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Patterns of controversy and consensus in German, Canadian, and US online news on climate change



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ABSTRACT

Individual action and support for policy to tackle climate change have been linked to perceptions of political and scientific controversy and consensus concerning the issue. Recent media effects research indicates that presentation of agreement or conflict between actors' opinions influences how audiences respond to news about climate change and policy. While some national case studies have investigated portrayals of actors' positions on important questions regarding climate change in the media, they are largely absent from comparative research. This study addresses this gap by analysing portrayals of actor-issue-positions and the emerging patterns of controversy and consensus in German, Canadian, and US coverage. Studying a sample of occurrences of climate change-related issues ($N = 902$) in-depth, the results show German media present political consensus about the need to limit emissions and societal controversy about the efficacy of specific mitigation measures. Presenting mainly consensus, Canadian media report more on climate change's impact, leaving aside the issue of efficacy. In the US, media emphasise political controversy — about the need to limit emissions and occasionally about climate change's impact on humans. The findings, consistent with other recent publications, can best be explained by journalists selectively indexing of seemingly relevant actor-issue-positions.

1. Introduction

As climate change warms the earth's atmosphere and oceans, it also heats up public discussions of the phenomenon. Matters of contention range from fundamental questions about the causes of global warming to detailed disputes over how exactly to achieve specific renewable energy goals and involve scientists, politicians, businesspeople, and citizens across the globe. News media in most countries increasingly make climate change visible (Barkemeyer et al., 2017) and have considerable power over selecting which issues and actors are portrayed. This also means that they decide which issues appear as controversial, consensual, or remain entirely hidden from their audiences. As demonstrated by the literature linking coverage to perceptions of climate change, public engagement, and policy support, such choices can have effects on the recipients of news, but the relationship is complicated, sometimes counter-intuitive, and differentiated between audience groups (e.g. Feldman et al., 2014; Hart et al., 2015; Nisbet et al., 2013).

Recent findings in the field of media effects research suggest that the actors driving controversy and consensus are particularly important in explaining links between news coverage and public beliefs and attitudes about climate change. For example, the perception of consensus among

scientists has been linked to engagement and policy support for mitigation measures (Kerr and Wilson, 2018; van der Linden et al., 2015). Some evidence suggests that the portrayed positions of political leaders on climate science and policy influence how audiences react to consensus-reinforcing messages (e.g. Benegal and Scruggs, 2018; Kousser and Tranter, 2018). While extensively studied from a message-effects perspective, actors have received little attention in comparative studies analysing news coverage in multiple countries.

In the communication science literature, media coverage of climate change has been discussed extensively in each national context (Schlichting and Schäfer, 2014). Some of these case studies made issue-specific actor positions and the relations between them the subject of inquiry (e.g. Rice et al., 2018; Stoddart et al., 2017). Comparative research sometimes (indirectly) captures controversy and consensus, for example by studying the “scientific uncertainty” frame (Schäfer and O'Neill, 2017, p. 13). However, most cross-national studies place little emphasis on the actors presented by the media and focus on dynamics at a higher level of abstraction, such as issue attention (e.g. Barkemeyer et al., 2017), thematic emphasis (e.g. Gurwitt et al., 2017), or the use of frames (cf. Schäfer and O'Neill, 2017). Portrayals of actors, their positions, and the relations between them drive these patterns. Yet, detailed

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studies of these underlying dynamics are still strikingly absent from the comparative literature, which means that national case studies remain isolated and their findings difficult to integrate with existing theory.

In order to address this gap, we present a comparative analysis of media portrayals of controversy and consensus in Canadian, German and US news coverage of climate change. These countries are well researched, both as individual cases and from a comparative perspective. They exhibit interesting variation in terms of national politics, public attitudes to climate change, the media system, and journalistic cultures. At the same time, all three are considerably invested in their fossil fuel industries and are subject to international pressure to limit greenhouse gas emissions, which means that variation cannot easily be reduced to seemingly external factors.

In each of the three countries under scrutiny, we study online news coverage — including digital-born outlets and those with roots in print publishing and TV broadcasting — of climate change in media consumed by audiences across the political spectrum during the period 3 months before, during, and 3 months after COP 23 in Bonn in 2017. The timeframe and selection of outlets contains news reporting both idiosyncratic to the national context and driven by a prestigious international event (see Wessler et al., 2016). It thus corresponds well to the range of coverage the issue typically receives.

2. Controversy and consensus

Presenting controversy is one way of “generating newsworthiness” (Lester, 1980), by providing an overall narrative that can contextualise individual news items, such as coverage of specific actors’ positions found in press releases or media events (Price, 1989). Its effects, however, are ambivalent. Controversy can lead to higher engagement with the issue at stake, as demonstrated in the case of European parliamentary elections (Schuck et al., 2016). However, it can also have demobilising effects, for example when disagreement is linked to “incivility” (Mutz and Reeves, 2005).

In the field of climate change communication, controversy has proven particularly pertinent: public perceptions of controversy among scientists have been linked to lower levels of engagement and policy support (e.g. Lorenzoni et al., 2007). Consequently, media portrayals of arguments about scientific controversy have been studied intensively (e.g. Boykoff and Boykoff, 2004; Painter and Ashe, 2012). The absence of controversy, here conceptualised as “consensus”, is also highly relevant: explicit emphasis of scientific consensus on certain key questions about climate change can have substantial effects on audiences, acting as a “gateway belief” (Kerr and Wilson, 2018; van der Linden et al., 2015). Thus, the *mode of presentation* (controversy or consensus) is a highly relevant distinguishing feature of different media portrayals of climate change.

Previous cross-national comparative research has conceptualised controversy with relatively little theoretical sophistication and has a strong focus on media portrayals of climate science (rather than policy and societal responses). For example, research has investigated the presence of a “scientific uncertainty” frame (Schäfer and O’Neill, 2017, p. 13) and “sceptic” arguments that questioned the anthropogenic nature of climate change (Painter and Ashe, 2012). Cross-sectional studies were able to show that these were more prominent in the UK and the US, as compared to other countries, e.g. France, India, China, Brazil (Painter and Ashe, 2012), or Germany (Grundmann and Scott, 2014). Recent case studies, on the other hand, use more fine-grained approaches and have deepened scholarly understanding of *how* the media present controversy about climate change. For instance, Schmid-Petri et al. (2017) show that while still prominent in US media, the nature of scepticism covered has changed from “trend” and “attribution” towards “impact” scepticism. In the German context, Kaiser and Rhomberg (2016) show that media occasionally “question the doubt” by critically evaluating sceptical arguments.

Concerning the topics covered in the news media, the presentation

of climate science is well-researched, but climate change, taken as a whole, is a broad discursive arena, allowing the media to emphasise different themes. Experimental studies have demonstrated the impact these choices have on how audiences respond to climate change messages (e.g. Myers et al., 2012). Thus, both the *mode of presentation* and *thematic emphasis* differentiate coverage. Recent comparative research is sensitive to this second dimension of cross-country and between-outlet differentiation. For example, Gurwitt et al. (2017) show that, across the globe, print coverage of the Paris climate conference was “heavily skewed towards the developed world, with little discussion of the most vulnerable countries or the issues that are important to them” (p. 281). One remarkable insight from the comparative field is a change of reporting during international climate conferences: in contrast to the national differentiation discussed above, coverage of these events is characterised by cross-country convergence (Wessler et al., 2016).

2.1. Actors matter

By using approaches sensitive to thematic emphasis and the mode of presentation, the field has generated valuable insights. However, the role of actors in media portrayals of climate science, policy, and politics is understudied from a comparative perspective. In contrast, the literature on media effects demonstrates that understanding the role of actors is crucial. Recent findings from a range of experimental studies show that audiences are sensitive to “competitive framing environments” in which they are presented with different options of how to interpret news (Nisbet et al., 2013). This is typically the case in real-life climate change reporting, where coverage involves many actors and their competing views. In order to reduce the “information costs” of thinking about complex and distant phenomena, such as climate change, individuals often rely on heuristics that help them make sense of news (Rugeley and Gerlach, 2012). The actors and their opinions presented serve as such a heuristic and can have a strong influence on how audiences respond to messages. For example, as Benegal and Scruggs (2018) show, consensus supporting messages by partisan peers have the potential to increase belief in scientific consensus about climate change. In the Australian context, Kousser and Tranter (2018) demonstrate that cues about political leader’s positions trigger support or opposition for climate change energy policy among partisan voters. Most of the work in the field has been done in the US, and without a cross-national dimension, but these findings highlight how important individual actor’s positions are in shaping audience responses.

National case studies have responded to such insights and started to focus on the actors driving scepticism and uncertainty. They have shown, for example, that “the vast majority of the uncertainty, controversy, disagreement, and scepticism frames in [US] climate change journalism are not from scientists” but from political actors (Rice et al., 2018, p. 17). Discourse network analysis (Leifeld and Haunss, 2010), has been extensively used to extract climate change policy advocacy networks from newspaper coverage, demonstrating how think tanks and politicians advocate for business interests in Canada (Stoddart et al., 2017). While actor-centric case studies have produced valuable insights into the nature of climate change coverage, their focus on single countries and the diversity of methods employed makes it difficult to compare findings and integrate them in a broader theoretical framework for comparison.

2.2. Actor-Issue-Positions drive controversy and consensus

The theoretical challenge, then, is to use the existing literature to conceptualise *thematic emphasis*, the relative proportion of coverage per issue, its *mode of presentation*, controversy and consensus, and the *actors* presented in a coherent manner suitable for a comparative study. The most common strategy to study opposition between actors uses the notion of “conflict frame”, defined as news item-level presence of disagreement among actors or the emphasis of multiple sides to a story

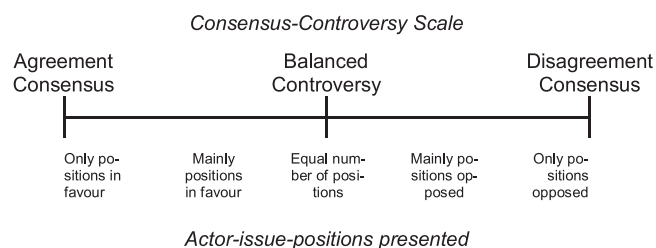


Fig. 1. Consensus-controversy scale.

(Semetko and Valkenburg, 2000) — a concept too coarse to capture the complex interactions between actors presented in most climate change coverage. On the other end of the spectrum, Rice et al. (2018) offer a fine-grained distinction between different types of “opinion divergence” (p. 5) among individuals, groups, and ideas. This level of detail produces highly valuable insights but is too fine-grained to be used in a comparative setting. Discourse network analysis and its theoretical predecessor claims analysis (see Leifeld and Haunss, 2010) conceptualise relations between actors based on their agreement or disagreement with inductively coded statements and analyse the emergent patterns. The advantage of such an approach is that it enables both issue- and actor-centred analyses.

Building on the latter two approaches but taking a semi-deductive stance, we conceptualise coverage of climate change as the presentation of arguments in favour of or against claims representative for key issues made by different actors. Using these *actor-issue-positions* (AIPs) as foundation for further theorising, the mode of presentation is best thought of as a position on a scale ranging from *agreement consensus* over *controversy* to *disagreement consensus* emerging from the combination of multiple AIPs (Fig. 1). The degree of controversy or direction of consensus is thus specific to each issue covered in a news item. For instance, in one item, the actors presented may agree on climate science, while debating the correct policy response. As the default statements are formulated to be in line with the (scientific) consensus position on climate change (see Table 3 in section 4.2 for details), our conceptualisation links up with existing research. For example, agreement consensus with respect to the anthropogenic nature of climate change represents a “consensus communication” (e.g. Chinn et al., 2018) pattern, whereas disagreement consensus on the same issue would correspond to a news item presenting only arguments that deny climate science.

Our approach allows us to investigate the *patterns of controversy and consensus* found across countries: This term captures the three dimensions analysed in this study in which news coverage can differ between countries: *i) thematic emphasis*: which issues are presented more prominently than others by devoting a larger share of coverage to them, *ii) mode of presentation*: which issues are presented as controversial, or as matters of (dis-)agreement consensus, and *iii) the actor-issue-positions* driving thematic emphasis and mode of presentation. The following research question captures the aim of this study and the theoretical background developed.

RQ. How do patterns of controversy and consensus about climate change differ between Germany, Canada, and the US?

3. Patterns of controversy and consensus across countries

In order to contextualise and explain our country-specific and comparative findings, we build on an extensive body of published research. However, we face two gaps in the literature that we need to address. First, as noted in the theoretical discussion above (section 2.1) only little comparative research studies the positions of actors portrayed in news coverage and the resulting patterns of controversy and consensus beyond climate science. Second, theoretical work that

connects such patterns with contextual knowledge concerning political and media systems or cultural factors is sparse. Consequently, neither a data- nor theory-driven route to a fully-fledged comparative design are available for strict hypothesis testing. In this study, we thus use extant empirical research to formulate tentative hypotheses and theories from the field of communication science at large to provide a fitting explanation of our findings.

In order to facilitate this strategy, starting from the pool of fossil-fuel dependent countries with international commitments, we choose three cases — the United States, Canada, and Germany — that differ in ways conducive to formulating theory and its integration with existing comparative research. Political and media institutions are part of well-established comparative frameworks, such as media systems theory (Hallin and Mancini, 2004), which suggests selecting cases that differ along these dimensions. We follow Schäfer et al. (2016a, p. 15), in highlighting public values and beliefs on the one hand and journalistic cultures on the other. These macro-level, cultural concepts fit better with the degree of abstraction and generalisation used here than micro-level theories about journalists’ behaviour (cf. Esser and Hanitzsch, 2012). We proceed by using findings from national case studies of our countries (and comparative work, if available), that relate to the dimensions of interest to develop hypotheses.

We focus on five issues: the anthropogenic nature of climate change, its impact on humans, the necessity to limit greenhouse gas emissions, the efficacy of different measures, and international climate agreements. While much more fine-grained thematic distinctions are possible (e.g. Rebich-Hespanha et al., 2014), these categories capture well the breadth of topics discussed at a level of abstraction suitable for a comparative study and are covered extensively in the scientific literature. The extant literature indicates that we will find “disagreement consensus” only very infrequently. Thus, our hypotheses focus on comparing the frequency of controversy across countries, but when discussing our results, we present all three categories.

3.1. Anthropogenic climate change

US media have historically overrepresented scientific controversy about the anthropogenic causes of climate change (Boykoff and Boykoff, 2004) but recent research reveals that “sceptic” arguments in the media have shifted towards the impact of climate change (Schmid-Petri et al., 2017). What drives this shift — a decline in the journalistic norm of balance, as argued by Boykoff (2007), or other dynamics — is not fully understood in the field. Neither Canadian nor German media have an established record for presenting such sceptical arguments and we expect this issue to be covered similarly across countries.

H1. Similar levels of coverage (H1a) concerning “anthropogenic climate change” can be found across countries. Likewise, the issue is presented as controversial with similar frequencies across countries (H1b).

3.2. Impact on humans

The turn to “impact scepticism” (Schmid-Petri et al., 2017) in US media appears to be primarily driven by portrayals of politicians’ dissent (Rice et al., 2018). Neither conservative nor liberal German media seem to report frequently on this type of scepticism (Schmid-Petri, 2015) and when they do so, it appears to often involve critical evaluation of foreign (chiefly US) political actors’ sceptical arguments (Kaiser and Rhomberg, 2015). This may be the outcome of public and political consensus that treats this aspect of climate science as relatively settled (Hake et al., 2015; Metag et al., 2015). In Canada, public perception is a bit more doubtful in some regions (Mildenberger et al., 2016) but the public appears less fundamentally divided than in the US. Taken together with higher levels of climate change scepticism in the US found across the literature (e.g. Painter and Ashe, 2012), these

tendencies suggest the following hypotheses.

H2. In comparison to the other countries, “impacts on humans” has the highest level of coverage (H2a) and is most often presented as controversy (H2b) in the US.

H3. Political actors’ positions on “impacts on humans” are more often presented in the US than in Canada and Germany.

3.3. Limiting greenhouse gas emissions

Germany is often portrayed as one of the global leaders in efforts to mitigate climate change, mainly due to its ambitious “Energiewende” policy (usually referred to as “energy transition”). The overall goals of this policy are at large supported throughout the multipolar party system (Renn and Marshall, 2016); divisions mostly concern the measures perceived as necessary or feasible to obtain them. Consequently, a majority of the public supports continued implementation of the policy (Sonberger and Ruddat, 2016). In contrast, the US is characterised by a high degree of politicisation and polarisation; opinions about climate change-related issues are separated into two camps, which largely overlap with the two major parties (Hopkins and Markowitz, 2017, p. 10), often sparking public controversy. In Canada, climate change politics has seen some historical back-and-forth but currently, the government under the leadership of prime minister Justin Trudeau pursues an ostensibly climate-friendly agenda. On average, the population is concerned about climate change and in favour of national policies addressing the issue (Mildenberger et al., 2016) but not at a level similar to Germany.

H4. In Germany, media devote more coverage to “limiting emissions” (H4a) and present it less often as controversial (H4b) than in the other two countries.

While political actors are likely to dominate media portrayals of discussions about the need to limit emissions in all countries, other actors participate. Building on a historically activist stance (Weingart et al., 2000), German media have been shown to explicitly and critically comment on climate science-sceptics’ positions (Kaiser and Rhomberg, 2016) and we expect a similar pattern in the discussion about the need to limit emissions.

H5. Media actors’ positions on “limit emissions” are more often presented in Germany than in the other two countries

Likewise, German scientists do actively engage with national media, the public, and political institutions through communicative efforts (Schäfer et al., 2016b, p. 10), and frequently comment on the necessity to limit emissions (Rhomberg and Kaiser, 2015, p. 35).

H6. Scientists’ positions on “limit emissions” are more often presented in Germany than in the other two countries

In Canada, as Stoddart et al. (2017) show, fossil fuels are an important issue of contention, but this does not appear to correspond to a high level of media presence of corporations involved in the sector. According to the authors, government representatives at different levels (sometimes promoting fossil fuel industry arguments) and environmental activists are most visible in the media.

H7. Business actors’ positions on “limit emissions” are less often presented in Canada than in the other two countries.

3.4. Efficacy

As mentioned, German politics has to a large extent moved past discussing climate change policy goals, the focus now mainly lies on the policy measures and individual efforts needed to obtain them — questions of efficacy. According to Ivanova (as cited in Schäfer et al.,

2016a, p. 15), portrayals of this issue are more frequent in Germany than elsewhere. Also, Hart and Feldman (2014) found that efficacy messages are relatively infrequent in US media. The role of efficacy messages in news coverage has not been studied in Canada and no specific hypothesis is formulated for the country.

H8. German media devote more coverage to “efficacy” than their counterparts in the US.

3.5. International agreements

International agreements and negotiations are frequently and similarly covered in different countries (Wessler et al., 2016). Ancillary to this study, this issue will not be discussed in great detail if the following hypothesis holds.

H9. Similar levels of coverage (H9a) and modes of presentation (H9b) can be found across countries concerning “international agreements”.

4. Methods and measures

4.1. Audience-driven sampling

Any study of news coverage trying to generalise to a national level faces the challenge that drawing representative samples of all news production is practically impossible. Typically, the way out of this dilemma is to focus on a theoretically identified type of media, such as “broadsheet” national newspapers, the “prestige press”, “business and financial news” and selecting the biggest or most prominent outlets from the category. Another approach uses expert-established political leanings of news outlets to sample from sources across the political spectrum. In this study, we have taken inspiration from these practices but used a slightly different and novel approach to select news sources.

Majorities in the selected countries use online news sites, which have a wider reach than print media and have surpassed that of TV in Canada and the US (Newman et al., 2017, pp. 70, 103, 109). Using representative survey data from the Reuters Digital News Report (Newman et al., 2017), we selected online media outlets that reflect preferences across political audience segments and include business-oriented publications and national broadcasters (if possible). In the case of Canada, the most prominent left- and right-leaning French-language outlets were also included. Table 1 presents the outlets selected, the percentage of the population who name it as a source of news used last

Table 1
News outlets selected for analysis.

Country	Outlet	Weekly Consumers	Position
United States	npr.org	9.8%	Public Broadcaster, far left
	huffingtonpost.com	24.4%	Left
	cnn.com	21.8%	Centre-left
	wsj.com	9%	Business, Centre-right
	fox.com	19.9%	Far right
Canada	huffingtonpost.ca	19.4%	Left
	lapresse.ca	5.6%	French-language, centre-left
	cbc.ca	21.3%	Public broadcaster, centre
Germany	ctv.ca	16.6%	Centre-right
	tva.ca	7.2%	French-language, right
	sueddeutsche.de	6.6%	Left
	tagesschau.de	13.2%	Public broadcaster, centre-left
	spiegel.de	14.8%	Centre
	handelsblatt.com	3.3%	Business, centre-right
	focus.de	12.5%	Right

week (multiple mentions possible) and a description of the position in the national spectrum of online media outlets — based on the average political orientation of the outlet's audience on a left-right scale reported in the same survey.

As previous research has shown, national or international events, such as the regular Conference of the Parties (COP) are associated with heightened media attention to climate change (Schäfer et al., 2013), making them a common object of study. However, previous studies suggest that conferences are covered differently from regular reporting — more focused on the individuals and groups attending the event and its proceedings and more similar across countries (Wessler et al., 2016; Gurwitt et al., 2017). Thus, to focus on only conference coverage would understate cross-national differences, while excluding it would overestimate them. Given that this study aimed to provide a broad picture of differences and similarities of national coverage (which includes reporting on international events in regular intervals), a middle ground was most appropriate. Consequently, we collected articles published in the period three months before, during, and three months after COP 23, the longest time frame around the conference possible within the context of this study.

Most databases include only a limited collection of online media, and few outlets provide a searchable archive, which means that articles have to be sampled using different means. We collected articles using a novel procedure developed to study online news coverage. Our corpus was built from the results of daily searches of each outlet's website for a range of keywords (e.g. “climate change”, “fossil fuels”, “carbon dioxide”) using a Google Custom Search Engine. This technique is in principle prone to sampling biases introduced by the unknown search algorithms. However, our manual inspections of the sample found the procedure to be highly inclusive but also yielding a large share of irrelevant articles, which were manually excluded during the analysis. The full corpus of search results (N = 13,149) was used to draw a sample for analysis, which also yielded articles used during coder training and a second, smaller sub-sample for reliability pre-testing (n = 24). The sample was drawn using disproportionate stratified random sampling, in order to obtain a considerable amount of relevant (see section 4.3) articles from each of the five outlets and three time periods (before, during, and after COP 23). This resulted in 15 strata per country. When the number of articles identified as relevant in a stratum turned out to be too low, additional articles were sampled for that stratum. Ultimately, 364 relevant articles were analysed in-depth during the coding stage. While this number may appear low at first sight (~8 per strata), it is important to keep in mind that the goal of the analysis is not to compare outlets or time periods across strata but to aggregate at the national level. Furthermore, the main units of analysis are the actor-issue-positions and issue discussions, which have much higher case numbers (see the following section).

4.2. Coding actor issue positions

Building on the theoretical approach discussed in Section 2.2, the following coding procedure was developed and used by a team of three coders. We first checked for relevance, based on whether at least one actor-issue-position for one of our issues of interest could be found in the article but did not distinguish further between genres (op-ed, news, interview, ...). We then identified the six most prominent issues and the six most pertinent actors portrayed to have a position on agreement or disagreement with a key claim representative of the issue or a more specific statement that would still support the main claim (see Table 3). For each of the actors identified to have a position, we also coded an actor category (codebook available upon request). This procedure resulted in 2042 actor-issue-positions, across 902 issue-discussions, the main unit of analysis, distributed over 364 articles.

Multiple rounds of training and pre-testing resulted in the inter-coder reliability scores reported in Table 2 and 3, measured using Krippendorff's alpha (Hayes and Krippendorff, 2007). The ultimate units

Table 2
Reliability measure.

variable	Scope	N	Description	alpha
relevant	article	24	The article is relevant for the analysis	0.83
actor category	actor	66	The actor's category (see theory)	0.84
agreement	actor-issue-position	39	The actor agrees with the affirmative statement or a more specific statement	1

for analysis, the issues raised in each article and the actor-issue-positions are coded inductively and consist of relational data, which creates a challenge when assessing reliability (cf. Muller, 2015). Put briefly, it is impossible to do classical inter-coder-reliability analysis for actor-issue positions, as an exhaustive list of possible actors cannot be given beforehand. Additionally, most actors (and consequently AIPs) are not present in a given article, due to the sheer number of them, which would invalidate attempts at assessing ICR at this level. Thus, in this study, we re-coded our relational data and used proxy units to give the best possible assessment of inter-coder reliability: First, for each issue category used, we calculated an article-level dummy variable indicating the issue's presence; Table 2 presents the ICR results for each of the dummies (n = 19). The issues “limit emissions” and “efficacy” have relatively low reliability, which means that these issues were not always correctly identified (see discussion of limitations in section 6.3). Second, for each actor coded by all coders, we checked the reliability of the assigned category (Table 3). Third, for each actor coded by all coders to have a position on the same issue, we checked reliability for the agreement with the default statement (Table 3).

4.3. Analysing patterns of controversy

Since the actual number of relevant articles per national strata were unknown, an estimate based on our categorisation was used to calculate per-strata sampling probabilities and national design weights to counteract design effects (Tracy and Carkin, 2011). These were then scaled to the estimated national population sizes to enable cross-national comparisons and significance tests (Kaminska and Lynn, 2016) and applied in all subsequent analyses. While this procedure cannot yield estimates representative for the entire national landscape of media reporting, it ensures that the findings are approximately representative of the news output of the outlets analysed.

Next, the actor-issue-positions identified during coding were used to classify each mention of an issue according to three categories — representing agreement consensus, controversy or disagreement consensus, as discussed in section 2.2 with one simplification: To ease analysis, we do not measure controversy on a scale, but treat all instances that do not fall into the (dis-)agreement consensus categories as “controversy”. The following measures were calculated for each country and subsequently compared: *i*) the proportion of issue discussions for each issue category (operationalising the level of coverage/thematic emphasis), *ii*) the issue-specific shares of agreement/disagreement consensus and controversy (mode of presentation), and *iii*) the percentage of issue-discussion mentioning each actor category under scrutiny. In order to account for the sampling design – design weights and finite population corrections – the R package “survey” (Lumley, 2004) was used for all aggregations and comparisons. For each variable of interest, we test for cross-country differences by first using a χ^2 -test for independence, followed by Bonferroni-corrected pairwise t-tests (Hayes, 2009, pp. 368–369), if warranted. Confidence intervals presented in the graphs are estimated by fitting a logistic regression model, estimating a Wald-type interval and transforming to the probability scale. For most issues, differences between actor contributions to the mode of presentation (i.e. who disagrees and who agrees with the key claim) could not be tested across countries, due to media in

Table 3
Issue descriptions and Reliability (N = 19).

Issue	Name	Affirmative Statement	alpha
1	anthropogenic climate change	climate change is human-made	0.84
2	impact on humans	climate change has an impact on humans (health, economy, security, etc.)	0.78
3	limit emissions	greenhouse gas emissions need to be reduced/limited	0.55
4	efficacy	efforts to mitigate climate change can be successful	0.63
5	international agreements	a response to climate change should be found through international agreements	0.85

one or two countries covering the issue so infrequently that case numbers are too low for reliable significance tests of AIP differences. In this scenario, we present intra-country χ^2 -tests of independence to compare actor categories within the countries of interest.

5. Empirical results

In this section, we present empirical results obtained from analysing actor-issue-positions in climate change news. For each of the issues discussed in section 3, we present levels of coverage, the shares of issue-discussions classified as controversy and consensus, and an analysis of the actors driving these patterns. Where appropriate, we present significance tests and refer back to the corresponding theoretical hypotheses (summarised in Table 4). In addition, for each issue, we append a short illustration of the coverage captured by the patterns described; these descriptions provide qualitative context needed for the discussion of our results in the following section. To give an overview, Fig. 2 presents issue coverage across the three countries. The omnibus test reveals a significant association between the country variable and observed issue categories ($\chi^2(10) = 111.77, p < .001$).

5.1. Anthropogenic climate change

The question of whether climate change is human-made is covered relatively infrequently in the three countries studied here. The point estimate is slightly higher for the US: 11% as compared to 7% in Canada and 6% in Germany. However, these differences are not significant (see Table 4). Likewise, the estimated share of this issue presented as controversy is higher in the US but given the low amount of coverage (esp. in the other two countries), these differences are non-significant as well. These results corroborate hypothesis 1: Indeed, media in all countries seem to have largely parted with presenting (scientific or political) controversy concerning the anthropogenic nature of climate change.

5.2. Impact on humans

The next issue of interest, “impact on humans”, is discussed

Table 4
Significance tests for planned comparisons.

Issue	Measure	Overall	US-CA	US-DE	DE-CA
Anthropogenic Climate Change	Share	$\chi^2(2) = 4.38$	—	—	—
	Controversy	$\chi^2(2) = 4.38$	—	—	—
Impact on Humans	Share	$\chi^2(2) = 10.74^{**}$	t(218) = 0.02	t(204) = 3.86 **	t(213) = 3.37 **
	Controversy	$\chi^2(2) = 7.39^a$	t(78) = 2.50 **	t(48) = -1.67	t(53) = 0.55
	AIP (political)	$\chi^2(2) = 2.30$	—	—	—
Limit Emissions	Share	$\chi^2(2) = 31.41^{**}$	t(218) = 0.68	t(204) = 4.36 **	t(213) = 4.93 **
	Controversy	$\chi^2(2) = 25.55^{**}$	t(84) = -2.90 **	t(108) = -4.78 **	t(95) = -1.21
	AIP (science)	$\chi^2(2) = 1.59$	—	—	—
	AIP (media)	$\chi^2(2) = 15.05^*$	—	—	—
	AIP (market)	$\chi^2(2) = 27.47^{**}$	t(84) = 0.82	t(108) = 2.55 **	t(95) = 3.34 **
Efficacy	Share	$\chi^2(2) = 59.36^{**}$	t(218) = 0.00	t(204) = 7.04 **	t(213) = 6.62 **
	Controversy	$\chi^2(2) = 4.97$	—	—	—
	AIP	—	—	—	—
International Agreements	Share	$\chi^2(2) = 1.13$	—	—	—
	Controversy	$\chi^2(2) = 1.84$	—	—	—

significantly less often in Germany (9%) than in the US (17%) and Canada (17%), while there is no significant difference between the latter two. Nonetheless, taking a closer look at the patterns of controversy, the US and Canada differ in two aspects: First, although US media do not devote more space to the issue than their Canadian neighbours, in the US, the issue is covered significantly more often as controversy (Fig. 3), which corroborates hypothesis 2 in part. Second, counter to expectation, fewer actor-issue-positions concerning this issue are attributed to political actors in the US (21%) compared to Germany (32%) and Canada (28%). While this difference is non-significant, it constitutes evidence counter to hypothesis 3.

While political actors appear similarly often, they contribute very differently to the public discussion across countries, as revealed by within-country tests. In the US, 26.1% of political actors’ AIPs presented disagree with the default claim, comparing to 3.9% for all other actor categories ($\chi^2(1) = 10.73, p = .003$). In contrast, political actors’ proportion of disagreeing statements on the issue is neither significantly different from those of other actor categories in Canada (4% compared to 0%, ($\chi^2(1) = 3.44, p > .05$) nor Germany (0% compared to 4%, $\chi^2(1) = 3.44, p > .05$). To summarise, despite inconclusive evidence concerning differences in how frequently political actors are portrayed across countries, in the US, such portrayals lead to a considerable amount of controversy about whether or not climate change has significant impacts on humans.

What types of discussions result in these quantitatively observed patterns? In the US, President Donald Trump’s nominations for a range of environment-related governmental functions received ample coverage. Often, his candidates held sceptical stances on climate change, sparking controversy with other politicians and environmental activists. As in the other countries, the cases of agreement consensus usually appeared in reports on scientific conferences or publications. In Canada, coverage of political actors focused on prime minister Justin Trudeau’s portrayed international leadership and on politicians’ responses to reports on economic repercussions of climate change across the country. In this coverage, potential controversies (about policy, see the following issue), is typically paired with a political recognition of the impact of climate change on humans, resulting in the pattern

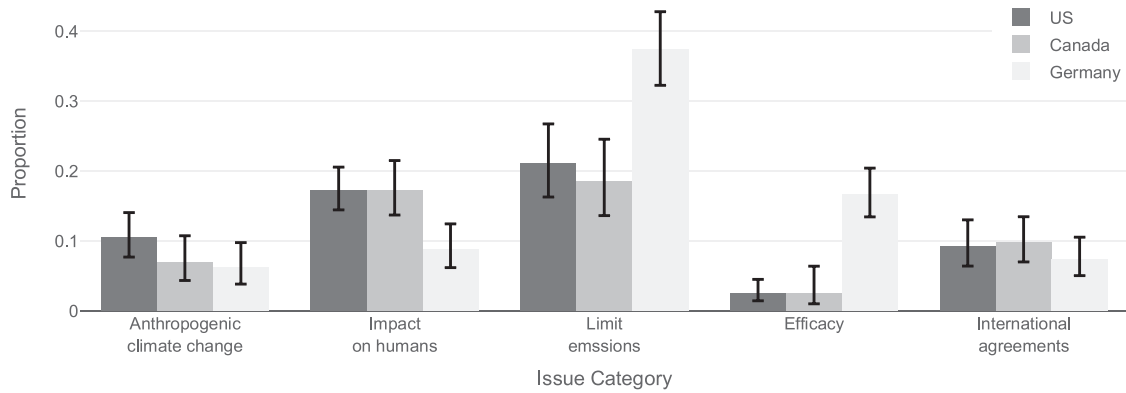


Fig. 2. Proportion of issue-discussions per category and country.

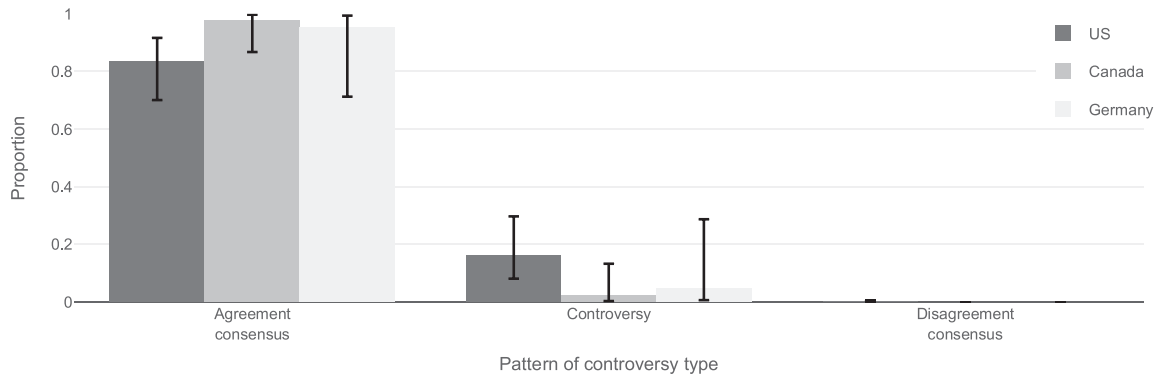


Fig. 3. Proportion of pattern of controversy types per country for the “impact on humans” issue.

described here.

5.3. Limit emissions

German media devote significantly more space to discussing whether or not to limit emissions (37% of issue discussions), corroborating hypothesis 4a, but the difference in media attention between the US (21%) and Canada (18%) is not significant. However, the issue is presented with significantly more controversy in the US (61%) compared to either of the other two countries (Fig. 4), with no significant difference between Germany (23%) and Canada (32%). Thus, hypothesis 4b is rejected in part: German media present the issue of limiting emissions less often as controversy than US media (but not less often than Canadian media).

Against expectation, there are no significant differences between the levels of scientists’ involvement across countries (US: 22%, Canada: 10%, Germany: 15%), rejecting hypothesis 5. The test for association

shows a marginally significant difference for media actors, but given the rare occurrence of media actors’ positions, the pairwise comparison yields no significant result. Last but not least, taking a look at market actors, Germany drives the significant inter-country differences. There, 14% of actor-issue-positions are attributed to market actors, compared to 2% in the US and 4% in Canada, the difference between the latter being insignificant. Hypothesis 7 is rejected: market actors are not less present in Canadian news than in the US. Additional in-depth tests reveal marginally significant inter-country differences concerning political actors ($\chi^2(2) = 25.81, p < .05$) and activists ($\chi^2(2) = 15.79, p < .1$). These are driven by lower shares of activists in Germany (4%), compared to the US (15%, $t(108) = 2.29, p < .1$) and higher shares of political actors in Canada (60%) compared to 43% in Germany ($t(92) = 2.10, p < .1$) and 36% in the US ($t(80) = 2.47, p < .05$).

Taking an in-depth look at the articles discussing whether or not to limit emissions, the following features stand out. In the US, the high levels of controversy surrounding policy stem mainly from reports on

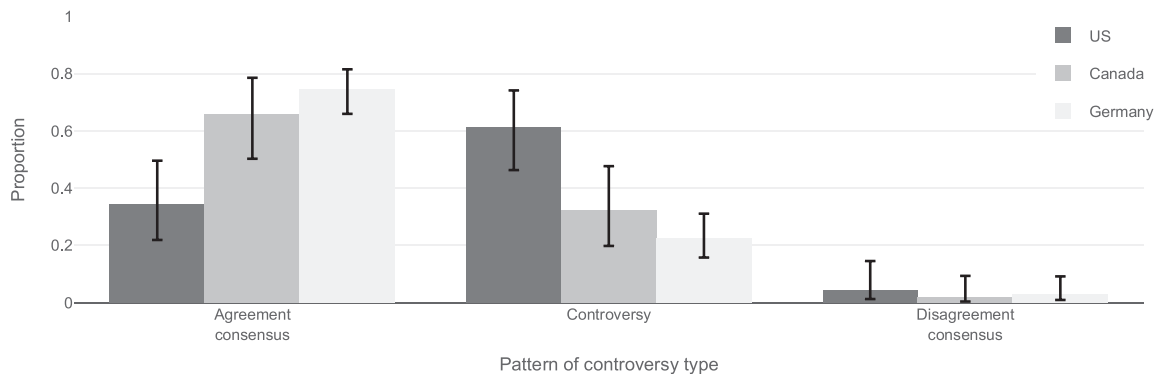


Fig. 4. Proportions of patterns of controversy types per country for the “limit emissions” issue.

Table 5
Hypotheses and findings.

Hypothesis	Result	Remarks
H1: Similar levels of coverage (H1a) concerning “anthropogenic climate change” can be found across countries. Likewise, the issue is presented as controversial with similar frequencies across countries (H1b).	Yes / Yes	
H2: In comparison, “impacts on humans” has higher levels of coverage (H2a) and is more often presented as controversy (H2b) in the US than in the other two countries.	No / Yes	Similar levels of coverage in Canada and the US
H3: Political actors’ positions on “impacts on humans” are more often presented in the US than in Canada and Germany.	No	Same level in the US and Canada. US political actors drive controversy, Canadians consensus
H4: In Germany, media devote more coverage to “limiting emissions” (H4a) and present it less often as controversial (H4b) than in the other two countries.	Yes / No	Similar levels of controversy in Canada and Germany
H5: Media actor’s positions on “limit emissions” are more often presented in Germany than in the other two countries.	No	No difference between countries
H6: Scientists’ positions on “limit emissions” are more often presented in Germany than in the other two countries.	No	In the US, media actors play a larger role than in Germany
H7: Business actors’ positions on “limit emissions” are less often presented in Canada than in the other two countries.	No	Similar levels of involvement for US and Canadian market actors
H8: German media devote more coverage to “efficacy” than their counterparts in the US.	Yes	
H9: Similar levels of coverage (H9a) and modes of presentation (H9b) can be found across countries concerning “international agreements”.	Yes	

the Trump administration’s declared intention to repeal Obama-era policies, such as the Clean Power Plan. These arguments can play out in drastic terms, such as claims to end a purported “war on coal”. In addition, the numerous op-eds discussing climate change policy typically present “both sides” — positions in favour of and opposed to policy. Part of the Canadian coverage is on US politicians’ opinions, but the larger share of reports concerns intra-country disagreements between individual politicians, parties, and regional governments. However, these controversies tend to focus on specific policies and are cast less frequently in fundamental terms than in the US, where the question of policy intervention is often framed as a matter of principle. In Germany, discussions about policy measures are usually cast as questions of how much political intervention is required and possible (see Section 5.4 below). Often, these questions are preceded by re-iterating commitments towards goals or demanding further policy measures, for example by business owners who demand a clear regulatory framework.

5.4. Efficacy

When discussing whether certain efforts to limit emissions (by government policy or based on private initiative) should be implemented or pursued, the argument can also be framed in terms of “efficacy” — the question of whether a specific response will lead to desirable effects or not. At the most fundamental level, this issue is transformed into a question concerning anthropogenic nature of climate change: When the issue at stake flips to doubting whether any climate goals can be obtained by human activities or them being entirely out of reach (in which case it would have been coded as “anthropogenic climate change” and not as “efficacy”). As expected, and in line with the other findings, German news media devote significantly more coverage (17%) to these questions than their Canadian (3%) or US (3%) counterparts, corroborating hypothesis 8.

The rare occurrence of this issue in the latter two countries prohibits more detailed comparison of issue-specific patterns of controversy but taking a closer look at the German case reveals an interesting pattern. The issue is presented as agreement consensus in 42% of cases, controversy in 24% and disagreement consensus in 33%. This pattern originates primarily in frequent coverage of a two-sided argument about whether or not specific measures (most notably abandoning coal within the next few years) are needed to achieve the goals of the energy transition (“Energiewende”). In this context, the disagreement consensus pattern is typically used to argue for more far-reaching policies, by stating that current policy is inadequate. The discussion surrounding Germany’s decision not to join an international anti-coal coalition advocated for by Canada and the UK further spurred discussion of this

issue.

5.5. International agreements

The issue of international agreements played a minor role in all three countries: 9% of US, 9% of Canadian, and 7% of German coverage was devoted to the issue, the differences being insignificant. Likewise, there is no significant association between countries and the levels of controversy and consensus observed. These results corroborate hypothesis 9 in full. The patterns observed are driven by Donald’s Trump decision to withdraw the US from the Paris Agreement, Germany’s sceptical stance towards the anti-coal coalition and the fact that COP 23 in Bonn spurred discussions about international agreements.

6. Discussion

Recent case studies of climate change coverage have begun to use actor-sensitive designs, yielding insights at a higher level of detail than previously possible. This study aimed to complement country-specific research by developing an actor-centred approach suitable for quantitative comparative research. Making actor-issue-positions the core theoretical concept, the study was able to show how differently German, Canadian, and US media portray scientists, market actors, environmental activists, and political actors and their positions on issues related to climate change. The findings just presented, and summarised in Table 5, show distinct patterns of controversy and consensus: In Germany and Canada, the studied media outlets emphasise political and scientific (agreement) consensus that climate change will have an impact on humans. In contrast, in the US, portrayals of some political actors’ disagreement create noteworthy levels of controversy surrounding this issue, but few articles fall in the disagreement consensus category. Similarly, in the US, the media frequently present controversy concerning the need to limit emissions, whereas the issue is predominantly seen as a matter of agreement consensus in Canada and Germany. In the latter case, this provides the basis for a controversial, yet inclusive discussion concerning the efficacy of specific measures, the only issue and country where disagreement consensus was a common occurrence. This issue is rarely raised in US or Canadian media outlets. As conflict and controversy can engage and mobilise audiences (Schuck et al., 2016), the patterns described here have some wider implications for climate change communication practitioners and researchers. Before discussing these, we consider some possible explanations of our findings.

6.1. Politics drive coverage?

In our view, two sets of factors influence most strongly how the media report on climate change in a specific country: *i)* the political system and public opinion, generating political events and accessible background information to report on and *ii)* journalistic culture and norms shaping how such inputs are transformed into media coverage. While all three countries studied here are among the top emitters of greenhouse gases and face strong international pressure to limit their emissions, the politics of climate change and the associated public discussions have evolved quite differently. In Germany, national climate and energy policy builds on the energy transition ('Energiewende'), initiated in the early 2000s by a coalition government between the Social Democrats and the Green party (Hake et al., 2015). The policy fits with the German corporatist approach to economic policy, where regulation of key industries and markets is commonplace and publicly legitimate — in fact, 60% of the population support the energy transition and oppose slowing down the subsidised expansion of the renewable energy sector (Sonnberger and Ruddat, 2016). German political and public discourse for a large part has taken the overarching goals of this policy as given and moved on to discuss how to achieve the country's ambitious emission reduction agenda. Many concrete policy measures, such as shutting down coal-fired power plants, face opposition from business interests and parties (including the Social Democrats) when they see their constituencies at a disadvantage. However, the Greens, together with their activist support base, keep pushing for far-reaching policies generating a lively political discussion — and media portrayals seem to correspond quite well to these political and social trends.

In the US, in contrast, climate policy positions at the national level are increasingly aligned with the existing two-party polarisation. While a majority of the population believes in climate change and supports policy to mitigate the problem, public perceptions and attitudes are sharply differentiated according to party affiliation (Leiserowitz et al., 2018). This extends deep into attitudes relevant to climate change politics: trust in environmental impact science (McCright et al., 2013), attitudes towards the government and corporations (cf. Pechar et al., 2018), and pro-environmental values pertinent to the issue (Lucas, 2018). Given that these differences align with other political cleavages, the winner-takes-all electoral system leads to more polarised political positions by vocal partisans and prevents the formation of a party catering to voters that care strongly about environmental issues. The patterns of media coverage observed foreground fundamental political controversy about the need to limit emissions, to the detriment of voices discussing policy options and private or sub-national efforts to address climate change.

Canada experienced some political polarisation surrounding climate change — as evidenced by political back-and-forth concerning international agreements. The country's withdrawal from the Kyoto Protocol in 2011, under a Conservative Party-led government, is contrasted by the current administration, which pursues an ostensibly climate-friendly agenda, both at a national and international level. Overall, a majority of the population supports this position, but there is considerable regional variation (Mildenberger et al., 2016), which continues to create tensions and disputes about energy and environmental policies, in particular when linked to the fossil fuel extraction sector. Whether or not the current political state of affairs concerning climate change is indicative of a long-term trend, or another swing of the pendulum is to be seen. Despite many cleavages and conflicts that could be highlighted by Canadian media, the overall emphasis lies on consensus rather than controversy — in stark contrast to the US. Political and media system factors would put the country closer to the US than Germany (Hallin and Mancini, 2004), but the observed patterns of controversy and consensus point to the opposite. Journalistic norms and routines are well-suited to add nuance to these system level variables and explain our findings.

6.2. Selective indexing and interpretation

Political dynamics and public attitudes are important factors explaining climate change coverage, but ultimately, journalists and media organisations *make* the news. In the US, previous research has identified a shift in media presentations of trend and attribution to impact scepticism (Schmid-Petri et al., 2017). Our results are in line with such findings and add evidence to the notion that portrayals of climate change controversy are "frequent but accurate" (Rice et al., 2018), by being correctly attributed to mostly political actors. This observation adds evidence to the hypothesis suggested by Schmid-Petri et al. (2017) that "indexing" politically relevant opinions (Bennett, 1996) drives news coverage of climate change in the US. According to this hypothesis, journalists may try to assess an issue's relevance or boost its newsworthiness by providing an index of what they deem the most relevant political opinions. In our material, for example, many articles that primarily focused on new scientific findings were given context by citing a recent denialist statement by President Trump. We find similar patterns in Germany and Canada, where political actors also receive ample attention — however with less focus on voices denying climate change's impact on humans, such as Trumps' nominees, the AfD in Germany, and regional contrarians in Canada.

Our results also add support to Brüggemann and Engesser's (2017) findings that the norm of balance is being replaced by "interpretative reporting": journalists contextualise and explain the positions of the actors they cover. In our data, political statements are often contrasted with the scientific consensus position. This is achieved by citing another political actor (and sometimes scientists), or direct journalistic intervention that makes the author's position on the issue apparent (cf. Bartholomé et al., 2015). In the German case, this has been previously described as journalists "questioning the doubt" (Kaiser and Rhomberg, 2016, p. 556) and commenting critically on climate change denialist arguments. In some sense, this is still indexing behaviour. However, our findings suggest that German news media, compared to their North American counterparts, increasingly ignore (political) contestation of the scientific evidence of climate change and instead portray societal and political discussions of the best strategies to achieve mitigation goals — still following an indexing logic but with a different emphasis.

Indexing, interpretation, and contextualisation may result in accurate pictures of the political landscape and of recent climate science findings. Yet, these norms aren't determinate, and leave room for giving emphasis to select opinions and ignoring others. In the US, the media noticeably foreground political controversy, which results in marginalising voices seeking to shift the public discussion towards finding workable solutions. These trends are in line with US media's widely discussed emphasis on "game" aspects of politics (Aalberg et al., 2012), personalisation (Van Aelst et al., 2012), and polarisation (McCluskey and Kim, 2012), rather than policy, sometimes captured under the notion of "media logic" (cf. Brants and van Praag, 2017). In contrast to the US, German media emphasise a comprehensive solution-oriented public discussion. Canada is situated in the middle of these two poles: while the media tend to focus on political actors, they emphasise agreements between them, more so than in the US. To sum up, indexing appears to be an essential factor in all countries alike, but the overlap with other norms drives which actors and which of their statements are selected to give context and build a story.

6.3. Limitations

In many respects, our findings fall in line with and complement existing research on climate change coverage in the three countries. Nonetheless, generalisation from the findings presented here should be done with care and acknowledging the limitations of this study. First, public discussions in the three countries during the period of investigation were driven by idiosyncratic national events and topics (such as political nominations and discussions surrounding specific

national policies) and thus differ strongly. This is an interesting finding and should not be ignored, especially given that coverage of an international climate conference was part of the sample, which has been previously shown to lead to convergence. However, differences may be emphasised by a relatively short sampling frame (6.5 months). In order to evaluate the effect of specific circumstances, a study using the same or similar methodology but over a longer time frame would be needed. This could also remedy the low case numbers in select countries on specific issues, preventing statistical comparison of relevant actor-issue-positions.

Second, in this study, we chose to focus on online coverage, and we selected outlets with great care to obtain the best approximation of a nationally representative sample by focusing on widely-read outlets across the political spectrum. Nonetheless, any selection of online outlets will always present a minority of what is available for audiences. While we have chosen to generalise to the national level, the specifics of the sample should be kept in mind. Third, the data collection and sampling method, while briefly manually validated, would deserve a more formal investigation and comparison with other data sources and strategies. In addition, the impact of estimating design weights on confidence intervals and significance tests needs further discussion. Fourth, the reliability scores reported in section 4 are mediocre in some cases. Considering that coders analysed mainly different country data, this potentially influences the results presented here. However, most findings are based on variables with acceptable scores and the first author coded data from the US and Germany, making it unlikely that the impact was systematic. The results are also validated by comparison with the existing country-specific literature, which strengthens our confidence in our findings.

7. Concluding remarks

While these limitations require the results to be treated with care, the findings of this study have some wider implications for climate change communication research and practice. To begin with, they provide evidence against the notion that climate change coverage is becoming more homogenous across the globe. On the one hand, COP 23 and US President Donald Trump's decision to intend withdrawal from the Paris Agreement received similar coverage across countries (cf. Wessler et al., 2016). On the other hand, countries differed remarkably with respect to issue emphasis, mode of representation and the actors presented. This supports Schäfer, Ivanova, and Schmidt's (2011) diagnosis that climate change is not discussed in a global public sphere but differentiated national ones.

The emphasis of political actor's positions is in line with what Schmid-Petri et al. (2017) call the "large issue cycle of climate change" and the overall shift towards politics. However, in the US case, it does not follow Downs (1972) or Habermas (2006) idealised models of a public discussion that moves from problem identification to finding a solution, since the observed patterns seem to reinforce political division, rather than solution-finding. There is increasing experimental evidence that political identity cues may be important triggers of motivated reasoning (Benegal and Scruggs, 2018; see also McLaughlin et al., 2016), which indicates that the focus on political actor's positions furthers existing polarisation concerning the issue, in particular in the US.

How audiences react to political actors' positions on climate change is only partly understood. Given the frequency with which they are being portrayed as the drivers of controversy, this is a potentially highly relevant avenue for further studies. For example, media attention to political actors and motivated reasoning could reconcile findings of "reinforcing spirals" (Feldman et al., 2014) — linking conservative media use to declining belief in global warming and vice-versa — with the absence of political parallelism in US media (Schmid-Petri et al., 2017). When audiences are cued into motivated reasoning, for instance by portrayals of political actors' positions or the presence of climate

change (Feldman and Hart, 2018), they tend to respond by reinforcing existing attitudes in the light of new information (Hart et al., 2015; Hart and Nisbet, 2012). Thus, rather than a result of media bias, declining beliefs among US Republicans may be an incidental outcome of exposure to political positions concerning climate change, which are widespread across media outlets due to the journalistic norms and routines discussed.

Taken together, these conclusions imply that journalists and campaigners should be careful when selecting a focus for their messaging efforts — emphasising bipolar conflict and controversy concerning fundamental policy (and science) questions side-lines those concerning feasibility and efficacy that more societal actors have a stake in. For example, devoting coverage to the denialist positions of some politicians, while potentially mobilising those already supportive of mitigation policies, reinforces the politicisation of facts otherwise supported by a scientific consensus. It also foregoes the opportunity to discuss different strategies for limiting emissions put forward by scientists, businesses, and activists. Similarly, when presenting relevant positions on climate change policy, practitioners should pay more attention to non-political actors. Presenting their views may contribute to directing attention away from the impression that the issue can be reduced to only two sides in favour and opposed to policy intervention.

As a final note, our findings suggest a middle ground in the discussion about (de-)politicising climate change (e.g. Corry and Jørgensen, 2015; Pepermans and Maesele, 2016). Our results point to a need for a *differentiated (de-)politicisation* as the path forward. Some scientific insights, such as the impact of climate change on humans, broadly speaking, need defence against becoming the object of political controversy, while discussions of the path forward involve difficult questions concerning many that deserve more media coverage and space in the public sphere. In addition, the results presented here suggest that the role and effects of political actors in climate change news need both further studies and more careful treatment by communication practitioners. In combination, such efforts may contribute to a better understanding of how to make current patterns of media portrayals more inclusive and directed towards critically evaluating different mitigation and adaptation policies.

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Data statement

The raw data used for this research contains information about identifiable natural persons, according to EU General Data Protection Regulation definitions, and cannot be shared. An anonymized aggregate dataset can be made available upon request. The research procedure presented in this article was approved by the Ethics Review Board at the Faculty of Social and Behavioral Sciences, University of Amsterdam; Amsterdam, The Netherlands (ID 2019-PCJ-10143).

Declaration of Competing Interest

The authors declare no conflicting interests.

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