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Article

## Ready for the World? Measuring the (Trans-)National Quality of Political Issue Publics on Twitter

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### Abstract

This article presents a multi-method research design for measuring the (trans-)national quality of issue publics on Twitter. Online communication is widely perceived as having the potential to overcome nationally bound public spheres. Social media, in particular, are seen as platforms and drivers of transnational communication through which users can easily connect across borders. Transnational interactivity can be expected in particular for policy fields of global concern and elite or activist communication as practiced on Twitter. Nevertheless, there is still a lot of evidence for the enduring national structuration of political communication and publics as it results from a shared language (mostly), culturally defined media markets, established routines of social and political communication, and sociocultural stocks of knowledge. The study goes beyond measuring user interaction and also includes indicators of cross-referential cohesion. It applies a set of computational methods in network and discourse analysis and presents empirical evidence for Twitter communication on climate change being a prime issue of global concern and a globalized policy agenda. For empirical analysis, the study relies on a large Twitter dataset ( $N \approx 6m$  tweets) with tweet messages and metadata collected between 2015 and 2018. Based on basic measurements such as geolocation and language use, the metrics allowed measurement of cross-national user interactions, user centrality in communicative networks, linking behaviour, and hashtag co-occurrences. The findings of the exploratory study suggest that a combined perspective on indicators of user interaction and cross-referential cohesion helps to develop a better and more nuanced understanding of online issue publics.

### Keywords

climate change; cross-referential cohesion; issue publics; national structuration; network analysis; transnational communication; Twitter

### Issue

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### 1. Introduction

Online communication and social media have undeniably extended the possibilities for every user to reach out to the world of other users in a shared communicative environment. This not only holds true for the so-called “producer” (Bruns, 2009) and his/her ability to realize one-to-many communication to large audiences bypassing the traditional gatekeepers of public communication (Shirky, 2008). Reaching out to the world is also meant in the literal sense; by reducing the role of media gatekeep-

ers, the internet and social media are widely regarded as bearing the potential to overcome nationally bound publics co-constituted to a large extent by classical media institutions, and move them towards a new state of the “online networked public sphere” (Benkler, 2006). The fundamental technical architecture of the internet provides the technical connectivity for transnational public spheres to emerge beyond nation-states and national identities (Cairncross, 2001). In contrast, however, nationally structured public spheres seem to be quite persistent. As mass media research has already shown, me-

dia markets are embedded in systems of socio-cultural structuration, most often at a national scale (Straubhaar, 1991, 2010). In accordance with such research, non-essentialist theories and studies on nationalism have emphasized the role that mass media play in the social construction of national identities (Anderson, 2006; Kielmansegg, 2003, 2013). Whether the structural transformations of public spheres induced by the internet and social media are able to break up this co-foundational relation is yet to be determined.

In this article, I seek to contribute to this fledgling field of research by providing an integrated set of indicators for the empirical analysis of social media communication. This should help to answer the question of how (trans-)national online issue publics are. How do (trans-)national flows of communication differ between policy fields and among national user communities? Going beyond measurements of user interaction as applied in Social Network Analysis the approach presented here is innovative in that it builds on a more sociologically informed discourse theoretical perspective. Consequently, it includes a set of indicators for cross-referential cohesion of online communication at different dimensional levels. In order to test the measures introduced and to explore the (trans-)national quality of a prominent case, I apply the multi-method research design to the global Twitter debate on climate change (#ClimateChange).

The article contributes to the field of research on social media and political communication in several ways: First, it presents innovative empirical indicators for the (trans-)national quality of online communication. Second, it provides instructive insights for the case included. Third, it offers a set of methods for further application.

## 2. Transnational Twitterspheres versus Structural Nationalism

### 2.1. Transnationalisation of the Public Sphere

Where internet development in general and social media, in particular, are expected to induce structural transformations of public spheres expectations of transnationalisation are often included in this developmental story. Indeed, scholars of online communication and the “networked public sphere” have argued for an opening up of social communication across borders (Benkler, 2006; Cairncross, 2001; Castells, 2008). Internet technology and social media would make social interaction less dependent on being at the same place (Giddens, 1991) but would open up “electronic elsewheres” (Berry, Kim, & Spigel, 2010) as new places for social interaction (Papacharissi, 2015). Moreover, structural changes induced by digitalization even affect the very concept of the public sphere with a network of public spheres and issue publics emerging instead of a single, widely shared public as constituted by traditional mass media (Bruns, 2008, p. 69). Twitter plays an important part in this devel-

opment with hashtag functionality being crucial for the dynamic emergence of (ad hoc) issue publics (Bruns & Burgess, 2011).

An important field of scholarly research on transnational public spheres has been focussed on European integration and so-called Europeanization (Risse, 2010, 2015). A wide range of concepts, different operationalisations, and methodologies were used. Communication flows were measured by network analysis (Bennett, Lang, & Segerberg, 2015) or claims analysis (Koopmans & Statham, 2010). Others turned towards discourse analytical approaches (Kantner, 2015; for an overview, see Pfetsch & Heft, 2015). A number of works put a particular focus on internet communication and social networks (Bennett et al., 2015; Koopmans & Zimmermann, 2010; Ruiz-Soler, 2018). As to the fundamental question of European public spheres, results diverge. If there is a common baseline, however, it is that transnational publics cannot be expected to appear “above and beyond the various national or issue-specific public spheres,” but rather through the “Europeanization of national and other public spheres” (Risse, 2015, p. 17). Given the persistence and prevalence of national publics, more nuanced approaches are required in order to reveal what may well turn out to be the gradual transnationalisation of issue publics. Kantner’s theoretical conception of “transnational discourse arenas” (Kantner, 2015), meaning national public spheres that reflect different degrees of transnational political communication, measurable by topical coherence, the timing of media reporting, and aligned framings, might be a helpful orientation for a more nuanced approach. The combination of indicators in this article follows a kind of reversed logic, as network indicators might reveal a high degree of transnational interactivity with remarkably lower topical coherence as measured by indicators of cross-referential cohesion.

Not surprisingly, the issue of transnationalisation has also been intensely discussed in social movement research where transnational movements had been investigated long before digital change became a phenomenon and heavily affected mass communication (Della Porta & Tarrow, 2005; Tarrow, 2005). Activists can be seen as more adaptive for globalised communication environments and good test cases given their self-interest in connecting transnationally to drive their agendas regarding global issues. New media, of course, have been embraced as potential drivers of the developments under study (Della Porta & Diani, 2011; Vicari, 2014). As Dahlgren (2013, p. 35) stated: “The web facilitates protest and solidarity on the global arena.” Recent empirical works have studied the role of social media in general and Twitter in particular for inter- and transnational climate activism (e.g., Chen, Tu, & Zheng, 2017; Segerberg & Bennett, 2011; Stier, Schünemann, & Steiger, 2018).

Empirical studies on transnational online communication of social movements, however, have presented a mixed picture. Focused on transnational protest move-

ments, scholars have on the one hand found evidence for transnational interaction via Twitter, e.g., in the cases of Egyptian and Tunisian revolutions or the anti-austerity movements in Spain and Greece (Theocharis, Lowe, van Deth, & Garcia-Albacete, 2014). However, on the other hand several studies have questioned these results by emphasizing the difference between digital interconnectedness and substantial interaction and discourse (Kneuer & Richter, 2015). Thus, even from the perspective of social movement studies, one could argue with Gerbaudo (2012, 2014) and others that the more substantial exigencies of transnational mobilisation “cannot be reduced to the material affordances of the technologies it adopts but also involves the construction of shared meanings, identities, and narratives.”

## 2.2. Structural Nationalism in Mass Media Communication

Countering expectations of transnational public spheres, previous work on mass media communication emphasized the fact that what is said to be global communication is more or less an aggregation of “culturally defined markets” (Straubhaar, 1991, 2010). In the same vein, even for more recent trends in the digital media environment, scholars concluded in line with cultural proximity theory that “structural factors have a powerful influence on patterns of media use” (Taneja & Webster, 2016). The theoretical fundamentals of cultural proximity cannot be reduced to media markets, however. Therefore, I propose structural nationalism as a theoretical perspective that also includes insights from non-essentialist theories of nationalism (Anderson, 2006; Billig, 1995) as well as the sociology of knowledge (Berger & Luckmann, 1966/1990). From this perspective, one would expect to find at least traces of national structuration even in online communication and elite-centred Twitterspheres.

A lot of previous studies on international online communication have indeed found such traces and impediments of communicative flows. Scholars researched web traffic, be it with a focus on e-mail, hyperlinking, web audiences, or Twitter following (State, Park, Weber, & Macy, 2015; Takhteyev, Gruzd, & Wellman, 2012; Taneja & Webster, 2016; Taneja & Wu, 2014), and in effect questioned the supposedly transnational character of internet communication (Hale, 2012; Taneja, 2017). As part of their comprehensive presentation of tools and methods to study the geography of Twitter, Leetaru, Wang, Cao, Padmanabhan, and Shook (2013) also tested geographical proximity as a factor increasing the likelihood of regular interaction (measured by @mentions and retweets). While they find average distance for pairs of interacting users indeed decreasing at an exponential rate for users with up to 9 interactions per month, for users with a greater number of interactions the average distance increases again. Their finding suggests that up to a certain degree, geographical distance does indeed matter for user relationship intensity—with the 500 to 600 miles be-

ing the minimum for users who interact up to nine times per month, supporting a potentially higher relevance for nationality or national discourse community than for locality. In contrast, the increasing distances above this threshold point to the role of celebrities etc. for whom geography matters less (Leetaru et al., 2013, pp. 23–24). This again speaks for differentiated approaches of measurement as presented in this article.

## 3. Case Selection and Expectations

### 3.1. Case Selection

As a test case for the exploratory study, I selected the international Twitter debate on climate change represented by the hashtag #ClimateChange. Climate policy is a paradigmatic case of a globalized policy agenda, with climate change affecting people across the world and thus putting territorial political order and nation-bound approaches of political action under stress (Held, 1997, p. 258). Climate change has been the core concern of global environmental policy development for more than two decades since the famous Rio de Janeiro Earth Summit (United Nations Conference on Environment and Development) in 1992. Intergovernmental efforts including multiple stakeholders have been institutionalised at a high level with the United Nations Framework Convention on Climate Change (UNFCCC) established in Rio and the so-called Conference of Parties (COP) gathering all kinds of stakeholders from across the world for an annual flagship event. Three COPs are included in the dataset.

### 3.2. Expectations of International Variation

The transnational quality of Twitter communication shall be assessed by measuring the degrees of actual user interaction and cross-referential cohesion. Measurements of user interaction are actor-based. On Twitter, users can deliberately link to other users by @-mentioning them, thus including their Twitter handle preceded by the @ symbol. Moreover, they can refer to a particular post another user has made by retweeting it. As done in a lot of other Twitter studies, we take both actions as user interactions (Schünemann, Steiger, & Stier, 2015). In contrast, cross-referential cohesion is not based on user interactions but topical references. References can be made within the Twittersphere with the use of hashtags or other web content that is referred to using hyperlinks. Both kinds of references are indicators of how a message is embedded in wider networks of content and discourse. The variation between national user communities for both sets of indicators might be instructive for gaining a deeper understanding. From existing research and theoretical reflections, three tentative expectations can be derived for the exploratory study.

First of all, I expect Twitter communication on climate change to show a greater variation for indicators

of cross-referential cohesion than on cross-national user interaction (Expectation 1). Users who interact cross-nationally on Twitter might still leave cultural imprints by the content that they share and the references they make, be it within the sphere of the platform (hashtags) or beyond (URLs). Moreover, countries represented in the dataset cannot be treated as equal. Previous works have shown that especially the size of a national community and whether it belongs to the Anglo-Saxon language sphere affect the likelihood of transnational interaction (Hale, 2012; Takhteyev et al., 2012, p. 75). Thus, cross-national user interaction is expected to be lower for English-speaking countries than for user communities with English as a foreign language (Expectation 2). In contrast, given their cultural proximity, cross-referential cohesion is expected to be higher for countries from the Anglo-Saxon sphere (Expectation 3).

#### 4. Data and Geolocation

##### 4.1. Data Collection

Twitter is a unique data source for interactional data of a large user community around the globe (Takhteyev et al., 2012, p. 73). Data access for researchers is still relatively easy and comprehensive. There are important downsides to using Twitter for social science research as well (boyd & Crawford, 2012; Jungherr, 2014; Ruths & Pfeffer, 2014), most importantly its elite bias as Twitter is certainly not the platform for the masses. However, it is relevant for political information and activism alike. It can hardly be ignored by actors of strategic communication. While elite actors active on Twitter can be regarded as informants for broader domestic publics in the sense of so-called two-step flow communication (Lazarsfeld, Berelson, & Gaudet, 1948), at the same time and in a reverse direction, they can be expected to leave their domestically formed discursive imprints on the global debate as well.

We used Twitter's Streaming API (application programming interface) by applying the R package StreamR (Barberá, 2013) for automatic data collection. We streamed data for an extended research period of almost two and a half years between August 2015 and January 2018, acquiring about 10m tweets in total, from which around 6m tweets could be kept for the final dataset after data cleansing and geolocation of users.

##### 4.2. Geolocation

The geolocation of users is an essential preparatory step for further analyses as any measurement of (trans-)national interaction or structuration of social communication requires that messages can be ascribed to a national origin. Precise geoinformation with coordinates is included in the metadata provided by Twitter only for a marginal share of tweets, namely for users who enabled geotagging in their user settings. In or-

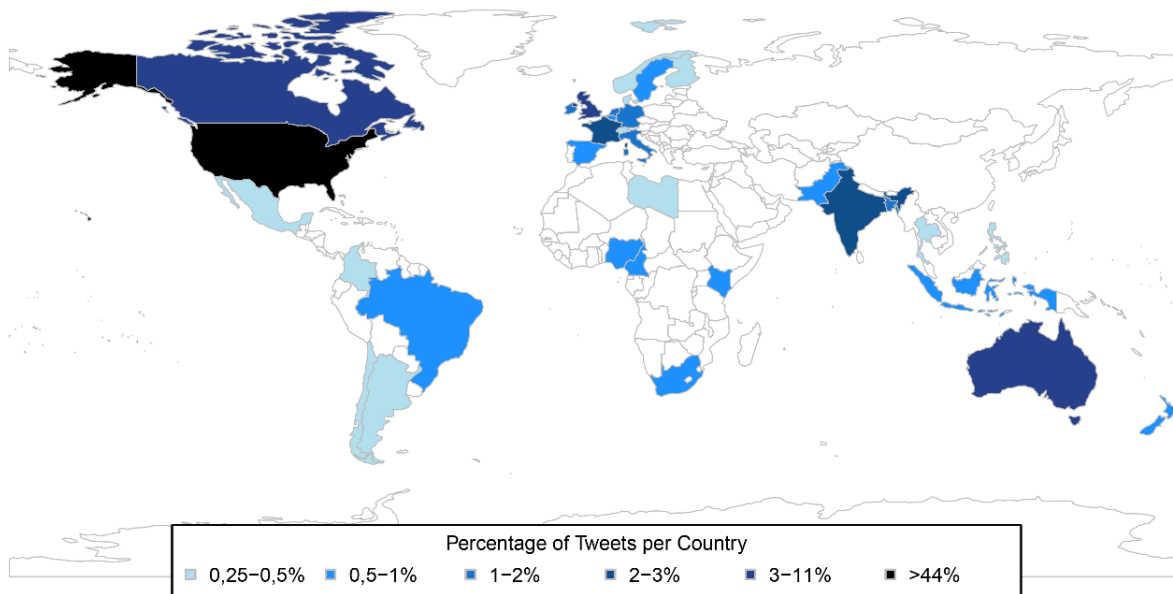
der to make assessments on the national background of users, I used the geographical index of the Data Science Toolkit (DSTK), a collection of open-source tools and open datasets provided by data scientist Pete Warden (2011). Geolocation, as applied for this article, takes self-reported user-location as input from the metadata obtained via the API. Previous research has shown that taking entries in the location field as input data for geocoding tools—geolocating users as opposed to their tweets—provided better coverage and accuracy (Leetaru, 2013, p. 14). Moreover, as critics might point to the lack of reliability of user-reported locations—the findings presented in empirical research support the assumption that a majority of users are truthful when filling in the location field (Leetaru, 2013., p. 17). The DSTK geocoder returned geolocation data for 59.2% of tweets collected. The subset of geolocated tweets remained comprehensive with around 6m tweets posted by roughly 1m users. I used the subset of accurately geolocated data (by geotagging) as a reference for the evaluation of DSTK geolocation. Taking the 'naturally' georeferenced tweets as a "sensor-based gold standard" for assessing the quality of geocoding is a common evaluation practice in the field (Leetaru et al., 2013, p. 13). This way I measured an accuracy level of 81% of tweets (for a comparison to other tools, see Takhteyev et al., 2012, p. 76).

Activity on Twitter is highly unequally distributed across the world with the platform being most heavily used in the US. This general observation for online communication has been well documented by previous research (Barnett & Park, 2014). It is illustrated by the World Map depicted in Figure 1. Most tweets were posted by US users with a share of 44.2%, followed by other Anglo-Saxon countries, ranging between 7.7% for Canada, and 10.3% for the UK. France, the host country of COP21 in December 2015, is the first continental European country in the ranking with 2.1%. I included the top 20 countries for the comparative analyses presented below. This meant a lower threshold for inclusion at 0.6% of all tweets sent as reached by Indonesia and Kenya.

##### 4.3. Language Use

Language use is a fundamental aspect of connected communication across cultures and national communities as every social interaction relies on the peoples' ability to understand each other, which in most cases means to share a common language (Takhteyev et al., 2012, p. 75; Taneja & Webster, 2016, p. 176). English has a special function in this regard as it serves as a global language (Crystal, 2012). Consequently, as previous works have shown, English is the dominant language in cross-nationally linked issue publics online (Hale, 2012). Other linguistic communities are more likely to be linked via English sites than bilaterally. Content that is provided in other languages than English will likely not be recognised by international audiences at all (Hale, 2012, p. 146). Nevertheless, previous work has shown for gen-

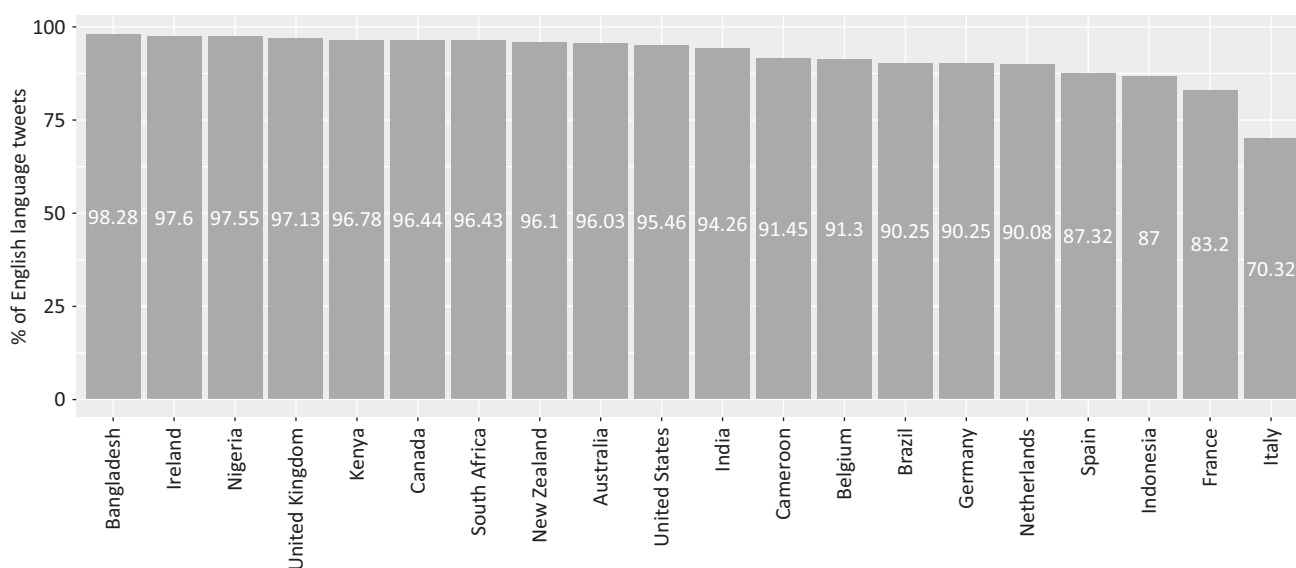
## #ClimateChange



**Figure 1.** World map of Twitter activity for #ClimateChange between August 2015 and January 2018. Note: A detailed frequency table for all countries is provided in Supplementary File, appendix A. Source: Author, prepared with R worldmap.

eral Twitter communication, that users tend to dominantly write tweets in their own languages (Leetaru et al., 2013, p. 11). This, however, is obviously not true for this English-language hashtag taken as query term for data collection. Against potential critique, it is important to note that the use of English for tweeting is nevertheless widely spread across linguistic communities across the world and thus not exclusive to Anglo-Saxon or

Western countries (Leetaru et al., 2013, p. 11). Obviously, as Figure 2 illustrates, English is the all-dominant language in the dataset for this study as well. Data collection with the international English language hashtag #ClimateChange as a query term has, of course, introduced a strong bias to find English language communication. Thus, language cannot be taken as an indicator of discursive cohesion itself. The measured extent to



**Figure 2.** Percentages of English language tweets by country. Notes: Only the 20 most frequent countries in the dataset were included. Values for the detected language of a tweet were directly taken from the metadata provided by Twitter. Source: Author, prepared with R ggplot2.

which English is dominant or—inversely put—the extent to which users also write in other languages might, however, give a rough comparative impression of linguistic structuration. Unsurprisingly, Figure 2 shows higher percentages of English language tweets for countries with English as the official language (all countries on the left-hand side of the axis until Cameroon). Countries with English only as a foreign language have lower values, with the Romanic speaker communities of France and Italy being at the bottom of the list.

## 5. Empirical Indicators

For the study of the transnational quality of issue publics on Twitter, I propose a combination of indicators that are grouped into network indicators (cross-national user interaction and network centrality) and indicators of cross-referential cohesion (hyperlink referentiality and hashtag co-occurrences).

### 5.1. Network Indicators

#### 5.1.1. Cross-National User Interaction

The analysis of user interaction is the most basic and straightforward measurement of (trans-)national interaction among the methods applied. Twitter communication is taken as what it is, a network, with users acting as nodes and retweets and @-mentions as links between them. This operationalisation is well established in social science Twitter research (Ruiz-Soler, 2018). It is important to note that this is a lower-bound definition of interaction. Twitter ties, in general, are relatively weak (Takhteyev et al., 2012, p. 74). In contrast to network analysis based on e-mail traffic (State et al., 2015) or users who follow each other on Twitter (Takhteyev et al., 2012), the links defined for this study do not require nor express any pre-existing social ties of users. In correspondence to the other indicators included, the links of the network reflect an awareness of other users and/or exposure to their content. The comparative indicator is the percentage of outgoing cross-national linkages in a directed network.

#### 5.1.2. Network Centrality

Going beyond counting interactions, network analytical measures can help to better understand the actor-based structuration of an issue public based on actor centrality. Which actors are central to a debate? Which are the most influential, which are most listened to? The results of Twitter network analysis do not only tell something about the Twittersphere. In fact, relational structures in a Twittersphere issue public already reflect discursive structuration beyond it. Many accounts, for instance, that attract the most attention on Twitter (indegree centrality) only seldom write or reply to others (outdegree centrality) as Ruiz-Soler (2018, p. 438) and

others have shown in previous research. Their relative standing within the network is thus not derived from their activity on the platform but from holding a prominent speaker position in the general debate. For the purposes of this article, this is best reflected by indegree centrality. Indegrees were calculated for all nodes in the global network and the national subgraphs. The resulting frequency distributions were then correlated with each other. I used Pearson's R for calculating correlations with every pair of values for the respective entries from the global distribution and the distribution for the respective national cases having been taken into account (see Leetaru et al., 2013). This resulted in a list of 20 correlation coefficients, one per country.

### 5.2. Indicators of Cross-Referential Cohesion

#### 5.2.1. Hyperlink Referentiality

Hyperlinks are at the core of internet technology (Benkler, 2006). Hyperlink analysis helps to better assess how users realize the potential interconnectedness of internet technology in their actual communication. Hyperlinks serve as a proxy to measure awareness of content across national or linguistic borders (Barnett, Chung, & Park, 2011; Taneja & Webster, 2016). This understanding of hyperlinks is well established in previous literature on the blogosphere (Adamic & Glance, 2005; Hale, 2012) and is transferable to social media (Jacobson, Myung, & Johnson, 2016). As Leetaru et al. (2013) have shown, a considerable share of sent tweets globally contains hyperlinks (almost 16%, see Leetaru et al., 2013, p. 26). Given the fact that with URLs, Twitter users mostly refer to other online content provided beyond Twitter, hyperlink analysis opens an analytical window to the wider mediascapes that users populate. For hyperlink analysis, link shorteners—as standard in Twitter communication—needed to be re-translated for obtaining the actual URLs—I used longURL for R (Rudis, 2016). URLs were again shortened to domains in order to compare referenced sources of content. From the resulting lists, dominant content service providers such as Facebook, Google, and of course Twitter itself have been removed before comparative analysis. From that, I built frequency distributions for the global dataset and for national subsets. A high correlation—expressed with Pearson's R—in domains referred to between a single national user community and the global distribution would thus indicate a higher degree of cross-referential cohesion.

#### 5.2.2. Hashtag Co-Occurrence

Hashtags have become a core element of Twitter usage. They are user-created metatags that serve as dynamic markers of issue publics themselves (Bruns & Burgess, 2011). In practical use, hashtags are often accompanied by further hashtags that might relate sub-discussions to a broader Twitter debate. This allows

the study of co-occurrences of hashtags. Hashtag co-occurrences have been used to analyse trends in Twitter debates (Steinskog, Therkelsen, & Gambäck, 2017). From a discourse theoretical perspective, they can be read as connectors between topically oriented discourses or as frame-bridging elements connecting different contexts of social sense-making regarding certain commented on events (Eriksson Krutrök & Lindgren, 2018). As Twitter communication cannot be conceived as separate from broader public debates, co-occurrences of hashtags might carry substantial information on the discursive structuration of those debates. For the analysis, I obtained hashtags co-occurring to the main hashtag that had been used as a query term. From that, I built frequency distributions for the global dataset and for national subsets with a high correlation between them indicating a higher extent of cross-referential cohesion per national user community.

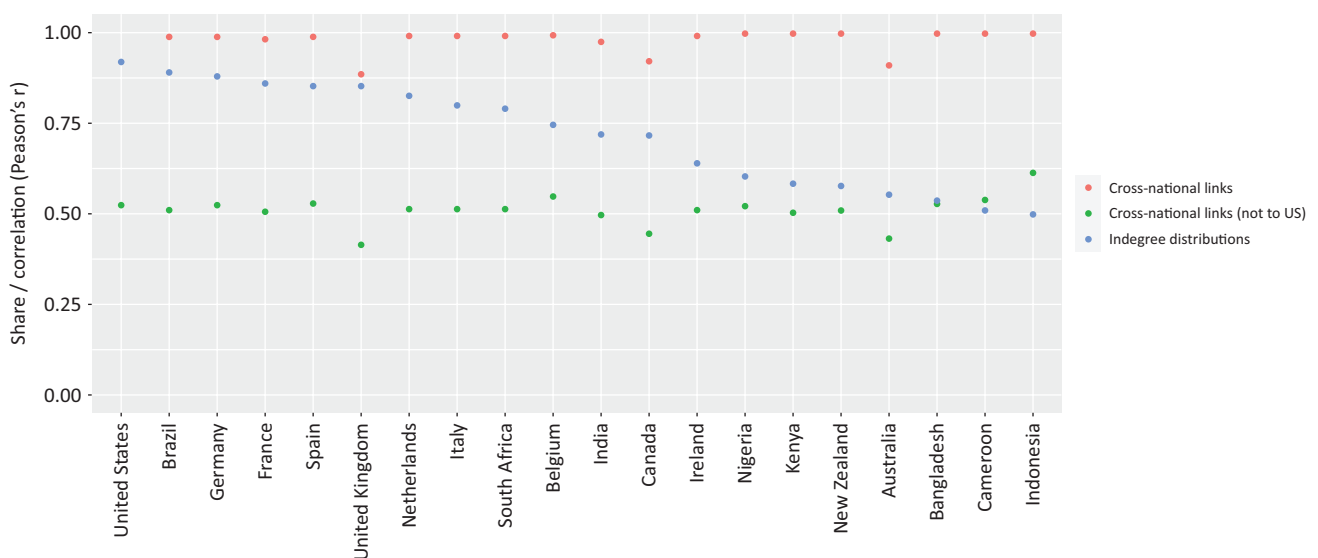
## 6. Results

### 6.1. Network Indicators

Network indicators include the share of actual cross-national user interactions, thus retweets or @-mentions that referred to other users of a different national community, and the correlation of indegree distributions per country, equally based on retweets and @-mentions as links of the network. The values per country are depicted in Figure 3, sorted in descending order by indegree correlation. As the entire dataset reflects the prevalence of US users in Twitter communication so does the network built for this study. US accounts are by far the most frequently referred to. This, to a large extent, explains why cross-national links are a kind of standard for

the observed communication ranging from 88.5% of all interactions for the UK to almost 100% for Cameroon with the obvious exception of the US itself with only 52.3% of interactions towards other national user communities. While this would typically underscore assumptions of cultural dependency, one should keep in mind the inequality of Twitter usage reflected in the dataset. If one, for a contrastive picture, disregards all links towards US users, data points for all other countries drop to values around the 50%-line. Both curves showing lower values for English-speaking countries with high Twitter populations (UK, Canada, and Australia) suggest that those countries are somewhat less connected to the cross-national debate than the other countries. This is most clearly illustrated by correlations of indegree. In clear contrast to the very basic statistics on language use, most of the countries with English as the official or major language (Bangladesh), with the notable exception of the UK, are now positioned on the right-hand side of the figure, thus with the lower values of correlation. On the other side, at the top of the list just behind the US itself, we find large user communities from non-English language countries such as Brazil, Germany, France, and Spain.

Table 1, in addition, allows for a cursory qualitative glance at what kinds of users are most central to the global network and to selected country subnetworks. I selected the cases to be included for the table according to their position in Figure 1 (thus correlation values for indegree distributions) with the US representing the dominant user community, Germany as the first European country in the list and Indonesia as the user community with the lowest correlation (respective lists for all 20 countries are provided in Supplementary File, Appendix B). The top 10 lists depicted are mainly



**Figure 3.** Network indicators (share of cross-national links and indegree correlation) per country. Notes: Only the 20 most frequent countries in the dataset were included. Sorted in descending order by indegree correlation. Network analyses were exerted with igraph for R. N (tweets)= 6,041,024; N (users/nodes) = 1,197,515; N (edges) = 4,260,896. Source: Author, prepared with R igraph and ggplot2.



**Table 1.** Top 10 users measured by indegree for the global network and selected country subgraphs.

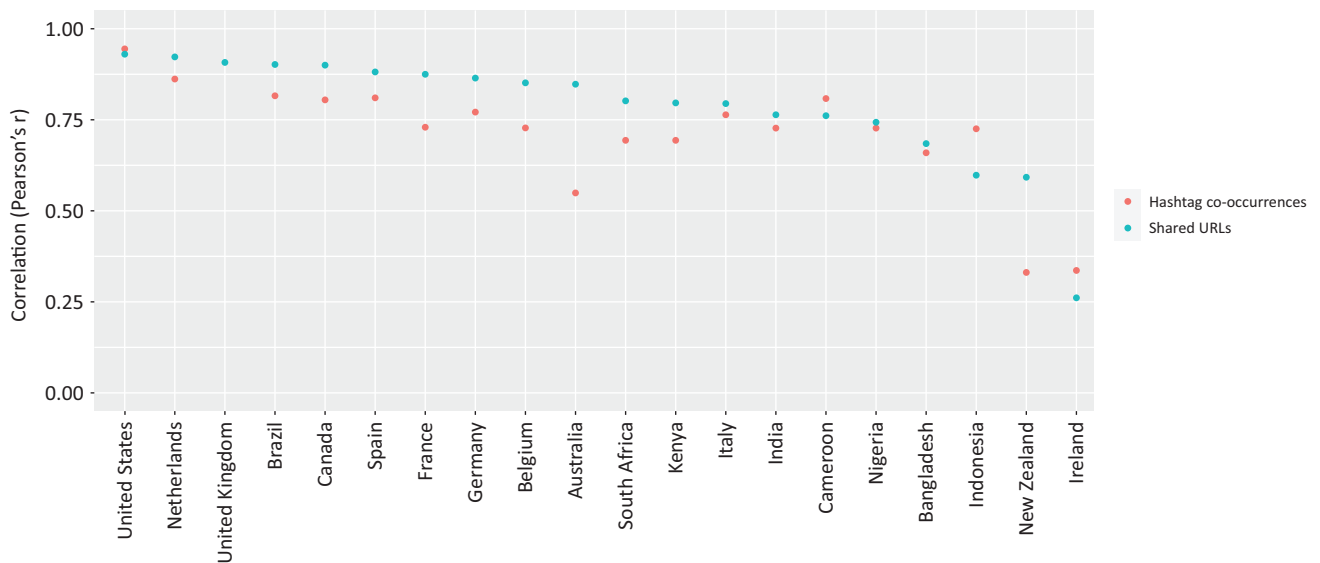
Rank	Global	US	Germany	Indonesia
01	leodicaprio	realdonaldtrump	unfccc	wscmedia
02	realdonaldtrump	leodicaprio	leodicaprio	examinercom
03	unfccc	badlandsnps	greenpeace	greenpeace
04	greenpeace	potus	wef	leodicaprio
05	potus	biologistdan	realdonaldtrump	humanity4frica
06	badlandsnps	climatereality	unep	unicef
07	wef	greenpeace	un	unfccc
08	biologistdan	algore	climatereality	wef
09	climatereality	unfccc	anttilip	who
10	unep	billnye	cop23	unep

composed of actors from US politics and administration, UN organisations, and programmes (like UNEP) and fora (COP23 for Germany), as well as other international organisations like the World Economic Forum, NGOs (especially Greenpeace), and some individual activists (Leonardo DiCaprio as a celebrity and climate activist). While one cannot read too much into this comparison of the top entries only, the top-10-lists include some interesting hints to international variation with the US and Germany having more entries in common with the global list, and there being slightly more international organisations and NGOs with higher ranks in the case of Germany, and especially Indonesia, than for the US.

6.2. Indicators of Cross-Referential Cohesion

As indicators of cross-referential cohesion, I propose web-based cross-referentiality represented in tweets as shared URLs and discursive linkages as seen in hash-

tag co-occurrences. Figure 4 integrates the two indicators into a comparative plot. The descendant order of the plot is according to shared URLs. Overall, correlation is highest for shared URLs with values ranging mostly between .59 for New Zealand and .93 for the US. Ireland constitutes a remarkable outlier though with only  $r = .26$ . Cross-referential cohesion measured by hashtag co-occurrences shows overall lesser correlations with a comparable variation, ranging from .55 in the case of Australia to .94 for the US. Here again, Ireland and New Zealand have much lower values (.34 and .33 respectively). Both countries need to be more deeply investigated in further research. Nevertheless, I leave them aside for the further discussion of results in this article as their highly divergent discursive patterns might be explained with a high degree of automated activity, professional propaganda or trolling. At least, qualitative insights obtained by the inspection of the top-50-lists of hashtag co-occurrences and shared URLs (as pro-



**Figure 4.** Indicators of cross-referential cohesion (correlations of hashtag co-occurrences, shared URLs) per country. Notes: Only the 20 most frequent countries in the dataset were included. Sorted in descending order by correlation of shared URLs. N (tweets) = 6,041,024; N (unique domains) = 37,271; N (co-occurring hashtags) = 291,053. Source: Author, prepared with R ggplot2.



degree centrality distribution. This underlines the dual character of Twitter links as both marked user interactions and discursive events. In support of Expectation 2, comparative observations of user interaction suggest an effect of language in the sense that communicating in the mother tongue allows for a somewhat higher separation of debates from the global stream of communication while cosmopolitan elites tweeting in English as a foreign language are more cross-nationally active. In contrast, when looking beyond user interactions and including user centrality, it seems that other factors such as regional or developmental status also affect the results. This, of course, makes much sense especially regarding the overall topic and policy field represented by this case study: climate policy. While this would be in line with previous research (Hale, 2012), it is important to keep in mind that at least the linguistic effects can partly be ascribed to the choice of hashtag with users from non-English speaking countries using the English hashtag decidedly for their international communication while tweets obtained based on the initial query for users from countries with English as the official language also reflect national debates. This fundamental divergence might also be part of the explanation for the differences observed for indegree distributions.

This bias should, however, produce lesser effects for the indicators of cross-referential cohesion as they should reveal traces of national structuration also for cosmopolitan elite communication. Thus, including shared URLs and hashtag co-occurrences as further indicators allows for more nuanced findings. In fact, in contradiction to Expectation 3, it seems that it is not cultural proximity in a linguistic sense that is having an integrating effect on the user communities of the Anglo-Saxon world. Instead, regional and developmental statuses seem to matter more when explaining variation, with Australian users serving as an illustrative case in this respect.

To conclude concerning the broader research question, whether Twitter allows for a transnational quality of issue publics, the findings presented above yield a mixed picture. They certainly do not suggest national encapsulation or isolation as the degree of cross-national user interaction is high. The US as the dominant and much more self-sufficient user community needs to be considered as a special case, of course. Otherwise, the more indicators reflect the structuration of discourses, the more they show variations that help to produce nuanced insights into the (trans-)national structuration of online issue publics.

However, to corroborate the preliminary findings presented so far and to find causal explanations, further research needs to be done, i.e., by including additional case studies and by inspecting the development of indicators over time. Moreover, the fluidity of hashtag use needs to be considered for data collection as well as the limitations of studying a single platform such as Twitter and the taking of only a single hashtag as query term for data collection. Despite those limitations, this article

aimed to introduce a set of indicators into the methodology and to test it on a prominent case. Further applications should follow. As most of the indicators included can be adapted for use beyond the Twittersphere as well and further indicators—most importantly indicators for the measurement of discursive structuration (e.g., topic modelling)—can be added to the methodology, there is a lot of potential for more nuanced approaches to the measurement of (trans-)national structuration to thrive in future.

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### Conflict of Interests

The author declares no conflict of interests.

### Supplementary Material

Supplementary material for this article is available online in the format provided by the author (unedited).

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