Cultivating the art of hearing and being heard: how regulators strategically use public communication in regulatory governance

Müller, M.

Chapter 4

Spreading the word?
European Union agencies and social media attention

A version of this chapter has been published as:

Müller, M. (2022). Spreading the word? European Union agencies and social media attention. *Government Information Quarterly*. 39 (2): 101682

Introduction

Public communication and the speedy dissemination of information are key aspects in regulatory affairs, as regulatory risks and outcomes might directly or indirectly affect the public (Pildes and Sunstein 1995, 105). For instance, during the 2020 Covid-19 pandemic, EU public agencies such as the European Centre for Disease Prevention and Control played a key role in informing the public about current developments and in providing accurate and timely information (even more so in the face of online misinformation). In this effort, agencies are faced with a recurring challenge: making sure that their information does not remain unnoticed and actually reaches the public. The institutions of the European Union are no strangers to this problem and have been historically criticized for a lack of communication with the public. Already in the early stages of the union, the EU Commission has been accused of "alleged arrogant detachment from the public in particular" (J. Lodge 1994, 343) and from policy-making behind closed doors (Héritier 2003). The EU considers its public agencies as key players in addressing this perceived communication deficiency, as it states in an official publication: "*The European Union agencies play a key role in implementing EU policies and contribute to the EU's overall visibility and image. For many agencies, external communication is a core task. Only through communication activities can they relay information and research-based evidence on specific issues, trends and challenges which relate to EU policy and its implementation, to inform policy makers and the public*" (European Commission 2013, 1).

The emergence of social media has sparked optimism amongst EU organizations that these channels will contribute to a closer connection between public organizations and the public (Brainard and McNutt 2010; Bonsón et al. 2012; Mergel 2013a; Bertot et al. 2012; European Commission 2018). However, a little over a decade after public institutions took their first steps on social media, research on the matter points towards a rather unsuccessful use of such technologies in western democracies (Brainard and McNutt 2010; Sandoval-Almazan and Gil-Garcia 2012; Theocharis et al. 2016; Grimmelikhuijsen and Meijer 2015). A key problem identified in this line of research is what could be called the 'presence-attention gap' on social media: Whilst many public institutions are *present* on social media, they receive relatively little *attention* on these platforms. For instance, when examining the social media presence of the Dutch police force, Grimmelikhuijsen and Meijer state that their findings "[…] debunk the idea that Twitter heralds the dawn of an age of frequent interactions between citizens and government

organizations" (2015, 604). They find that only a small fraction of citizens gets information on governmental affairs via social media when compared to other news sources.

Whilst the political science and public administration literatures offer nuanced explanations of how public organizations defend their reputation against external threats, we know relatively little about the audiences that these organizations target (Boon, Verhoest, et al. 2019). In addition, much of this scholarly work has focused on organization- and environment-specific cases, which makes it difficult to compare findings across organizational contexts (Ibid.). We know very little about determinants of the size of a public agency's social media audience and whether the organization can influence the size of its attentive public through the way it communicates. Recently, the public administration literature has recognized the potential of social media to engage the public in governmental matters and connect citizens closer to the state (Mossberger et al. 2013; Mergel 2013b; Zavattaro and Sementelli 2014). Specifically, it has started recognizing the struggle of social media to live up to the expectations regarding citizen engagement – for instance, due to inherent biases in the technology (Feeney and Porumbescu 2021) or because public organizations are not harvesting the potential of the technology and rather use it as 'just another media outlet' for information dissemination (Gunawong 2014; Feeney and Welch 2014). Even stronger, some scholars argue that in its current shape, social media entrenches existing power asymmetries and deteriorates rather than improves communication between governments and citizens (Piccorelli and Stivers 2019). In this regard, much criticism relates to the underutilization of the engaging potential of social media platforms (Grimmelikhuijsen and Meijer 2015; Gunawong 2014).

We, therefore, have to wonder whether public organizations' use of social media can live up to the expectations that were raised more than a decade ago and whether a more effective tapping into the engaging potential of social media can indeed increase the visibility of public organizations on social media platforms. While there are many subcomponents of this question, this research sets out to answer one of the most fundamental aspects: *What determines how much attention public agencies receive on social media?* It is important to examine this question, as we currently do not know if public organizations adequately utilize social media, and if how they use it shapes their ability to reach out to the public. From the perspective of public agencies, it is important to know if they are the architects of their fortune and

therefore can pursue specific social media strategies to increase their impact, or if their success on social media is determined by factors that are largely outside of the agencies' power.

Based on bureaucratic reputation and public communication research, we derive two sets of explanatory factors that can potentially contribute to an agency's attention on social media. The first set of explanations relates to institutional factors such as policy field and legal mandate of an agency. Another set of explanatory factors emphasizes the importance of how public organizations communicate on social media. The question is empirically examined through the study of the 39 Twitter accounts of regulatory and non-regulatory EU agencies (appendix C). This is the full population of the EU's decentralized and executive agencies present on Twitter (as of October 2019). Using a novel machine learning method to classify agencies' using Google's BERT language learning algorithm with an accuracy close to human performance and manually constructing a database of various explanatory factors, we test the determinants of social media attention of the agencies.

This article contributes to existing research about whether and how communication through social media channels impacts the way that the public perceives public organizations (Mergel 2017; Kagarise and Zavattaro 2017; Mergel 2013b). From a practitioner perspective, it illustrates a sound and straightforward way for public organizations to better estimate 'who they are talking to' and how their communication strategies might result in tangible engagement outcomes. The theoretical and empirical contribution of this article is threefold. Firstly, it extends ongoing research on agency communication by directly measuring the effect of different communication strategies on the demand-side: the audiences (Rimkutė 2019). Secondly, by examining if the information disclosed on social media is noticed by a larger audience, it contributes to the literature examining the spread of governmental information to mitigate risks and support policy implementation (Pildes and Sunstein 1995). Lastly, this work complements emerging research on the determinants of audience attention (Boon, Verhoest, et al. 2019; Boon, Salomonsen, et al. 2019) and links this line of research more strongly to social media studies (Mergel 2017).

Attention on social media

In the face of information overload, attention from mass audiences has become the new scarce resource in the media system (including traditional news sources) that actors in the media sphere compete for. The

ability to secure media attention has been understood to be "mostly advantageous" for an actor (Vliegenthart et al. 2005). In this struggle for attention, "media organizations and platforms vie for eyeballs, as do the issues, actors, causes, and factions that make up our civic and political sphere" (Zhang et al. 2018, 3163). Media attention has been shown to impact agenda-setting and rulemaking in the policy process and is therefore instrumental for regulatory organizations (Boydstun 2013; Wolfe et al. 2013; Jones and Baumgartner 2012). Public attention has been a difficult concept to measure, it has often been conflated with the notion of mass media coverage (Zhang et al. 2018). However, this proxy measure only quantifies the amount of attention that media organizations *dedicate* to a certain actor or issue, and provides no insight into attention the audiences these organizations are trying to reach.

With the beginning of the scientific study of social media dynamics, scholars have started to untangle the differences between media coverage and audience attention. Social media makes it possible to study how much attention actors pay to various topics – for instance by looking at the content of an actor's social media posts (Waters and Jamal 2011). This approach is very much in line with the traditional conceptualization of media attention as 'how much attention does media actor X pay to topic Y'. What sets social media apart from traditional media is that it enables scholars to look at the other side of the "attention game" in a different way – that is, how much attention social media *audiences* pay to an actor or a topic. For instance, Barbera et al. (2019) show that political elites' attention to topics on Twitter follows rather than leads the amount of attention their audiences are paying to the same issues. Likewise, Halpin et al. (2020) assess which specific audiences advocacy groups target on Twitter, distinguishing between elite, peer and mass audiences, and analyze the extent to which these audiences actually engage with these groups on this social platform.

Social media attention – here defined as the amount of attention that mass audiences pay to topics or actors on social media – therefore exhibits an audience-based approach to examine media attention. Platforms such as Twitter provide a wealth of different metrics that measure various aspects of attention. They can be broadly separated into two categories: long-standing and temporal attention (Van Aelst et al. 2017). Long-standing attention measures an actor's constant audience, that is how many other social media actors are interested in receiving updates from this actor on a continuous basis. On Twitter, an actor with many followers can be assumed to be impactful in the long run, as each one of the messages

that this actor posts can be visible to their permanent audience. This long-standing attention is often related to the general public salience of an actor, as individuals such as "[…] famous politicians can reach a large crowd on Twitter, even without being particularly active or innovative users" (Van Aelst et al. 2017, 719).

In contrast, temporal attention speaks to the engaging nature of social media and relates to how much attention individual messages of actors receive. If messages are well constructed and relevant to certain audiences, they may spread through the social media network beyond those constant audience networks that devote long-standing attention to the organization (i.e., subscribe or follow the actor's account). Users can share (i.e., retweet) messages they see within their own networks and therefore help to disseminate important information. For instance, social movement research has shown that 'peripheral actors' - actors on social media that are relatively inactive and have few followers - are essential to spread important news about social protest movements (Barberá et al. 2015). This implies that individual messages can be carried by the overall social network that spreads beyond an individual actor's or organization's direct followership.

Analytical framework: How organizational features influence social media attention

Both long-standing and temporal attention matter for public agencies, as they benefit from both having a large steady audience that they can engage with constantly, and being able to spread important news quickly and widely through a wider online network. The literatures on regulatory governance and public communication offer two different sets of possible explanations of variation in public agencies' long-standing and temporal social media attention. The first group focuses on institutional factors that could explain how important the public considers an agency to be and in turn if it is 'follow-worthy'. The second group stipulates that the style in which an agency publicly communicates influences how much attention this organization will receive. Whilst hypotheses on long-standing attention refer to factors that influence the size of the steady audience of an agency (e.g., the number of followers on Twitter), the hypotheses on temporal attention refer to how the same factors influence how much attention individual messages (e.g., individual tweets of an agency) receive. Since there is to our knowledge no comparable

research on how these factors would determine long-standing and temporal attention independently, we will formulate separate hypotheses for both types of attention in this section.

The regulatory governance and bureaucratic reputation literatures argue that how a public organization is set up (competencies, legal mandates, etc.) and the type of policy field in which it is active determines how an agency operates, how it communicates, and which stakeholder populations it is likely to addresses (Arras and Braun 2017; Beyers and Arras 2019; Leech et al. 2005; Carpenter and Krause 2012; Boon, Verhoest, et al. 2019). Research on EU agencies has shown that regulatory agencies – agencies that have a mandate that allows for rule-making, evaluation, or sanctioning powers in the implementation of EU policies (Font and Pérez Durán 2016; Kelemen 2002; Hanretty and Koop 2012) – are more independent from political supervisors than their non-regulatory counterparts (Wonka and Rittberger 2010). Whilst non-regulatory agencies are concerned with 'fitting in' the existing regulatory institutional environment and contributing to the policy process through efficiency-increasing measures, regulatory agencies are responsible for enhancing the credibility of a policy commitment (Majone 2001). This difference is also reflected in the way in which the agencies communicate through their regular communication channels. Regulatory agencies emphasize technical, procedural, and moral aspects of their organization, whilst non-regulatory agencies tend to refer more to performative aspects, for instance through showcasing and promoting regulatory outputs (Rimkutė 2020). Additionally, regulatory agencies (in particular EU agencies) tend to employ more tools to involve non-state stakeholders and could therefore be expected to put more resources into social media activities than non-regulatory agencies (Arras and Braun 2017)

This expectation becomes even more pronounced when considering the particular supranational legal environment in which EU agencies operate. Although EU regulatory agencies have far-reaching regulatory responsibilities, they also face legal restrictions when compared to their national counterparts, especially coercive powers (Chiti 2013). This in turn has been theorized to lead these agencies to adopt a much more information- and persuasion-based approach to regulation than their national counterparts (Majone 1997). Since these agencies rely more heavily on convincing the broader public, we assume that regulatory agencies aim to reach a wider audience than non-regulatory agencies.

H1a (long-standing attention): *Regulatory agencies receive more long-standing attention on social media than non-regulatory agencies.*

H1b (temporal attention): *Messages of regulatory agencies receive more temporal attention on social media than those of non-regulatory agencies.*

We know that EU agencies working in the field of social policy follow different communication patterns than those working on economic policy (Rimkutė 2020). The impacts of the activities of social policy agencies can be felt in a very direct way: since they are required to protect consumers in the EU from personal damages (e.g. food policy, environmental policy), they need to show that they can craft policies that are based on sound scientific evidence and therefore heavily depend on good and reliable public communication (Majone 1997). In contrast, economic regulators usually work on more abstract topics that are difficult to convey to a broader audience. Zingales (2013, 124) argues that "[t]he regulated are also perhaps the primary audience of the regulators, as taxpayers and citizens more generally have much less incentive to monitor regulation, and generally remain ignorant". We can therefore expect that agencies active in the field of social regulation will be more interesting to follow on social media than those working in the field of economic regulation.

H2a (long-standing attention): *Agencies active in social policy receive more long-standing attention on social media than agencies concerned with economic policy.*

H2a (temporal attention): *Messages of agencies active in social policy receive more temporal attention on social media than those of agencies concerned with economic policy.*

The last hypothesis related to organizational features draws a somewhat pessimistic picture about the possibility of social media to elevate the visibility of organizations in the public eye. Some research suggests that the visibility of actors on social media broadly resembles the degree of visibility they have in more traditional media venues such as the news media. For instance, Gerhards and Schäfer (2010) show that the online presence of actors dealing with a particular issue was mostly similar to their presence in traditional news coverage. Other studies show that actors that are already visible in other news coverage will be much more likely to gain high visibility on social media (for interest groups, see Hong and Nadler

2016; for political parties, see Klinger 2013). This literature, therefore, suggests that social media attention of public agencies might be directly related to the attention they receive in traditional media

H3a (long-standing attention): *Agencies' long-standing social media attention is positively associated with their salience in traditional news media.*

H3b (temporal attention): *Temporal attention to messages of agencies is positively associated with their salience in traditional news media.*

How communication features influence social media attention

In addition to organizational characteristics, the public communication and e-government literatures offer another group of explanatory factors for social media attention, namely how governmental organizations communicate. This work demonstrates that how a governmental actor uses social media can greatly influence the attention and reaction of the public. Zavattaro and Sementelli (2014) show that citizen uptake rates are still low despite the public organizations offering online participation tools. Governmental actors, therefore, have to choose if they want to remain passive and neutral, or if they want to encourage more frequent communication with citizens via social media (Bonsón et al. 2017; Bryer and Zavattaro 2011). Mergel (2013) demonstrates that a more engaging way of addressing the public can indeed yield positive payoffs for public organizations: Encouraging citizens to share ideas on municipal issues on social media does not only increase citizen engagement but also increases individual's willingness to collaborate with the government.

Drawing on work by Haro-de-Rosario et al. (2018) and Grimmelikhuijsen and Meijer (2015), we argue that public communication that focuses on operational information (e.g., stating what the agency currently works on) will be less popular and therefore less widespread than information that is engaging or inspiring for the reader (e.g. a call for action). This seems to imply that a more interactive and engaging way of communicating can yield better and closer communication of governments with varying groups of stakeholders amongst the population. Grimmelikhuijsen and Meijer (2015, 599) fittingly state that "[g]overnments that only use social media to deliver messages to citizens and never ask for feedback or react to comments or posts from citizens limit their ability to communicate". It has been argued that various kinds of engaging messages can increase engagement with the audiences and might draw their

attention. For instance, sharing someone else's message has been argued to create "message ties" with the message originator (Saxton and Waters 2014; Guo and Saxton 2018). Other types of messages employ the bi-directional nature of social media that allows for interactions between the audience and the agency and try to motivate audiences to become active (Wukich and Mergel 2015; in a different context also described by Grimmelikhuijsen and Meijer 2015 and Theocharis et al. 2016) or capture their interest in other ways (Naaman et al. 2010; Saxton and Waters 2014). We therefore assume that interactive ways of communicating will attract more social media attention.

H4a (long-standing attention): *The share of interactive messages published by an agency is positively associated with its level of long-standing attention.*

H4b (temporal attention): *Temporal attention to messages of agencies is positively associated with the use of interactive language.*

Research design

Context

We examine these hypotheses based on a study of EU agencies' communication via the social media platform Twitter. The EU agency population is a relevant object to study in this context for several reasons. Firstly, the wide variety of agencies in the EU enable us to observe attention dynamics across organizational contexts. Whilst in-depth studies of single public organizations might provide a more detailed picture of social media interaction, the external validity of such studies is limited (see Boon, Verhoest, et al. 2019 for a similar argument). In contrast, this case allows us to observe effects across policy areas and legal mandates of the organizations. Importantly, the EU is not a case that directly compares to national (or regional) governments, as the citizens typically feel more attached to their cities and country than the European Union (European Commission 2021, 154–160). It can be expected that it is more difficult for EU agencies to gain attention from a wider audience on social media than for their national counterparts. Still, if EU agencies deploy strategies that secure public attention, these approaches also seem likely to work, and perhaps work even better, in more favorable national contexts.

Secondly, we have selected public agencies since they are particularly dependent on reaching key audiences. Social media attention can be crucial for these organizations, for instance when regulators have

to issue product warnings, have to relay important information to the public during environmental or health disasters such as earthquakes or pandemics, or would like to receive input from specialist communities (Kuran and Sunstein 1999; Pildes and Sunstein 1995). Social media might therefore provide a good platform for these organizations to transfer information to targeted audiences or the wider public, depending on the specific context. Furthermore, different public agencies might sometimes compete for similar mandates and responsibilities and often rely on public backing to secure legal, political, and financial support (Wilson 1989; Busuioc 2016). The ability to reach a large audience as well as targeted communities, and highlighting their competencies and abilities, is important for communication officials within these organizations, as it, in the long run, can also ensure the survival of their organization (Gilad and Yogev 2012).

Studying the agencies' presence of Twitter specifically, as compared to other social media platforms such as Facebook or Instagram, provides multiple advantages. Despite justified concerns about the biased nature of Twitter, much recent work demonstrates that this platform is a very suitable environment to study human and organizational communication behavior. Firstly, all large governmental organizations are present on the platform (particularly in the EU case), whilst only certain organizations have active social media presences on other platforms. Furthermore, they are more likely to communicate key issues via Twitter compared to other social media platforms such as Facebook or Instagram, and these issues have demonstrated to mirror their issue priority in other venues (Casas and Morar 2019). Issues discussed by individuals on Twitter also seem aligned with issues that are salient among the overall population (O'Connor et al. 2010). From a practical standpoint, Twitter allows researchers to examine social media communication on a more granular level than other social media platforms. We will discuss the relevant implications and limitations of relying on social media communication in the conclusion.

Data

This research is based on an extensive dataset collected via the Twitter API. Firstly, all official Twitter accounts of EU agencies that are present on the platform were collected via the website of the EU (European Union 2018). In total, we included 39 accounts of 38 agencies, as the European Food Safety Authority has two separate accounts on Twitter. We collected the most recent 3200 tweets of each agency (collected on October 16, 2019) as this was the maximum limit that the open-access Twitter API allows

to download (or less if the agency has posted less than 3200 tweets).[12] This resulted in a dataset of 91168 agency tweets. Tweets that were not formulated by the agencies (i.e., retweets of other accounts) and non-English tweets were removed, after which 53865 tweets remained in the dataset. The dataset was enriched with data on characteristics of each of the sampled agencies that were collected via desk research. Eventually, the dataset contained each of the agencies, their institutional characteristics, and their communication behavior. The next paragraphs clarify details on these characteristics.

Operationalization

Dependent variables: Long-term and temporal social media attention

As outlined above, we test the impact of the possible determinants on both long-term and temporal attention. Unifying the measure of attention into one variable might blur differing effects of explanatory factors on specific types of attention. The analyses on long-standing attention are run on the agency account level (n=39), whilst the analyses on temporal attention are run on the agency tweet level (n=53865).

To measure the long-standing attention that an agency receives on Twitter, a *count of all followers* of the Twitter account was taken (as of June 15, 2019). The number of followers is seen as one of the key metrics to measure online attention as it reflects the user's primary audience (Bruns and Stieglitz 2014; Van Aelst et al. 2017). If a Twitter user follows another account, each of the followed account's messages (i.e., tweets) will appear in the follower's news feed. In comparison to other ways of paying attention on social media, following an account constitutes a way of paying attention for the long-term, as from the point of following onward each new message will be brought to the attention of the follower. Since the distribution is strongly right-skewed, the natural logarithm was used in the statistical models.

The *number of retweets* per message was used as a measure for temporal social media attention. If other social media users retweet messages of an agency, they help to increase the visibility of these messages within their follower networks. Retweeting increases the chances that a particular message will spread beyond an agency's follower network (Van Aelst et al. 2017). As each message might receive varying

[12] This limit has since been lifted by Twitter for authorized academic accounts. However, the common software packages in RStudio that are used for retrieving the tweets via the Twitter API have not implemented the limit removal at the time of writing.

levels of retweeting, this metric can be considered a measure of temporal social media attention. In this context, retweets were considered a more adequate measure compared to "likes" or taking the sum of likes and retweets. In the case of governmental affairs, likes do not necessarily signal attention. For instance, if a consumer safety authority issues a product warning for a children's toy and publishes the warning via their social media accounts, it is unlikely to receive many likes. In contrast, users are more likely to retweet the message to warn other users in their network.

Independent variables

The organizational (binary) variables *legal mandate (regulatory vs. non-regulatory)* and *policy field (social vs. economic)* for H1a/b and H2a/b are coded according to Rimkute's (2020) classification scheme. Regarding the legal mandate, regulatory agencies include all agencies that follow what Majone (1997) calls the "logic of 'regulation by information' (i.e., agencies in charge of information gathering, technical advice, standard-setting, or [quasi-]decision- or rule-making tasks), whereas nonregulatory agencies comprise those possessing executive and coordination tasks" (Rimkutė 2020, 395). Regarding coding the policy area, agencies that are involved in environmental, health, and broader safety and security issues were coded as social policy agencies, whereas agencies involved in safeguarding and supporting the European single market were coded as economic policy agencies. To obtain the information to code the agencies, we searched the websites of the agencies to determine their respective policy fields and legal mandates. *Media salience* (H3a/b) was calculated by using the number of search results that appear searching for each agency in the Factiva newspaper database for the years between 2014 and 2018 (including all news outlets).

The second group of variables taps into the varying communication strategies of the agencies on Twitter (testing hypotheses 4a/b). Whilst social media research occasionally mentions the positive effects of more interactive communication on government-citizen interaction (Grimmelikhuijsen and Meijer 2015), it is not disclosed what constitutes 'more interactive' in practice. This research will therefore adopt a reductionist approach and test two different types of messages that have been shown to increase audience engagement: *informational tweets* and *engaging tweets* (for examples, see table 2). Engaging messages ask the reader to become active in some way and have been shown in numerous ways to increase the likelihood that the addressed will engage with the content of the message (Wukich and Mergel 2015; in a different context also described by Grimmelikhuijsen and Meijer 2015 and Theocharis et al. 2016). Examples

include calls to action – for instance, to recycle more or to vote. Informational messages aim at making complex topics more accessible to the reader by pointing out interesting facts (for example about how to stay healthy) that are aimed to be interesting for a broader audience (Naaman et al. 2010; Saxton and Waters 2014).

For each yweet posted by the agencies, a supervised machine learning algorithm classified whether it was informational or engaging (after hand-coding a subsample of tweets). For the hypotheses on long-standing attention, the tweeting style had to be aggregated to the agency account level by calculating the share of each message type amongst the overall sent messages. To obtain the share, the numbers of informational and engaging tweets were divided by the number of overall tweets posted by the agencies.

Lastly, several control variables were included: The models control for *staff size*, *agency budget*, *tweeting frequency,* and *Twitter account age*. Staff size (in FTEs) and budget values were collected via desk research and refer to the latest known values, either from 2016 or 2017. Both control for the possibility that those agencies with more staff and budgetary resources can spend more time on social media activity and therefore increase their visibility. Tweeting frequency was calculated by averaging the number of tweets each agency had posted per month within the last three months before data collection (the data were collected in October 2019). It controls for the option that agencies that communicate more often create more possibilities to be seen by other Twitter users and subsequently be followed by them. Twitter account age is the number of days since each agency has created their account on Twitter until the date of data collection (for simplicity taken to be October 01, 2019). This variable controls for the possibility that agencies that have been on Twitter earlier simply had more time to build up a followership.

Table 4-1: Independent Variables

Measure	Description	Source
Staff size	FTEs of the agency; control variable	Annual budget declarations, agency websites
Budget	Annual budget of each agency; control variable	Annual budget declarations, agency websites
Media salience	Number of newspaper articles that appear when using the agency name as a search term on the Factiva newspaper database for the time from 01/01/2014-01/01/2018	Factiva
Legal mandate	Responsibility for regulatory or non-regulatory tasks	Coded based on Rimkute (2019) coding scheme, verified by checking agency websites.
Policy field	Responsibility for economic or social policy	Coded based on Rimkute (2019) coding scheme, verified by checking agency websites.
tweeting frequency	Average number of posted tweets per month	Twitter
(Share of) informational tweets	(Percentage of) tweets that have an informational character	Twitter, machine learning classification of Tweets
(Share of) engaging tweets	(Percentage of) tweets that have an engaging character	Twitter, machine learning classification of Tweets
Age	Age of each agency Twitter account in days until October 1, 2019.	Twitter

Classification of agency tweets

This research used a machine learning classifier to automatically classify the tweets of agencies according to whether they are informational or engaging in nature (or none of these two options). Using machine learning techniques is increasingly common in public administration and political science research and has also been applied to agency communication (Anastasopoulos and Whitford 2018; Hollibaugh 2018; Loftis and Mortensen 2020). A subset of account descriptions and agency tweets was hand-coded into different classes (see table 2) and then automatically classified by the Bidirectional Encoder Representations from Transformers (BERT) algorithm (Devlin et al. 2018) provided by Google AI (for detailed information on how BERT operates, see appendix B). BERT is a language model that is based on some of the most recent developments in natural language processing and outperforms many of the standing benchmarks

in language recognition and text classification. It is therefore well suited for application in this research context.

Amongst the over 91000 tweets of the EU agencies, 1000 were randomly sub-sampled and hand-coded whether they belonged to one or two of the non-exclusive tweet categories (for coding examples, see table 2). Tweets were classified as engaging if they encouraged the reader to become active, either in everyday life or by participating in events and venues of the agency. They were coded as informative if they contained general information, quick facts, or recommendations from the general policy field of the respective agency. These tweets do not necessarily have to refer to ongoing policy processes but can also have a more general character (e.g., a health agency posting about how to live a healthier life).

[Table 2 here]

After training the machine learning classifier with the hand-coded data, the whole dataset was automatically classified on an external server (as the operation is computationally demanding). Details on text pre-processing, model training, and model evaluation can be found in a detailed step-by-step appendix (B). We conducted validity tests by manually verifying 200 of the classified tweets. This test showed that the classifier reached an F1-scrore of 96.77% for informational tweets and 95.65% for engaging tweets. Both can be considered as extremely reliable outcomes (for performance metrics, see appendix A).

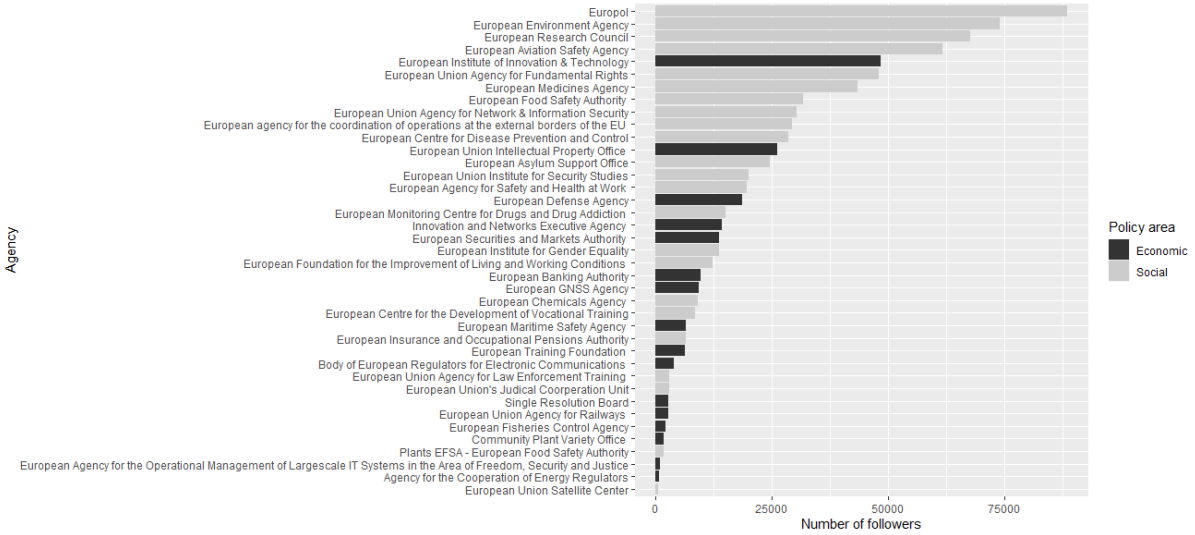
Results

This section will first provide a concise general overview of audience size and communication behavior of EU agencies on Twitter. Subsequently, we present the statistical analyses required to evaluate the hypotheses.

The characteristics of social media attention

In line with previous studies on media attention (Boydstun 2013; Jones and Baumgartner 2005), we see a highly skewed distribution of both long-standing and temporal social media attention to varying agencies. As shown in Figure 1, the five agencies with the most followers (Europol, EEA, ERC, EASA, EIT) attract more followers (i.e., long-standing attention) than the remaining 33 agency accounts in the sample

combined (for the key metrics of the dataset, including a list of agencies and classification results, see appendix C).



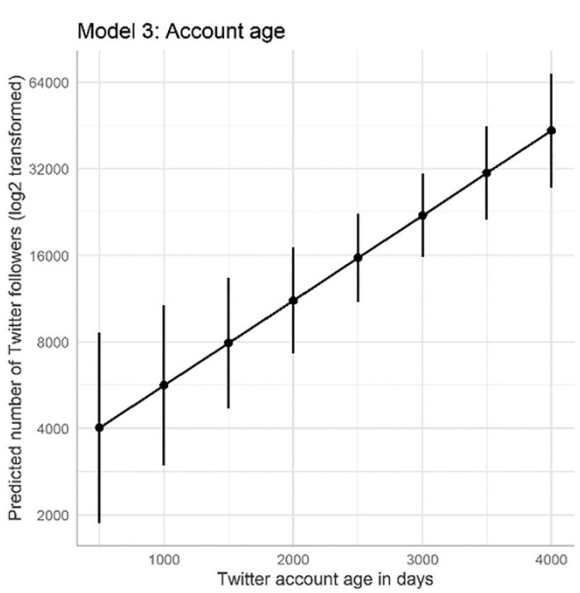
Which agencies attract long-standing attention on social media?

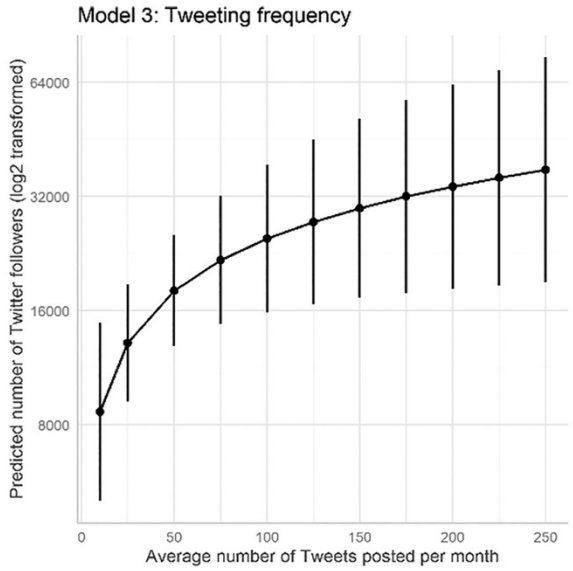
Since the first dependent variable (number of followers) is a logged continuous variable, using a linear regression model is adequate. We tested the models for any violations of linear regression assumptions (i.e., linearity, homoscedasticity, skewness, and kurtosis). The dataset does also not suffer from multicollinearity. The explanatory variables were assessed across 3 different models: Model 1 tests organizational variables and model 2 tests communication variables. Due to the (naturally) low number of observations, we used a method of variable selection that would allow us to provide enough observations per tested independent variable. We built a third model that retained those variables from model 2 that would contribute the highest relative explanatory power to the model, using a method first proposed by Lindeman, Merenda, and Gold (1980, 119ff). Three variables contribute a majority of the explanatory power to model 2 and from a theoretical side also serve well to explain the number of followers of an account and have therefore been added to model 3. Although our models are naturally confronted with the small population size, the significant effects remain robust across all models they are included in and effect sizes remain stable, suggesting that the findings are quite robust. The adjusted R^2 – which in contrast to multiple R^2 controls for the number of independent variables in a model - values range between 0.55 (model 1), 0.6 (model 2), and 0.62 (model 3), suggesting that model 3 is best able to explain the variation in the dependent variable.

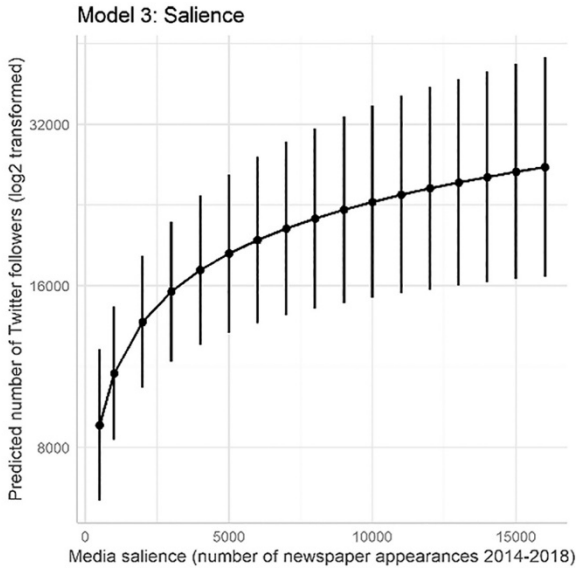
Model 1, 2, and 3 suggest that the size of an agency's social media followership, that is the long-standing attention, is influenced by the media salience of the agencies (H3a confirmed). The more salient an agency is in the news media, the larger this agency's audience tends to be on social media. The policy field and the legal mandate are not significantly related to the size of the social media followership (H1a and H2a rejected). Lastly, how the agencies communicate does not seem to have a large influence on whether they can reach a broader public (H4a rejected). Other significant variables are the Twitter account age and the average tweeting frequency, both of which are positively associated with the size of the followership. The marginal effects plots in figure 2 demonstrate the size of the significant effects in relative terms. Account age by itself provides a lot of explanatory power to predict followership size, as an exclusion of the variable leads to a drop of the adjusted R^2 to .35 - .40 (model 1 and model 3 respectively).

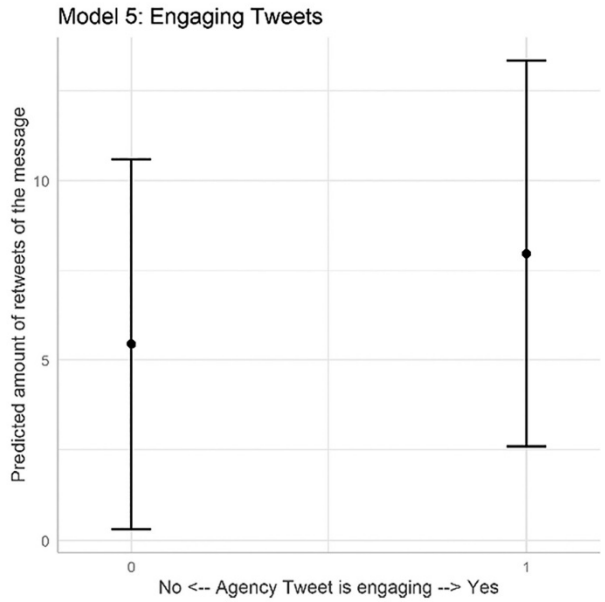
Model results (1-3)

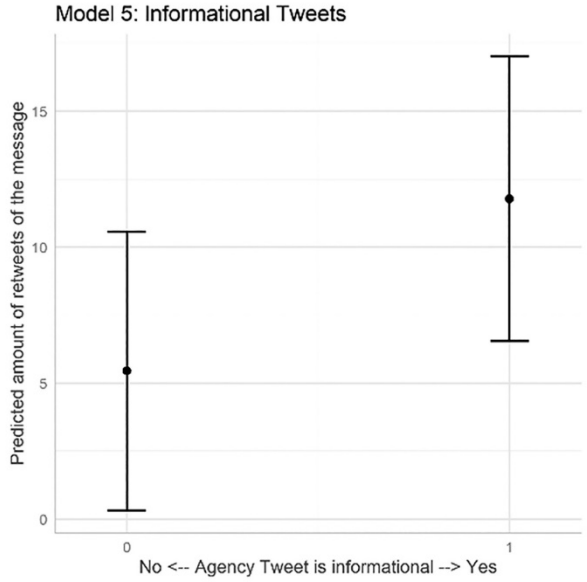
	Dependent variable:		
	log(followers)		
	(1)	(2)	(3)
Staff	-0.00005 (-0.002, 0.002)	-0.0005 (-0.003, 0.002)	
Salience (log)	***0.284** (0.058, 0.511)***	***0.291** (0.059, 0.522)***	***0.319*** (0.162, 0.477)***
Budget	0.003 (-0.002, 0.007)	0.003 (-0.002, 0.007)	
Policy field (ref:economic)	0.420 (-0.232, 1.073)	0.337 (-0.341, 1.016)	
Legal mandate (ref:non-regulatory)	-0.246 (-0.844, 0.352)	-0.183 (-0.774, 0.408)	
Account age	***0.001*** (0.0004, 0.001)***	***0.001*** (0.0003, 0.001)***	***0.001*** (0.0004, 0.001)***
Share of informational tweets		0.523 (-2.251, 3.297)	
Share of engaging tweets		2.087 (-3.950, 8.124)	
Tweeting frequency (log)		***0.386** (0.034, 0.737)***	***0.457*** (0.135, 0.778)***
Constant	4.966*** (3.397, 6.534)	3.715*** (1.895, 5.536)	3.448*** (1.899, 4.998)
Observations	39	39	39
R^2	0.620	0.694	0.651
Adjusted R^2	0.549	0.599	0.622
Residual Std. Error	0.896 (df = 32)	0.845 (df = 29)	0.820 (df = 35)
F Statistic	8.710*** (df = 6; 32)	7.296*** (df = 9; 29)	21.807*** (df = 3; 35)
Note:			*p<0.1**p<0.05***p<0.01

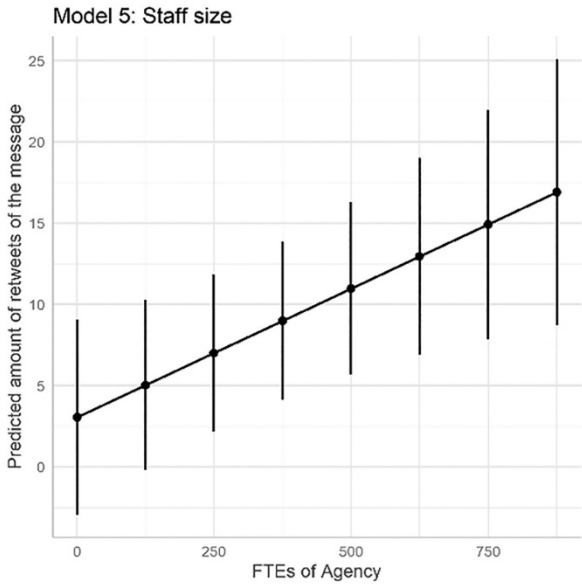

Model 3: Account age
Predicted number of Twitter followers (log2 transformed)
64000
32000
16000
8000
4000
2000
1000
2000
3000
4000
Twitter account age in days


Model 3: Tweeting frequency
Predicted number of Twitter followers (log2 transformed)
64000
32000
16000
8000
0
50
100
150
200
250
Average number of Tweets posted per month


Model 3: Salience
Predicted number of Twitter followers (log2 transformed)
32000
16000
8000
0
5000
10000
15000
Media salience (number of newspaper appearances 2014-2018)


Model 5: Engaging Tweets
Predicted amount of retweets of the message
10
5
0
0
1
No <-- Agency Tweet is engaging --> Yes


Model 5: Informational Tweets
Predicted amount of retweets of the message
15
10
5
0
0
1
No <-- Agency Tweet is informational --> Yes


Model 5: Staff size
Predicted amount of retweets of the message
25
20
15
10
5
0
0
250
500
750
FTEs of Agency

Which agencies attract temporal attention on social media?

Changing the dependent variable from long-standing attention to temporal attention presents a different picture of social media attention. Since the dependent variable treats individual tweets of agencies as the unit of analysis, the analysis applies a generalized linear mixed model with random intercepts for agency accounts (i.e., tweets nested in agency accounts). The models were built stepwise to ensure the best model fit (i.e., best nesting of variables) and it was found that the random intercept for agencies reduced the log-likelihood in comparison to a null model and other sensible model specifications. Model 4 includes organizational variables, whilst model 5 includes all variables under observation.

The two models show that organizational features do not explain how much temporal attention agencies receive for their tweets. Neither policy field, nor legal mandate or media salience are significant in both models (H1b, H2b, H3b rejected). Instead, communicational variables can explain how much attention the agency tweets receive. Across all agencies in the sample, tweets that use either informational or engaging language receive more retweets and therefore spread more within the Twitter network (H4b moderately confirmed). Model 5 suggests that the use of informational language increases the number of retweets of the message by 6.3 compared to the baseline, whilst engaging language increases retweets by 2.5. However, the effect is modest and 95% confidence intervals between tweets that use and do not use said language are overlapping (see marginal effects in figure 2). Amongst the control variables, we see that the staff size of the agencies seems to be positively associated with the number of retweets per posted tweet.

Model results (4-5)

	Dependent variable:	
	Retweet count	
	(4)	(5)
Staff	*0.017** (0.005, 0.029)*	*0.016** (0.004, 0.028)*
Salience (log)	0.726 (-0.783, 2.235)	0.656 (-0.829, 2.142)
Budget	-0.017 (-0.046, 0.012)	-0.017 (-0.045, 0.012)
Policy field (ref:economic)	3.261 (-0.873, 7.395)	2.543 (-1.535, 6.622)
Legal mandate (ref:non-regulatory)	-3.129 (-6.789, 0.531)	-2.707 (-6.305, 0.890)
Account age	0.0005 (-0.002, 0.003)	0.0003 (-0.002, 0.003)
Tweet is informational (ref: no)		*6.333*** (5.118, 7.547)*
Tweet is engaging (ref:no)		*2.518*** (0.834, 4.203)*
Tweeting frequency (log)		0.462 (-1.694, 2.617)
Constant	-2.750 (-13.921, 8.420)	-4.114 (-16.899, 8.672)
Observations	53,865	53,865
Log Likelihood	-288,064.200	-288,005.300
Akaike Inf. Crit.	576,146.400	576,034.500
Bayesian Inf. Crit.	576,226.500	576,141.300
Note:		*p<0.1**p<0.05***p<0.01

Discussion

The analysis shows that EU agencies receive drastically varying amounts of attention on social media. Across the whole agency landscape, attention is strongly skewed towards a small number of organizations that capture a majority of followers. The analysis shows that the amount of long-standing attention, that is the audience size of an agency on Twitter is largely determined by the amount of attention it receives 'in the real world' outside of Twitter. Regarding explanations of long-standing attention, only media salience could significantly explain the variation of attention across agencies: An agency that is salient in the news media will most likely gather more attention on social media. Agencies that do not receive much attention in the traditional media will find it difficult to gather a large audience on social media.

What agencies actually *do* on social media, how they communicate with their audience, does not seem to play an important role for how much long-standing attention they gather. This is very much in line with what Van Aelst et al. (2017) have stated regarding politicians' social media accounts: the amount of followers is often mostly determined by how prominent each politician is outside of the social media sphere and what they do on social media has no large impact on their audience size. None of the tested communication strategy variables are significant in the models that examine long-standing attention. Communication frequency does seem to play a minor role in how many followers an agency has, as well as the age of the account. While communication frequency does have a positive effect, the effect does decrease as the frequency of Tweeting goes up. Agencies that post very infrequently typically have less followers than those that post at an average frequency. However, the differences are less outspoken when comparing accounts with average communication frequency and those that particularly frequently, as frequent communicators do not have significantly more followers than average communicators. This finding dampens the hope that social media may provide a new venue for small public organizations to make their voices heard. If these organizations are not receiving attention in the 'old' media (i.e., traditional news media), they will most likely also not receive broader long-standing attention on social media.

Does this mean that how an agency communicates does not matter? Models 4 and 5 show that the opposite is true. When shifting the focus of investigation from long-standing to temporal attention, we find that communication styles can impact audiences' attention. The models show that across all agencies,

messages (i.e., tweets) that are informational or engaging are more likely to be shared within the social media network than messages that are not informational or engaging. The findings suggest that although the overall audience size (i.e., long-standing attention) of agencies is capped mostly by factors that lie outside of their control – such as account age and media salience -, individual messages can still spread through the network if they are well-crafted and make use of the interactive nature of Twitter. While we can only speculate about the reasons for the positive significant effect of staff size on temporal attention, these findings could further underline the positive effect of well-crafted social media communication on audience attention: Organizations with more staff potentially have more available human resources for public communication matters. Having more public servants in the communication departments of these agencies might, therefore, lead to better-designed communication. Of course, this interpretation is only speculative and should be tested by future research.

Conclusion

This research has demonstrated that social media has the potential to be a powerful public engagement tool for EU agencies. While it seems that the long-term attention for an agency is largely predetermined by its general news salience, account age, and tweeting frequency, the findings provide support for an engaging and interactive governmental use of social media. Only when messages are well crafted can social media live up to what the technology was designed to do: spread the word.

The results show that both long-standing and temporal attention vary substantially across agencies. The degree of usefulness of social media to engage with the public, therefore, differs considerably between the sampled organizations. The ability to "be heard" is crucial for many public agencies, since social media provide an easily accessible venue for both organizations and the public to exchange information. It is therefore important to understand what agencies can do to increase their engagement potential and how different communication strategies influence their visibility and followership on social media.

This research provides three interesting insights regarding this question. Firstly, long-standing attention to an agency on social media is predetermined by the salience of the agency in the traditional news media. An organization that is frequently discussed in the news media tends to have a larger Twitter followership than an organization that does not capture much news media attention. Secondly, the empirical findings

of this paper do not provide much support for the theory that the legal mandate or the specific policy area plays an important role in how much attention an agency received on Twitter. The findings suggest that social media attention is rather determined on an individual case-by-case basis and cannot be generalized along dimensions related to the specific policy area or legal mandate. Thirdly, the results show that agencies are usually not able to capture more long-standing attention (i.e., larger followership) through carefully crafted communication – besides the finding that regular communication leads to larger audience bases than very infrequent communication. However, certain communication styles such as informational or engaging tweets can increase the attention to *individual tweets* of agencies and facilitate the wider dissemination of these messages within the Twitter networks. These findings are promising from the perspective of agencies, as they align with findings from earlier research (e.g. Grimmelikhuijsen and Meijer 2015; Theocharis et al. 2016) that suggest that public organizations and political actors can reach a wider audience via social media if the technology is used more strategically. Given the relatively small effect sizes that we observed and overlapping confidence intervals, research should dive deeper into the question of how more effective communication can bring more engagement with public organizations' audiences.

These results have practical implications for both researchers and practitioners within agencies and other public organizations. For researchers in the field of governmental use of social media, it means that more research is required to understand what exactly allows public organizations to connect closer with their audiences. While much of the current research focuses on the intentions of communication officials to reach wider audiences, as well as anticipations and demands of their audiences, we need to better understand concrete dynamics behind communication between public organizations. Researchers should examine what constitutes good and effective social media communication, how the quality of communication can be empirically assessed, and how audiences react to various ways of being addressed by public organizations. For practitioners, this finding means that greater emphasis should be put on how public communicators reach out to their audiences. The way in which they communicate via social media can make the difference between being heard and remaining unnoticed. Additionally, tweeting frequently tends to grow the size of the audience quite considerably. Our research also suggests that it might be

worthwhile for public organizations to analyze their social media interactions in-depth to streamline their outreach strategies and assess the impact that their communication strategies are having.

Our approach also illustrates the potential of automated text analysis techniques applied to the study of public institution's use of social media. The use of large pre-trained language models such as BERT enable researchers to reliably classify large amounts of data with relatively little required hand coding (i.e., learning material) and high precision. Applying similar methods to other large data sources can help us to understand patterns of behavior that we were previously unable to examine. This is by no means an argument to adopt a 'less is more' approach for the use of automated machine learning methods. Still, this research suggests that, if used correctly and with many checks and much caution, machine learning methods for text qualification can be employed by public organizations with relatively little resources with a high accuracy and assist researchers and public organizations in their daily activities.

Some limitations of our research point to interesting future avenues in this area of study. Firstly, Theocharis et al. (2016) point out in a similar case that the data does not allow to determine if the connection between communication behavior and audience size is causal or not. We do not know if agencies communicate in a certain way because they know that they are talking to a certain audience or if their audience adapts according to how they communicate. Further experimental studies would be a valuable addition to measure how various audiences react (differently) to varying communicational cues. Likewise, the analysis includes only two organizational types and tests only two different communication strategies (engaging and informational tweets) to measure varying communication styles. This approach is reductionist and was chosen to measure the impact of key differences between organizations and in communication. However, there might be other factors that have an impact on the dependent variable. Future research might develop additional or alternative methods of measuring variance in communication and organizations and uncover mechanisms that have previously stayed unexplored. For instance, does it matter whether organizations are engaged in service delivery, have advisory tasks, or directly engage with citizens?

Furthermore, we lack understanding of the motivations of the various agencies to use social media. As Mergel (2016) points out, different governmental agencies might use (or not use) social media for varying

reasons. Some might use it purely as a tool for information dissemination, some might use it to connect to their 'fanbase' (Mergel 2016, 145), whilst others again might use it to actively engage with the public in a social media dialogue. Particularly in the European context, we lack qualitative studies that uncover these motivations and could provide a great addition to our understanding of the public organization social media landscape.

Another point of caution is that this research only includes the limited population of European Union Agencies on Twitter. While this sample is naturally limited and cannot be extended, future research might examine national agencies and compare them across countries. This would allow for interesting comparisons across national contexts, as well as enable for the inclusion of interesting interaction terms – for instance, is the positive effect of communication frequency on audience size more or less pronounced for less media salient agencies? Eventually, such approaches could show whether communication strategies can serve as a weapon of the weak by allowing less prominent agencies to enter larger communication stages.

Lastly, we have opted to study the agencies' communication via the social media platform Twitter, which in itself is a biased platform that attracts and connects specific types of users that do not necessarily represent the average public. Furthermore, scholars have pointed out that a platform such as Twitter might enlarge existing power asymmetries between citizens and the state and might increase existing biases (Feeney and Porumbescu 2021). Future research can certainly address the limitations of our study by examining public communication in different social media channels.

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