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# Heating up the debate? Measuring fragmentation and polarisation in a German climate change hyperlink network

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## ABSTRACT

Research into polarisation on the internet has so far primarily focused on contentious issues and yielded contradictory results. Shifting the focus to a non-contentious setting, this article combines community detection with brokerage analysis and exponential random graph models to assess the degree of polarisation at different levels of a German hyperlink network on climate change. Although homophily accounts for a moderate degree of polarisation at the top level of the network, the communities reveal that other factors prove more decisive in shaping its structure and the article thus contributes to a more refined understanding of the nature of online polarisation.

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## 1. Introduction

One of the central questions of current research regarding the internet is whether it is able to expand the political public sphere.<sup>1</sup> Optimists argue that the low costs and easy access are apt to generate a more level playing field by granting a greater voice to civil society actors, which in turn should make political discourse more diverse as it integrates a broader range of (often marginalised) views (e.g., [Bimber, 2003](#)). Pessimists in turn point out that the radical democratic potential of the web is undermined by virtue of its normalisation—that is, the fact that on closer examination it is equally stratified, demonstrates the same distortions of power, and therefore reflects, rather than complements, the reality of the offline world (e.g., [Hindman, 2008](#)).

What remains uncontested is that the internet and its hyperlink topology add a new dimension to the way actors become visible, how they relate to one another through their social and political ‘acts of association’ ([Rogers, 2012](#); p. 6) and thereby structure the public space, *and* how we conceive of it. Indeed, the algorithms of search engines such as Google take the hyperlinks running between websites as a measure of their visibility and prominence. Just what the effects of these individual choices are on a larger, cumulative level and how they affect the topology of the internet is a matter of some debate and concern.

One of the main worries is that actors primarily link to like-minded others, abetting the formation of ‘echo chambers’ ([Sunstein, 2009](#)), which effectively undermine any hopes of a greater diversity associated with the digital revolution. This form of polarisation is generally taken to consist of a sorting process, through which actors with opposing viewpoints come to be located in politically uniform camps that have little communication with one another. The concern is that this separation between opponents is apt to erode the very structures of a digitally expanded public sphere in the long run ([Chaffee and Metzger, 2001](#)).

Against these far-reaching implications, the existing research on polarisation of the online space has for the most part examined linking patterns on single platforms such as Twitter ([Williams et al., 2015](#)), the activities of single civil society actor types such as bloggers ([Adamic and Glance, 2005](#); [Elgesem et al., 2015](#)), and generally focused on instances of heightened controversy between the opposing camps of an issue. For all the important insights these studies have generated, we are still left with an incomplete understanding of the dynamics at work: we know little about polarisation processes outside individual online platforms, specific actor types, or how the actors structure their hyperlink communication in less contested issues. Furthermore, by focussing primarily on the general level of the network, the existing research tends to overlook the more complex patterns that shape the intermediate level of brokered relationships and the local level of tie formation processes. It also faces difficulties in distinguishing between the expected degree of interactions between like-minded actors and instances of

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<sup>1</sup> This article uses the terms ‘internet’, ‘web’, and ‘online’ interchangeably.

proper polarisation, which significantly distort the communicative space.

This article therefore explores the degree to which linking patterns between different types of online actors reveal tendencies to fragment the online space into polarised pockets by analysing a hyperlink network on climate change that originates in Germany. This also allows us to investigate whether polarisation is an irredeemable quality of any *res publica* or whether it relates to the degree of contentiousness that surrounds an issue. Much research tends to concentrate on instances of heightened political controversy, which may lead to a somewhat incomplete understanding of polarisation processes, as we tend to ignore other configurations of political issues. From a methodological point of view, current research suffers from the general shortcoming that while several studies have documented tendencies of online polarisation, it is not clear to what extent this is really evidence for further-reaching segregation processes, or whether it simply reflects a normal economy of attention between opposing camps (Benkler, 2006). This raises the question of measuring polarisation and defining corresponding thresholds. Here, the present study argues that polarisation is a complex dynamic that occurs at different levels of the network and proposes a set of measures that capture polarising tendencies on the general, intermediate, and local levels, assesses whether they are beyond the threshold of statistical significance, and examines how substantive the effect is. Whereas the different network levels offer a more detailed concept of polarisation processes, the thresholds allow us to distinguish between regular communication patterns and segregationist tendencies and assess their relative strength.

The article proceeds as follows: the next section reviews the literature on fragmentation and polarisation on the internet, highlighting the conceptual issues with which it has been hampered. This is partly due to a one-sided focus on highly contested debates, and we will therefore widen the theoretical focus to encompass both 'open' and 'closed' issues. The methods section presents the case selection, outlines the procedure used to generate the German climate change hyperlink network, and introduces the different measures that allow us to assess the form and degree of polarisation, moving from the general level of the network and the intermediate level of the relationships between the single communities to the local level of the nodes' tie formation processes. As the analysis shows, the overall moderate degree of polarisation is mainly present in the higher levels of the network, and extending the analysis to the local level by employing exponential random graph models (ERGMs) safeguards us against premature conclusions. The concluding section embeds the analysis in the wider context of the current debate and shows that closed issues, as do open ones, pose a number of challenges for normative theory.

## 2. Literature review

Empirical research into polarisation in hyperlink networks takes a different approach to the prevalent view, which is employed above all in audience studies (e.g., Stroud, 2008) and is rooted in the social psychological literature of the 1970s (for an overview, see, e.g., Myers and Lamm, 1976). This recent work marks a return to the 'risky shift' tradition (Stoner, 1961), or more generally, the 'group polarisation phenomenon', which has been documented in numerous experiments and shows that subjects in groups tend to adopt more extreme positions with regard to their individual pre-group responses (Myers and Lamm, 1976). Polarisation in this context refers to a shift of the views and attitudes of individuals within a group towards one extreme, for instance, in terms of risk assessment or political attitudes.

In contrast to this, communication researchers analysing hyperlink networks have focused on online communities formed by the interaction between websites or blogs (e.g., Adamic and Glance, 2005) and are interested in whether the resulting topology leads to enclaves of like-minded actors. Polarisation here refers to a process that affects the structures of a networked public sphere (Benkler, 2006), as opposing views become segregated from each other and thus undermine the porousness of the informal public (Habermas, 1996), leading to worries about its potential to integrate societies and confer legitimacy to political decisions.

In its standard form, this type of polarisation is modelled as a bidirectional process, which differs from the one-directional shift of social psychological studies. Despite the differences between the two approaches, it is easy to see that they complement each other, as enclosed and ideologically homogenous spaces on the internet are apt to act as catalysts to the individual polarisation of online users, and the importance of authors such as Sunstein (2009) lies in the fact that they have indeed connected the two perspectives.<sup>2</sup>

An important difference between the two notions regards the analysis of polarisation. Whereas social psychologists have examined the effect of group discussions on the views and attitudes of individual subjects, internet researchers have so far failed to study hyperlink interaction as it unfolds. Rather than studying the process itself, whereby actors come to build more intense relationships with those sharing the same position, they have focused on its product, that is, clearly delimited areas shaped by the interaction of like-minded actors, which is taken to indicate a preceding sorting process (e.g., Elgesem et al., 2015; Guerra et al., 2013; Hargittai et al., 2008; Williams et al., 2015). In effect, what this research documents are the hyperlink fragmentation tendencies of the online spaces that lead to politically homogenous enclaves that are segregated from one another. These are taken to reflect instances of hyperlink polarisation, and the present study employs this definition when examining the structure of the German climate change online space.

Several blog-linking studies empirically support the echo chamber view. According to Adamic and Glance (2005), the US blogosphere fragmented before the 2004 presidential election into liberal and conservative camps, a finding confirmed in part by Hargittai et al. (2008) analysis of the linking patterns in liberal and conservative blogs, although they also find substantive argumentative exchange between the opposing camps. Similarly, Woo-young and Park's (2012) study of the Korean blogosphere during the US beef import controversy reveals a fragmented and polarised online space. Conversely, Adamic (2008) shows that, depending on the issue, here the bankruptcy bill, a usually divided blogosphere might temporarily integrate across the political divide.

From the perspective of climate change as a political issue, two recent studies partly confirm an existing polarisation: analysing 1.3 million blog posts in the English speaking blogosphere, Elgesem et al. (2015) employ an inductive community detection procedure in combination with a topic-modelling approach to pinpoint the distribution of topics in the discourse. They find a cohesive community of climate-sceptical bloggers alongside several climate advocate clusters. Contrary to this division, however, the topics identified by the study cut across the different communities and thus integrate the network. Applying a similar approach, Williams et al. (2015) examine the climate change debate on the microblogging platform Twitter, restricting the analysis to English tweets. The communities they identify through their linking patterns only partly form uniform clusters characterised by a single view on

<sup>2</sup> Note that the original social psychological literature does not require groups to be homogenous with regard to the property of interest to the researcher—the polarisation effect occurs nevertheless (e.g., Myers and Lamm, 1976)

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