Social Media and Political Agenda Setting*

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March 11, 2021
Paper accepted for publication at *Political Communication*

Abstract

What is the role of social media in political agenda setting? Digital platforms have reduced the gatekeeping power of traditional media and, potentially, they have increased the capacity of various kinds of actors to shape the agenda. We study this question in the Swiss context by examining the connections between three agendas: the traditional media agenda, the social media agenda of parties, and the social media agenda of politicians. Specifically, we validate and apply supervised machine learning classifiers to categorize 2.78 million articles published in 84 newspapers, 6,500 tweets posted on official party accounts, and 210,000 tweets posted by politicians on their own accounts from January 2018 until December 2019. We first use the classifier to measure the salience of the four most relevant issues of the period: the environment, Europe, gender equality, and immigration. Then, using a vector autoregression (VAR) approach, we analyze the relationship between the three agendas. Results show that not only do the traditional media agenda, the social media agenda of parties, and the social media agenda of politicians influence one another but, overall, no agenda leads the others more than it is led by them. There is one important exception: for the environment issue, the social media agenda of parties is more predictive of the traditional media agenda than vice-versa. These findings underscore how closely different agendas are tied together, but also show that advocacy campaigns may play an important role in both constraining and enabling parties to push their specific agendas.

*This project received funding from the Swiss National Science Foundation (grant nr. 10DL11_183120) and the European Research Council (ERC) under the European Union's Horizon 2020 research and innovation program (grant agreement nr. 883121). We thank Lucien Baumgartner for research assistance, Clau Dermont for coordinating data collection and contributing valuable ideas, and Deen Freelon, Alexandra Feddersen, Christina Gahn, Christoffer Green-Pedersen, Zachary Greene, Emiliano Grossmann, Ana Langer, Thomas Meyer, Markus Wagner, and three anonymous reviewers for helpful comments. Previous versions of this paper were presented at the 2020 Annual General Conference of the European Political Science Association (virtual), the Digital Democracy Workshop at the Digital Democracy Lab (virtual), and the workshop Party Competition in the Electoral Cycle at the Université de Fribourg / Humboldt University of Berlin (virtual). Replication materials are available at https://doi.org/10.7910/DVN/PS3MNB.

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1 Introduction

Influence over the political agenda, and political discourse more broadly, is one of the most important sources of power (Bachrach and Baratz, 1962; Schattschneider, 1960). The fundamental question who gets to set this agenda has been studied from several perspectives, including media studies, policy studies, and political communication (Wolfe et al., 2013). A central argument is that of the agenda-setting function of the mass media (McCombs and Shaw, 1972, 1993), which posits that newspapers, television, and radio influence what political actors think and care about—that is, the content of the political agenda. The literature has long debated the direction of agenda-setting dynamics, without fully resolving the question of whether the media agenda shapes the political agenda or vice-versa, and under which conditions (Walgrave and Van Aelst, 2006). We even "know relatively little about the forces that drive media attention" (Boydstun, 2013, 1). Moreover, the internet and social media have created new "hybrid media systems" that have expanded the number and types of actors potentially able to shape the political discourse and agenda (Chadwick, 2017; Jungherr et al., 2019). Therefore, the rise of digital platforms brings up the question of who sets the political agenda in these kinds of environments.

Despite a large and increasing number of studies (Jungherr, 2016), a clear answer regarding the role of social media in political agenda setting is still missing. Previous work has studied important questions such as the perception of social media messages (Feezell, 2018; Chen et al., 2019), the effects of exposure to news media on social media discussions (King et al., 2017), and the interaction between politicians and the public on social media (Fazekas et al., 2020). Shapiro and Hemphill (2017) study the congruence between the *New York Times* and Congressional Twitter, finding variation across policy areas. Peeters et al. (2019) compare the issue profile of politicians in parliament, in the media, and on Twitter, finding a high degree of congruence. The study that is closest to ours is Barberá et al. (2019), which focuses explicitly on agenda setting dynamics of Twitter and is interested primarily in the connection between the issues discussed by legislators and the public, finding that legislators are more likely to follow than to lead the agenda. Relatedly, James et al. (2019) study information flows during election campaigns. They find that although social media allows the public and parties to share information, traditional media still maintains a mediating gatekeeper position.

In contrast to these studies, we examine the connections between three agendas in the Swiss case: the traditional media agenda, the social media agenda of parties, and the social media agenda of politicians. Our theoretical expectations are based on the traditional agenda-setting literature in policy and media studies as well as the more recent literature on social media. First, we expect that the social media agenda of parties is more predictive of the traditional media agenda than vice-versa. This hypothesis is based on the (pre-social media) consensus that "during campaigns, the media's impact on politicians' and parties' agendas is limited or even absent" (Walgrave and Van Aelst, 2006, 96). Our observation period includes the Swiss national elections held in October 2019 as well as several referenda. Second, we expect that the traditional

media agenda is more predictive of the social media agenda of individual politicians than vice-versa. This hypothesis is based on the argument that "legislators are more likely to follow, than to lead, discussion of public issues" (Barberá et al., 2019, 883). Third, we expect that the social media agenda of parties is more predictive of the social media agenda of politicians than vice-versa. We argue that in systems with distributed power, individual politicians, especially political candidates, may have a harder time shaping the parties' agenda. However, we are open to the argument that social media might shift the balance among parties and politicians. We acknowledge that for each of the expectations, the theoretical arguments are less straightforward than in this brief summary. We discuss them more in depth in Section 2.

Our empirical analysis compares daily issue salience in the Swiss media and on Twitter over two years, 2018 and 2019. First, we apply and validate supervised machine-learning classifiers and use them to classify about 2.78 million articles published in 84 newspapers, 6,500 tweets posted on official party accounts, and 210,000 tweets posted by politicians on their own accounts from January 2018 until December 2019. Then, following Barberá et al. (2019), we use vector autoregression (VAR) models to determine which agenda (media, parties, politicians) is more predictive of which other agendas. In other words, we analyze whether the media are more likely to report on a given issue after parties or politicians discuss it on social media or, on the contrary, parties' or politicians' social media activity reflects the issues that were previously reported in the media. Moreover, we consider the relationship between parties and politicians.

Specifically, we concentrate on four sets of issues. First, we focus on two issues that emerged prominently on the Swiss political agenda during our observation period, and in particular during the campaign leading to the Swiss national elections in October 2019: climate change and gender equality. Both issues were widely perceived to prompt some parties to redefine their positions facing the national elections in 2019 (Gilardi et al., 2020). Second, as a contrast, we also consider two issues with longstanding salience in Swiss politics (as well as other European countries): immigration and the relationship with the European Union. In contrast to climate change and gender equality, these two issues remained in the background during the 2019 elections. The focus on four issues with different levels of salience allows us to test dynamics of agenda setting across different types of issues.

Results show that not only do the traditional media agenda, the social media agenda of parties, and the social media agenda of politicians influence one another but, overall, no agenda leads the others more than it is led by them. There is one important exception, which we did not anticipate: for the environment issue, the social media agenda of parties is more predictive of the traditional media agenda than vice-versa, by a significant difference of two percentage points. These findings underscore how closely different agendas are tied together, but also show that advocacy campaigns may play an important role in both constraining and enabling parties to push their specific agendas.

2 Theory and Hypotheses

2.1 Social Media and Political Agenda Setting

Following Kingdon's classic definition,[1] the political agenda has been understood as "the list of issues to which political actors pay attention" (Walgrave et al., 2008, 815). Therefore, agenda-setting is the process by which some issues, but not others, attract political attention. We argue that social media have become an important part of this process.

Agenda setting has been studied in several literatures across several subfields in communication and political science, which have not always been strongly integrated (Wolfe et al., 2013). A key, uncontroversial argument in all strands of the literature is that the media are an important component of political agenda setting (McCombs and Shaw, 1972, 1993). As Wolfe et al. (2013, 179) state, "[a]genda setting from the policy processes approach is fundamentally about the politics of attention and attention dynamics at the level of the political system. As a consequence of this focus on information processing, media dynamics are intimately bound up with policymaking." While the literature shares this core premise, the empirical findings do not paint an unambiguous picture. As Sciarini and Tresch (2019, 734) write, "[a] number of studies have demonstrated that media coverage influences the issue priorities of a variety of political agendas, but that the media's agenda-setting power is contingent on a series of factors." However, the specific conditions under which the media affect the political agenda tend to vary depending on the specific study. Walgrave and Van Aelst (2006, 89), for example, concluded: "we still cannot answer the basic question whether the mass media determine the political agenda or, put more precisely, under what specific circumstances the mass media are able to boost political attention for issues." One reason might be that "only a few studies have actually compared the mutual influence of media and politics" (Vliegenthart et al., 2016, 285). As Boydstun (2013, 196) argues, "[i]t is extraordinarily difficult to get a theoretical or empirical handle on how the media affects and simultaneously is affected by other political forces." Making progress on this front is one of the goals of this paper.

We argue that social media as a communication platform creates new challenges and opportunities for political agenda setting. Social media do not just add a layer of complexity to agenda-setting dynamics. Potentially, they change their nature. While these changes have been recognized in the literature, their implications are not fully understood. Our argument proceeds in three steps.

First, social media have become a relevant channel for political communication (Jungherr, 2014, 2016; Harder et al., 2017; Shapiro and Hemphill, 2017; Feezell, 2018; King et al., 2017; Popa et al., 2020; Chen et al., 2019). Candidates and legislators use social media to communicate with journalists and the public (Barberá and Zeitzoff, 2017) and to engage with (or even attack) their political opponents (Russell, 2018). Politicians are less restricted in expressing their opin-

[1] "[T]he list of subjects or problems to which governmental officials, and people outside of government closely associated with those officials, are paying some serious attention at any given time" (Kingdon, 1984, 3).

ions, compared to, for instance, parliamentary speech or parliamentary questions (Proksch and Slapin, 2015). Legislative activities are often regulated, for instance due to speaker selection rules (Herzog and Benoit, 2015), limited speaking time, or top-down control by party leaders. On social media, however, candidates do not face these restrictions. Therefore, social media channels are an ideal tool for politicians to shape their own profile and display expertise in certain areas they are highly interested in (Enli and Skogerbø, 2013). Thus, we regard social media messages as a suitable proxy of politicians' issue emphasis during the legislative cycle and during election campaigns (Barberá et al., 2019, 884).

Second, social media are relevant not only for political communication in general, but for agenda setting specifically: "the rapid rise of social media, including the microblogging platform Twitter, has provided new avenues for political agenda setting that have increasingly discernible impact" (Lewandowsky et al., 2020, 2). As Langer and Gruber (2020, 3) argue, "a thorough understanding of agenda setting necessitates a broadening of focus," including both traditional and social media. Several studies document the agenda-setting effects of social media: King et al. (2017) show that the media affect what people tweet about; Feezell (2018) finds that people perceive issues to be more salient if they are exposed to them in Facebook; Shapiro and Hemphill (2017) find that the *New York Times* is responsive to congressional Twitter posts; Barberá et al. (2019) come to the opposite conclusion, namely, that the media have a stronger influence on politicians than vice-versa; James et al. (2019) argue that social media has not altered the gatekeeping role of traditional media; finally, Fazekas et al. (2020) argue that politicians use Twitter to expand issues from elites to the public. Importantly, social media have engendered "[p]olitical information cycles [that] may involve greater numbers and a more diverse range of actors and interactions than news cycles as they have been traditionally understood" (Chadwick, 2011, 8). Social media have reduced the gatekeeping power of traditional media, leading to "hybrid media systems" (Chadwick, 2017) that have expanded the number and types of actors who potentially have the ability to "introduce, amplify, and maintain topics, frames, and speakers that come to dominate political discourse" (Jungherr et al., 2019, 17).

Third, via social media political actors can potentially reach an audience that goes well beyond social media users.[2] Journalists monitor social media activity closely and use it in their reporting: "Tweets become public record and are increasingly incorporated into traditional journalistic coverage of political events" (Jungherr, 2014, 2). The fact that journalists rely on Twitter to decide which events and voices are newsworthy is well established in the literature. As McGregor (2019, 1071) writes, "Journalists draw on social media in various ways in the course of their reporting on political contests, from documenting public reaction to media events to evaluating the performances of candidates." In an experiment, McGregor and Molyneux (2020) find that journalists evaluate the news-worthiness of tweets on par with headlines from the Associated

[2]Social media have an elite character in our case. During the 2019 Swiss election campaign, only around 15% of respondents stated that they were attentive to political news on social media like Facebook and Twitter (compared to over 50% for newspapers) (Selects, 2020).

Press wire. Therefore, political actors can realistically hope to influence the traditional media agenda using social media.

In sum, social media change political agenda setting dynamics for three reasons: first, they are a relevant channel for political communication; second, they expand the number and types of actors who can potentially shape the agenda; third, using social media, political actors can potentially reach the broader public via traditional media. In the next sections, we discuss our expectations regarding the connections between the different agendas, taking the role of social media into account.

2.2 Traditional Media Agenda and Social Media Agenda of Parties

To explain the extent to which parties set the media agenda or respond to it, we rely on theories of issue ownership and agenda setting as well as responsiveness. On the one hand, previous research suggests that government parties often *respond* to changes agenda setting by the media and other parties (Green-Pedersen and Mortensen, 2010; Green-Pedersen, 2019). For example, literature on election campaigns has argued that "riding the wave," i.e. campaigning on issues that dominate the news cycle, provides politicians with an opportunity to appear concerned and responsive (Ansolabehere and Iyengar, 1994). While most of the literature studies parties' responsiveness to the priorities of voters (Barberá et al., 2019; Neundorf and Adams, 2018; Jones and Baumgartner, 2004; Klüver and Spoon, 2016; O'Grady and Abou-Chadi, 2019), media reports are also an important source of information for parties about public priorities.

In contrast, the question of whether and when parties can influence the media agenda has received less attention from a party competition perspective, even though parties face large incentives to exert influence over the political agenda. As Schattschneider (1960, 69) argues, "who determines what politics is about runs the country." Setting the media agenda allows parties to gain an electoral advantage by focusing public debate on issues that are electorally favorable to them. To determine whether the media or parties lead in setting the public agenda, it is crucial to consider the context of our study: while research on parties' agenda-setting power has led to conflicting results (Vliegenthart et al., 2016; Walgrave and Van Aelst, 2006, 95–98), there is a consensus that parties are able to set the agenda during campaign times (Walgrave and Van Aelst, 2006; Brandenburg, 2002; Hopmann et al., 2012). On the one hand, parties increase their efforts to influence the public agenda during campaign times (Dalton et al., 1998, 476). On the other hand, media also simply focus on political news more in those periods (Walgrave and Van Aelst, 2006).

In contrast to most of the literature, we consider the parties agenda expressed on social media, specifically Twitter. Although Twitter is much less popular among the public than Facebook, it matters for political communication: "especially what parties emphasize or decide to talk about on Twitter contributes to what their supporters will know" (Popa et al., 2020, 329). The Twitter agenda can be considered "symbolic," similar to parliamentary questions, although politicians

can express themselves much more freely on social media, and with a much broader potential audience. Like for parliamentary questions, however, we expect the social media agenda to be more subject to media influences than the "substantial" agenda, which comprises actual decisions. Therefore, the focus on the social media agenda raises additional reasons to think that the media agenda might lead the parties agenda.

As we see, the literature is not entirely conclusive regarding the direction of agenda setting influences between parties and the media, especially when considering parties agendas on social media. It is clearly a question where more research is needed and where, hopefully, our study can make a useful contribution. Overall, given that we study a period that includes a national election campaign and several referenda, we expect that, on balance, the parties agenda leads the media agenda:

H1: The social media agenda of parties is more predictive of the traditional media agenda than vice-versa.

2.3 Traditional Media Agenda and Social Media Agenda of Politicians

Our second hypothesis relates to the interactions between the media and politicians. Classic behavioral theories of political parties assume that politicians are vote-seeking, office-seeking, and policy-seeking (Strøm, 1990; Pedersen, 2012). Politicians aim to maximize votes in elections to get elected or remain in parliament. Vote seeking has several observable implications. Politicians put a lot of time and resources into campaigns (Sudulich and Trumm, 2019). Engaging in more campaign activities correlates with the probability of winning a seat (Bowler et al., 2020). Politicians appear to act strategically during a campaign and emphasize policy issues that are perceived as important by the public. Research shows that, at the individual level, political information seen on social media affects perceptions of the salience of issues (Feezell, 2018).

We posit that vote-seeking behavior also influences the relationship between politicians and the media. Politicians face strong incentives to profile themselves in the media. Politicians are responsive to the electorate and to topics that dominate public discussions. For instance, Barberá et al. (2019, 883) demonstrate that "legislators are more likely to follow, than to lead, discussion of public issues." A comparative study of media coverage and the content of parliamentary questions conclude that "the media matter more for politics than vice versa" (Vliegenthart et al., 2016, 284). These findings hold also in the Swiss context (Sciarini et al., 2020).

Besides increasing name recognition and presenting their personality or personal life, politicians use social media to declare policy positions (Kobayashi and Ichifuji, 2015). When talking about policy issues, politicians can use social media to "expand" issues from elites to the public (Fazekas et al., 2020). This expansion can occur directly, when voters see and engage with social media posts by politicians, but also (and maybe especially) indirectly, when politicians and their messages make it into traditional media. Journalists frequently cite social media messages by politicians, and politicians engage with social media with the goal of getting their mes-

sage out (Jungherr, 2014). Tweets are suitable sources for direct quotes since these messages are short, pointed, publicly available, and easily accessible. To make it into the news—a central vote-seeking strategy—it makes sense for politicians to mention topics that are already salient in the media. In their study of party press releases, Meyer et al. (2020, 281) show that "party messages are more likely to make it into the news if they address concerns that are already important to the media." Such a logic may well apply to politicians and social media, and suggests that the direction of agenda setting is from traditional media to politicians.

We see that the literature is not entirely clear regarding the direction of agenda setting between traditional media and politicians, especially when considering social media. This is another point where our study can make a valuable contribution. Overall, we expect that issue emphasis in the media leads that of politicians on social media.

H2: The traditional media agenda is more predictive of the social media agenda of politicians than vice-versa.

2.4 Social Media Agendas of Parties and Politicians

Our third expectation concerns the relationship between parties and politicians, which is not straightforward. We argue that there is a reciprocal influence between parties and politicians, both within and across parties. As Polk and Kölln (2017, 5) put it, "parties may be collective entities but internal factions, groups and divisions structure those entities." Such divisions are particularly likely to appear on social media: "Social media is comparatively free from agenda setting or selection power by political parties. An arena, in which personal preferences and individual strategic considerations dominate position taking" (Sältzer, 2020, 3). From this perspective, we argue parties and candidates can be considered as two separate entities.

However, there has been little research on how parties' central communication interacts with communication by politicians. We suspect that this partly depends on the character of the political system. In systems with distributed power, such as the Swiss system, individual politicians may have a harder time shaping the parties agenda with their social media activity than in systems where individual officeholders yield significant power. This holds all the more given we look at political candidates, some of which do not hold office and may lack the resources to get significant public attention. What is more, individual politicians may want to respond to the larger agenda to receive attention and to increase their profile within the political sphere. Hence, we expect parties to yield more influence than individual politicians.

In a narrower sense, much of the influence of parties may be on their own politicians. Based on research on intra-party politics, we may expect that parties lead the candidate agenda. Internal coherence and discipline is important to parties (Greene and Haber, 2016), as intra-party conflict can harm public approval. Parties that are perceived as internally divided and ambiguous in their policy statements enjoy considerably lower degrees of public support than internally coherent and broad-appealing strategies (Lin and Lehrer, 2020; Lehrer and Lin, 2020). However,

broad-appeal strategies can be electorally successful (Somer-Topcu, 2015). Therefore, parties may encourage their politicians to focus on many different issues and not necessarily stick to the issues that the party focuses on during an election campaign. Social media is highly relevant in this context because it makes it very easy for politicians to conduct their own communication fully autonomously, engaging in exchanges both within and across parties, as well as with journalists and the broader public.

Overall, we posit that politicians respond to parties rather than the other way around, and candidates do not go too far beyond the wider party issue agenda, given the asymmetry in their prominence. Instead, politicians might follow the agenda set by their party specifically in order to signal responsiveness and internal coherence. They may equally follow the agenda of other parties as "first responders" to the agenda of competitors and to raise their political profile. This assumption does not imply that politicians always stick to the party agenda. For vote-seeking and policy-seeking reasons, it may well make sense for politicians to put their own issues forward at times, especially when there is a favorable opportunity structure for a topic. Yet, on balance, we expect that the parties agenda leads the politicians agenda on social media:[3]

H3: The social media agenda of parties is more predictive of the social media agenda of politicians than vice-versa.

3 Data and Methods

3.1 Data

We draw the data for this study from three sources: First, Twitter data from Swiss parties, politicians, organisations, administrations and newspapers; second, newspaper articles from Swiss newspapers; and third, official press releases published by the parties and organisations in the Twitter sample. For all three sources, we gather documents published between January 1st, 2018 and December 31st, 2019. For the three data sets, this results in 330,375 tweets (excluding retweets) from more than 1,161 accounts, 2,786,159 articles from 83 different newspapers and 6,477 press releases.[4] We outline the process of data collection and analysis below. All data was collected daily through an ingestion system distributed over multiple machines which collects the data from the different sources and immediately stores it in a database.

3.1.1 Twitter Data

The collection of tweets includes all tweets from the six largest parties in the national council of Switzerland as well as all politicians[5] of these parties who had a Twitter account before the

[3] This hypothesis, and the corresponding analysis, does not distinguish among parties. Disaggregated results by party are shown in Si Section G.

[4] We also rerun our models by including retweets which increases the number of tweets to 397,828 but does not change our substantive conclusions (SI Section C).

[5] Specifically, we consider all politicians who ran for office in the national elections 2019.

national election in 2019 and tweets from newspapers, organisations and administrations.[6] The number of tweets for each actor is summarized in Table A4. The parties alone published 6,548 tweets over the course the two years. The politicians of these parties are responsible for 211,790 additional tweets.

3.1.2 Newspaper Articles

In addition to the news outlets' Twitter accounts, we also collected and classified all newspaper articles published by 84 Swiss newspapers. The articles are available through the *swissdox* database. The text corpus of consists of 2,786,159 articles. In Table A5, we report the average number of articles each paper published at a given day over the full two year period along with the maximum and minimum number of articles.

3.1.3 Press Releases

Finally, we collected all official press releases published by Swiss political parties and many of the organisations. While we are not primarily interested in press releases, they are an important medium for parties to communicate their policy positions and issue emphasis (Haselmayer et al., 2017). Hence, we include them in our model to assess the effect of each data source net of the effect of this frequently used source. Due to the relative low volume of press releases with only 6,477 published texts over the time period (of which 1,195 cover one of our four topics of interest), we aggregate all parties to a single actor. Thus, press releases serve as the "baseline" of issue attention at a given time.

3.2 Methods

3.2.1 Measuring Attention to Political Issues with Ensemble Classifiers

We build two classification systems for the tweets and the longer news articles separately using supervised machine learning.[7] The main difference between the two classifiers is that we implement a two-step classification for newspaper articles, since we collect not only political but all articles from the respective newspapers. Therefore, we first use a simple keyword counting decision tree to decide whether a text is politically relevant in Switzerland or not (Figure 1). Only texts that contain information on politics are included in the classifiers of issue emphasis.

To train the classifier for newspaper articles, we rely on a dataset of newspaper articles classified by hand from the APS (Année Politique Suisse).[8] The number of annotated articles included

[6] The six strongest parties in the national council between 2015 and 2019 were the SVP (Swiss People's Party), SP (Social Democratic Party), FDP (Liberal Party), CVP (Christian Democratic Party), Greens, GLP (Green Liberal Party) and the BDP (Conservative Democratic Party).

[7] We also use the classification system based on newspaper articles to classify the content of press releases included in our model.

[8] https://anneepolitique.swiss/.

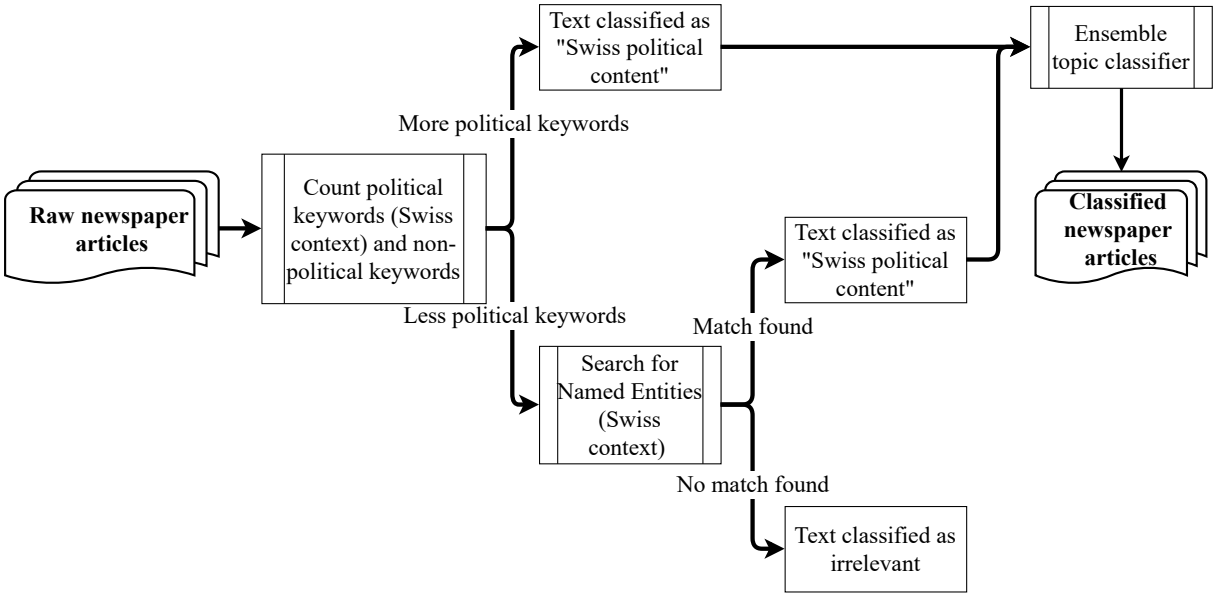

Figure 1: *Binary classification procedure for newspaper articles running on our distributed cron-like task scheduler.*

in the training set for the newspaper classification range from 1,210 (gender) to 9,889 (environment) German articles and from 318 (gender) to 1,460 (immigration) French news articles. This allows us to use supervised machine learning for the classification instead of unsupervised techniques (such as topic models).

For the classification of tweets we built separate classifiers because transfer learning (classifiers trained on newspapers and applied on tweets) does not work reliably. We used all tweets we collected from politicians, parties, organisations and experts participating in the weekly political TV show SRF Arena published between January 1st and September 1st 2019. We considered the 2,000 most frequent German and French hashtags in the corpus to classify the tweets into nine different political topics and a category for "other" topics. The number of annotated tweets per class range from 345 to 1,956 French tweets and from 5,320 to 13,410 German tweets.

The classifiers are built around an ensemble procedure which uses different algorithms to classify the texts (Géron, 2019) . The feature engineering is based on a Word to Vector (Word2Vec) approach. Word2Vec is a neural network trained to reconstruct linguistic context of words using a vector space built form a large corpus of words. We base the vector space on our text corpus which enables us to reconstruct the linguistic context of words within the political domain. The ensemble classifiers for tweets and longer texts both perform reasonably well over all topics of interest. The main difference between the two classifier systems, besides the different training data, is that the social media classifier classifies texts into ten different topics, while the second classifier considers a slightly wider range of topics (see also Table A1). The ensemble method results in out-of-sample accuracy of at least 80% for all classes in German and French.[9] Tables

[9] As a point of comparison, Barberá et al. (2021) report an accuracy of 71% for the classification of sentiment on the level of sentences.

A2 and A3 provide detailed information on the classifier performance and underscore that the ensemble methods do not suffer from systematic classification error.

The classifier for social media texts has an overall F1 score of 88% in German and 65% in French, while the overall classification of newspaper articles has an F1 score of 78% in German and 86% in French. Due to the large amount of training data, we do not need to consider active learning approaches and do not face the issue of imbalanced classes (Fong and Tyler, 2020). Our extensive validation in the Supporting Information underscores that we do not face the issue of systematic misclassification.

3.2.2 Autoregressive Models

To test our hypotheses we draw on vector autoregression models (VAR) with topic-fixed effects. VAR models explain the evolution of multiple variables based on their own lagged values as well as the lagged values of other terms, thereby allowing us to analyze the relation between several evolving variables. VAR models are well suited to capture the process between endogenous variables and have been used by similar studies (Barberá et al., 2019; Wood and Peake, 1998; Edwards and Wood, 1999). Compared to similar models, e.g. structural equation models, it is not necessary to have a precise theory regarding what influences the development of a variable. Instead, the model merely requires to include all which can be hypothesized to affect each other intertemporally (Qin, 2011). Note that we only interpret and present results for the effect of tweets by parties and politicians, as well as newspaper articles. We include but do not discuss in our model specification other variables that may affect the salience of political issues, namely the salience of these issues in press releases of parties and other actors, as well as tweets by newspapers, organizations or administrations.

We build our model on the design of Barberá et al. (2019). They used a VAR model with a set of stationary time series Y_i representing the share of the daily attention each group i paid to the topics j of interest. The model employs a set of stationary time series Y_i which represent the proportion of the daily attention each group of actors i paid to each topic j of interest on day t over the period of the years 2018 and 2019. The distribution is strongly skewed to the right as attention is distributed among many issues. In turn, this results in low issue attention for any single issue on any given day, except very few time points when a specific issue receives more attention. Hence, we use the log odds Z_i of the described series Y_i.

We express the endogenous relationship of these variables as a system of equations where each variable Z_i is a function of its own previous lags plus the lags of all the other variables. In this specification, there are no time-restrictions to when groups respond to changes in public issue attention. While we expect such responses to be rather fast on social media and, with a short delay, in news reports, we account for a possible longer-term decay by using a seven day lag structure.[10] Hence, our model therefore looks exactly like Barberá et al. (2019) and can be

[10] Using seven days as lag structure accounts for the differences in article numbers due to weekdays (see SI Section F). We also use a seven day lag to account not only for the differences in news article frequencies over different

expressed as:

$$Z = log\left(\frac{Y}{1-Y}\right)$$

$$Z_{i,j,t} = \alpha_j + \sum_{i}^{} \sum_{p=1}^{7days} \beta_{i,p} Z_{i,j,t-p} + \varepsilon_{i,j,t}$$

The model allows us to estimate how much issue attention by one group needs to change on average to predict a subsequent reallocation of the issue attention of another group. Since the results of these models are hard to interpret, we use cumulative impulse response functions (IRFs), which allow us to display how a 10 percentage point unit increase in attention to a given issue by a group, changes the cumulative attention the other actors contribute to the same topic over time. We do this for brief changes in attention of 10 percentage points (from 0% to 10%) for just one day at day zero. This change is calculated in a simulation for up to 60 days after the initial increase. These cumulative impulse responses are then summed over the first seven days to calculate the seven day lag structure to incorporate a whole news cycle of about one week. In Figure A5, we report all results using lags of one, three, five, seven, and nine days. The direction of the effects is identical across specifications.

4 Results

We present three sets of results regarding the connection between the traditional media agenda, the social media agenda of parties, and the social media agenda of politicians. First, we describe the distribution of issue salience over time for the three agendas. Second, we analyze the responsiveness of the traditional media, parties, and politicians to each other's agendas. Third, we examine which agenda, on balance, is more predictive of the others. This third point allows us to test our hypotheses more directly.

Figure 2 shows the distribution of the three agendas over time, with a focus on the four issues that we consider in this paper: environment, gender, Europe, and immigration. First, some context: the Swiss National Elections 2019 were held on October 20, 2019, and were characterized by massive gains for the Green and Green Liberal parties, at the expense of the Social Democratic Party and the Swiss People's Party. The election campaign was concerned with various topics (Gilardi et al., 2020).[11] In particular, there is widespread consensus among political actors and commentators that climate change and environmental issues dominated the campaign. This assessment is confirmed by a systematic media analysis (Gilardi et al., 2020). Moreover, 2019 was

weekdays but also to account for the typical news cycle in Switzerland which ends and starts with the weekly Sunday editions of many newspapers.

[11] The analysis does not contrast "campaign" and "routine" times because such a clean comparison is not possible in our case. First, it is not clear when exactly the electoral campaign starts. The campaign proper is considered to start in August, but the media consider anything happening in the whole year as part of the election campaign. Second, the Swiss political system is characterized not only by national elections every four years, but also by national referenda (four times a year) as well as cantonal elections and referenda.

Figure 2: *Distribution of issue emphasis over time.*

perceived to be a "women's year," due to the historical women's strike held June 14, which was the biggest protest event since decades in Switzerland, as well as the record number of female politicians running for office in the national elections (leading to a record number of women represented in parliament). However, the two issues were not equally dominant and present (Gilardi et al., 2020). The environment issue was constantly central in the traditional media and one of the more frequent topics online. By contrast, gender issues were highly salient around the women's strike, but were otherwise not a dominant topic. However, both issues ultimately shaped the elections, on the one hand with the "green wave" and the increase in Green seats, on the other hand with an increase in the proportion of women in both the National Council and the Council of States. Two other issues that are usually highly salient—immigration and Europe—remained in the background during the election campaign, although the relationship with the European Union was debated intensely in the context of a referendum held in May 2019. The referendum concerned gun regulations but had a direct link with the agreements that Switzerland has with the EU.

Several aspects stand out in Figure 2. First, in the traditional media, the environment was the most salient issue in 2018 and, especially, 2019. Second, the politicians' focus on the environment on social media is apparent throughout 2019, and especially during the core of the election campaign (August to October 2019). Third, parties engaged intensively with the Europe issue during the campaign leading to the May 2019 referendum, which impacted directly Switzerland's relationship with the EU. Fourth, immigration and gender had low salience throughout most of the period. Among politicians, immigration was the least salient issue for most of 2019. Regarding gender, the relative salience among politicians, and a few peaks for newspapers and parties, have to do with the historical women's strike held on June 14, 2019, as well as with the record number of women running for office (and eventually being elected).

Figure 3 shows the interdependencies between the three agendas, controlling for the press releases of the most relevant political actors.[12] Specifically, the figure shows how each agenda responds to a one-time, 10 percentage-point increase in attention to each of the four issues in each of the other two agendas. For example, the fourth line from the top (Parties → Newspapers) shows the effect of such an increase in the social media agenda of parties on the traditional media agenda. We see that when parties tweeted more about the environment or gender, the attention traditional media gave to those issues in the following week increased by about 1.5 (for gender) and 3 (for the environment) percentage points, although the relationship is statistically significant only for the environment issue. We translate these two estimates into substantive effects. The estimate for gender translates to 400 newspaper articles, 1.1 tweet by parties and 30.5 tweets by candidates per day. For the environment, this translates to 800 newspaper articles, 2.2 tweets by parties and 61 tweets by candidates. The effects are computed for an average week in

[12] We include the same model without the press releases. There is no difference visible when comparing the two models regarding the agendas of interest, since the model is only looking at the interaction of one agenda with all others at once (see also SI Section D).

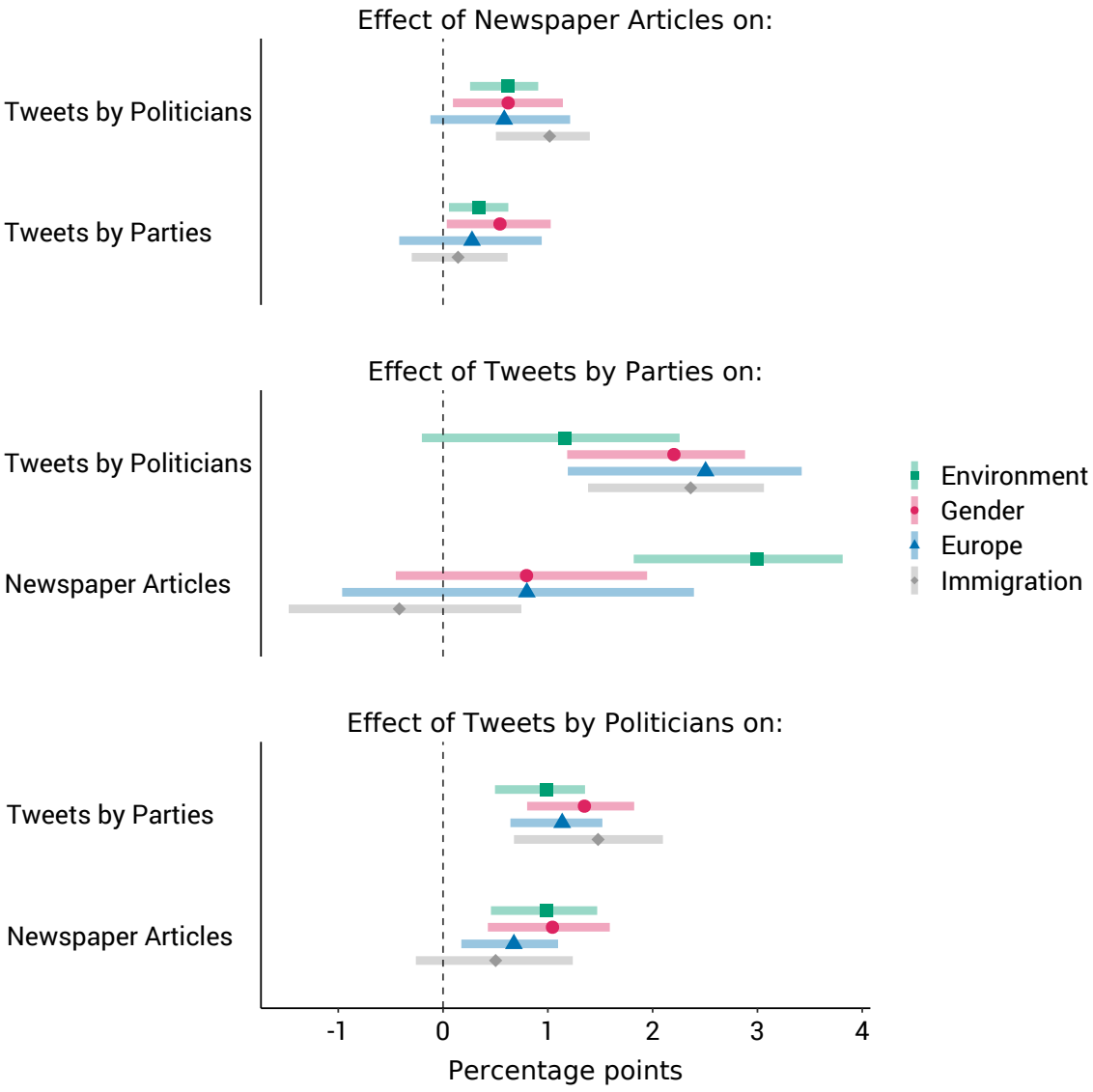

Figure 3: *Agenda responsiveness of parties, politicians, and newspapers. Bars denote 95% confidence intervals.*

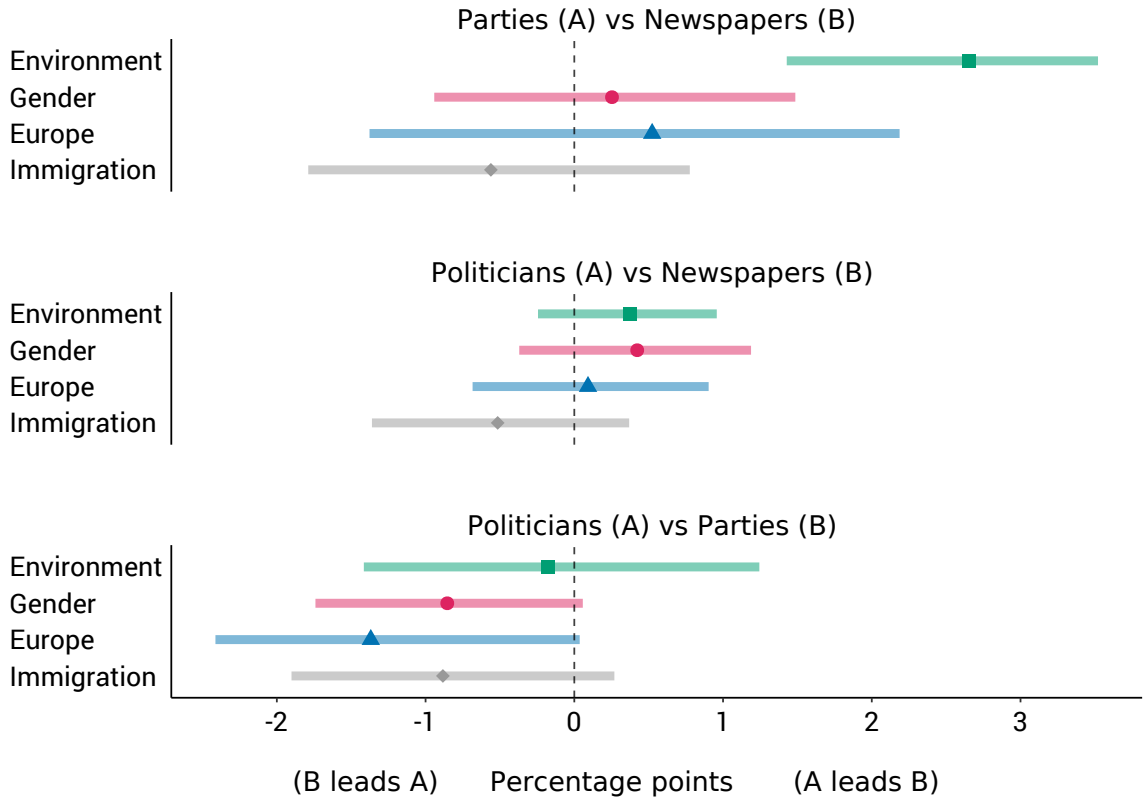

Figure 4: *Attention responsiveness differences. Bars denote 95% confidence intervals.*

our time period. These effect sizes are comparable to those measured by Barberá et al. (2019, e.g. Figure 6, p. 897). For the two other issues, like for gender, more tweets by parties are not significantly associated with more media coverage. In our context, what separates the environment and gender issue from Europe and immigration is that the former became highly salient in 2019 due to two large-scale advocacy campaigns by non-partisan actors, namely, the climate respectively women's strike.

Overall, several insights stand out in Figure 3. First, all correlations are either indistinguishable from zero or, more often, positive, which makes sense. Second, and related, we observe a high degree of mutual influence among the various agendas. Third, the strongest relationships, in terms of effect size, are driven by the social media agenda of parties. Fourth, there are relatively few differences among issue areas. Fifth, although for many topics media effects are significant, they are small. This result is consistent with findings pointing to limited media influence during elections campaigns (Walgrave and Van Aelst, 2006; Brandenburg, 2002; Hopmann et al., 2012), although we cover a much longer period.

Figure 4 allows us to test our hypotheses more directly, again controlling for the press releases of the most relevant political actors. The hypotheses imply a comparison between the mutual responsiveness of agendas. For instance, as shown in Figure 3, the social media agenda of parties

predicts the social media agenda of politicians, but the opposite is also true. On balance, does one agenda lead more than it follows, or do they lead and follow to roughly the same extent? We test the direct comparisons by calculating the differences between the agenda responsiveness of each pair of actor groups against each other. The 95% confidence interval of the differences are based on 1,000 simulated effects of each actor's agenda responsiveness on another actor, subtracting the values of the same pair of actors in the opposite direction. This allows us to test if one group's agenda leads the other more than it follows it. Figure 4 shows that, overall, the three agendas both lead and follow each other in roughly equal measure. For example, when politicians post more content on the environment issue on Twitter, it leads newspapers to publish more articles on that issue. But the relationship goes also in the opposite direction: when newspapers publish more articles on the environment, politicians tweet more about that issue. Figure 4 shows that for most issues and groups, the strength of those relationships is roughly the same, such that no agenda leads the others more than it is led by them.

There is one important exception to this pattern, which we did not anticipate: for the environment issue, the traditional media are over two percentage points more responsive to parties than parties are to traditional media. In other words, for the environment issue, parties lead newspapers more than they follow them. Again, what characterized this issue in 2019 was its high salience due to an advocacy campaign that was largely exogenous to the Swiss political system. Given this high degree of salience, we expected that parties would not be able to further increase it. However, the opposite turned out to be the case. Finally, for issues other than the environment, the social media agendas of parties seem to be more predictive of the social media of politicians than vice-versa, which is consistent with our third hypotheses. None of the differences among these two sets of actors are statistically significant, however.

5 Conclusion

In this paper, we studied the relationship between three agendas: the traditional media agenda, the social media agenda of candidates, and the social media agenda of politicians. First, we observe significant influences among several agendas. Only in a few cases (e.g. the effect of parties on newspapers on three issues and newspapers on parties on two issues) are the effects indistinguishable from zero. Second, contrary to most studies, we have considered the mutual influences among these agendas, and found that, on balance, they counterbalance each other. That is, each agenda influences each other agenda by roughly the same extent.

There is an important, surprising exception, however: for the environment issue, the social media agenda of parties is more predictive of the traditional media agenda, with a significant difference of about two percentage points. The analysis takes into account the press releases of various political actors, including parties. Therefore, the differences we uncover can be attributed specifically to the social media activity of parties.

Regarding our results for the environment issue, our paper highlights the need for further

research in differences across issues and the role of advocacy campaigns that politicize an issue. Recent literature has pointed to both permanent "problem characteristics" and more variable "problem information" as determinants of political attention to issues (Green-Pedersen, 2019). Two of the issues we discuss, namely gender and the environment, were the subject of large-scale campaigns by actors not explicitly covered by our empirical approach. Such an expansion of actors, including to the protest arena, has frequently been identified as crucial to the politicization of issues (Hutter et al., 2016). At least for the environment, this expansion seems to have increased responsiveness to the agenda of political parties. This may be a consequence of the high public resonance of political statements on this issue in the context of the climate strike. As our empirical approach compares several issues, we are unable to test how the variation in the availability of "problem information" affects agenda-setting capacity on single issues like the environment in detail. However, we hope that our findings will inspire future work that analyzes the relationship between advocacy and election campaigns with an event-centered approach.

Our paper stands out in several ways. We study a longer period (two years) than most studies; we consider both traditional and social media; we distinguish between parties and politicians; and we analyze the mutual influences among the different agendas instead of focusing on a specific direction. Our findings underscore the complexity of the relationship between the political and media agendas, but also the potential of social media for political communication. In some contexts—in our case, a topic already enjoying a high degree of salience—political parties can further increase media attention to the environment issue, net of press releases and other confounding factors.

Our study also highlights the value of Twitter data to extend the analysis of issue emphasis by parties and politicians to new forms of political communication. First, even though Twitter users are not representative of the population (Blank, 2017; Jungherr, 2016; Mellon and Prosser, 2017), an increasing proportion of candidates and elected politicians use Twitter extensively. Second, parliamentary questions or speeches, previously used as proxies for politicians' issues emphasis, usually do not receive much public attention. In fact, politicians tend to over-estimate the influence of these channels (Soontjens, 2020). Third, politicians can state their policy preferences on social media platforms without institutional restrictions, such as speaker selection or limited speaking time in parliament (Proksch and Slapin, 2015). Online communication might offer a more comprehensive assessment of personal issue priorities. As we have argued in discussing the importance of social media, these statements are treated as newsworthy by traditional media and ultimately reach large audiences (McGregor and Molyneux, 2020; Jungherr, 2014). We present a method to classify tweets by parties and politicians and link them to newspaper reports in order to study daily agenda setting dynamics.

This paper contributes primarily to a better understanding of the role of social media and agenda setting, but our results also provide avenues for further research. While we have already pointed to differences between topics, cross-national and comparative research could investigate how party characteristics shape actors' agenda setting capacity. For instance, the size of a party,

its incumbency status or the ownership of certain issues (Green-Pedersen, 2019) could mediate the ability to set the political agenda.

Social media have become an established channel for political communication, which parties and politicians are eager to use. Despite their relevance, many aspects remain poorly understood, including their role in political agenda setting. Our findings contribute to a growing body of research and, we hope, provide a template that could be replicated and extended in many different contexts.

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Social Media and Political Agenda Setting

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Online Supporting Information

A Measuring Issue Attention with Ensemble Classifiers

The ensemble methods used for the newspaper articles in German and French consist of two deep learning models and one gradient boosting model trained with a random grid search using a large hyper-parameter space. All classification algorithms were trained using the R interface for H_2O.[1] The probabilities are calculated for each topic and then summed over all algorithms. The text is assigned to the topic that has the highest probability across all algorithms. For the social media ensemble model, we use the same procedure with two deep-learning models and a gradient-boosting model. Since tweets are much shorter than newspaper articles, it is more difficult to classify them into an issue topic.

Prior to classification, suitable training data is required. For this purpose, we constructed a training data set of annotated newspaper articles in German and French using the database from the Année Politique Suisse (APS),[2] which includes topics classifications. For the Twitter data we constructed a separate annotated training set based on a sample of all tweets we collected from politicians, parties, organisation and people participating in the weekly TV debate SRF Arena, posted between January 1st and September 1st 2019. We considered the 2,000 most frequent German and French hashtags in the corpus to classify the tweets into nine different political topics, while classifying all other tweets as "not classified" to allow for tweets which are not part of these topics.

Before we can use the training data for classification, we need to transform the texts into a numerical format, since no algorithm will work with raw text. One of the simpler methods of encoding text data is by constructing a term-document frequency matrix, but this approach was not reliable enough, especially for shorter texts from social media. Instead, we use an approach called Word to Vector (Word2Vec). This shallow neural network is trained to reconstruct the linguistic context of words. The Word2Vec model takes the large text corpus (training data) and produces a vector space of 600 dimensions in our case, with each word in the corpus assigned to a corresponding vector space. Words that share similar contexts in the corpus are placed in close proximity to one another in this vector space. In H_2O the predictive model used to learn the word embedding is the Skip-Gram model which predicts surrounding context words from the target words itself. The method tries to maximise classification of a word based on an other

[1] https://www.h2o.ai.
[2] https://anneepolitique.swiss.

word in the same text.

Specifically, the probabilistic model relies on two matrices with different weights, where the rows of the first matrix and the columns of the second matrix embed the input words and target words. The product of these word vectors are then used to get the probabilities of being a target word, given the selected input word. The vectors are optimized using gradient descent such that the probabilities of the targets are maximized. The key here is that the shallow neural network is used to calculate the optimal weights. Instead of using these weights to decompress the original input back in the output layer, we use the weights as our word embeddings and discard the rest of the model. This Word2Vec model transforms each text into one single vector space. We then use this vector space as the feature set in the ensemble algorithm for the classification of the texts.

In order to reliably classify the data from newspaper articles and Twitter, we run ensemble algorithms for each type of text (tweets and newspaper articles) and the two languages (German and French). Our ensemble model uses the sum of all probabilities of the individual classification topics for the final classification and then selects the class with the highest probability. For the training of the models, all classification algorithms were optimised using a random grid search with a comprehensive hyper-parameter space using early stopping techniques and regularization. This method allows to train many different model configurations in less time then a pure grid search. This approach has the benefit of minimizing the risk of over-fitting the algorithms on the training data while keeping the possible model configurations as big as possible. This state-of-the art method of training the classifiers is faster than a pure grid search and produces the same results (Géron, 2019).

To reduce the number of complex (parsimonious) models, we used Lasso and Ridge Regularization. Lasso Regularization is a type of linear regression that shrinks values towards a central point, like the mean. Thus, it is often referred to as a L1 regularization as the Lasso procedure encourages simpler, sparser models, which limit the size of the coefficients with a penalty equal to the absolute value of the magnitude of coefficients. Ridge regression, on the other hand, adds an L2 penalty, which equals the square of the magnitude of coefficients. All coefficients are shrunk by the same factor. For both types of regularization, higher values set for the tuning parameter yield in a higher shrinkage of the coefficients (Géron, 2019, 309). Finally, early stopping is used to finish the training as soon as the model either stops improving for a certain amount of training iterations or already exceeds a given threshold. This is useful to minimize training time.

For the classification of newspaper articles, we used the same process as for the social media data. The best deep learning models have an average F1 scores ranging from 0.50 to 0.89 depending on the topic and the classifier, exceeded by the best Gradient Boosting models, which achieve F1 scores from 0.60 to 0.89. This raises the question of why an ensemble model is used at all when the deep learning models or a gradient boosting model perform reasonably well on their own for most topics, with overall F1 scores of 0.74. The reason is that the error rate varies greatly from class to class and also between different classification algorithms. Therefore using models helps improve classification of some topics which are poor in one algorithm but better

Topic	German			French		
	Precision	Recall	F1	Precision	Recall	F1
Agriculture	0.91	0.80	0.85	0.95	0.85	0.89
Public Health	0.90	0.87	0.88	0.96	0.89	0.92
Education & Culture	0.87	0.80	0.83	0.86	0.86	0.86
Environment & Energy	0.84	0.81	0.83	0.86	0.88	0.87
Public Services & Infrastructure	0.83	0.82	0.82	0.91	0.88	0.89
Economy	0.83	0.83	0.83	0.91	0.88	0.89
Immigration & Asylum	0.81	0.77	0.79	0.85	0.80	0.83
Finance & Taxes	0.81	0.77	0.79	0.85	0.80	0.83
Political System	0.81	0.70	0.75	0.86	0.82	0.84
Social Security & Welfare State	0.79	0.80	0.80	0.87	0.84	0.85
Gender Issues & Discrimination	0.78	0.84	0.81	0.83	0.91	0.87
Law & Order	0.77	0.77	0.77	0.96	0.92	0.94
International Relations	0.75	0.73	0.74	0.82	0.77	0.79
Other Problems	0.75	0.74	0.74	0.87	0.80	0.83
EU & Europe	0.73	0.79	0.76	0.77	0.85	0.81
Labour Market	0.71	0.77	0.74	0.91	0.85	0.88
Regions & National Cohesion	0.71	0.71	0.71	0.83	0.78	0.81
Not Classified	0.49	0.67	0.57	0.76	0.82	0.79
All Topics	0.78	0.77	0.78	0.87	0.85	0.86

Table A1: *Classification Performance for Newspaper Articles*

in another. For example, the F1 score of "Law and order" in the ensemble model is 0.77 while it is only 0.70 in the two best Deep Learning models, and 0.75 in Gradient Boosting model. Similarly, the classification of the French texts achieves F1 scores ranging from 0.74 to 0.93 for Deep Learning models, and from 0.77 to 0.95 for Gradient Boosting models. By using different algorithms within the Ensemble method, we are able to reduce the error rate for those topics that do not perform very well with one algorithm and achieve an F1 score of 0.71 and more for all political topics in German and 0.81 and more for French political topics (Table A1). The results for precision, recall, and the F1 score are about 0.79 or higher. Overall, the classification performance is very satisfactory and we do not face the issue of systematic classification in one of the topics.

For the classification of tweets, we chose the same mix of models as for the newspaper articles and press releases. The deep learning algorithms achieve an accuracy of more than 75%, followed by the best gradient boosting models, which reach an accuracy of almost 70%. As with the newspaper articles, the ensemble method can be used to reduce the error rate even further and achieve an accuracy of at least 84% for the German tweets. Again, the French classifier works

Topic	German			French		
	Precision	Recall	F1	Precision	Recall	F1
Not Classified	0.97	0.98	0.98	0.94	0.96	0.95
Public Health	0.95	0.89	0.92	0.54	0.84	0.65
Elections	0.91	0.85	0.88	0.90	0.69	0.78
Finance & Taxes	0.90	0.88	0.89	0.50	0.81	0.62
EU & Europe	0.89	0.89	0.89	0.64	0.85	0.73
Social Security & Welfare State	0.84	0.89	0.87	0.31	0.72	0.43
Environment & Energy	0.84	0.88	0.86	0.46	0.63	0.53
Immigration & Asylum	0.84	0.91	0.87	0.54	0.77	0.64
Gender Issues & Discrimination	0.83	0.91	0.87	0.55	0.68	0.60
Polls	0.68	0.84	0.75	0.47	0.79	0.59
All Topics	0.87	0.89	0.88	0.58	0.77	0.65

Table A2: *Classification Performance for Tweets*

Social Media Classifier		Newspaper Articles Classifier	
	Topic		Topic
		Agriculture	0.7 %
		Economy	2.1 %
		Education & Culture	1.8 %
Elections	27.7 %		
Environment & Energy	6.1 %	Environment & Energy	1.6 %
EU & Europe	3.6 %	EU & Europe	0.7 %
Finance & Taxes	0.7 %	Finance & Taxes	0.7 %
Gender Issues & Discrimination	2.5 %	Gender Issues & Discrimination	0.3 %
Immigration & Asylum	1.6 %	Immigration & Asylum	0.5 %
		International Relations	1.2 %
		Labour Market	0.2 %
		Law & Order	1.1 %
		Political System	1.8 %
Polls	0.7 %		
Public Health	0.3 %	Public Health	1.0 %
		Public Services & Infrastructure	2.4 %
		Regions & National Cohesion	0.8 %
Social Security & Welfare State	2.0 %	Social Security & Welfare State	1.0 %
Not Classified	54.9 %	Not Classified	1.1 %
		Other Problems	0.9 %
		Not Political	80.4 %

Table A3: *Topics frequency for social media and newspaper articles classifiers*

less reliably, with an average F1 score of 0.65, compared to an average F1 score of 0.88 for German tweets. For our four classes of interest, the F1 scores for French range from 0.53 (environment) to 0.73 (EU & Europe), and from 0.86 (environment) to 0.89 (EU & Europe) for German tweets (Table A2).

Table A3 lists all topics for the classifiers of tweets (left-hand column) and news articles (right-hand column), along with the proportions of tweets/articles falling into each category. 80.4% of newspaper articles and 55% of tweet are classified as non-political.

B Number of Tweets per Actor

Type	N accounts	Average	Min	Max	N tweets
Government	10	270.5	51	693	2,705
Media	20	5,380.1	360	16561	107,601
Organisations	10	173.1	9	370	1,731
Parties	20	327.4	59	670	6,548
Politicians	1,101	192.3	1	8,497	211,790

Table A4: *Number of tweets per actor*

C Results with Retweets

The main analyses reported in the paper exclude retweets. The content of retweets is not created by the user. However, they might be relevant to measure how political actors emphasize issues. To evaluate the robustness of our findings, we rerun all models including retweets. Figure A1 shows that the results are not sensitive to the inclusion or exclusion of retweets. The substantive findings remain the same.

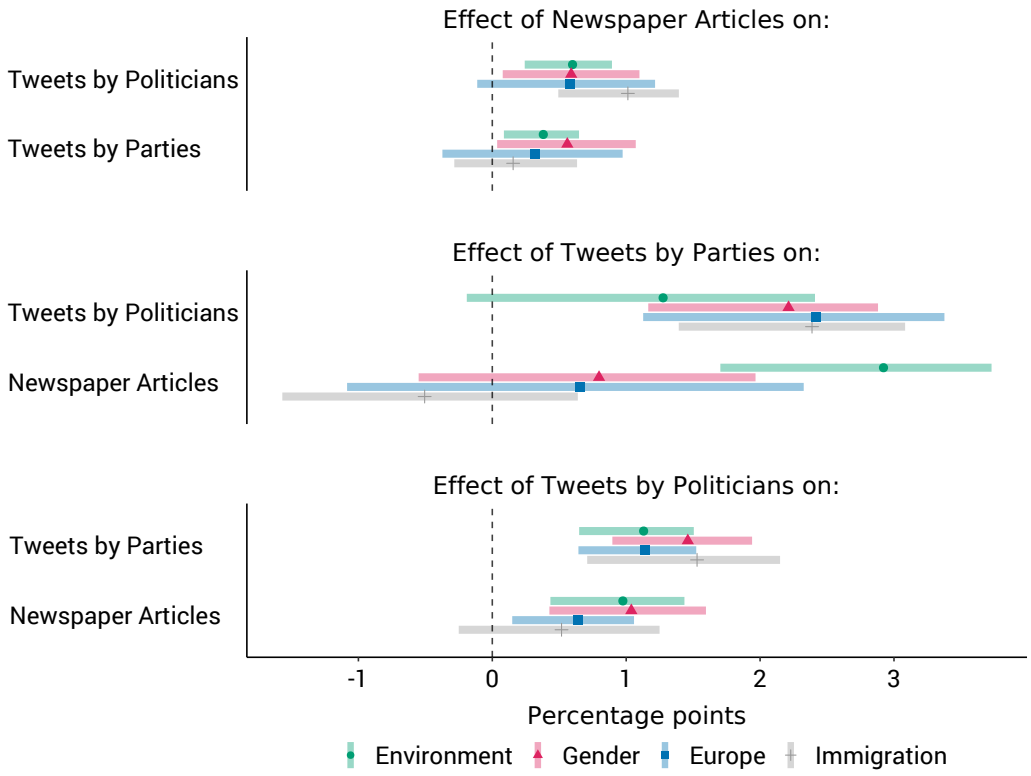

Figure A1: *Agenda responsiveness of parties and politicians in detail with retweets. Bars denote 95% confidence intervals.*

D Results without Press Releases

Our main analyses include press releases because they are an important medium for parties to communicate their policy positions, and also serve as a "baseline" for issue attention (see Section 3). However, the inclusion of press releases could potentially bias our results depending on the model configuration. Excluding press releases from the model does not change the findings in our case because we do not include interactions between press releases and the issue agenda of other actors in our models (Figure A2).

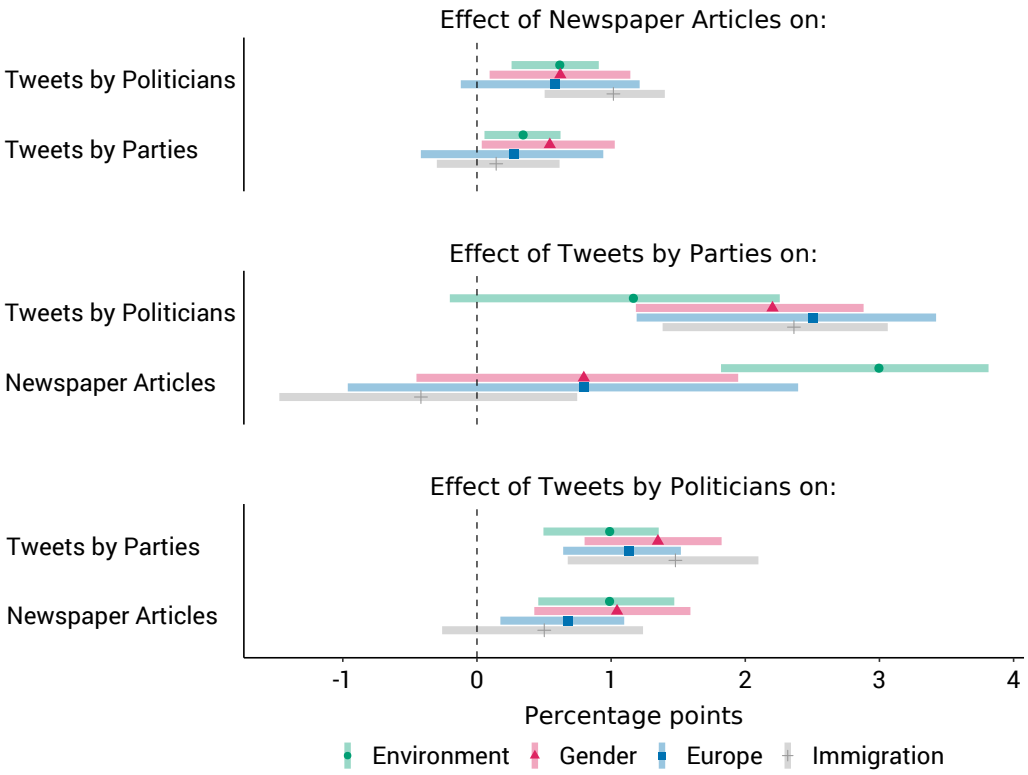

Figure A2: *Agenda responsiveness of parties and politicians in detail without controlling for press releases. Bars denote 95% confidence intervals.*

E Full Effects from Main Model

The graphics in the paper focus on the main variables of interest to ensure that the findings can be interpreted as clearly as possible. Here, we present the effects of all variables on all other other variables (Figures A3 and A4). The results are much more difficult to interpret due to the much larger number of actors. Two findings are noteworthy. First, the agenda of newspaper accounts on Twitter is very similar to the agenda of newspapers articles. The high degree of correspondence between the print versions of outlets and the Twitter account of newspapers in our sample points to the face validity of our method. Second, we observe substantial responsiveness of tweets by government accounts to tweets by newspapers in relation to the EU and Europe (Figure A4).

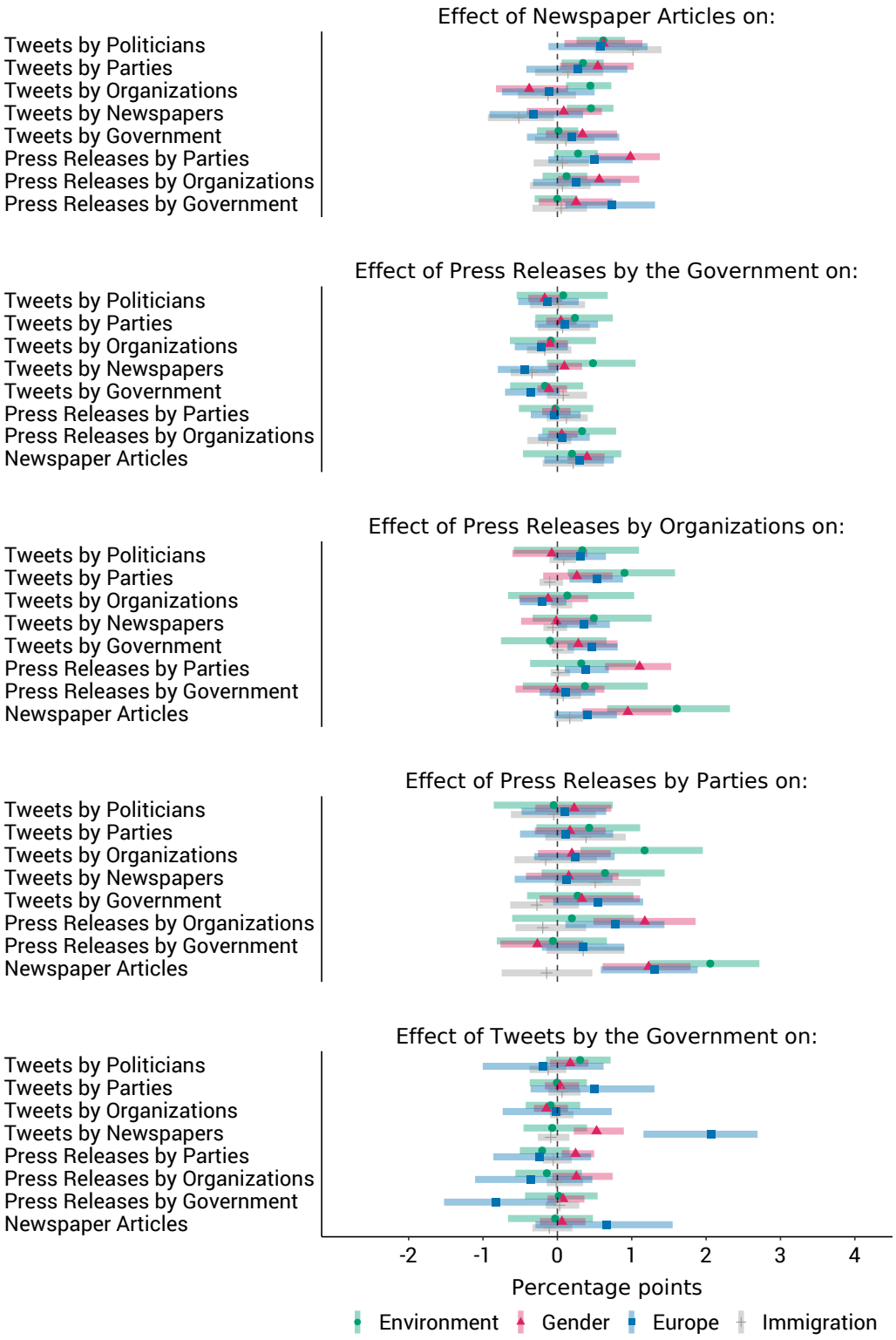

Figure A3: *Agenda responsiveness of all variables. Bars denote 95% confidence intervals.*

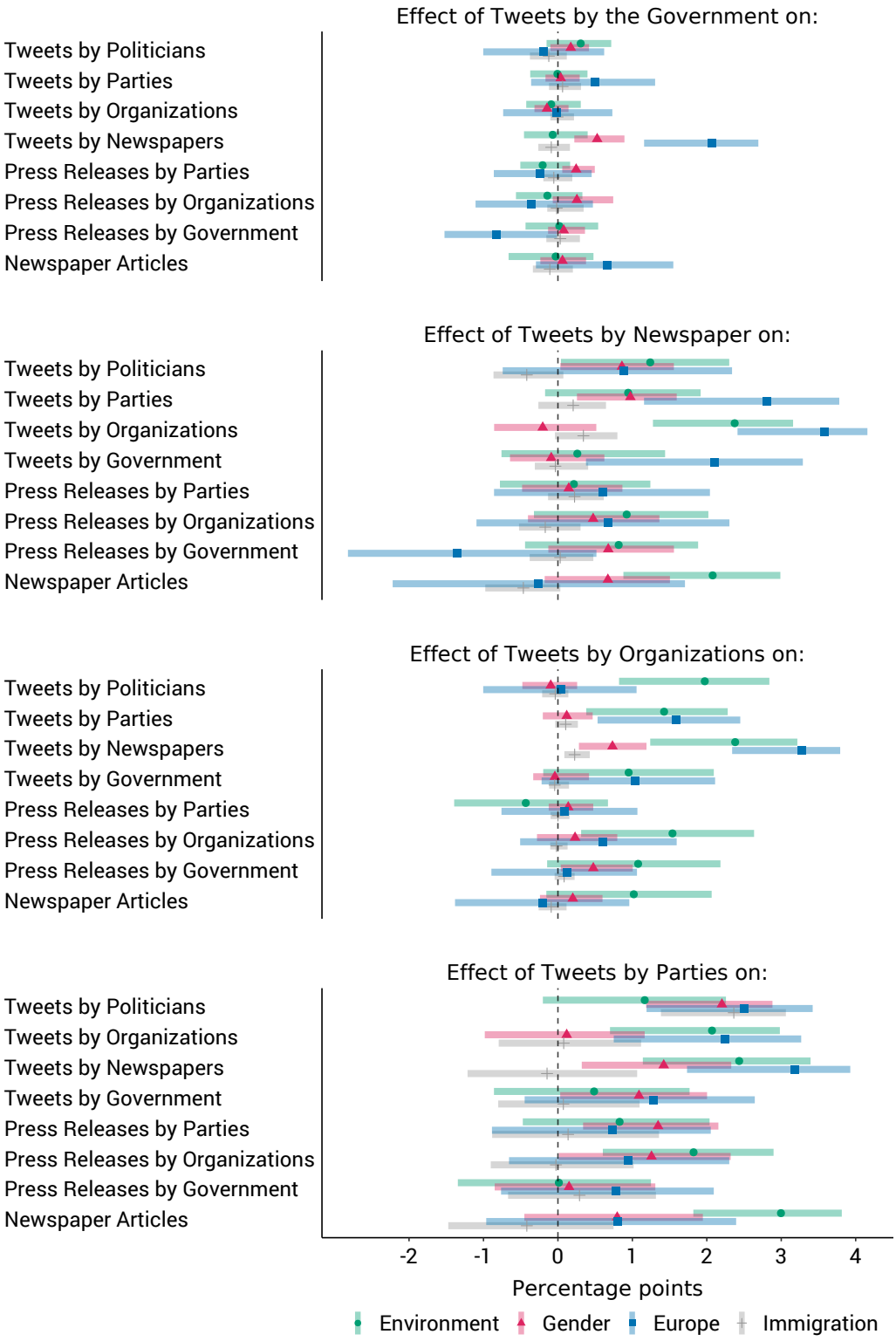

Figure A4: *Agenda responsiveness for all variables. Bars denote 95% confidence intervals.*

F Comparing Different Lag Structures

To choose the most appropriate lag structure for our final analysis we simulated the results from one up to 60 days. Figure A5 shows different lags from one to nine days. After just three days the cumulative IRF does not change much. This indicates that for an increase of issue attention of a given topic, other actors usually react (or do not react) within three days. Yet, we report seven-day lags because the typical news cycle last seven days. In addition, using a lag of one week allows us to include weekend editions of newspapers without inducting any bias stemming from Saturday or Sunday editions of news outlets.

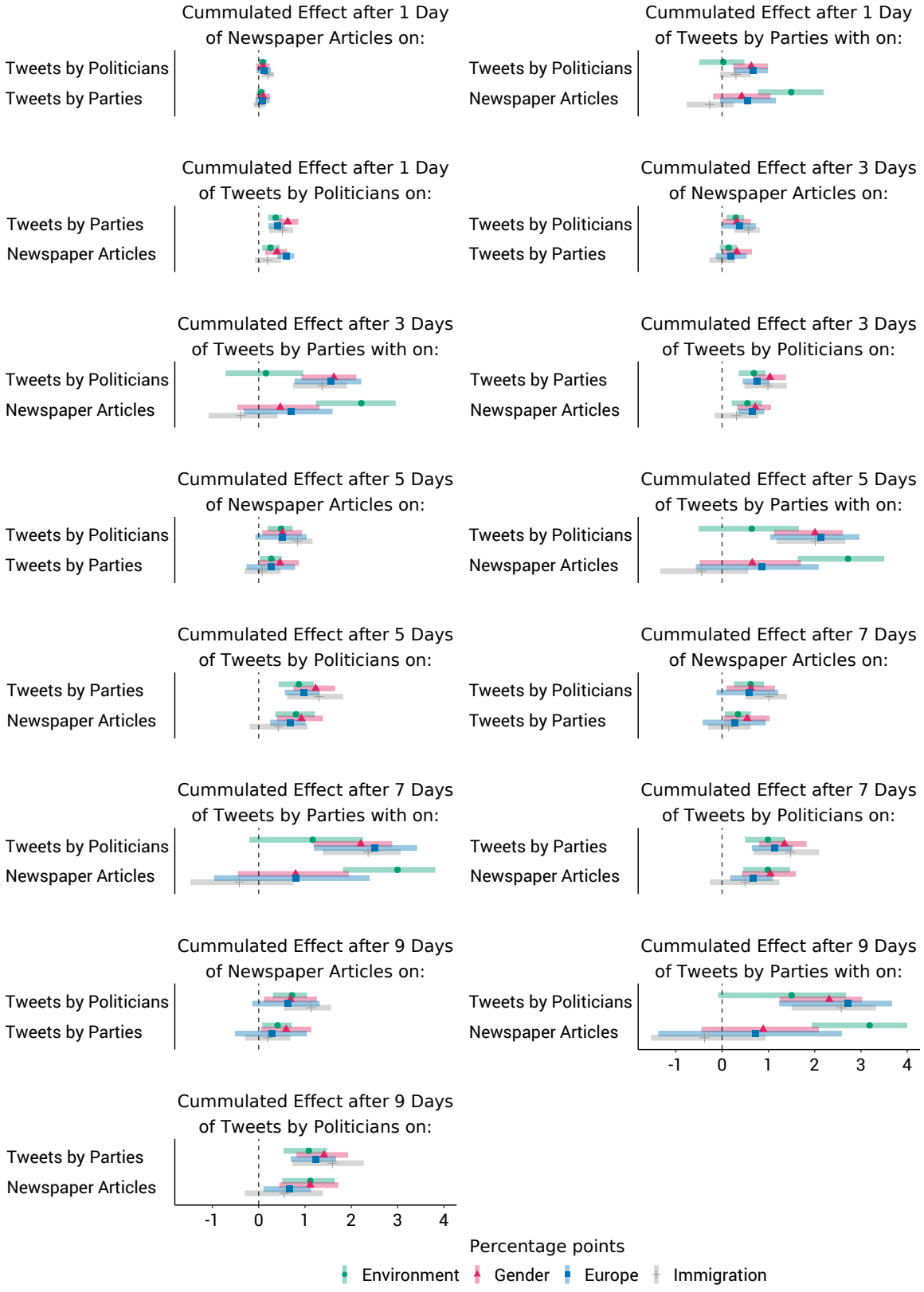

Figure A5: *Agenda responsiveness of media, parties and politicians with different lags. Bars denote 95% confidence intervals.*

G Disaggregated Results by Parties

Figure A6 and Figure A7 report disaggregated results by party.[3] Like for our main analyses, the two figures show how each agenda responds to a one-time, a 10 percentage-point increase in attention to each of the four issues in each of the other agendas. Due to the large number of parties, the figures are not easy to interpret. However, Figures A6 and A7 support the assumption that the relationships cut across party lines and, therefore, pooling parties and candidates makes sense. For example, in Figure A6 we see that tweets by the Green party on the environment issue led SVP candidates and the GLP and FDP parties to tweet more about that issue, but not its own candidates.. Moreover, parties with "ownership" of an issue, tend to lead, rather than follow, the agenda. Figure A6 displays this nicely with the environment issue where the Green Party and the Green Liberal Party (GLP) are clearly able to nudge other parties to react when they increase the salience of the issue on their channel. The same holds true for the issue regarding politics about Europe: the Swiss People Party (SVP) is somewhat more capable of influencing other parties' emphasis on Europe and the EU, but this relationship is weaker than for Green parties' issue emphasis on environmental issues.

[3] We had to drop the CVP and BDP from this analysis due to a very low number of tweets which results in convergence issues of the model.

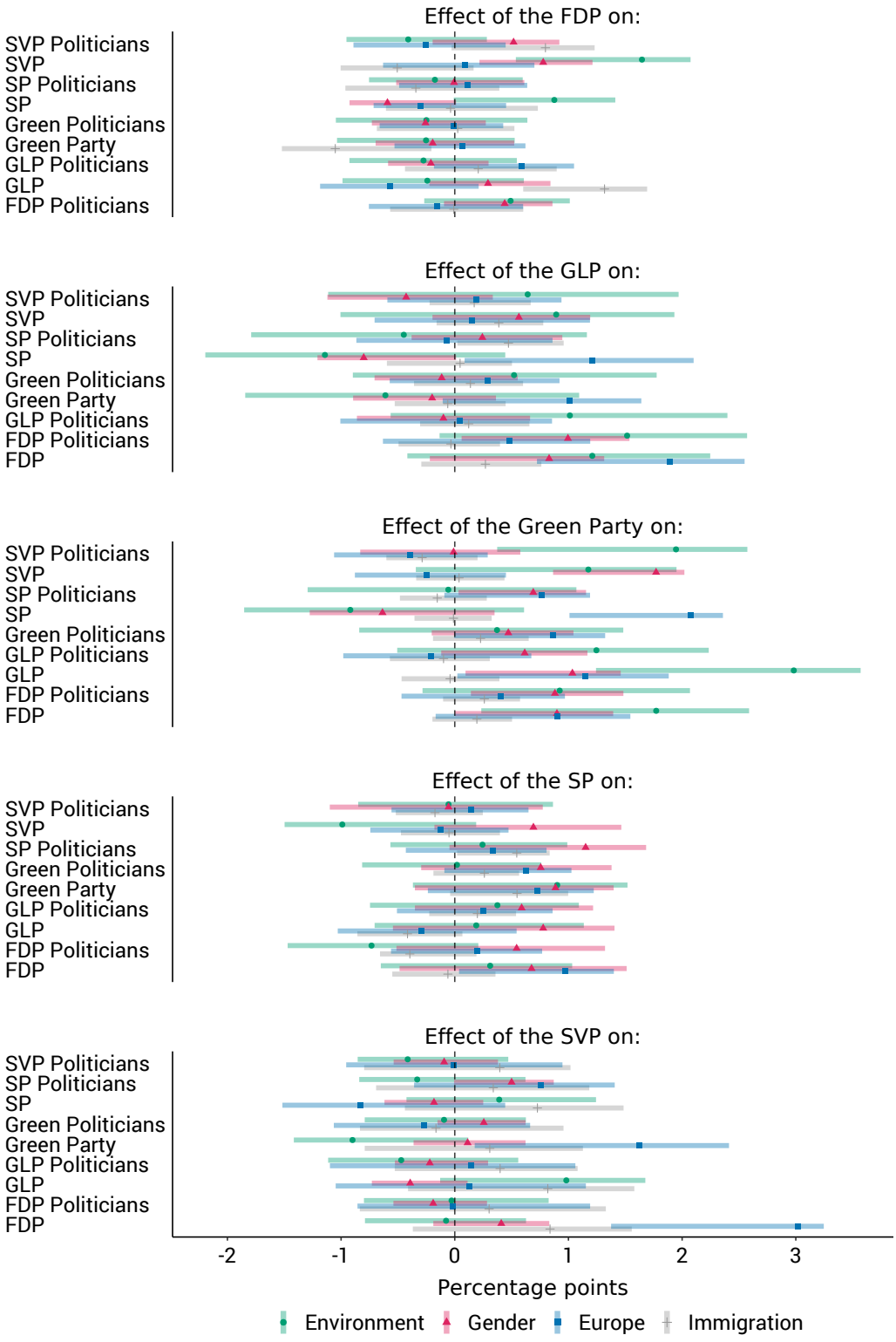

Figure A6: *Agenda responsiveness of parties and politicians in detail. Bars denote 95% confidence intervals.*

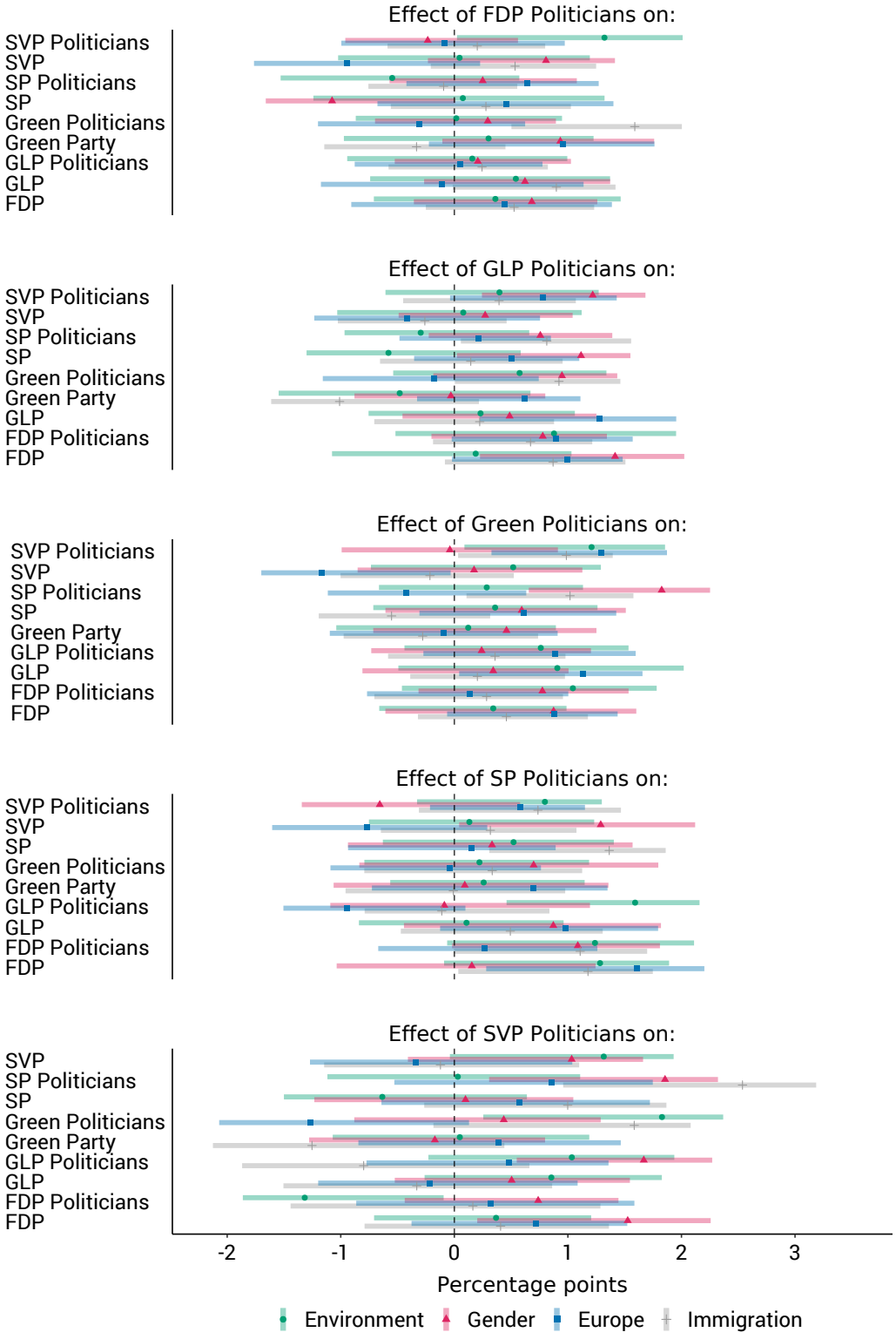

Figure A7: *Agenda responsiveness of parties and politicians in detail. Bars denote 95% confidence intervals.*

H Newspaper Articles by News Outlet

Table A5: Number of Articles per Newspaper.

Newspaper	Total	Daily Average	Daily min	Daily max
20 minuten	169096	232.59	25	394
24 heures	112920	155.32	33	342
Aargauer Zeitung	62511	124.77	8	421
Agefi	20394	46.04	1	81
Anzeiger von Uster	2015	3.35	1	13
Appenzeller Zeitung	50412	97.51	60	172
Arcinfo	18120	56.98	27	162
Basellandschaftliche Zeitung / MLZ	28894	71.34	17	180
Basler Zeitung	88083	121.16	4	284
Berner Oberländer	32681	78	51	103
Berner Zeitung	117047	162.34	1	251
Bieler Tagblatt	35655	58.93	38	118
Bilanz online	2259	4.39	1	12
Blick	28428	47.07	15	95
Blick am Abend	9501	38.62	26	53
Bote der Urschweiz	47539	80.03	34	153
Bündner Tagblatt	32947	54.46	23	86
Cash Online	108829	149.7	17	308
Coopzeitung	12272	113.63	2	184
Das Magazin	1324	14.24	5	23
Der Bund	91732	126.18	15	196
Der Landbote	43482	72.11	51	106
Die Weltwoche	5959	60.81	49	122
Die Wochenzeitung	3625	38.16	31	59
Finanz und Wirtschaft	21853	34.85	1	83
Freiburger Nachrichten	31204	52.18	12	93
Furttaler	3692	35.5	17	59
GHI	2479	26.66	1	49
Glattaler	2756	27.29	15	49
Glückspost	8283	82.01	71	95
Handelszeitung	15471	22.95	1	114
Infosperber	2064	2.85	1	7
Journal de Morges	5	1	1	1

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Table A5: Number of Articles per Newspaper

Newspaper	Total	Daily Average	Daily min	Daily max
L'Illustré	4399	42.3	5	82
La Broye	6687	68.23	38	96
La Liberté	49594	82.79	1	115
La Tribune de Genève	109	54.5	50	59
Le Journal du Jura	31444	51.97	1	93
Le Matin	76874	106.18	3	191
Le Matin Dimanche	11029	106.05	64	170
Le Nouvelliste	35871	59.98	26	133
Le Temps	28951	48.33	25	99
Limmattaler Zeitung / MLZ	32286	64.57	9	160
Luzerner Zeitung	32277	107.23	58	294
Medienwoche	325	1.52	1	3
Migros-Magazin	11920	113.52	71	155
Neue Zürcher Zeitung	53738	89.12	50	133
Nidwaldner Zeitung	44192	86.99	51	149
NZZ am Sonntag	12705	122.16	82	175
Obersee Nachrichten	3684	37.59	20	58
Obwaldner Zeitung	44537	87.33	51	176
Oltner Tagblatt / MLZ	23753	47.6	5	114
Ostschweiz am Sonntag	5662	72.59	56	86
Rümlanger	2697	25.93	7	53
Schweizer Bauer	15563	77.82	51	118
Schweizer Familie	3338	34.77	24	60
Schweizer Illustrierte	5122	49.25	29	93
Seetaler Bote	6225	61.03	19	129
Solothurner Zeitung / MLZ	40606	81.21	27	222
Sonntagsblick	9953	95.7	71	176
SonntagsZeitung	9656	92.85	72	121
srf.ch	87940	120.96	37	291
St. Galler Tagblatt	69586	115.4	66	259
Südostschweiz	47385	78.32	33	136
swissinfo.ch	8334	11.46	1	36
Tagblatt der Stadt Zürich	4777	45.93	32	63
Tages-Anzeiger	101371	139.44	33	205
TagesWoche Online	2063	6.55	1	18
Thurgauer Zeitung	72748	120.24	77	257

Continued on the next page…

Table A5: Number of Articles per Newspaper

Newspaper	Total	Daily Average	Daily min	Daily max
Toggenburger Tagblatt	49407	95.94	56	174
Tribune de Genève	104945	144.35	27	308
Urner Zeitung	44060	86.56	28	160
Volketswiler	1073	10.62	1	38
Walliser Bote	43290	72.39	1	105
watson.ch	36923	50.79	21	106
Werdenberger / Obertoggenburger	41445	68.73	38	130
Willisauer Bote	14363	70.06	26	127
zentralplus	16619	22.92	1	80
Zentralschweiz am Sonntag	9285	119.04	81	211
Zofinger Tagblatt / MLZ	35812	71.62	14	180
Zuger Zeitung	47238	92.81	56	173
Zürcher Oberländer	42921	71.18	41	107
Zürcher Unterländer	38886	64.49	42	93
Zürichsee-Zeitung	48959	81.19	53	123