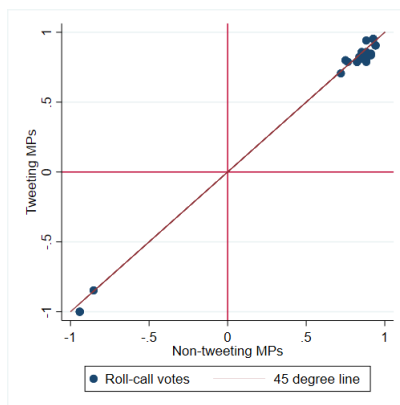


Figure 12: Comparison of the average roll-call votes of MPs who share and who do not share news items on Twitter during our observation period for SPD.

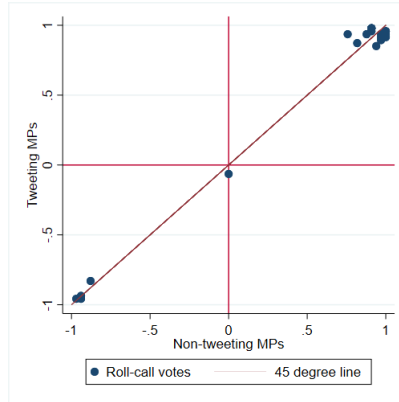


Figure 13: Comparison of the average roll-call votes of MPs who share and who do not share news items on Twitter during our observation period for FDP.

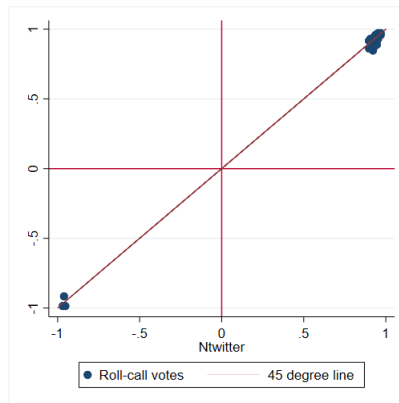


Figure 14: Comparison of the average roll-call votes of MPs who share and who do not share news items on Twitter during our observation period for CDU.

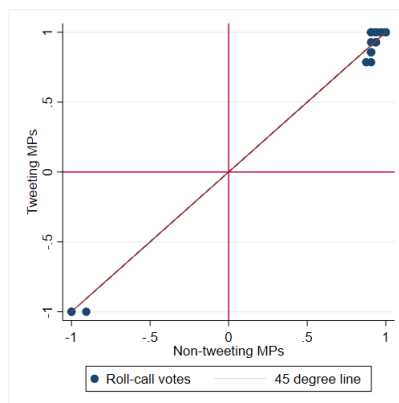


Figure 15: Comparison of the average roll-call votes of MPs who share and who do not share news items on Twitter during our observation period for CSU.

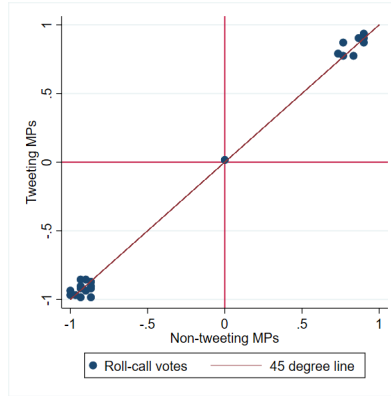


Figure 16: Comparison of the average roll-call votes of MPs who share and who do not share news items on Twitter during our observation period for AfD.

Table 1: Absolute number of Twitter referrals by party

	BILD	Spiegel	Focus	n-tv	Welt	Zeit	SZ	Stern	F.A.Z.	ARD	ZDF	D.funk	Total
LINKE	16	551	67	79	200	275	264	65	113	314	92	125	2,161
Grüne	99	896	63	64	430	425	619	32	382	349	94	217	3,670
SPD	73	749	58	51	324	290	347	48	237	188	78	133	2,576
FDP	123	293	102	85	542	128	117	23	375	88	37	66	1,979
CDU	280	283	130	89	707	145	193	28	484	256	69	140	2,804
CSU	17	22	4	3	54	6	23	0	25	9	5	7	175
AfD	674	564	912	286	2,175	255	202	86	572	363	81	95	6,265
Total	1,282	3,358	1,336	657	4,432	1,524	1,765	282	2,188	1,567	456	783	19,630

*Notes:* Table 1 shows the absolute number of Twitter referrals by party to each news outlet under consideration. Newspapers and magazines: *BILD* refers to news items from **bild.de**. *Spiegel* refers to news items from **spiegel.de**. *Focus* refers to news items from **focus.de**. *Welt* refers to news items from **welt.de**. *Zeit* refers to news items from **zeit.de**. *SZ* refers to news items from **sueddeutsche.de**. *Stern* refers to news items from **stern.de**. *F.A.Z.* refers to news items from **faz.net**. Public service broadcasters (television): *ARD* refers to news items from **tagesschau.de**. *ZDF* refers to news items from **zdf.de/nachrichten**. Public service broadcasters (radio): *D.funk* refers to news items from **deutschlandfunk.de**. Other online news outlets: *n-tv* refers to news items from **n-tv.de**.

Table 2: Relative number of Twitter referrals by party

	BILD	Spiegel	Focus	n-tv	Welt	Zeit	SZ	Stern	F.A.Z.	ARD	ZDF	D.funk	Total
LINKE	.0074	.2550	.0310	.0366	.0925	.1273	.1222	.0301	.0523	.1453	.0426	.0578	1
Grüne	.0270	.2441	.0172	.0174	.1172	.1158	.1687	.0087	.1041	.0951	.0256	.0591	1
SPD	.0283	.2908	.0225	.0198	.1258	.1126	.1347	.0186	.0920	.0730	.0303	.0516	1
FDP	.0622	.1481	.0515	.0430	.2739	.0647	.0591	.0116	.1895	.0445	.0187	.0334	1
CDU	.0999	.1009	.0464	.0317	.2521	.0517	.0688	.01	.1726	.0913	.0246	.0499	1
CSU	.0971	.1257	.0229	.0171	.3086	.0343	.1314	.0	.1429	.0514	.0286	.04	1
AfD	.1076	.0900	.1456	.0457	.3472	.0407	.0322	.0137	.0913	.0579	.0129	.0152	1

*Notes:* Table 2 shows the relative number of Twitter referrals by party to each news outlet under consideration. The relative numbers are computed based on the absolute numbers in Table 1. Newspapers and magazines: *BILD* refers to news items from **bild.de**. *Spiegel* refers to news items from **spiegel.de**. *Focus* refers to news items from **focus.de**. *Welt* refers to news items from **welt.de**. *Zeit* refers to news items from **zeit.de**. *SZ* refers to news items from **sueddeutsche.de**. *Stern* refers to news items from **stern.de**. *F.A.Z.* refers to news items from **faz.net**. Public service broadcasters (television): *ARD* refers to news items from **tagesschau.de**. *ZDF* refers to news items from **zdf.de/nachrichten**. Public service broadcasters (radio): *D.funk* refers to news items from **deutschlandfunk.de**. Other online news outlets: *n-tv* refers to news items from **n-tv.de**.



Table 3: Overview of the ranks

	Party	BILD	Spiegel	Focus	n-tv	Welt	Zeit	SZ	Stern	F.A.Z.	ARD	ZDF	D.funk
LINKE	1	1	6	4	5	1	7	4	7	1	7	7	6
Grüne	2	2	5	1	2	2	6	7	2	4	6	4	7
SPD	3	3	7	2	3	3	5	6	6	3	4	6	5
FDP	4	4	4	6	6	5	4	2	4	7	1	2	2
CDU	5	6	2	5	4	4	3	3	3	6	5	3	4
CSU	6	5	3	3	1	6	1	5	1	5	2	5	3
AfD	7	7	1	7	7	7	2	1	5	2	3	1	1

*Notes:* Table 3 shows the ranks (i) for the parties' political position from most left-wing to most right-wing and (ii) for the parties' relative number of Twitter referrals to the twelve news outlets. The ranks of the referral shares are computed based on Table 2. Newspapers and magazines: *BILD* refers to news items from *bild.de*. *Spiegel* refers to news items from *spiegel.de*. *Focus* refers to news items from *focus.de*. *Welt* refers to news items from *welt.de*. *Zeit* refers to news items from *zeit.de*. *SZ* refers to news items from *sueddeutsche.de*. *Stern* refers to news items from *stern.de*. *F.A.Z.* refers to news items from *faz.net*. Public service broadcasters (television): *ARD* refers to news items from *tagesschau.de*. *ZDF* refers to news items from *zdf.de/nachrichten*. Public service broadcasters (radio): *D.funk* refers to news items from *deutschlandfunk.de*. Other online news outlets: *n-tv* refers to news items from *n-tv.de*.

Table 4: Main results

	BILD	Spiegel	Focus	n-tv	Welt	Zeit	SZ	Stern	F.A.Z.	ARD	ZDF	D.funk
$\rho_o$	0.964***	-0.857**	0.571	0.179	0.964***	-0.964***	-0.571	-0.393	0.286	-0.679	-0.679	-0.857**
<i>p</i> -value	(0.0028)	(0.024)	(0.200)	(0.714)	(0.0028)	(0.0028)	(0.200)	(0.396)	(0.556)	(0.110)	(0.110)	(0.024)

*Notes:* Table 4 shows the Spearman rank correlation coefficient computed for each news outlet under consideration based on the ranks given in Table 3. Newspapers and magazines: *BILD* refers to news items from *bild.de*. *Spiegel* refers to news items from *spiegel.de*. *Focus* refers to news items from *focus.de*. *Welt* refers to news items from *welt.de*. *Zeit* refers to news items from *zeit.de*. *SZ* refers to news items from *sueddeutsche.de*. *Stern* refers to news items from *stern.de*. *F.A.Z.* refers to news items from *faz.net*. Public service broadcasters (television): *ARD* refers to news items from *tagesschau.de*. *ZDF* refers to news items from *zdf.de/nachrichten*. Public service broadcasters (radio): *D.funk* refers to news items from *deutschlandfunk.de*. Other online news outlets: *n-tv* refers to news items from *n-tv.de*. Exact *p*-values in parentheses.

\*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

Table 5: Results by newspaper sections

	BILD	Spiegel	Focus	n-tv	Welt	Zeit	SZ	Stern	F.A.Z.	ARD
Politics section	0.750*	-0.857**	0.393	-0.071	0.964***	-0.857**	-0.750*	-0.714*	0.357	-0.750*
<i>p</i> -value	(0.066)	(0.024)	(0.396)	(0.906)	(0.003)	(0.0238)	(0.066)	(0.088)	(0.444)	(0.066)
Business section	0.893**	-0.857**	-0.143	0.321	0.857**	-0.321	-0.750*	n.a.	0.750*	-0.893**
<i>p</i> -value	(0.012)	(0.024)	(0.782)	(0.498)	(0.024)	(0.498)	(0.066)		(0.066)	(0.012)
Feuilleton, sports, knowledge section	0.464	-0.857**	0.929***	0.214	0.750*	-0.714*	-0.179	0.321	0.536	n.a.
<i>p</i> -value	(0.302)	(0.024)	(0.007)	(0.661)	(0.066)	(0.088)	(0.713)	(0.498)	(0.235)	

*Notes:* Table 5 shows the Spearman rank correlation coefficient by newspaper section. Newspapers and magazines: *BILD* refers to news items from *bild.de*. *Spiegel* refers to news items from *spiegel.de*. *Focus* refers to news items from *focus.de*. *Welt* refers to news items from *welt.de*. *Zeit* refers to news items from *zeit.de*. *SZ* refers to news items from *sueddeutsche.de*. *Stern* refers to news items from *stern.de*. *F.A.Z.* refers to news items from *faz.net*. Public service broadcasters (television): *ARD* refers to news items from *tagesschau.de*. Other online news outlets: *n-tv* refers to news items from *n-tv.de*. Exact *p*-values in parentheses.

\*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

Table 6: Robustness Checks

	BILD	Spiegel	Focus	n-tv	Welt	Zeit	SZ	Stern	F.A.Z.	ARD	ZDF	D.funk	taz
No criticizing tweets	0.929*** (0.0068)	-0.857** (0.024)	0.750* (0.066)	0.179 (0.714)	0.964*** (0.0028)	-1.000*** (0.0004)	-0.464 (0.302)	-0.500 (0.266)	0.429 (0.354)	-0.750* (0.066)	-0.464 (0.302)	-0.857** (0.024)	
Exclude LINKE	0.943** (0.0166)	-0.886** (0.034)	0.771 (0.102)	0.371 (0.498)	0.943** (0.0166)	-0.943** (0.0166)	-0.771 (0.102)	-0.029 (1.000)	-0.143 (0.802)	-0.486 (0.356)	-0.486 (0.356)	-0.829* (0.058)	
Exclude AfD	0.943** (0.0166)	-0.771 (0.102)	0.314 (0.564)	-0.314 (0.564)	0.943** (0.0166)	-1.000*** (0.0028)	-0.314 (0.564)	-0.657 (0.176)	0.714 (0.136)	-0.714 (0.136)	-0.486 (0.356)	-0.771 (0.102)	
Exclude LINKE and AfD	0.900* (0.084)	-0.800 (0.134)	0.600 (0.350)	-0.100 (0.950)	0.900* (0.084)	-1.000** (0.0166)	-0.600 (0.350)	-0.400 (0.516)	0.500 (0.450)	-0.500 (0.450)	-0.100 (0.950)	-0.700 (0.234)	
Include taz	0.964*** (0.0028)	-0.857** (0.024)	0.571 (0.200)	0.321 (0.498)	0.964*** (0.0028)	-0.929*** (0.0068)	-0.464 (0.302)	-0.393 (0.355)	0.429 (0.556)	-0.571 (0.200)	-0.571 (0.200)	-0.857** (0.024)	-0.929*** (0.0068)
Absolute no. of tweets	0.607 (0.166)	-0.464 (0.302)	0.321 (0.498)	0.321 (0.498)	0.429 (0.354)	-0.643 (0.138)	-0.643 (0.138)	-0.179 (0.714)	0.357 (0.444)	-0.107 (0.840)	-0.571 (0.200)	-0.500 (0.266)	
Longitudinal analysis	0.964*** (0.0028)	-0.857** (0.024)	0.857** (0.024)	0.643 (0.139)	0.857** (0.024)	-0.857** (0.024)	-0.750* (0.066)	-0.393 (0.396)	0.464 (0.302)	-0.786** (0.048)	-0.750* (0.066)	-0.679 (0.110)	
European Parliament	0.929*** (0.007)	-0.643 (0.139)	0.143 (0.783)	0.071 (0.840)	0.893** (0.012)	-0.929** (0.007)	-0.857** (0.024)	0.252 (0.595)	0.643 (0.139)	-0.893** (0.012)	-0.286 (0.556)	-0.143 (0.783)	
State Parliaments	1.000*** (0.0004)	-0.786** (0.048)	0.893** (0.012)	0.714* (0.088)	0.893** (0.012)	-0.821** (0.034)	-0.571 (0.200)	0.607 (0.167)	0.643 (0.139)	-0.857** (0.024)	-0.893** (0.012)	0.607 (0.167)	
Exclude 10% most active MPs	0.857** (0.024)	-0.857** (0.024)	0.357 (0.444)	0.429 (0.354)	1.000*** (0.0004)	-0.786* (0.048)	-0.857** (0.024)	-0.536 (0.238)	0.607 (0.167)	-0.750* (0.066)	-0.679 (0.110)	-0.714* (0.088)	
Inverse prob. weighting	1.000*** (0.0004)	-0.857** (0.024)	0.464 (0.302)	0.321 (0.498)	0.964*** (0.0028)	-0.964*** (0.0028)	-0.750* (0.066)	-0.393 (0.396)	0.286 (0.556)	-0.679 (0.110)	-0.679 (0.110)	-0.786** (0.048)	

*Notes:* The first row of Table 6 shows the Spearman rank correlation coefficient computed based on a randomly drawn subsample of tweets, excluding all tweets that were classified as criticizing (Section 6.1). The second, third, and forth rows show the Spearman rank correlation coefficient computed when excluding the Tweets by LINKE, AfD, and both at the same time, respectively (Section 6.2.). The fifth row shows the Spearman rank correlation coefficients when *taz* is considered (Section 6.3.). The sixth row shows the Spearman rank correlation coefficient based on the *absolute* number of Twitter referrals as given in Table 1 (Section 6.3.). The seventh row shows the Spearman rank correlation coefficient based on Tweets from Dec 2018 to July 2019 (Section 6.4.). The eighth row shows the Spearman rank correlation coefficient based on Tweets from German Members of the European Parliament on Tweets from Dec 2018 to July 2019 (Section 6.5.). The ninth row shows the Spearman rank correlation coefficient based on Tweets from German Members of the German State Parliaments from Dec 2018 to July 2019 (Section 6.5.). The tenth row shows the Spearman rank correlation coefficient excluding the Tweets from the 10% most active MPs from each party (Appendix B). The eleventh row shows the Spearman rank correlation coefficient based on weighted referrals (Appendix B). Newspapers and magazines: *BILD* refers to news items from *bild.de*. *Spiegel* refers to news items from *spiegel.de*. *Focus* refers to news items from *focus.de*. *Welt* refers to news items from *welt.de*. *Zeit* refers to news items from *zeit.de*. *SZ* refers to news items from *sueddeutsche.de*. *Stern* refers to news items from *stern.de*. *F.A.Z.* refers to news items from *faz.net*. *taz* refers to news items from *taz.de*. Public service broadcasters (television): *ARD* refers to news items from *tagesschau.de*. *ZDF* refers to news items from *zdf.de/nachrichten*. Public service broadcasters (radio): *D.funk* refers to news items from *deutschlandfunk.de*. Other online news outlets: *n-tv* refers to news items from *n-tv.de*. Exact *p*-values in parentheses.  
\*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

Table 7: Correlation matrix Spearman coefficients

	NP 2017/18	NP 2018/19	EP 2018/19	SP 2018/19
NP 2017/18	1.0000			
NP 2018/19	0.9720	1.0000		
EP 2018/19	0.8664	0.8517	1.0000	
SP 2018/19	0.8235	0.8897	0.8184	1.0000

*Notes:* Correlation matrix for the Spearman rank correlation coefficients based on different sets of Twitter referrals to online news outlets. *NP 2017/18* corresponds to the Spearman rank correlation coefficient computed based on Twitter referrals from German Members of (National) Parliament in the time period Oct 2017 to May 2018. *NP 2018/19* corresponds to the Spearman rank correlation coefficient computed based on Twitter referrals from German Members of (National) Parliament in the time period Dec 2018 to July 2019. *EP 2018/19* corresponds to the Spearman rank correlation coefficient computed based on Twitter referrals from German Members of European Parliament in the time period Dec 2018 to July 2019. *SP 2018/19* corresponds to the Spearman rank correlation coefficient computed based on Tweets from Members of the German State Parliaments in the time period Dec 2018 to July 2019.

Table 8: Effect of observable MP characteristics

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	DTweet	DTweet	DTweet	DTweet	DTweet	Tweets	Tweets	Tweets	Tweets	Tweets
Age	-0.0116*** (0.00184)	-0.0125*** (0.00181)	-0.00965** (0.00474)	-0.0126*** (0.00182)	-0.0100** (0.00480)	1.000* (0.528)	0.677 (0.465)	-0.811* (0.434)	0.687 (0.453)	-0.826* (0.427)
Female	0.00589 (0.0396)	-0.0806** (0.0383)	-0.0797** (0.0384)	0.00135 (0.104)	-0.00346 (0.104)	-3.681 (8.673)	-0.129 (7.767)	1.080 (7.494)	9.161 (10.81)	10.99 (9.805)
PhD	0.0476 (0.0463)	0.0527 (0.0445)	0.0588 (0.0449)	0.0521 (0.0446)	0.0574 (0.0451)	-6.057 (10.91)	-2.867 (10.83)	-0.531 (11.41)	-2.962 (10.96)	-0.883 (11.54)
Experience	-0.0233** (0.0107)	0.00224 (0.0115)	0.00343 (0.0121)	0.00315 (0.0115)	0.00467 (0.0121)	-5.149 (3.146)	1.905 (2.270)	3.403 (2.175)	1.725 (2.272)	3.111 (2.223)
AfD		-0.0809 (0.0728)	0.249 (0.311)	-0.0581 (0.0897)	0.225 (0.319)		63.96*** (20.78)	-135.8* (79.10)	68.53*** (24.09)	-136.2* (77.42)
CDU		-0.395*** (0.0620)	0.0581 (0.304)	-0.352*** (0.0812)	0.0791 (0.307)		-0.632 (10.99)	-32.41 (36.56)	7.978 (13.15)	-27.96 (37.16)
CSU		-0.491*** (0.0855)	-0.469 (0.445)	-0.441*** (0.104)	-0.406 (0.458)		-27.12*** (8.324)	-37.38 (31.55)	-24.56*** (9.252)	-37.17 (35.06)
FDP		-0.224*** (0.0771)	-0.345 (0.354)	-0.179* (0.0965)	-0.323 (0.360)		6.202 (13.47)	3.271 (54.46)	9.861 (15.73)	7.411 (61.08)
SPD		-0.182*** (0.0651)	-0.0651 (0.341)	-0.0960 (0.0877)	-0.00798 (0.342)		-10.67 (7.951)	-81.99** (35.78)	-7.345 (9.037)	-79.30** (37.73)
GRUENE		0.129** (0.0645)	-0.145 (0.327)	0.0697 (0.0976)	-0.163 (0.326)		24.77** (10.65)	-91.04* (54.16)	27.02* (16.27)	-87.96 (56.84)
AfD*Age			-0.00614 (0.00594)		-0.00528 (0.00602)			3.974** (1.819)		4.043** (1.792)
CDU*Age			-0.00849 (0.00576)		-0.00817 (0.00584)			0.567 (0.739)		0.655 (0.739)
CSU*Age			-0.000342 (0.00847)		-0.000698 (0.00858)			0.0836 (0.627)		0.174 (0.658)
FDP*Age			0.00275 (0.00702)		0.00308 (0.00708)			-0.0207 (0.963)		-0.0111 (1.020)
SPD*Age			-0.00223 (0.00651)		-0.00173 (0.00655)			1.383* (0.760)		1.405* (0.744)
GRUENE*Age			0.00561 (0.00659)		0.00492 (0.00655)			2.270** (1.127)		2.287** (1.086)
AfD*Female				0.0821 (0.155)	0.0742 (0.154)				-12.85 (42.24)	-0.975 (39.06)
CDU*Female				-0.105 (0.129)	-0.0894 (0.129)				-39.01** (16.40)	-38.92** (15.72)
CSU*Female				-0.153 (0.198)	-0.135 (0.200)				4.864 (15.44)	-7.635 (14.78)
FDP*Female				-0.103 (0.169)	-0.0832 (0.168)				-6.817 (31.35)	-11.62 (33.14)
SPD*Female				-0.195 (0.131)	-0.191 (0.132)				-6.019 (17.07)	-7.314 (16.34)
GRUENE*Female				0.0916 (0.131)	0.0793 (0.131)				-5.605 (21.44)	-8.656 (20.29)
Constant	1.208*** (0.0924)	1.424*** (0.101)	1.270*** (0.242)	1.388*** (0.111)	1.251*** (0.246)	14.06 (19.60)	1.472 (21.84)	73.46*** (22.67)	-2.967 (21.68)	70.39*** (23.35)
$N$	707	707	707	707	707	391	391	391	391	391
$R^2$	0.076	0.194	0.203	0.202	0.210	0.014	0.082	0.105	0.085	0.107

Notes: Robust standard errors in parentheses. The dependent variable in Columns 1 to 5 is a dummy variable that indicates if MP  $i$  eventually shares a news items on Twitter. The dependent variable in Columns 6 to 10 is equal to the absolute number of Twitter referrals to the news outlets under consideration during our observation period. *Age* corresponds to the age of MP  $i$  in years, *Female* and *PhD* are dummies that are equal to 1 if MP  $i$  is female or has a PhD, respectively. *Experience* corresponds to MP  $i$ 's number of election periods in the Bundestag. *AfD*, *CDU*, *CSU*, *FDP*, *SPD*, and *GRUENE* are party indicators with LINKE as the omitted category. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

Table 9: Vote as party majorities

	Tweeting MPs	Non-Tweeting MPs
AfD	0.91	0.91
CSU	0.95	0.94
CDU	0.93	0.94
FDP	0.93	0.93
SPD	0.89	0.89
GRUENE	0.84	0.86
LINKE	0.84	0.88

*Notes:* Table 9 shows the average share of MPs who voted along their party line in the roll-call votes during our election period for each party for MPs who eventually share (left column) and who do not share (right column) news items on Twitter.