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REVISITING KEY CONCEPTS IN DIGITAL MEDIA RESEARCH: INFLUENCE, POPULISM, PARTISANSHIP, POLARISATION

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Panel Introduction

Recent scholarship on the intersections between digital media and political debate has taken on a decidedly pessimistic, even dystopian tone, and not without reason: from the effective use of social media platforms by populists and demagogues like Donald Trump to the expression of deepening ideological divides in online public debate, and from the emergence of partisan online communities and platforms to the intensification and exploitation of such partisanship by conspiracy theorists and state actors, there are substantial concerns about the way that extremist actors are utilising digital and social media logics to further their ideological agendas. The situation is further complicated by platform providers' and regulators' limited and unsystematic responses to these issues.

But while there is considerable research into the various issues and events that illustrate these developments, many of the central concepts that are used to describe these cases receive substantially less critical attention. Terms such as 'influence', 'populism', 'partisanship', and 'polarisation' are often deployed as if did not themselves require further qualification and definition – even in spite of the considerable volume of literature in political science and other ancillary disciplines that addresses the various facets that such concepts may have. Informed by and building on substantial empirical research, this panel therefore facilitates a conversation between methodological innovation at the coalface of digital trace data analysis and careful reflection on the definitions of key concepts, in order to explore the conceptual frameworks and methodological approaches that might illuminate the distinct features of our four key concepts in sharper focus.

Our first paper engages with the concept of *influence*, which it conceptualises as the power to affect others. Focussing especially on the spread of verified false content (VFC) through social media, it proposes a novel population-scale approach that both employs a bottom-up perspective for identifying the influential actors spreading such content, and highlights the exposure of ordinary citizens to these messages. It demonstrates this approach by drawing on the large-scale Facebook URL-sharing dataset available from Social Science One, developing an EU-wide perspective on VFC exposure at national levels.

Our second paper continues this approach by critiquing the concept of *populism*, highlighting the term as a weak analytical concept. It argues that, rather than focussing on their populist stance, populist politicians can be judged by the extent of their

delegitimising rhetoric. Further, the paper asserts that such rhetoric is enabled by the decentralised communication environment of social media. The utility of the concept of delegitimisation is that enables the identification of political messages that are truly dangerous because they are meant to destabilise fundamental democratic principles, such as the integrity of the vote and the legitimacy of alternative policy perspectives. By situating this in the context of social media messaging, we can see how such messages are amplified by distributed network channels.

Our third paper shifts focus to the possible results of influence campaigns and populist demagoguery, and addresses the concept of *partisanship*. Taking as case study the 2022 Italian election, it introduces a novel combination of computationally informed analytical methods and applies them to social media data to gauge the level of partisan attention devoted to the different news sources and political topics in the election campaign, and distinguish between partisan and cross-partisan sources and themes. This provides new insights into the structures, intersections, and faultlines of partisanship, and enables the mapping of a broader multi-dimensional ideological space.

Our final paper continues this discussion by exploring the complexities of *polarisation*. It highlights the conceptual fluidity of this term, which is expressed in the multitude of adjectives and qualifiers that can be found in the relevant literature – from ideological through affective to interactive polarisation and beyond, and from benign and even beneficial to pernicious and destructive polarisation. Mapping these distinct forms of polarisation onto a diverse range of mixed-methods digital media research approaches, and outlining a number of criteria for assessing whether the dynamics of polarisation have turned destructive, it outlines new pathways for polarisation research in Internet studies.

In combination, then, these four papers offer a timely nudge for digital and social media research to revisit and reconsider some of the central concepts in online political communication studies, and to retrace and reaffirm the connections between the definitions of these concepts and the methodological frameworks that we use to study them. We include the extended abstracts for the individual papers on the following pages.

UNWANTED INFLUENCE IN THE FACEBOOK NEWS FEED: COMPARING CITIZEN EXPOSURE TO VERIFIED FALSE CONTENT IN ALL 27 EU COUNTRIES

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Actors' influence on citizens via the media has long been addressed in media studies, especially in relation to advertising and during elections and crises when people seek out media for trustworthy information (Blumler & McQuail, 1968; McQuail, 1979, 2016; McQuail & Deuze, 2022). Current issues relating to the spread of verified false content (VFC) during elections, the pandemic, and the current war in Ukraine have reignited interest in influence, or more precisely in *unwanted influence*, from a societal perspective, especially as it is nowadays exerted in a much more complex global media environment with personalised and algorithmically curated feeds that conceal information about VFC exposure and viewing (Charquero-Ballester et al., 2021; Nissen et al., 2022).

This paper argues that this opaque nature of the current media landscape, with a focus on social media, and the lack of bottom-up investigations of influence combined with the lack of theoretical discussions on influence (Gruzd & Wellman, 2014), provide little conceptual and empirical ground to understand what influence in social media entails in its diversity, and what different types of influential actors potentially exert unwanted influence in various modes of the influence process.

In this paper, *influence is conceptualized as the power to affect*, with effect as its result (Katz & Lazarsfeld, 1955; McQuail & Deuze, 2022); this is followed by critical reflections on how (unwanted) influence through social media has been addressed previously. The paper proposes a population-scale approach that:

- a) centralises a bottom-up perspective to influential actors, focusing on potential influence on populations and citizens, rather than adapting a predefined influential actor perspective focusing on either tastemakers, (micro)celebrities, or opinion leaders per se, as they can change status depending on the context, e.g. platform, subject, audience, and region (Abidin, 2016; Giglietto et al., 2019; Jerslev & Mortensen, 2018; Katz & Lazarsfeld, 1955; Marwick, 2013), and
- b) highlights the citizen exposure mode of the process that is seldom studied, due to limited access to personal feeds on national population scales outside the US

(e.g., Allcott et al. 2019; Bailey et al. 2021; Canary et al. 2022; Guess et al. 2019; Yang, A. et al. 2021; Yang, K.-C. et al. 2021).

The paper asks:

How do national populations in the EU differ in their exposure to VFC in terms of the topic of VFC, the actors creating it, and the demographic profile of the citizens exposed to it? And do these actors create integrated networks across and beyond EU countries?

The paper hypothesises great variation across countries due to national cultural history, and political and media systems (Hallin & Mancini, 2004) that potentially will favour some actors over others and that will affect the way social media is used as a platform in different countries. Furthermore, we expect to find differences across demographics of age and gender due to stereotypic differences in age and gender-related lifestyles and interests, and we expect to find rather integrated networks across countries due to the activities of well-known influential VFC actors. The outcome of the analysis will thus among others be to divide European countries in a VFC country typology, with inspiration from Hallin & Mancini.

Methodologically, we will utilise our access to the Social Science One Facebook URL dataset to answer the research question, and combine this with lists of verified false stories from the International Fact-Checking Network (IFCN) fact-checkers to enable filtering of the dataset for VFC (Nissen et al., 2022). Furthermore, we will register overlap of source URL sharing across countries. Facebook is chosen as it is the most used social media platform across Europe in terms of monthly active users (Statista, 2022, 2023).

The paper is unique in its contribution to our understanding of exposure data on national levels, and outside US, across the 27 EU countries whose susceptibility to VFC is understudied at scale (Bak et al., 2022). The paper also provides an important and novel contribution in its attempt to produce a population-level country typology in Europe in relation to Facebook VFC exposure patterns. The dataset, scale, and scope of the study allows us to understand more general patterns and dynamics that we might be unaware of, and which can both feed into the way that we understand and measure influence, and function as an empirical grounded contribution to societal processes towards regulation of unwanted influence and transparency.

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DELEGITIMIZATION VERSUS POPULISM: THE CASE STUDY OF DONALD TRUMP IN OUR SOCIAL MEDIA COMMUNICATION ENVIRONMENT

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Introduction

Scholars, journalists, and political observers have embraced the idea of *populism* to explain the recent and current spate of political leaders who are contributing to democratic backsliding. These politicians include U.S. President Donald Trump, U.K. prime minister Boris Johnson, Indian prime minister Narendra Modi, and Brazil's Jair Bolsonaro, just to name a few.

Our concern with *populism* as a way to identify and describe problematic democratically-elected politicians is that *populism* is a weak analytical concept. It does not help differentiate merely problematic democratically-elected leaders from those who are truly dangerous to democracy. Moreover, the object of analysis is muddy: Is it ideology? Is it rhetoric? Is it tone?

We argue that a better analytical concept is needed by which to judge political elites in democracies. Using the case of the 2020 U.S. presidential election and a comparison of the social media messages of two candidates -- Donald Trump and Joseph Biden – we advance the argument that politicians can be judged by the extent of their delegitimizing rhetoric. We further assert that such rhetoric is enabled by the decentralized communication environment of social media.

We ascribe to the perspective of Laclau (2014) that populism is a style of rhetoric rather than an ideology. All democratically-elected politicians, he argues, ascribe to populism to some degree given that the basic premise of democracy is that the voices of the public are represented in the political system. At best, as Muddle (2004) notes, populism is a 'thin' ideology that focuses essentially on a position of antagonism towards elites.

Populism, though, is unhelpful analytically. First, if, as Laclau (2014) argues, all politicians have some aspect of populism in their rhetoric, and there is not a clearly identifiable ideology of the populist, then populism cannot help us differentiate the ideologically problematic from the downright dangerous. Engesser, Ernst, Esser, and Büchel (2016) find that a broad range of politicians articulate support for the public, while left-leaning politicians attack economic elites and right-leaning politicians attack the media elite. Given that nearly all politicians can be labeled as populists, even if the dimensions of what elites are attacked can be cleaved on different targets, it raises questions about how useful populism is as a concept.

Scholars have attempted to resolve this by providing additional adjectives to modify *populism* as a way to differentiate different politicians. For example, Rowland (2021) refers to Trump as a 'nationalist populist'. We argue that such adjective + populist labeling further muddies the conceptual waters. Scholars do not agree on what the right adjective + populism should be for 'bad' populists (right wing?, nationalist?, authoritarian?).

Second, and related to the first, scholars contend that there are good populists and bad populists. Mouffe (2018), for example, argues that there is a need for a *left populism* and Rowland (2021) contrasts nationalist populism (bad) with progressive populism (good). Yet, if most scholars highlight populism as problematic and a contributor to democratic backsliding (Müller, 2016), then to what use is the concept if it can also be applied to progressive or 'good' populists?

Third, the object of study or what makes for a populist is unclear. For some scholars it is their rhetoric (Mouffe, 2021), but for others it's the tone or style (Judis, 2016). For others still, the focus is more on the context that has given rise to populism (Moffitt, 2016), and the policies and actions undertaken in office that is the focus (Müller, 2016). Without a clear focus on the object of study, it is hard to clearly determine who is and is not a populist and what the potential implications of such are or might be.

We contend instead that the lens through which politicians should be evaluated is through argumentation theory. Fairclough and Fairclough (2012) suggest that political discourse analysis should be understood as analysis of argumentation. The foundation of argumentation is evidence that supports claims, which are made through language. When politicians advance only claims without evidence, or make claims that are premised on false information, then a foundational premise of democratic politics is violated. This is what we call *delegitimizing rhetoric* when the targets of that rhetoric focus on undermining democratic institutions, processes, and actors.

Trump's discourse as compared with Biden's is noteworthy for his delegitimizing rhetoric. Using as a case study the 2020 presidential campaign, Trump produced extensive arguments founded on lies that the Democrats were stealing the election, that voting machines and voting locations were being used to manipulate votes, and after the election he repeatedly claimed that he had won, even when he knew he had not. By contrast Biden never questioned election results, and underscored the importance of voting and of ensuring effective voting systems.

Moreover, Trump baselessly attacked opponents and institutions. He delegitimized his opponents through a rhetoric of disrespect – calling opponents names, insinuating ill motives, and making false accusations. He delegitimized institutions, from government agencies, such as the Federal Bureau of Investigation, to city governments of major cities like Philadelphia, Baltimore, and Chicago.

While scholars have highlighted the role of social media in the rise of populism (Gerbaudo, 2018), we make a second argument that social media can be used to amplify delegitimization rhetoric, as politicians like Trump not only bypass traditional journalism but also attack it. Undermining key gatekeepers in the information

environment enables delegitimizing rhetoric of democratic institutions to spread and to fail to be countered effectively, further putting the foundational pillars of democracy at risk.

The utility of the concept of delegitimization is that it allows us to differentiate political messages that are truly dangerous because they are meant to destabilize democratic bedrock principles, such as the integrity of the vote and the legitimacy of alternative policy perspectives. By situating it in the context of social media messaging, we can see the ways that it manifests unchecked and gets amplified through the power of distributed network channels.

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PARTISAN ATTENTION AND NEWS STORIES TOPICS DURING THE 2022 ITALIAN ELECTION

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Polarisation and Partisan Attention

The prevalence of extremist positions over moderate ones in some recent elections and the emergence of hyperpartisan media (Benkler et al., 2018) have brought renewed attention to the impact of political polarisation (Wojcieszak, 2015) on public discourse in liberal democracies (Katsambekis, 2017). Concerns have been raised regarding the potential of selective political exposure and ideological polarisation as a result of the ongoing fundamental shifts in communication ecosystems. Claims of skewed political news stories and partisan coverage of public issues are widespread throughout media history. Nonetheless, in the last few years, several factors, such as declining public trust in traditional media (Zuckerman, 2018), the emergence of social media and alternative digital media sources, have led to concerns about the social and political consequences of a surge in partisan selective exposure (Lazarsfeld et al., 1968) prompted by an increasingly fragmented media environment. Sunstein's (2017) "echo chambers" metaphor (Bruns, 2019) serves as a cautionary reminder about the effects of the combination of two phenomena: the tendency for individuals to self-segregate into groups with like-minded individuals, and the ability of social media users to shape their networks through a combination of platform constraints, algorithmic filters, prioritisation, and personal preferences (Bakshy et al., 2015). On the supply side, social media have aided the success of hyper-partisan media by providing effective options for the growth of micro (and macro) audience niches. Hyper-partisan journalistic and quasi-journalistic sources (McNair, 2017), which are now vying for online user attention alongside mainstream news organisations, often flout established ethical principles in professional news reporting, and in some cases, deliberately publish false or misleading news stories (Bhat, 2018).

Estimating Partisan Attention with Social Media Data

The political partisanship of news media outlets is a classic topic in political communication research. However, traditional methods of classification (e.g., Pew Research Center, 2018) are costly, restrict the number of news outlets considered, and are susceptible to the standard biases of self-reported data (Haenschen, 2019). New studies have emerged using digital data to measure media partisanship, resulting in three main approaches. The first analyses textual content to estimate the political bias

of news media outlets (e.g., Gentzkow and Shapiro, 2010). The second aims to scale the political leaning of various textual items, such as documents, news articles, or blogs, using semi-automated analysis methods (e.g., Laver, Benoit, and Garry, 2003). These approaches still require manual coding or data preparation, as they generally deal with classification problems and use semi-automated analysis methods. The third approach offers a more efficient and unbiased way of classifying political media, at least in that it is entirely data-driven. It uses automated methods, such as analysing Twitter users' political leaning through following-followers networks (Barberá, 2015), or classifying the political orientation of social media users and then the news sources they share online. An example of the latter approach is the Media Partisanship Attention Scores (MPAS) (Faris et al., 2017). Most of these approaches, however, are grounded in the U.S. bipolar political system and unsuitable for a multi-party system. More recently, Faris's approach (2017) has been adapted to the Italian multiparty political system with the "Multi-Party Media Partisanship Attention Score" or MP-MPAS (Giglietto et al., 2019a).

A wide range of studies has been conducted to better understand the challenges posed by this transformation to modern liberal democracies, with the goal of estimating partisan consumption of both legacy media and social media and assessing its effect on political and ideological polarisation. This paper contributes to the discussion by examining the case of the Italian general election, which was held on September 25, 2022. We analyse the Facebook posts around political news produced by 15 news media pages in the lead-up to the election and extract the main topics discussed by these news media. In addition, our study repurposes the original MP-MPAS technique to measure the attention dedicated by different partisan online communities to digital news media sources using Twitter data in a multi-party political system, with the goal of examining partisan political news consumption on social media. This work aims to map topics to news sources and (and in turn) partisan attention score and, finally, to measure the alignment between partisan attention score to media topics and prevalent party topics.

Methods: MP-MPAS and OpenAl Powered Topic Clustering

This paper implements an original combination of two methodological approaches: the Multi-Party Media Partisanship Attention Score (MP-MPAS) and the OpenAl powered topic clustering. With regards to MP-MPAS, its general idea "is to categorize users first (based on the proportion of their retweets) and then, in turn, the news sources they shared" (Giglietto et al., 2019a, p. 90). This approach has already been shown to be capable of shedding light on partisan information dynamics in social media (Giglietto et al., 2019b). To calculate the MP-MPAS score, we collected 509,219 retweets from political accounts the month before the election and then extracted 146,596 links shared by the 5,776 most active users. The method yielded a measure of partisan attention for 1,354 domains, including 15 prominent Italian news outlets, on which we focused our subsequent analysis.

As for the main topics discussed by news media on Facebook, we analysed all the posts published by the official Page of the 15 selected Italian news outlets between July 21 and September 25, 2022, using several techniques powered by the OpenAI language models. To begin, we fine-tuned OpenAI's ada model to carry out a binary

classification task, enabling the differentiation between political and non-political posts with a high level of accuracy (F1 score: 0.97). Overall, a total of 14,146 posts were subjected to analysis, with 12,604 posts categorised as political. To retrieve a 1536-dimensional vector document embedding for each political post, we utilised the "text-embedding-ada-002" model. The document embedding approach is a natural language processing technique that involves representing textual documents – in our case, social media posts – as dense vectors in a high-dimensional space. Lastly, we utilised K Means cluster analysis, with auto-topic labelling (text-davinci-003), to identify the salient topics that emerged from the political posts. We successfully identified 94 clusters, which allowed us to group similar posts together and allocate labels to each cluster based on the most frequently occurring topics. Subsequently, we mapped the partisan attention score of news sources on their corresponding Facebook Pages, and then to the relevant topical clusters. This process allowed us to gauge the level of partisan attention devoted to each of the identified topical clusters and to distinguish between insular and cross-partisan topics.

While based on a single national context, the results of this study offer useful insights into the role played on social media by different sources of information, which are sometimes used as a meeting/clash space between different partisan communities, while other times they act as megaphones for the benefit of specific communities. Beside these insights, the study introduces an original method that leverage social media traces to detect and map campaign topics on a latent multi-dimensional ideological space.

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TYPES OF POLARISATION AND THEIR OPERATIONALISATION IN DIGITAL AND SOCIAL MEDIA RESEARCH

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Introduction

Apparently increasing partisanship and polarisation, especially online, poses an urgent threat to societal cohesion in many democratic nations; polarisation is also a critical geopolitical concern when actively promoted by bad-faith actors to undermine citizens' trust in democratic institutions. But not all forms of partisanship and polarisation are inherently pernicious and destructive: milder forms of partisanship also motivate civic participation, constructive political debate, and policy advancement (Le Bas, 2018; McLaughlin, 2018; Mouffe, 1993). This raises complex questions about when polarisation shifts from constructive to destructive; whether this is linked with a move from issue-based, ideological polarisation to identity-based, affective polarisation; and at what point such problematic developments should be countered with active initiatives to depolarise.

Digital communication research provides new opportunities for studying polarisation in terms of traceable interactions and scale, but adds further complexity to an already challenging concept. In this paper, we draw on literature from political science and media and communication studies, concluding that much of the extant research studies polarisation without sufficiently conceptualising it (cf. Kubin & von Sikorski, 2021). This lack of conceptual definition is reflective of disagreements in these fields about what counts as polarisation and about how to assess its extent and impacts. This can lead to substantial problems when operationalising the concept of polarisation in digital media research. Key problems include the conflation of different forms of polarisation, the unquestioned adoption of technologically determinist perspectives, and the overdiagnosis of polarisation as destructive and static.

Building upon existing literature from political science and media and communication studies, we argue for a better demarcation of distinct concepts and definitions in the study of political polarisation as a threat to democracy. We describe the latter phenomenon as destructive political polarisation, in contradistinction from milder and more benign forms of political partisanship. Reviewing the diverse range of polarisation types identified in the literature across both fields, we highlight their key attributes and outline methodological approaches to their operationalisation in mixed-methods research that draws on the quantitative and qualitative analysis of digital trace data.

Polarisation and Its Definitions

Polarisation has gained a negative connotation due to widespread popular and media concerns that societies are becoming increasingly divided, or polarised, in a way that is destructive for democracies. In popular use, the term builds on a blurry definition that encompasses a spectrum from mild political disagreement to outright hostility, and often carries an *a priori* negative or destructive connotation. By contrast, the social sciences have historically used 'polarisation' in a neutral sense to refer to divisions between societal groups. These divisions can be understood as motivated by different attributes (e.g., ideologies, positions, issues, identities, values, affect, emotions), as operating at different levels (macro, meso, micro), and as focussing on different actors (e.g., politicians, political parties, citizens, journalists, media outlets).

Our full paper works through these definitions of polarisation and their key identified attributes, and outlines how they can be operationalised in digital media research. For instance, *ideological polarisation* can be understood as the distance between positions on one or more specific policy issues (DiMaggio et al., 1996; Fiorina & Abrams, 2008); traditional definitions in political science focus on elite or mass polarisation through political ideology, capturing (a) the level of agreement or disagreement with specific positions on political or societal issues; or (b) the placement in a broader ideological spectrum. In digital media, this may be investigated through computational or manual analyses of how a diverse range of mainstream or niche media outlets cover and frame the same issues, in terms of their language, tone, sourcing practices, and overall coverage choices (cf. Feldman et al., 2017); additionally, it is possible to trace how social media users in turn share and engage with such material in their own discussions (Giglietto et al., 2019).

But political polarisation can also be understood through concepts other than ideology. *Affective polarisation* is furthered through positive or negative sentiment expressed towards members of in- and outgroups, resulting in extreme cases in hatred and contempt towards outgroups (e.g., lyengar et al., 2012; Mason, 2015; Hobolt et al., 2021). Some empirical studies suggest that such affective polarisation can increase even while ideological differences remain static (e.g., lyengar et. al., 2012; Lelkes, 2016). Such polarisation is thus defined by hostility towards out-group members, and solidarity with one's own ingroup; notwithstanding the limits of simple computational sentiment analysis as applied to short-form social media texts, such discursive patterns can be assessed and analysed qualitatively and quantitatively through a combination of manual and automated evaluation of affective language and audiovisual components in social media discussions (e.g. Yarchi et al., 2021).

Further, it is also possible to evaluate networks of communication to determine the patterns of interaction between the various discursive groups, in order to examine what Yarchi et al. (2021) term *interactional polarisation*. This approach is exemplified by studies of climate change discussions on Twitter (Williams et al., 2015) and Reddit (Treen et al., 2022). Polarisation could be defined here simply by the absence of interaction between opposing sides, yet this may represent an oversimplification: as studies such as Williams et al.'s analysis of climate change hashtags on Twitter show, the various communicative affordances of specific platforms (here, @mentions, retweets, and following) may be used in diverging ways to attack, support, connect, and otherwise engage in constructive or destructive ways with in- and outgroup members (also cf. Giglietto et al., 2019). Network analysis, then, can point to distinct patterns of interaction with different groups, but only a further analysis of the content of such interactions will determine their positive or negative valence.

This introduction to three major types of polarisation is far from exhaustive, of course; we will discuss other possible definitions in the full paper, and outline how they may be operationalised in applied digital media research. Further, the approaches we have sketched out here may be employed at varying levels of specificity: in the context of distinct issues (e.g. a momentary political event or crisis); of longer-term debates (e.g. of major themes like climate change or minority rights); or even across multiple themes (e.g. to examine whether in- and outgroup patterns remain stable independent of the specific issues at hand).

Identifying Destructive Polarisation

Finally, a key aim of our work is also to determine whether and when the patterns of polarisation that may be observed in empirical analysis should be seen as inherently problematic. McCoy et al. (2018) argue that, although some political and societal polarisation is beneficial to a functioning democracy (e.g., by enabling political parties to define their distinct positions on key issues and thereby offer a clear choice to electors), once a level of "severe polarization" is reached democratic societies will struggle to maintain productive political processes.

Building on these ideas, we therefore propose a set of criteria for what we describe as destructive political polarisation. We suggest that the following key elements may serve as indicators of destructive polarisation in online communication: (a) breakdown of communication between opposing groups; (b) discrediting and dismissal of oppositional information; (c) erasure of complexities in the discussion of issues; (d) disproportionate space for and attention to extreme voices; (e) exclusion of opposing views through appeals to emotion. This is not intended to represent an exhaustive or definitive list, nor do all these elements need to be present in any one case for polarisation to be destructive. However, we posit that if one of these elements is present, it is likely that others are as well, as they are related and connected to each other in complex ways. The conceptual and methodological considerations presented in our paper make a substantial contribution to the identification of these destructive tendencies in digital and social media communication, and thus also serve as a first step towards addressing such problematic dynamics.

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