ORIGINAL ARTICLE

Climate denial in Canada and the United States

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Abstract

One type of climate change denial is the belief that climate change is naturally occurring instead of human caused; this form of denial is known as attribution skepticism or soft denial. While considerable research has addressed outright climate change denial, little research has focused specifically on soft denial and its complex and politicized relationship with science. We examine this form of denial using original survey data collected in 2017 in the United States ($n = 1510$) and in 2019 in Canada ($n = 1545$). Contrary to expectations about the United States being more divided by political ideology on the topic of climate change, we find that – after accounting for trust in political leaders – Canadians' views are driven more by ideological position than those of Americans. In the United States, climate denial is related to trust in President Trump as a source of information about climate change. The study of soft denial is important as it undermines the rationale for climate change solutions.

RÉSUMÉ

Parmi les types de dénis portant sur les changements climatiques on retrouve la conviction que le

changement climatique se produit naturellement au lieu d'être causé par les humains; cette forme de déni est connue comme le scepticisme d'attribution ou le déni doux. Malgré la recherche abondante qui documente le déni sur le changement climatique, peu de recherches se sont concentrées sur le déni doux et encore moins spécifiquement sur sa relation complexe et politique avec la science. Cette étude se penche sur ce type de déni en utilisant les données d'une recherche par sondages dont les données ont été collectées en 2017 aux États-Unis ($n = 1510$) et en 2019 au Canada ($n = 1545$). Malgré le fait que les États-Unis soient plus divisés dans leurs idéologies politiques par rapport aux changements climatiques, cette étude démontre que — après avoir tenu compte de la confiance envers les dirigeants politiques — le point de vue des Canadiens est motivé davantage par leurs idéologies politiques que ceux des Américains. Aux États-Unis, le déni envers le changement climatique est, quant à lui, lié à la confiance envers le Président Trump en tant que source d'information sur les changements climatiques. Cette recherche portant sur le déni doux est importante, car ce déni affaiblit les arguments visant à trouver des solutions visant pour contrer les changements climatiques.

INTRODUCTION

Climate change has been a major policy issue in the past few decades, with high profile international agreements and multi-year climate strikes aimed at encouraging further action to halt its progression. Despite this momentum, many high-profile politicians and news outlets are claiming that it is a natural occurrence; in other words, they do not think humans play a role in the earth's changing climate. This soft climate change denial poses a challenge when trying to encourage both international cooperation on climate change and action by individuals to reduce their own contributions to greenhouse gas emissions. Furthermore, this form of denial places science and scientific information at the center of climate change debates by manipulating scientific information. In particular, scientific data have documented a changing climate since the Quaternary ice age, but climate change science has focused on the human causes of climate change in the past 100–150 years. Soft climate change denial focuses on and exploits specific scientific facts for political reasons.

Hornsey et al. (2016) conducted a meta-analysis about climate change opinions. They gathered 25 polls conducted in 56 countries, which were published in 171 academic studies. They

TABLE 1 Summary of existing literature on trust in scientists and views about the anthropogenic-causes of climate change

	Country	Correlation	Sample size
Borick et al. (2011)	USA	0.375	517
Borick and Rabe (2010)	USA	0.360	1458
Borick and Rabe (2011)	USA	0.282	524
Hine, Reser, Phillips, Cooksey, Marks, Nunn, . . . Glendon (2013) (Wave I)	Australia	0.460	3096
Hine, Reser, Phillips, Cooksey, Marks, Nunn, . . . Glendon (2013) (Wave II)	Australia	0.473	4246
Kellstedt et al. (2008)	USA	0.437	1004
Malka et al. (2009) (2006 survey)	USA	0.290	982
Malka et al. (2009) (2007 survey)	USA	0.320	982
Truelove and Greenberg (2013)	USA	0.424	2568
Vignola et al. (2013)	Costa Rica	0.097	1454

*Source: Hornsey et al. (2016) Appendix. The above table only reports on studies with samples of more than 400, considering anthropogenic climate change belief, and including trust in scientists as a predictor of these beliefs.

found political affiliation and trust in scientists were much stronger predictors of climate change opinions than any demographic variable, subjective knowledge about climate change, self-identification as an environmental activist, or experiences of extreme weather events (see Hornsey et al., 2016, Table 1, p. 625). However, the meta-analysis did not examine: 1) the form of denial that explains climate change as a natural occurrence; 2) a robust set of climate change information sources (news media, political leaders, scientists) and how these sources shape opinions; and 3) cross-national differences. In addition, half of the published studies are based on the United States, which raises questions about whether key explanations are US-specific or are more universal.

This study uses surveys of Americans and Canadians to examine trust in various information sources about climate change and how these influence the attribution of climate change to natural causes. We contribute to well-established findings that people with right-wing views are more likely to be climate change deniers, but we build on this literature with a cross-national approach. The cross-national comparison is important to highlight the role of trust in different information sources in the process of attitude formation. Cross-national differences are evident: in the United States, trust in President Trump correlates with a soft form of denial; in Canada, soft denial relates to political ideology. Contrary to expectations about the United States being more divided by political ideology on the topic of climate change, we find that – after accounting for trust in political leaders – Canadians' views are driven more by ideological position than those of Americans. We also find that while few (2% to 3%) of respondents stated that they do not think climate change exists, 21% of Americans and 12% of Canadians expressed soft denial. This contemporary iteration of climate denial is important to study since it is more common than outright denial, but also because studying this phenomenon in a comparative perspective helps identify similarities and differences in why such soft denial has become so popular. These findings contribute to existing scholarship by offering insights into an under-studied form of climate change denial, a more comprehensive view of the information environment surrounding these views, and an understanding of which explanations of climate change views are robust and which are specific to the US context.

In terms of sociological theory, this paper examines the role of multiple social institutions (media, government, and higher education) in shaping citizens' views about climate change. In

particular, we address how these institutions, especially media, overlap in Canada and the United States, which may lead to similarities in views about climate change. Yet, these countries also have different political cultures that could be attributed to differences in their political systems (two-party versus multi-party systems). Specifically, the United States may be polarized into two camps aligning with life-long party affiliations, in contrast to Canada that has more fluid partisanship identity which reduces polarized views. Science is largely conducted in institutions of higher education; American and Canadian academic cultures overlap given the proximity of these two countries.

In general, cross-national comparisons help to reveal robust explanations, moving beyond single-country case studies and idiosyncratic explanations (Boulianne, 2019). The United States and Canada are ideal for comparison: they both have federal systems, similar levels of carbon dioxide emissions, and harmonized policies as part of ensuring good trade relations (Lachapelle et al., 2012). Furthermore, "the geographic contiguity and cultural proximity of the two federations provides ample opportunity for such other types of spillover as, to take one example, ideational contagion" (Lachapelle et al., 2012 p. 337). As such, we might expect some similarities as physical proximity helps the spread of ideas across borders. Yet, the countries have different political leaders, which might produce differences to the extent that leaders offer cues to the public about complex policy issues, such as climate change action (Zaller, 1992).

Climate change denial

Previous literature outlines many different types of climate change skepticism. For example, Haltinner and Sarathchandra (2021) place deniers at four points on a continuum: 1) epistemic deniers, who do not think humans are influencing the climate as they do not believe that climate change is occurring, 2) epistemic doubters, who are uncertain that climate change is real and impacted by human activity, 3) attribution deniers, who believe in climate change but that it is due to natural causes, and 4) attribution doubters, those who believe in climate change but are unsure that it is an anthropogenic phenomenon. The authors examine the relationship between various demographic variables, political ideology, and (dis)trust in science and attribution denial; only political ideology was predictive of this form of skepticism. Individuals who scored higher on conservatism were more likely to believe that climate change is a natural occurrence, compared to those who identify as liberal.

This paper looks specifically at those who see climate change as a naturally occurring phenomenon. Haltinner and Sarathchandra (2021) label these individuals attribution deniers. Akter et al. (2012) refer to this type of denial as attribution skepticism, while Benegal (2018) categorizes it as soft denial. Concentrating on a specific subset of climate skeptics is an important line of research, as previous work suggests "important fragmentations within the skeptical public" (Sarathchandra & Haltinner, 2021 p. 230). Dunlap and McCright (2015 p. 301) argue that existing policy reports "give denial short shrift." We argue that this pattern is also true about academic attention to attribution deniers.

Political ideology, partisanship, and politics in cross-national perspective

In the United States, climate change is one of many policy areas on which the public is deeply divided. This polarization may be the outcome of the US two-party system: countries with

multi-party systems may not record polarization to the same degree. There is also the issue of measuring political affiliation versus political ideology, which was distinguished in the meta-analysis by Hornsey et al. (2016). Political affiliation is a difficult concept to transport outside of the United States, especially to countries where political affiliations are fluid, party platforms are complex combinations of policies, and people have multiple parties to choose from when voting (Krange Kaltenborn & Hultman, 2019; Schickler & Green, 1997). For example, Whitmarsh (2011) shows that Conservative supporters in the United Kingdom are the most skeptical of climate change, Liberal and Labour in the middle, and Greens the least skeptical. In Canada, Conservative supporters are also the least likely to believe in climate change, with New Democrats in the middle, and Liberal, Greens, and the Bloc Québecois being least skeptical (Lachapelle et al., 2012).

Fisher et al. (2013) find that the polarization is not about the science of climate change, but rather the policy solutions; however their findings are based on an analysis of Congressional Hearings from 2005 to 2009, leaving questions about whether this is the case among the public. In a 2019 study, Smith and Mayer find that both the perceived danger of climate change and the importance of climate change as an issue are considerably more partisan and polarized in Anglophone states – including the United States and Canada – compared with Western European and post-Communist states. Canada is a unique point of comparison for the United States. Canada has a multi-party system, but national elections are historically won by one of two major parties. The other parties interact with these major parties in terms of policy agendas and possible coalitions in the case of a minority government. In addition, Canadians are much more strategic in how they vote in particular elections, rather than relying on life-long party affiliations to decide for whom to vote (Schickler & Green, 1997). As such, it is not clear whether Canadians' opinions align with existing party platforms or rely solely on climate change policies when deciding who to vote for. For this reason, our survey question focuses on ideology versus party affiliation. Due to the Canadian multi-party system, we might expect that partisanship is less of an issue in Canada than the United States.

A US-Canada comparison raises questions about the degree to which the polarized and highly partisan discussion of climate change extends beyond geographic boundaries. Much previous research has found an association between climate change denial (broadly construed) and right-wing or conservative ideology (or identifying as Republican) in the United States (Ballew et al., 2020; Benegal, 2018; Schmid-Petri et al., 2017; Hornsey et al., 2016; Sarathchandra & Haltinner, 2021). Using survey data from 2005 to 2009, Tesler (2018) finds that the United States is distinctive in its degree of polarization. When the Republican US government withdrew from the Kyoto Protocol in 2001, climate change skepticism became a foundational element of conservatism (Schmid-Petri et al., 2017).

On a more global scale, this brand of conservatism is connected to neoliberalism, which does not support state intervention in the economy, the environment, or other domains (Dunlap & McCright, 2015). Climate denial is linked to neoliberalism which prioritizes the economy at the expense of the environment (Neubauer, 2011). Climate change as a policy issue would require state intervention to balance environmental protection with economic development. Dunlap and McCright (2015) argue that climate denial is strongest in neoliberalist countries, including Canada and the United States, but also Australia and the United Kingdom.

Our first research question examines whether political ideology influences this form of climate change denial that focuses on natural occurrences. Although political ideology and political affiliation are not identical constructs, they are highly correlated (Abramowitz & Saunders, 2008; Smith & Mayer, 2019), and a measure of political ideology is more appropriate to capture political
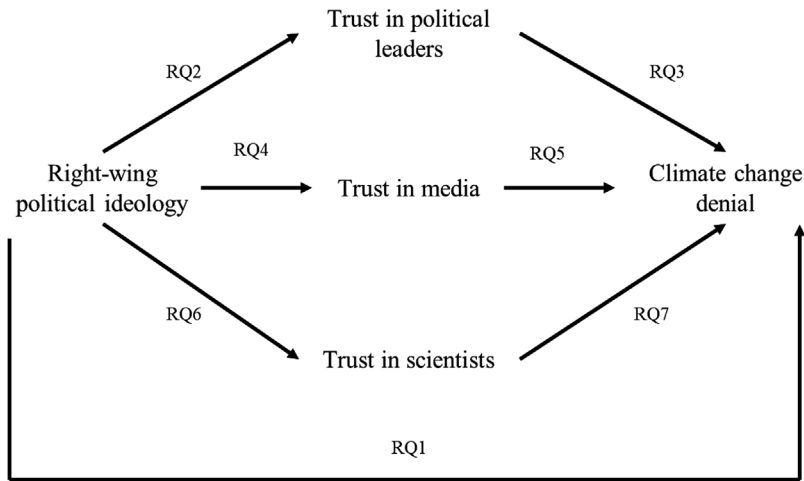
FIGURE 1 Theoretical model with research questions

sentiment across both nations. We extend research by exploring whether political ideology has a consistent effect in both Canada and the United States.

> RQ1: How does political ideology relate to climate change denial (natural occurrence) in Canada and the United States?

Political ideology has a direct influence on views about climate change, but may also have an indirect effect through the information sources used. We examine the direct effects of political ideology on trust in scientists, media sources, and political leaders in relation to climate change, as well as the indirect effects of political ideology through the politicizing of information sources (see Figure 1). Finally, we examine the robustness of this model across two countries, the United States and Canada. In the section following, we outline how this model might work differently in Canada compared to the United States, which is the focal point of much research (Hornsey et al., 2016).

Information sources

Trust in political leaders

With the Trump administration withdrawing from the Paris Agreement in 2017, climate change denial may have new energy. Scholars have pointed to Trump's populist style, which includes attacking the media and other elites (Boulianne et al., 2020). This approach resonates with some citizens, leading to greater trust in Trump as a political leader; however, it also contributes to anti-intellectualism and increases public skepticism toward scientists and scientific claims related to climate change (Merkley, 2020).

In contrast, none of the major party leaders denied climate change during the 2019 and 2021 Canadian elections, but they differed in their attention to this issue (Boulianne et al., 2021). Also, their policies differed in terms of how to address it and the ambitiousness of their goals to reduce

relevant emissions (Nisbet, 2020). Maxime Bernier, leader of the populist People's Party of Canada, did advance the framing of climate change as a natural occurrence (Bernier, 2019); however, neither this leader nor his party received much electoral support in 2019 or 2021. Former Prime Minister Stephen Harper (2006–2015) was an avid climate change denier and invoked policies to restrict government-employed scientists from sharing their findings with the media (see discussion in Boulianne & Belland, 2019). However, current Prime Minister Justin Trudeau (of the Liberal Party) subscribes to the science of climate change.

> RQ2: How does political ideology influence trust in political leaders (Trump/Trudeau) as sources of information about climate change in Canada and the United States?
>
> RQ3: How does trust in political leaders relate to climate change denial (natural occurrence) in Canada and the United States?

Trust in mainstream news

The majority of people rely on mainstream news media for environmental information (Boulianne & Belland, 2019; Funk et al., 2017). However, according to a Gallup poll, the percentage of Americans who have a "great deal/fair amount" of trust in the mass media dropped from 53% in 1997 to 32% in 2016 (Swift, 2016). Furthermore, trust in the media is strongly correlated with political partisanship, with only 14% of Republicans reporting a "great deal/fair amount" of trust versus 51% of Democrats in 2016 (Swift, 2016). For climate change more specifically, the public does not consider the media to be a trustworthy source; media reports are often interpreted as being sensationalized or politicized (Buys et al., 2014). This mistrust in conventional media can consequently push people to seek out alternative news sources, which may be further biased or rife with misinformation (James, 2019). Use of Fox News is linked to climate change denial, whereas the use of mainstream news sources is not (Bolin & Hamilton, 2018; Feldman et al., 2012). According to the *Digital News Report 2019*, 29% of Americans use Fox News each week (Newman et al., 2019).

Canada is an interesting comparator for the United States because Canadians' media diets include a good deal of American news sources, though the sources used are mostly mainstream (Brin, 2019). While CNN (27% broadcast, 19% online) and MSN (15%) news are common in Canadians' media diets, Fox News is used by only 9% of Canadians (Brin, 2019). In the United States, Fox News has been connected to right-wing ideology, climate change denial, and support for Trump. Furthermore, the Canadian media ecosystem is distinct in that it has a publicly funded broadcasting system (the Canadian Broadcasting Corporation or CBC), which is used by up to 32% of English Canadians (Brin, 2019). In the scholarship of media systems, public broadcasting media are distinguishing features that lead to more informed citizenry (Esser, 2019). Lastly, while Americans and Canadians consume some similar US-based news sources, Americans do not consume Canadian news sources and Canada's media ecosystem is distinctive in terms of consumption of CBC.

> RQ4: How does political ideology influence trust in media as a source of information about climate change in Canada and the United States?
>
> RQ5: How does trust in media relate to climate change denial (natural occurrence) in Canada and the United States?

Trust in scientists

Within the scientific community, the anthropogenic nature of climate change and its potential consequences are certain (Groves, 2019; James, 2019; Pew Research Center, 2015; Schmid-Petri et al., 2017). The public's faith in climate science influences not only its receptiveness to climate change information and concern about the issue (Malka et al., 2009) but also the degree to which they support public policies to combat it (Akter et al., 2012; Hornsey et al., 2016; Sleeth-Keppler et al., 2017; Stoutenborough et al., 2014). In the past, the public generally relied on scientists as a trusted source of information regarding climate change (Buys et al., 2014), but this is changing. Sleeth-Keppler et al. (2017) explain that the public feels alienated from public institutions, such as universities, as well as disconnected from scientists because they do not share the same values related to the importance of the scientific method. In addition, recent research reveals that even an individual's trust in scientific messengers can be heavily influenced by political partisanship (Bolson et al., 2019; Hamilton & Saito, 2015; Leiserowitz et al., 2012; Myers et al., 2017). This demonstrates that the degree to which the public trusts scientists is not only dependent upon the work those scientists perform but is also impacted by how this work may be publicly undermined by other social and political actors (Groves, 2019).

Table 1 summarizes the subset of studies in Hornsey et al. (2016) that offers large-scale survey analysis on climate change views. We focus on the subset of studies that examines trust in scientists and specifically anthropogenic causes of climate change, as this subset of results is most closely aligned with our interest in forms of denial. Not surprisingly, trust in scientists highly correlates with beliefs that humans are causing climate change (Table 1). Table 1 establishes the dominance of US research on this subject, but also raises a question about the possible existence of cross-national differences. In Costa Rica, trust in scientists has a relatively small impact on climate change views (Vignola et al., 2013). However, trust in scientists has the largest impact on climate change views in the two studies conducted in Australia (Hine et al., 2013, two waves). The existing research suggests cross-national differences in the importance of trust in scientists in shaping one's views about climate change. Yet, this line of research does not consider natural occurrence as a form of climate change denial. As mentioned, this form of denial pits scientific claims against each other, that is, warming since the ice age versus warming due to recent human activity.

RQ6: How does political ideology influence trust in scientists as a source of information about climate change in Canada and the United States?

RQ7: How does trust in scientists relate to climate change denial (natural occurrence) in Canada and the United States?

METHOD

Measures

The US survey data were collected using an online panel ($n = 1510$) between June 9 and June 30, 2017. The Canadian survey data were collected using an online panel ($n = 1545$) between September 20 and October 3, 2019. Both studies were conducted in the context of national elections. For

TABLE 2 Descriptive statistics

	Min and Max	United States			Canada		
		Mean	**St.Dev**	**Valid N**	**Mean**	**St.Dev**	**Valid N**
Independent variables							
Female	1 = Yes; 0 = No	0.50	n/a	1510	0.52	n/a	1537
Age	18–95	46.94	17.56	1510	46.39	16.62	1545
Postsecondary Education	1–4	2.27	1.06	1510	2.16	0.94	1542
Income	1–4	2.22	0.85	1496	2.22	0.85	1462
Right-wing Ideology	0 = left/independent 1 = right	0.36	n/a	1510	0.34	n/a	1545
Dependent variables							
Trust scientists	1 = Strongly Distrust- 4 = Strongly Trust	3.13	0.81	1510	3.07	0.82	1545
Trust media	1 = Strongly Distrust-4 = Strongly Trust	2.36	0.93	1510	2.59	0.82	1545
Trust President (USA.) or Prime Minister (Canada)	1 = Strongly Distrust- 4 = Strongly Trust	2.17	1.05	1510	2.26	0.92	1545
Cause of climate change	1 = naturally caused; 0 = not naturally caused	0.21	n/a	1458	0.12	n/a	1517

the United States, the survey was conducted seven months after the election. This time span allowed President Trump to enact his views about climate change, which included de-funding the Environmental Protection Agency and prompted public protests such as the March for Science (April 2017). In Canada, the survey was conducted weeks before the election, in which Prime Minister Trudeau was re-elected. During this time period, there were global climate strikes, including strikes in Canada, and Prime Minister Trudeau met with Greta Thunberg to discuss his climate change agenda.

The US survey was administered by Kantar-Lightspeed, and the Canadian survey by Dynata. In both cases, age and gender distribution closely replicate census data. Respondents had to be a minimum of 18 years old to participate. Table 2 outlines the descriptive statistics for each variable used in the analysis. While the response categories for demographic variables varied slightly, they are recoded to offer a consistent measurement approach. Question wording about ideology, information sources, and climate change are identical in both surveys.

Gender

Quota sampling was used on gender to match population data from the US government (51% females; Howden & Meyer, 2011) and Statistics Canada (51%, Statistics Canada 2017). The variable was recoded to a binary dummy variable where 1 = female and 0 = male. Approximately 50% of the US sample ($n = 1510$) and 52% of the Canadian sample ($n = 1537$) are female.

Age

Quota sampling was used on age to match population data from the US government (Howden and Meyer, 2011) and Statistics Canada (2017). The US census and sample estimates are as follows: 13.1% aged 18 to 24 years (survey: 12.4%); 17.5% aged 25 to 34 years (survey: 18.2%); 17.5% aged 35 to 44 years (survey: 17.1%); 19.2% aged 45–54 years (survey: 18.2%); and 32.7% aged 55 or older (survey: 34.1%). The Canadian census and sample estimates are as follows: 10.9% aged 18 to 24 years (survey: 8.5%); 16.4% aged 25 to 34 years (survey: 22.9%); 16.2% aged 35 to 44 years (survey: 16.7%); 17.9% aged 45 to 54 years (survey: 18.3%); and 38.6% aged 55 or older (survey: 33.6%).

Education

The education variable was recoded into four categories. In the United States, categories were coded as follows: 1 as grade school, some high school, and graduated high school or GED; 2 as graduated college, associate's degree, technical school, or vocational training; 3 as graduated college – bachelor's degree; and 4 as advanced degree, postgraduate, or doctoral degree (M.A., PhD, etc.). In Canada, categories were coded as follows: 1 as no schooling, some elementary school, completed elementary school, some secondary, high school, completed secondary/high school; 2 as some technical, community college, CEGEP, college classique, completed some technical, community college, CEGEP, college classique, some university; 3 as bachelor's degree; and 4 as master's, professional, or doctorate degree.

Income

Household annual income was asked using different approaches in each country, but recoded to have matching intervals: 1 ($0 to $30,000); 2 ($30,000 to 60,000); 3 ($60,000 to 200,000); and 4 ($200,000 or more).

Ideology

Respondents were asked about ideology using the following: "In politics, people sometimes talk of left and right. Where would you place *yourself* on this scale? Note: sometimes people refer to the left as liberal and to the right as conservative." In the United States, respondents were also offered the option of "neither left nor right" but this option was not available in the Canadian survey. These responses were identified as "zeros" and any responses lower than 6 on the 11-point

scale were also coded as "zero". The recoding ensures that the response options are identical in the Canadian and American results. The remaining respondents (6, 7, 8, 9, 10) were coded as 1 (right-wing). The theory is related to right-wing ideology and the recoding enables a focus on right-wing ideology. The recoding created a variable with identical proportions in both countries; 36% of Americans and 34% of Canadians identified as right-wing, which further facilitates a cross-national comparison. In addition, the simplification helps with interpreting the differential effects of ideology across the different measures of trust in sources and climate denial in both countries.

Cause of climate change

Respondents were asked, "Do you think that climate change is a natural occurrence or human caused?" with response options as follows: natural; human caused; both equally; and climate change does not exist. The question was inspired by the Pew line of questioning about attribution (see Klima, 2016). Only 3% of Americans and 2% of Canadians selected the last category (climate change does not exist). This small number of outright deniers does not influence the results, so we decided to exclude them. For this paper, we computed the variable "cause of climate change" as a dummy variable where "naturally caused" responses are coded as 1 and all other response options are coded as 0. Approximately 21.19% of the American sample and 12.33% of the Canadian sample reported believing that climate change was naturally caused.

Trust in sources

Respondents were asked, "How much do you trust or distrust [scientists/mainstream news media/President/Prime Minister] as a source of information about climate change?" Table 2 lists the averages and standard deviations by country. The response scale ranged from strongly distrust (1) to strongly trust (4). Canadian and American respondents have similar levels of trust in scientists but differ in their views about the media.

Analysis

To examine the direct effects of political ideology on trust in scientists, media, and political leaders as well as the role of all of these variables on denial, we employ simultaneous equation modeling using Amos 27. The figures are country-specific and summarize the coefficients related to the seven research questions. Additional analysis appears in Appendices A–F. In addition, the data and replication files are available at https://doi.org/10.6084/m9.figshare.19164071.v1

RESULTS

To begin, we report on even-numbered hypotheses, which examine the role of ideology in trust in different information sources, comparing Canada (Figure 2) with the United States (Figure 3). In relation to Research Question 2, we find that political ideology influences trust in political leaders about climate change and this relationship is stronger in the United States than in Canada. The question wording for trust in political leaders references President Trump in the United States and
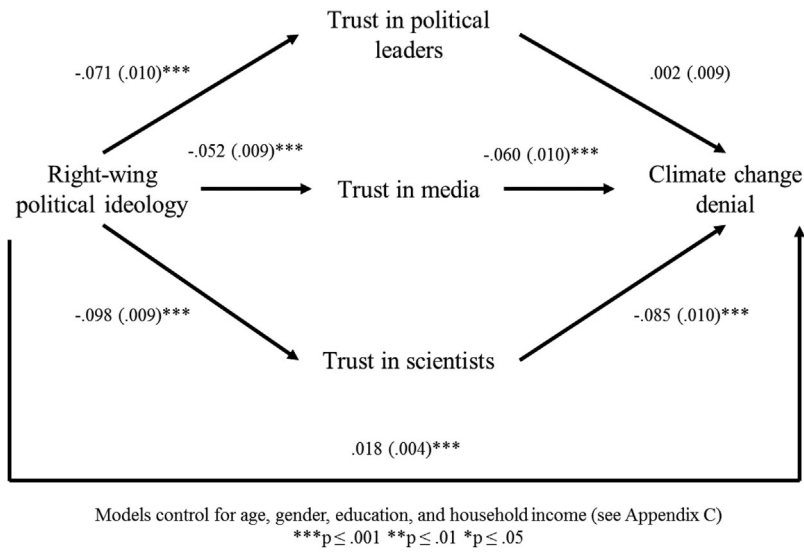
FIGURE 2   Simultaneous equation model for Canada
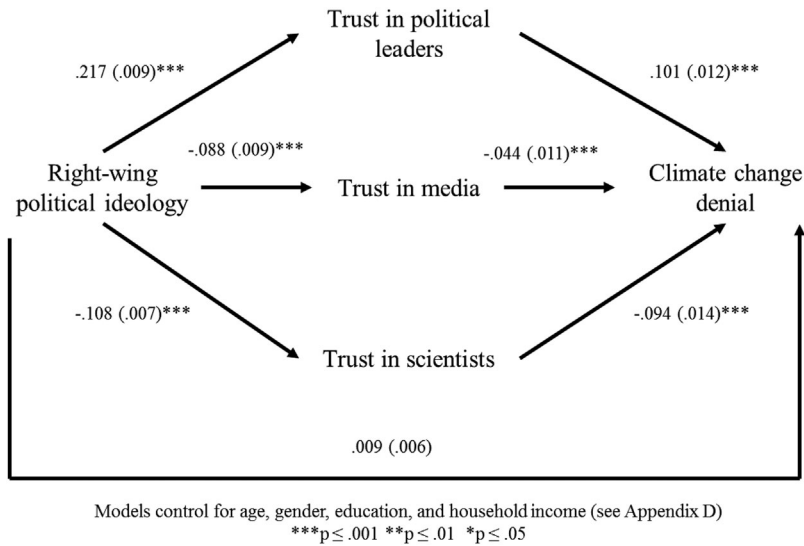
FIGURE 3   Simultaneous equation model for the United States

Prime Minister Trudeau in Canada. In the United States, those who identify with the right side of the ideological scale are more trusting of the Republican president about climate change. In Canada, ideology is a weaker predictor of trust in Prime Minister Trudeau (Liberal) related to the topic of climate change information. When modeled as a differential effect (interaction effect in Appendix A), we find that political ideology has a stronger influence on trust in the political leader of the United States compared to Canada (Appendix A). As further support for the magnitude of this effect, adding the interaction variable to the baseline model for pooled results increases the explained variance (R square) from 0.049 to 0.132 (Appendix A).

In terms of trust in mainstream news media (Research Question 4), Americans who identify with the right side of the ideological scale are less trusting of news media about climate change (Figure 3). Right-wing ideology is also a predictor of media distrust in Canada (Figure 2). To answer Research Question 6, we find political ideology correlates with levels of trust in scientists on the topic of climate change. In the United States, those respondents who identify with the right side of the ideological scale are less trusting in scientists (Figure 3). Right-wing ideology is also a predictor of distrust in scientists in Canada (Figure 2).

In relation to the odd-numbered research questions, we outline the effects of ideology and trust in different information sources in relation to soft climate change denial. American respondents are more likely to believe that climate change is naturally occurring (Table 2, Appendix B). In relation to Research Question 1, political ideology relates to this form of climate change denial; respondents who identify with the right side of the ideological scale are more likely to believe climate change is naturally occurring. However, this relationship is more substantial in Canada (Figure 2 vs. Figure 3). In other words, it is rare for a Canadian to attribute climate change to natural causes, but those Canadians who do are more likely to identify as right-wing versus left-wing or independent. Modeling country differences in the role of ideology on climate change denial yields the same conclusion, and the interaction variable is statistically significant (see Appendix B). To answer Research Question 1, we find that ideology has a stronger influence in Canada than the US, though this finding requires some qualification. In the United States, soft climate change denial is attributed to trust in a specific political leader, that is, President Donald Trump.

In contrast, data from Canada show no impact of trust in the Prime Minister on climate change denial (Figure 2). For Research Question 3, trust in political leaders matters more in the United States than Canada in relation to soft denial, but political ideology is more predictive of such denial in Canada than in the United States. We test these differential effects by introducing an interaction variable for country and trust in political leaders and find that it is statistically significant (Appendix B).

Research Question 5 looks at trust in media and climate change denial. In both countries, trust in mainstream media sources negatively correlates with soft denial; those respondents who trust the media are less likely to think of climate change as a natural occurrence. This pattern is consistent in both countries. Individuals who trust in scientists are also less likely to believe in naturally occurring climate change (RQ7). In other words, distrust of news media and scientists is linked to soft climate change denial. In the United States, trust in political leaders is important for soft climate change denial.

DISCUSSION

As mentioned, the existing meta-analysis by Hornsey et al. (2016) establishes political orientation as a significant predictor of climate change views; specifically that political ideology is a poorer predictor than political affiliation (0.149 vs. 0.301). In contrast, our cross-national survey establishes that political ideology is a major predictor with implications far beyond climate change views. Political ideology also influences trust in information sources that inform beliefs about climate change.

Brulle et al. (2012) examine climate change views in the United States from 2002 to 2010. Of the more than 20 predictors of these opinions, they find that elite cues are a critical factor in people's climate change opinions. Our findings support this conclusion in the United States, extending research beyond the study of ideology as the source of climate change views. Trust in President

Trump as a source of information about climate change is a top determinant of climate change views in the United States. However, this is not the case in Canada where trust in media and scientists are more important factors compared to trust in Prime Minister Trudeau.

Our research is based on cross-sectional data collected in the context of elections in both countries and as such we cannot assess the causal order of our variables. We assume that people form their ideological views first, then form their opinions about the media, scientists, and leaders as sources of information about climate change, then finally, they form their views about this new form of soft climate denial. In the case of the United States, this causal ordering makes sense in that there was a change of leader in November 2016; in June 2017, citizens could form their views about this new leader as a source of information about climate change. In addition, as mentioned, soft denial seems to be a more contemporary iteration of climate denial, so it is possible they changed their views to align with their new leader's views. The causal process is less certain in Canada, because the 2019 election re-elected Trudeau. It is not clear whether Canadians' views about Trudeau impact their climate denial. This limitation is not specific to our research. As mentioned, a meta-analysis of research does not consider the causal order of ideology and climate change opinions, nor does this research cite any over-time panel data that could test the causal order (Hornsey et al., 2016). We offer some insights.

In the post-Trump period, we could consider whether this soft denial and the related skepticism towards media and science is an enduring feature of American political culture. This skepticism is tied to populist discourse and populism has a global reach including in India, Switzerland, and many other European countries (Norris, 2020). Certainly, the COVID-19 pandemic and the anti-vaccination movement have placed scientific information at the forefront of policy debates. Our findings provide insight into the role of different information sources and political ideology in forming views about the pandemic and vaccination. Elite cues are important – ideology predicts which elites are trusted and these trusted elites are influential on public opinion.

As mentioned, limited research has been conducted specifically on soft climate change denial which manifests as skepticism in the attribution of climate change to human activity (Akter et al., 2012; Benegal, 2018; Klima, 2016; Nisbet & Myers, 2007). This attribution is important, as research suggests support for climate change policies relates to beliefs in the human causes of climate change (Akter et al., 2012; Hornsey et al., 2016; Sleeth-Keppler et al., 2017; Stoutenborough et al., 2014). The soft form of climate change denial differs from existing patterns of cross-national differences in climate change views, which suggest the US is more polarized than other countries (Tesler, 2018) due to its two-party system. We find that right-wing Canadians are more likely to believe in natural causes of climate change, indicating that Canada is more ideologically polarized in the case of attribution skepticism. In contrast, the effects of political ideology are smaller in the United States than in Canada once political leaders are considered in the model.

Our cross-national study also highlights robust findings in relation to climate change views, including some consistent findings across the United States and Canada. Right-wing ideology has a strong influence on distrust of scientists in both countries which is also linked to climate change denial in both countries. The connection found between trust and climate change views is consistent with that of Hornsey et al. (2016), however their meta-analysis did not explore cross-national differences. Lachapelle et al. (2012) find that Canadians are more likely than Americans to accept the scientific narrative about climate change. With our specific focus on the under-studied form of soft denial, we did not see this pattern; our results for both countries are similar. However, with this form of climate change denial, trust in science remains a significant predictor; those who trust scientists are less likely to think climate change is naturally caused. Soft denial

places science at center stage in terms of differentiating warming since the ice age versus climate change due to recent human activity.

Additionally, the meta-analysis did not examine the role of mainstream news media in climate change views (Hornsey et al., 2016); this is a considerable gap because the majority of citizens receive their climate change information from news media. We compared two countries with some overlap in news sources but also with some distinct patterns in the media ecosystem. As previously outlined, Canada has a unique media landscape that includes many mainstream American news sources, whereas the American news diet does not include Canadian sources. For this reason, we did not expect trust in mainstream news sources to differ between Canada and the United States. The two countries demonstrate differences in relation to ideology and media. We explain these differences in terms of the US media ecosystem including prominent right-wing news sources, such as Fox News, whereas the Canadian media ecosystem includes the CBC as a publicly funded broadcasting system (Brin, 2019).

As previously mentioned, Canada and the United States are ideal for comparison in climate change research due to similarities in federal systems, levels of carbon dioxide emissions, and trade relation policies (Lachapelle et al., 2012). However, the two countries differ in terms of political leaders and ideologies, which may account for the distinct patterns we observed in climate change views. In the United States, trust in President Trump as a source of climate change information is a strong predictor of attribution skepticism. In contrast, trust in the Canadian Prime Minister does not influence climate change views. Trusting President Trump about climate change increases the likelihood of believing that climate change is a natural occurrence. Considering the set of findings about distrust, the difference in views about political leaders might be a function of partisanship and populist style, where the US President cultivates distrust in all institutions, including scientific institutions and media outlets.

We have a number of recommendations for further research. First, our category of mainstream media sources is quite broad and detrimental with respect to understanding US-Canada differences. We encourage a more nuanced approach to determine whether these mainstream media sources are Canadian or American as well as an isolation of distinct media sources in each country (e.g., Fox News versus the CBC). Second, we encourage additional research to examine the use of various information sources (government, religious leaders, friends, celebrities) and how this differs by country. Third, we need to look beyond ideology and trust in scientists as explanations for people's views when trying to examine variations in trust in information sources and to understand this form of climate change denial. The model fit statistics are modest in relation to this form of climate change denial and poor in relation to trust in information sources. Further research should explore other variables and their influence on trust in information sources. Our paper is best positioned to highlight the connection between political ideology, political leaders, and scientists in relation to the attribution skepticism form of climate change denial.

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APPENDIX TABLE A: LINEAR REGRESSION OF TRUST IN INFORMATION SOURCES

	Trust in President/PM				Trust in mainstream news media				Trust in scientists			
	b	se	B	p	b	se	B	p	b	se	B	p
USA												
Female	0.022	0.049	0.010	0.653	−0.076	0.047	−0.041	0.111	−0.088	0.041	−0.054	0.032
Age	0.001	0.001	0.012	0.609	−0.005	0.001	−0.091	<0.001	−0.003	0.001	−0.068	0.006
Education	−0.119	0.025	−0.119	<0.001	0.126	0.024	0.143	<0.001	0.104	0.021	0.136	<0.001
Income	0.077	0.031	0.063	0.013	0.089	0.030	0.082	0.003	0.099	0.026	0.104	<0.001
Right–wing ideology	1.030	0.051	0.471	<0.001	−0.359	0.050	−0.186	<0.001	−0.395	0.043	−0.234	<0.001
Model characteristics	n = 1495		R square= 0.227		n = 1495		R square= 0.067		n = 1495		R square= 0.084	
CANADA												
Female	0.073	0.050	0.040	0.145	0.103	0.045	0.062	0.022	0.104	0.044	0.064	0.018
Age	−0.003	0.001	−0.054	0.044	0.004	0.001	0.085	0.002	0.001	0.001	0.013	0.634
Education	0.145	0.027	0.148	<0.001	0.085	0.024	0.097	<0.001	0.151	0.024	0.174	<0.001
Income	0.019	0.030	0.018	0.522	−0.007	0.027	−0.007	0.790	0.011	0.026	0.011	0.686
Right–wing ideology	−0.191	0.050	−0.100	<0.001	−0.163	0.045	−0.095	<0.001	−0.321	0.044	−0.188	<0.001
Model characteristics	n = 1454		R square= 0.037		n = 1454		R square= 0.026		n = 1454		R square= 0.068	

(Continues)

	Trust in President/PM				Trust in mainstream news media				Trust in scientists			
	b	se	B	p	b	se	B	p	b	se	B	p
POOLED												
Female	0.030	0.036	0.015	0.405	-0.006	0.032	-0.011	0.742	-0.006	0.029	-0.003	0.851
Age	-0.001	0.001	-0.024	0.182	-0.001	0.001	-0.001	0.246	-0.002	0.001	-0.039	0.030
Education	0.008	0.019	0.008	0.676	0.122	0.017	0.108	<0.001	0.126	0.016	0.155	<0.001
Income	0.055	0.023	0.047	0.016	0.039	0.020	0.040	0.047	0.054	0.018	0.057	0.003
Right-wing ideology	0.418	0.038	0.203	<0.001	-0.139	0.034	-0.257	<0.001	-0.355	0.031	-0.209	<0.001
USA1	-0.098	0.036	-0.049	0.006	-0.135	0.032	-0.238	<0.001	0.052	0.029	0.032	0.071
Model characteristics	n = 2950		R square=	0.049	n = 2950		R square=	0.052	n = 2950		R square=	0.071
+ USA*Ideology	1.192	0.071	0.467	<0.001	-0.060	0.066	-0.138	0.038	-0.034	0.060	-0.016	0.576
Model characteristics	n = 2950		R square=	0.132	n = 2950		R square=	0.053	n = 2950		R square=	0.071

APPENDIX TABLE B: BINARY LOGISTIC REGRESSION OF CLIMATE CHANGE DENIAL (NATURAL OCCURRENCE)

	USA				Canada				POOLED			
	b	Se	Exp (B)	p	b	se	Exp (B)	p	b	se	Exp (B)	p
Female	−0.280	0.149	0.756	0.061	−0.276	0.187	0.758	0.139	−0.318	0.114	0.727	0.005
Age	−0.002	0.004	0.998	0.686	0.015	0.006	1.015	0.009	0.005	0.003	1.005	0.148
Education	0.156	0.077	1.169	0.044	−0.160	0.103	0.852	0.118	0.006	0.060	1.006	0.924
Income	−0.072	0.096	0.931	0.455	0.092	0.112	1.096	0.413	0.031	0.072	1.032	0.663
RW ideology	0.376	0.162	1.456	0.020	1.133	0.182	3.105	<0.001	0.857	0.117	2.357	<0.001
Trust in scientists	−0.744	0.104	0.475	<0.001	−0.821	0.123	0.440	<0.001	−0.832	0.077	0.435	<0.001
Trust in media	−0.284	0.089	0.753	0.001	−0.525	0.129	0.592	<0.001	−0.381	0.071	0.683	<0.001
Trust in political leaders	0.768	0.083	2.155	<0.001	0.008	0.119	1.008	0.950	0.378	0.061	1.459	<0.001
USA									0.568	0.116	1.764	<0.001
Model characteristics	n = 1444		R Square=	0.186	n = 1431		R Square=	0.142	n = 2875		R Square=	0.155

(Continues)

	USA				Canada				POOLED			
	b	Se	Exp (B)	p	b	se	Exp (B)	p	b	se	Exp (B)	p
Model 1												
+ **USA*ideology**									-0.506	0.233	0.603	0.030
Model characteristics									n = 2875		R Square=	0.157
Model 2												
+ **USA*scientists**									0.451	0.141	1.570	0.001
Model characteristics									n = 2875		R Square=	0.158
Model 3												
+ **USA*media**									0.588	0.135	1.800	<0.001
Model characteristics									n = 2875		R Square=	0.161
Model 4												
+ **USA*political leader**									0.862	0.130	2.368	<0.001
Model characteristics									n = 2875		R Square=	0.168

*Model 1 to 4 include the baseline model plus one interaction variable. R square is Cox & Snell.

APPENDIX TABLE C: SIMULTANEOUS EQUATION MODEL AMOS OUTPUT FOR CANADA

			Estimate	S.E.	C.R.	*p* label
p_trustcc	<—	ideol	−0.071	0.010	−7.172	***
media_trustcc	<—	ideol	−0.052	0.009	−5.792	***
scientist_trustcc	<—	ideol	−0.098	0.009	−11.492	***
p_trustcc	<—	Females1	0.071	0.046	1.560	0.119
p_trustcc	<—	age	−0.003	0.001	−1.997	0.046
media_trustcc	<—	Females1	0.095	0.041	2.312	0.021
scientist_trustcc	<—	Females1	0.105	0.040	2.656	0.008
p_trustcc	<—	educ4	0.110	0.024	4.535	***
media_trustcc	<—	educ4	0.062	0.022	2.839	0.005
scientist_trustcc	<—	educ4	0.122	0.021	5.783	***
media_trustcc	<—	age	0.004	0.001	3.491	***
scientist_trustcc	<—	age	0.001	0.001	1.103	0.270
p_trustcc	<—	hhinc4	0.032	0.028	1.177	0.239
media_trustcc	<—	hhinc4	0.002	0.025	0.081	0.935
scientist_trustcc	<—	hhinc4	0.016	0.024	0.682	0.495
Deniers1	<—	ideol	0.018	0.004	4.940	***
Deniers1	<—	p_trustcc	0.002	0.009	0.184	0.854
Deniers1	<—	media_trustcc	−0.060	0.010	−6.105	***
Deniers1	<—	scientist_trustcc	−0.085	0.010	−8.289	***
Deniers1	<—	Females1	−0.047	0.016	−3.006	0.003
Deniers1	<—	age	0.001	0.000	1.927	0.054
Deniers1	<—	educ4	−0.008	0.009	−0.833	0.377
Deniers1	<—	hhinc4	0.008	0.009	0.875	0.381

APPENDIX TABLE D: SIMULTANEOUS EQUATION MODEL AMOS OUTPUT FOR THE UNITED STATES

			Estimate	S.E.	C.R.	P Label
p_trustcc	<—	ideol	0.217	0.009	25.505	***
media_trustcc	<—	ideol	−0.088	0.009	−9.996	***
scientist_trustcc	<—	ideol	−0.108	0.007	−14.614	***
p_trustcc	<—	Females1	−0.035	0.046	−0.758	0.449
p_trustcc	<—	age	0.000	0.001	−0.205	0.837
media_trustcc	<—	Females1	−0.061	0.046	−1.338	0.181
scientist_trustcc	<—	Females1	−0.078	0.039	−2.027	0.043
p_trustcc	<—	educ4	−0.062	0.022	−2.881	0.004
media_trustcc	<—	educ4	0.105	0.022	4.878	***
scientist_trustcc	<—	educ4	0.080	0.018	4.409	***
media_trustcc	<—	age	−0.004	0.001	−3.357	***
scientist_trustcc	<—	age	−0.003	0.001	−2.553	0.011
p_trustcc	<—	hhinc4	0.101	0.027	3.752	***
media_trustcc	<—	hhinc4	0.083	0.027	3.079	0.002
scientist_trustcc	<—	hhinc4	0.095	0.023	4.162	***
Deniers1	<—	ideol	0.009	0.006	1.551	0.121
Deniers1	<—	p_trustcc	0.101	0.012	8.081	***
Deniers1	<—	media_trustcc	−0.044	0.011	−3.950	***
Deniers1	<—	scientist_trustcc	−0.094	0.014	−6.957	***
Deniers1	<—	Females1	−0.046	0.019	−2.365	0.018
Deniers1	<—	age	0.000	0.001	0.487	0.626
Deniers1	<—	educ4	0.027	0.009	2.855	0.004
Deniers1	<—	hhinc4	−0.008	0.012	−0.690	0.490

APPENDIX TABLE E: CORRELATION MATRIX FOR CANADA

		Deniers1	Trust in scientists	Trust in media	Trust in leader	Females1	Age of respondent	Education	HH income
Deniers1	Pearson correlation	1							
	p-value								
Trust in scientists for climate change information	Pearson Correlation	−0.32	1						
	p-value	0.000							
Trust in mainstream media for climate change information	Pearson Correlation	−0.262	0.481	1					
	p-value	0.000	0.000						
Trust in leader climate change information	Pearson Correlation	−0.173	0.391	0.459	1				
	p-value	0.000	0.000	0.000					
Females1	Pearson Correlation	−0.107	0.060	0.035	0.052	1			
	p-value	0.000	0.020	0.173	0.043				
Age of respondent	Pearson Correlation	0.062	0.000	0.066	−0.065	−0.289	1		
	p-value	0.015	0.997	0.009	0.011	0.000			
Education	Pearson Correlation	−0.058	0.159	0.080	0.128	−0.077	0.039	1	
	p-value	0.024	0.000	0.002	0.000	0.000	0.000		
HH income	Pearson Correlation	0.014	0.048	0.017	0.056	−0.067	0.021	0.342	1
	p-value	0.593	0.067	0.522	0.031	0.010	0.423	0.000	
Right-wing ideology	Pearson Correlation	0.216	−0.186	−0.094	−0.096	−0.100	0.001	0.053	0.087
	p-value	0.000	0.000	0.000	0.000	0.000	0.984	0.038	0.001

APPENDIX TABLE F: CORRELATION MATRIX FOR THE UNITED STATES

		Deniers1	Trust in scientists	Trust in media	Trust in leader	Females1	Age of respondent	Education	HH income
Deniers1	Pearson Correlation	1							
	p-value								
Trust in scientists for climate change information	Pearson Correlation	−0.295	1						
	p-value	0.000							
Trust in mainstream media for climate change information	Pearson Correlation	−0.219	0.473	1					
	p-value	0.000	0.000						
Trust in leader climate change information	Pearson Correlation	0.343	−0.203	−0.121	1				
	p-value	0.000	0.000	0.000					
Females1	Pearson Correlation	−0.076	−0.028	−0.022	−0.077	1			
	p-value	0.000	0.280	0.390	0.003				
Age of respondent	Pearson Correlation	0.025	−0.059	−0.08	−0.006	0.025	1		
	p-value	0.004	0.025	0.390	0.812	0.328			
Education	Pearson Correlation	0.013	0.152	0.154	−0.038	−0.051	0.026	1	
	p-value	0.332	0.021	0.002	0.141	0.049	0.317		
HH income	Pearson Correlation	0.011	0.127	0.114	0.088	−0.093	0.001	0.410	1
	p-value	0.632	0.000	0.000	0.001	0.000	0.979	0.000	
Right-wing ideology	Pearson Correlation	0.253	−0.186	−0.143	0.465	−0.179	−0.029	0.129	0.161
	p-value	0.683	0.000	0.000	0.000	0.000	0.253	0.000	0.000