



# Interconnected bureaucracies? Comparing online and offline networks during global climate negotiations

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## Abstract

Measuring the influence of international public administrations has traditionally been conducted with ‘offline’ data, using interviews, surveys or official documents. However, an emerging strand of the literature argues that influence can also be observed ‘online’, with data based on online social networks, such as Twitter. Our contribution aims at bringing these two strands closer together. We triangulate offline data from a large-N survey with online data from Twitter to examine to what extent they provide distinct theoretical and methodological insights into the role of international public administrations in global governance. As a case study, we use the policy area of global climate governance, an issue area where the influence of international public administrations has raised increasing scholarly interest. Our findings show that international public administrations occupy potentially influential positions in both ‘offline’ and ‘online’ networks. They are more often central actors in the survey network than in Twitter

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network, but in both networks, they constitute the primary source of issue-specific information.

### **Points for practitioners**

First, online social networks provide practitioners with opportunities to connect and interact with other political actors and help shape public discourse through communication. Second, online social networks provide important forums for societal actors who aim to protect global public goods. Third, online social networks offer actors the opportunity to shape values and norms, and to persuade persons or organizations beyond one's own circle. Therefore, it is particularly important that online communication strategies are carefully designed and implemented in view of their potential power.

### **Keywords**

climate governance, international public administration, social network analysis, survey data, Twitter data, United Nations Framework Convention on Climate Change

## **Introduction<sup>1</sup>**

Scholars have used a variety of data sources to measure how bureaucracies of international organizations (IOs) exert (latent) influence in global policymaking. Particularly, document analysis (Biermann and Siebenhüner, 2009; Michaelowa and Michaelowa, 2017), interviews with staff members (Jankauskas and Eckhard, 2019; Well et al., 2020) or expert interviews and surveys with international public administration (IPA) staff and stakeholders of specific regimes (Busch et al., 2020; Saerbeck et al., 2020) have been popular among scholars of public administration. Data sources from online social networks (OSNs), such as Twitter, have only recently attracted the attention of IPA scholars (Bjola and Zaiotti, 2020; Ecker-Ehrhardt, 2020; Jörgens et al., 2016; Kolleck et al., 2017). Although data from OSNs have been available for many years, there are still only few studies in the field of IPA that rely on them. In addition, the usefulness of the data is still unclear for many scientists in the subject area so far. In this study, we aim to discuss and analyse the opportunities provided by these data sources from a theoretical and methodological perspective. Hence, the research question we aim to answer is: to what extent can traditional data sources and online data offer distinct insights into the role of IPAs?

To compare the usefulness of offline and online data, we use data from a survey as well as data retrieved from the OSN Twitter. We measure the potential influence of IPAs through techniques of social network analysis (SNA). This approach allows us to infer influence from the position and relations of IPAs within policy networks (Henry, 2011; Kenis and Schneider, 2011; Kolleck et al., 2017).

Asking actors directly about their influence might lead to over- or underestimations, especially if they are not actively allowed to influence policymaking, as is the case of IPAs (Jörgens et al., 2016). Hence, scholars have increasingly implemented more indirect ways of measuring the influence of IPAs through SNA (e.g. Jörgens et al., 2016; Kolleck et al., 2017). As a case study, we use the policy field of global climate change, which has become an increasingly important issue, encompassing many different stakeholders, and through its annual conferences, offers specific time periods for analysis.

Our data sets are built from a large-N survey with stakeholders of the climate regime (offline network) and from Twitter data collected during global climate negotiations (online network). Our analysis contains two steps. First, we use descriptive SNA measures to gain a picture of the positions of IPAs within the two networks. Second, we implement a technique of inferential network analysis, called exponential random graph models (ERGMs), to observe the network structures, with a focus on IPAs in both networks.

The remainder of this article is structured as follows. The next part provides an overview of how IPA influence has been studied so far and our expectations regarding the influence of IPAs and other stakeholders within online and offline networks. We then introduce the global climate change regime as our case study. The fourth part details our data sets and methodological approach. Thereafter, we present the results of our analyses. In the final section, we discuss our findings, outline the limitations of our study and give an outlook for future research.

## **Analysing the influence of IPAs**

Studying the influence of international bureaucracies is a challenging task. In contrast to other actors, impartiality is central to IPAs' success. This makes it difficult for researchers to assess their influence on global policy processes and outputs. A traditional way to assess an IPA's ability to exert influence is to focus on organizational characteristics, such as mandate, financial resources or staff numbers (Bauer and Ege, 2016; Biermann and Siebenhüner, 2009; Jinnah, 2014; Michaelowa and Michaelowa, 2017). This information can offer a useful starting point to analyse the key features of IPAs, which, in turn, create the basis for their potential influence. Interviews are a common tool to detect the mechanisms, strategies and motivations of IPA influence on global policymaking (Hickmann et al., 2021; Jankauskas and Eckhard, 2019; Well et al., 2020).

For quantitative and comparative analyses, researchers often rely on survey data (Busch et al., 2020; Saerbeck et al., 2020). Surveys with IPA staff and other actors within a policy domain can provide reliable information on the influence, power or authority of IPAs. Busch et al. (2020), for example, conducted a survey with national high-level civil servants to assess the potential authority gaps of different IPAs. Saerbeck et al. (2020) surveyed various stakeholders of the climate change regime, including IPAs themselves, to examine their role within the regime.

More recently, data from OSNs have been used to reveal the potential influence of IPAs (Goritz et al., 2020; Jörgens et al., 2016; Kolleck et al., 2017). OSNs such as Twitter or Facebook are online communication platforms where political and administrative actors are represented (Cooper, 2020) and can actively shape the public discourse on specific policy issues. Scholars have begun to analyse the role and potential impact of IPAs based on their behaviour in these online networks. Hence, the question arises as to what extent online networks differ from offline networks.

When comparing online and offline networks, network analytical techniques have become increasingly popular. Hayes and Scott (2018), for example, investigate to what extent online network ties reflect policy relationships offline. They compare characteristics from two online networks – Twitter interactions as well as hyperlinks – with characteristics derived from a survey. They find a significant but small correlation between the online and survey measures. Online networks, they suggest, are thus complementary to offline networks. Pilny and Shumate (2012) use the collective action framework to examine how offline and online networks are related. By examining hyperlink networks as online networks, and financial, membership and collaboration ties as offline networks, they find that online hyperlinks are an extension of offline instrumental collective action behaviour. Our analysis aims to build on these studies and examine the role and potential influence of IPAs in online and offline networks.

## **Influence in policy networks online and offline**

International bureaucracies can exert influence on global public policymaking in various ways (e.g. Ege et al., this issue). In their review of the literature on IPA influence, Eckhard and Ege (2016) identified expertise as one of the main determinants of an IPA's capability to shape policy outputs. Expertise has long been acknowledged as a crucial source of influence in public policymaking (Boswell, 2008; Haas, 1992; Krick, 2015; Metz, 2013; Radaelli, 1999). Most prominently, the work of Haas (1992) emphasized the role of information and knowledge within 'epistemic communities' – that is, networks of knowledge-based experts – for processes of international problem definition, transnational policy debates and the formulation of policy responses, particularly in complex and uncertain issue areas. IPAs can be perceived as actors within these policy networks, influencing policymaking through their expert authority (Bauer, 2006; Biermann and Siebenhüner, 2009; Jinnah, 2014).

IPAs have different kinds of expertise that make them important actors in global policymaking processes. First, they possess in-depth knowledge about the policy issue itself, for example, climate change and biodiversity. Through this knowledge, they can influence how state and non-state actors perceive these issues and, hence, shape their preferences (e.g. de Wit et al., 2020). Second, they know more than any other actor about the procedural aspects of multilateral negotiations, which makes them a 'go-to' actor on questions regarding negotiation

processes (Bauer, 2006; Saerbeck et al., 2020). Hence, their issue-specific knowledge, combined with the procedural information they provide to regime stakeholders, makes them crucial and potentially influential actors within issue-specific policy discourses and processes of global policymaking (e.g. Busch et al., this issue; see also Busch and Liese, 2017; Litzo-Monnet, 2017; Saerbeck et al., 2020).

## Theoretical considerations

We argue that the potential influence of IPAs, based on their expertise, can be observed in the offline and online spheres. Subsequently, we first outline the role of IPAs in offline governance networks and how their influence compares to other stakeholders; then, we elaborate on their relative influence in the online social network Twitter.

In the offline sphere, IPAs are often considered coordinators or orchestrators of actions in global policymaking, for example, in multilateral negotiations, involving state and non-state actors (de Wit et al., 2020; Hale, 2016; Hale and Roger, 2014; Hickmann et al., 2021). These functions make them points of reference for different kinds of regime stakeholders. Coordination efforts involve interactions with stakeholders of various types, for example, non-governmental organizations (NGOs), research organizations, businesses, state actors and other IPAs. Through coordination, IPAs can have an impact on the composition and structure of transnational policy networks, thereby affecting regime processes and outputs (Hale, 2016). Orchestration is a more subtle type of coordination, where IPAs work through intermediaries, such as NGOs, to push other actors, for example, nation states, towards a common governance goal (Abbott, 2017; Jørgens et al., 2017). In this function, IPAs work through other actors of the regime. IPAs can successfully perform these functions because of their bureaucratic authority, which they derive from their expertise (Barnett and Finnemore, 2004). The strong engagement with and reliance on IPAs can be used as an indicator of their potential to influence global policymaking.

Compared to IPAs, nation states can be expected to exert similar or greater influence in offline governance networks because they are still the primary decision-makers in international diplomacy and multilateral treaty systems (Kamau et al., 2018: 107–119), though their potential to influence can vary (e.g. Panke, 2012). Their formal decision-making powers make them central targets of the advocacy strategies of non-state actors, such as civil society organizations (CSOs) and businesses.

Non-state actors play an increasingly important role within global governance and multilateral negotiations (e.g. Andonova et al., 2009; Bäckstrand et al., 2017; Bovaird, 2005; Bulkeley et al., 2012). Due to their technical expertise on specific policy issues, they can be important sources of information. For example, think tanks and CSOs working on climate change have gained considerable expertise and reputation within the regime, making them experts in the field that are regularly

consulted for advice by other actors (Allan and Hadden, 2017). Similarly, businesses have information of how their products are built and know best how products and processes can be improved. Moreover, they can have considerable economic power to put pressure on nation states and shape their preferences (Meckling, 2011). We expect large non-state actors or networks that combine numerous non-state actors to be particularly influential. Overall, however, we expect non-state actors to be less influential than nation states and IPAs.

In the online sphere, to a great extent, we expect similar results. However, some differences need to be considered. Due to the public nature of the discourse that occurs online, some actors might be more active than others. This might be due to the formal authority they are ascribed. The digital sphere can be used by actors with little formal authority, for example, NGOs, to increase their visibility and outreach. They have the option to use Twitter and other OSNs to spread information and form coalitions with other like-minded state and non-state actors (Guo and Saxton, 2014; Vu et al., 2020). Doing so, they try to influence formal negotiations through their actions on OSNs. This might increase their influence compared to offline networks.

In contrast, state actors and IPAs are attributed formal and bureaucratic authority, making them important communication targets on OSNs as well as offline. Their online authority, or digital authority, builds on their authority offline (Goritz et al., 2020). Moreover, Twitter offers IPAs the potential to share information on specific policy issues fast and directly with a wider audience. This information can guide public attention towards important topics and create coalitions that go beyond formal negotiations (Jørgens et al., 2017), shape the public discourse (Kolleck, 2011, 2017, 2019) and, hence, potentially influence negotiations outcomes. Thus, we expect their influence to be similar or stronger in online networks.

## **The case of global climate change negotiations**

The policy field of climate change is an ideal case to compare whether and how offline and online data can offer distinct insights into the role of IPAs. First, it is a significant and interesting case because the core agreement of the global climate regime has recently been fundamentally revised. At the 21st Conference of the Parties (COP21) to the United Nations Framework Convention on Climate Change (UNFCCC) in 2015, the Paris Agreement was adopted as the successor to the Kyoto Protocol. It sets out both the targets and the process of implementation to strengthen climate action after 2020. Accordingly, 2015 represents a crucial year in global climate governance and serves as a reference point for the present analysis.

Second, the field of climate change lends itself to SNA due to the active presence of a wide range of actors. Due to the multitude of actors governing from different levels, cooperation within the regime is often described in terms of networks (e.g. Andonova et al., 2017; Cao and Ward, 2017). The vast number of actors

interacting within this field, and the increasing importance of the issue itself, make the field especially suitable for analysis.

Third, online and offline data are accessible for the case. Twitter has become a widely used platform among regime stakeholders, providing a large amount of information on the interactions of participating actors. To gather offline data during the negotiations, the UNFCCC secretariat provides lists of participants, which allows for the identification of important stakeholders within the regime and for large-N surveys to be conducted. Hence, the area of climate change is an essential one and offers the data to carry out an analysis of online and offline data with SNA techniques. Following Eckstein (2000), we use this case to test our theoretical expectations formulated earlier.

Although the role of international bureaucracies in the climate regime has previously been studied, the focus has mostly been on the bureaucracy at the centre of the regime, the UNFCCC secretariat (Busch, 2009; Hickmann, 2017; Hickmann et al., 2021; Kolleck et al., 2017; Saerbeck et al., 2020). Whereas Busch (2009) described the UNFCCC secretariat as being in a ‘straitjacket’, stuck in a structurally difficult policy field with a narrow mandate, more recent studies find the climate secretariat to be a ‘facilitative orchestrator’ that initiates, guides and strengthens the actions of sub-state and non-state actors (Hickmann et al., 2021). Both studies relied on offline data for their analyses. Other studies have started to include online data and to combine them with offline data, such as interviews and participatory observations, and have found the UNFCCC secretariat to be a central and therefore potentially influential actor within the different issue areas of the climate regime (Jørgens et al., 2016; Kolleck et al., 2017). This article adds to the literature by combining online and offline data, using the same methodological approach to both data sources in order to be able to compare the insights they offer.

## **Data and methodological approach**

In the following section, we discuss how the two data sources differ from and relate to each other, and subsequently describe our specific data and methodological approach in more detail.

### *The type and quality of interaction online and offline*

Due to the variation in the data-collection process, the information contained in both sources can differ. For survey data, participants are asked to take part in the survey and can thus choose to only disclose the information they want and/or can remember. In contrast, Twitter users operate in the public domain, without directly assuming that their communication and relationships are being studied.<sup>2</sup> With this in mind, Twitter data can be considered more objective because they are less affected by the answers of the surveyed actor. Of course, this is not to deny

that Twitter activities are mostly based on subjective information provided by Twitter users.

At the same time, however, the public nature of Twitter communication also presents a hurdle. For example, sensitive information is usually not disclosed publicly. Therefore, many topics, contents and responses remain undetected by researchers based solely on public data. This problem also applies to surveys but, here, interviewers have the opportunity to get to the bottom of topics that are not accessible to the analysis of public data through the skilful use of certain questions or item batteries.

Moreover, Twitter communication between two actors occurs through mentions, replies or retweets. These data allow researchers to identify key actors in the network and to observe the direction of the communication flow. For more in-depth analyses such as, for example, determining whether communication between actors has a positive or negative tone, additional text analysis or sentiment analysis would be necessary. This limits the type and variety of concepts that can be studied through Twitter data. Surveys allow for more flexibility, especially in those cases where already-validated constructs, questionnaires or items have been developed by scientists that operationalize selected theoretical approaches.

Similarly, with surveys, researchers can target specific organizations and actors they find most important. This is not possible with Twitter data, where analyses are restricted to the users of the platform, meaning that when drawing conclusions from the digital to the offline world, the potential lack of representativeness of Twitter users must be acknowledged. However, Twitter data might also identify new, potentially important actors that have so far been neglected by researchers.

### *Data sources*

*Online survey.* Our first data set is based on a stakeholder survey of the participants of COPs.<sup>3</sup> The UNFCCC secretariat provides lists of all participants for each COP, based on which the stakeholders were chosen. The survey was sent to stakeholders online and could be completed from October 2015 to March 2016. This long period was chosen to increase the response rate of the survey. Among other questions, participants were asked to name organizations that provided them with trustworthy information on the topics that they had worked on during the previous 12 months. This question provides the basis for the analysis of the offline network. The response rate to this global survey was around 18% for the SNA questions. Hence, the network in total included 692 nodes and 1029 ties.

*Twitter data.* The second data set is derived from Twitter. We obtained Twitter data from a company called Texifter for the two weeks of COP21, which took place in November and December 2015. Twitter has become a central platform for political debates at the national and international levels (Conover et al., 2011; Jungherr, 2014). Most heads of state and many IOs are represented on Twitter (Burson Cohn & Wolfe, 2020). Its main appeal for researchers is based on the public nature of the

conversations and the amount of data it provides. Twitter allows persons and organizations to interact publicly with each other, as well as to engage with other societal actors and individuals.

There are three main ways of interaction on Twitter: mentions, replies and retweets. A *mention* occurs when someone writes a short message (tweet) and tags another user with an '@' sign. A *reply* occurs when someone answers directly to a tweet. The last communication form is a *retweet*, which is also the focus of our study. Retweeting a message on Twitter means sharing it with your followers. Thus, this is a form of information flow. The message can either be shared in its original form or with an additional comment.

We used a search string with UNFCCC-specific hashtags and word combinations, such as '#unfccc' and '#cop21', to only include tweets that were related to the climate change conference. To be able to compare the two data sets, we reduced the Twitter data to retweets only. COP21 was the largest global climate conference so far, and thus the activity on Twitter was extremely high. Due to the amount of data in the Twitter network, we had to diminish the size of the network to be able to conduct inferential analysis. Hence, we only included the 300 actors with the highest indegree scores and created a core network of the most retweeted users and the relations among them for the inferential analyses. Similarly, we reduced the network of the survey data to the 300 most frequently named organizations. After cleaning the data, the Twitter network consisted of 286 nodes and 3434 ties. In contrast to the inferential analysis, for the descriptive analysis, the overall retweet network was not reduced.

### *Methodological approach*

*SNA.* To assess the potential influence of IPAs within global climate policymaking, we use SNA. This approach puts the focus on the relations of actors and on the structures of the networks (Wasserman and Faust, 1994), rather than on the attributes of the actors. Therefore, it provides a more structural analysis than 'traditional techniques', such as, for example, simple regression analyses. This makes SNA less biased to the subjective statements of actors themselves due to their awareness of being interviewed. Instead, it can infer potential influence from an actor's position and relations in the observed networks. These opportunities make SNA an ideal technique to study influence and provide an 'influence mapping' in governance networks (Bovaird, 2005: 226).

Based on our theoretical approach, a network consists of nodes and ties (Borgatti et al., 2018). Nodes can represent individual actors, organizations or countries. The ties are the relationships among the actors (i.e. nodes) of the network. Ties can characterize various kinds of relationships. For example, a tie can indicate communication and cooperation, but also conflict. In this analysis, we focus on information flows between actors during the climate change conference in 2015. Depending on the type of ties, networks are undirected or directed. Hence, the information exchange networks that we aim to observe are directed networks.

Thus, the nodes with outgoing ties are called *egos* and the ones with incoming ties are called *alters*.

The first step of our analysis is based on descriptive SNA measures to provide an overview of the most central and hence potentially influential actors within both networks. We used two centrality measures. First, we applied betweenness centrality, which is a measure often used to analyse central actors that have the potential to occupy broker positions within a network (Freeman, 1977). Actors with high betweenness centrality scores are identified by calculating which actors are most often on the shortest path between two nodes within the network. These actors have a structural advantage because they might connect two otherwise unconnected parts of the network. The other centrality measure we used is eigenvector centrality. This indicates how well connected an actor is to other actors with high centrality scores (Bonacich, 2007). It is thus a measure of popularity among the most popular actors within a network.

In a next step, we used an inferential network analytical technique to examine structural similarities of the two networks. We applied a widely used and well-established technique, called 'exponential random graph models' (ERGMs) (Robins et al., 2007). ERGMs can model the effects of the covariates of the actors on the ties in the networks, as well as such network parameters as, for example, reciprocity and transitivity explicitly (Cranmer and Desmarais, 2011; Morris et al., 2008). These models allow us to analyse to what extent the network structures of the observed networks (here, our survey and Twitter networks) differ from random networks. Our aim was to examine whether the actor type, for example, IPAs, is a significant determinant for a tie between two actors. The analyses were conducted with the package 'ergm' (Hunter et al., 2008) in the integrated development environment 'RStudio'.

We included two node-level attributes for networks – *actor type* and *regional focus*. Whereas the *actor type* variable is our main variable of interest, the *regional focus* serves as a control variable. In the survey data, the organizations were asked to provide information regarding their organizational type. They could choose from the following categories: (1) business, (2) government, (3) IO, (4) NGO, (5) research or (6) others. In the Twitter network, we coded the actors by hand into these categories and added two new ones for 'media actors' and 'others', representing, for example, popular individuals like actors or musicians. The regional focus was coded by hand for both networks. We used seven regions: (1) Africa, (2) Asia, (3) Australia/Oceania, (4) Europe, (5) Global, (6) North America and (7) South America. Moreover, in the Twitter network, we coded whether the actors are organizations or individuals. Besides these actor attributes, we included *dyadic covariates* to account for the tendency of actors to interact with similar actors. This effect is described as homophily in the literature (McPherson et al., 2001). We also modelled the *reciprocity* within both networks. In our case, this means that information is exchanged between two actors. Finally, all models also include an *edges* term, which accounts for the density of the networks.

The specified models are relatively simple due to some restrictions that come with incomplete network data. Complete networks are crucial for many SNA techniques. However, a response rate of 100% when conducting a survey is almost impossible to achieve. Thus, a response rate of 70% is often considered a minimum to conduct reliable SNA (Borgatti et al., 2006). Even this relatively high response rate is difficult to reach with many surveys, especially on a global scale. Therefore, we did not include higher-order network effects, such as transitivity, within our models because these are likely to be biased in incomplete networks.<sup>4</sup> In this regard, Twitter data are an advantage because they allow researchers to collect complete networks and thus apply many kinds of network analytical measures and techniques. Thus, we would be able to model these effects in the Twitter network. Since our aim was to compare these two networks, we chose to use similar but simple models.

## Results

In this section, we present the results of the descriptive and inferential SNAs. Tables 1 and 2<sup>5</sup> show the descriptive network measures (betweenness and eigenvector centrality) for the survey and Twitter networks, respectively. The descriptive network measures show that IPAs are among the most central actors in both types of network. However, we can observe that, overall, IPAs are more often represented in the survey network than in the Twitter network. The Twitter network contains many media actors that are not represented in our survey. Moreover, the Twitter network includes many state actors, such as individual politicians. This is partly due to our coding scheme. All accounts belonging to COP21 were coded as 'Government' because these accounts are managed by the government that hold the presidency of the COP and are supported by the UNFCCC secretariat. In the year 2015, France held the presidency; thus, many actors of the French government were among the most central ones.

This first step of our analysis reveals that IPAs are more often represented among the top 25 regarding eigenvector and betweenness centrality in the offline data than the online data. Nevertheless, we can see that IPAs score similarly high for eigenvector centrality in online and offline networks. Regarding betweenness centrality, the differences are more evident. Here, IPAs demonstrate many interactions with actors that also have many interactions (eigenvector centrality). However, government actors, media organizations and NGOs have more potential to connect to previously unconnected parts of the Twitter network (betweenness centrality).

Regarding other actor types, there are more significant differences between the two networks. Due to the nature of Twitter, media actors and individual high-level politicians are very present and score especially high for betweenness centrality, meaning that they occupy broker positions that can potentially link previously unconnected parts of the network. Twitter is a network that centres around individuals. This presents a difference to the survey network, which focuses on

organizations. Another feature of the Twitter network is the possibility to interact with the COP accounts, which are managed by the presidency of the COP and supported by the UNFCCC secretariat. These COP accounts are extremely influential within the Twitter network.

Table 3 shows the results of the ERGMs for both networks (for representations of both networks, see Figures 1 and 2). The first set of estimates offers information about the type of information provider (type of alter) in the survey data or the actor that has been retweeted in the Twitter network. The baseline for the interpretation of the results are IPAs. Hence, in the survey network, all other actors are less likely than IPAs to be named as an information source. The results are very similar for the Twitter network, except for government actors, which are more likely than IPAs to be retweeted. As described earlier, this might be a result of our coding scheme, which categorizes COP accounts as government accounts.

At the same time, the networks are only comparable to a limited extent. With respect to the Twitter network, results suggest that IPAs are less active than other actors (apart from media and research organizations). In contrast, no differences between IPAs and other actors are evident in the survey network. However, these results of our study should also be interpreted against the background that interviewees partly did not respond to questions of the survey. At the same time, ERGM results indicate strong tendencies of actors to share information from similar actors – particularly with respect to the Twitter network. For IPAs, however, this estimate turns out to be significant only for the online network.

## **Discussion and conclusion**

In the IPA literature, online data have received increasing but still little attention. Most of the research on the influence of international bureaucracies so far has been conducted with traditional data sources, such as surveys, interviews or document analysis. Hence, it is unclear to what extent data from OSNs might offer new insights into the role and potential influence of IPAs, or can validate traditional data sources. With this contribution, we address this research gap, using the policy area of global climate change. Based on survey and Twitter data around global climate change negotiations in 2015, we conduct analyses using descriptive and inferential SNA techniques.

The results of our descriptive SNA show that according to betweenness and eigenvector centrality, IPAs are among the most central actors in both networks and thus have considerable potential to exert influence. Interestingly, IPAs are more often represented among the top 25 central actors in the survey network than in the Twitter network, which is generally more diverse in types of actor. However, IPAs occupy top positions in both networks, providing a first indication of their authority and influence in online as well as in offline networks. These descriptive results are generally in line with our expectations that the bureaucratic authority of IPAs offline can also be observed online.

Next to descriptive network measures, we also used inferential network analysis to compare the role of IPAs in both networks. Our results show that IPAs are more likely to be sources of information than any other actor type in both networks, except for government actors in the Twitter network. This provides further support for our expectations. Government actors are attributed formal authority that can be mirrored online. Similarly, IPAs' bureaucratic authority, based on their technical and procedural expertise, makes them influential actors in both networks. Interestingly, IPAs are less likely than other actors to retweet information, apart from research and media organizations. Hence, they are less active than most other actors but more likely than others to be targets of communication within the online network. In the survey network, there is no significant difference between IPAs and other actors.

For the most part, our analysis of online and offline networks provides similar results regarding the role and potential influence of IPAs. Thus, when researching the potential influence of IPAs, online data can offer similar insights as offline data, which are more difficult and time-consuming to collect. Moreover, this contribution indicates the importance of OSNs such as Twitter for negotiation dynamics. IPAs as well as governments are represented on Twitter and are central targets of communication, which underlines their authority. However, while we previously expected IPAs to be more active in online networks, our expectation cannot be observed in the data used for this article.

For other actor types, the results differ more widely. Although these insights are beyond our research question, they can offer an interesting basis for future research. One explanation could be the more pronounced tendency among governmental and non-governmental actors to use Twitter as individuals rather than as collective actors, that is, organizations. In the field of IOs, we instead observe the opposite. The focus is more on the organization than on individuals, such as the UN secretary-general or the UNFCCC executive secretaries, though these actors are also present.

Hence, the analysis of online networks draws more attention to the role of individuals in global governance and raises the question as to whether this role only exists in online networks or can also be observed offline, where the focus is currently on collective actors. The selection bias in favour of organizations instead of individuals in offline networks occurs already during data collection and could make individual actors invisible or subordinated to their respective organizations. Regarding non-state actors, the comparison between online and offline networks raises the question as to whether prominent individuals such as actors, musicians or other artists also play a role in the issue-specific offline communication networks, and possibly have a greater influence than previous studies would lead us to assume due to their focus on collective actors.

With this contribution, we also showed that both types of data source have their advantages and limitations, which are important to consider. From a methodological perspective, data gathered from online networks pose the difficulty of having to define network boundaries in a way that enables inferential analysis.

In this study, we dealt with this challenge by reducing our data to the 300 most popular users. Gathering data through surveys leads to the disadvantage of a relatively low response rate, which makes more complex SNA difficult. Future research could therefore focus on overcoming these issues of incomplete offline networks and find adequate ways to deal with extremely large digital networks. Moreover, it would be interesting to compare digital and offline networks in other issue areas.

Our findings suggest that the bureaucratic authority of IPAs that we observe in offline governance networks can also be found in online networks. In particular, the results of the inferential network analysis lend support to this argument. Hence, this indicates that the online sphere is not completely detached from offline dynamics. However, when using online data based on descriptive network measures, results can be biased. Here, IPAs are among the most central actors in both networks, but the number of IPAs represented in the online network is lower than in the offline network due to the number of actors involved in online networks. The differences between these two data sources should not be underestimated. These are important considerations for researchers when deciding on data sources to research the influence of IPAs and other actors.

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### **Notes**

1. This article is part of a special issue on 'International Bureaucracy and the United Nations System'.
2. Some users do have a private account so that their interactions are only visible to their followers.

3. This survey was conducted by Barbara Saerbeck and Mareike Well. For further information on the data and the processing, see Saerbeck et al. (2020).
4. The accounts of the IOs are managed by the IPAs, the administrative part of the IOs.
5. All the tables and figures are available online at: <https://journals.sagepub.com/doi/suppl/10.1177/002085232111022823>

## Supplemental material

Supplemental material for this article is available online.

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