# THE SOCIAL BASES OF CLIMATE CHANGE KNOWLEDGE, CONCERN, AND POLICY SUPPORT IN THE U.S. GENERAL PUBLIC

*Aaron M. McCright**

*This Article analyzes the social bases of climate change knowledge, concern, and policy support, with an emphasis on examining the role of political identification (political ideology and party affiliation). Using survey data from eight nationally representative samples from 2001-2008, this study tests the generalizability of earlier results in this literature. Several findings from past research receive support, though a few—primarily those dealing with demographic characteristics—are challenged here. Of particular interest, political liberals and Democrats express more scientifically accurate beliefs and greater concern about climate change than do political conservatives and Republicans. Also, greater self-reported understanding translates into increased knowledge and concern for liberals and Democrats and decreased knowledge and concern for conservatives and Republicans. Political ideology and party affiliation have both direct and indirect effects on climate policy support, with liberals and Democrats expressing greater support for several climate policy proposals than conservatives and Republicans. This Article ends with a brief discussion of the implications of these trends in climate change public opinion for implementing effective climate policy.*

## I. INTRODUCTION

For the past two decades, the issue of climate change[1] has been thoroughly politicized in the United States. By the early 1990s, the U.S.

* Assistant Professor of Sociology in Lyman Briggs College and the Department of Sociology, Michigan State University, 2005-Present. Ph.D., Sociology, Washington State University, 2002; M.A., Sociology, Washington State University, 1998; B.A., Sociology, University of Northern Iowa, 1996. Thanks are extended to Riley Dunlap and the Gallup Organization for making the data available for analysis. Direct correspondence to: Aaron M. McCright; E-185 Holmes Hall; Lyman Briggs College; Michigan State University; East Lansing, MI 48825-1107 (mccright@msu.edu).

1. I use climate change and global warming interchangeably, although the former technically connotes all forms of climatic variability introduced by the general warming of the Earth's surface and oceans stemming from the increased accumulation of greenhouse gases in the Earth's atmosphere. The increased concentration of such gases strengthens the natural "greenhouse effect," whereby the atmosphere absorbs the sun's radiation rather than allowing it to escape into space. *See* COMM. ON THE SCI. OF CLIMATE CHANGE, NAT'L RESEARCH COUNCIL, CLIMATE CHANGE SCIENCE: AN ANALYSIS OF SOME KEY QUESTIONS 9-10 (2001); THE NAT'L ACADS.,

environmental community—the environmental movement, sympathetic climate scientists, and environmental policy-makers—successfully defined anthropogenic (human-induced) global warming as a legitimate social problem deserving of federal policy action. At the same time, a coordinated anti-environmental countermovement mobilized in the United States to challenge the legitimacy of climate change as a problem on which society should act.[2] This response included both significant lobbying by the American fossil fuels industry[3] and concerted actions by American conservative think tanks to question the necessity of dealing with climate change.[4] "Integral to these efforts has been the promotion of approximately a dozen scientists collectively known as climate change 'contrarians' (or sometimes 'skeptics')."[5]

Much of this research on the political dynamics of climate change in the United States has examined either organizations (for example, environmental movement organizations, conservative think tanks, and energy corporations) or elite actors (for example, climate scientists and policy-makers).[6] Less research has examined the political dynamics of climate change within the U.S. general public.[7] This Article improves

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UNDERSTANDING AND RESPONDING TO CLIMATE CHANGE: HIGHLIGHTS OF NATIONAL ACADEMIES REPORTS 6-7 (2005).

2. *See, e.g.*, Andrew Austin, *Advancing Accumulation and Managing its Discontents: The U.S. Antienvironmental Countermovement*, 22 SOC. SPECTRUM 71, 75 (2002).

3. *See, e.g.*, ROSS GELBSPAN, THE HEAT IS ON: THE CLIMATE CRISIS, THE COVER-UP, THE PRESCRIPTION 33-35 (1998); PETER NEWELL, CLIMATE FOR CHANGE: NON-STATE ACTORS AND THE GLOBAL POLITICS OF THE GREENHOUSE 97, 103-04 (2000); David L. Levy & Daniel Egan, *Capital Contests: National and Transnational Channels of Corporate Influence on the Climate Change Negotiations*, 26 POL. & SOC'Y 337, 343-44 (1998).

4. *See, e.g.*, Aaron M. McCright & Riley E. Dunlap, *Challenging Global Warming as a Social Problem: An Analysis of the Conservative Movement's Counter-Claims*, 47 SOC. PROBS. 499, 504 (2000) [hereinafter McCright & Dunlap, *Challenging Global Warming*]; Aaron M. McCright & Riley E. Dunlap, *Defeating Kyoto: The Conservative Movement's Impact on U.S. Climate Change Policy*, 50 SOC. PROBS. 348, 353-54 (2003) [hereinafter McCright & Dunlap, *Defeating Kyoto*].

5. Aaron M. McCright, *Dealing with Climate Change Contrarians*, *in* CREATING A CLIMATE FOR CHANGE: COMMUNICATING CLIMATE CHANGE AND FACILITATING SOCIAL CHANGE, 200, 200-01 (Susanne C. Moser & Lisa Dilling eds., 2007); *see also* Myanna Lahsen, *Experiences of Modernity in the Greenhouse: A Cultural Analysis of a Physicist "Trio" Supporting the Backlash Against Global Warming*, 18 GLOBAL ENVTL. CHANGE 204, 205-06 (2008); McCright & Dunlap, *Defeating Kyoto*, *supra* note 4, at 354-55, 359, 364.

6. *See, e.g.*, McCright, *supra* note 5, at 202 (noting how most contrarians "benefit substantially from affiliations with fossil fuels industry associations and conservative think tanks"); McCright & Dunlap, *Defeating Kyoto*, *supra* note 4, at 354 (analyzing the influence of think tanks on global warming policy).

7. *But see* Riley E. Dunlap & Aaron M. McCright, *A Widening Gap: Republican and Democratic Views on Climate Change*, ENV'T, Sept./Oct. 2008, at 26, 31-33.

our understanding of the latter, while engaging the broader literature on the social bases of climate change public opinion.[8]

Examining the dynamics of U.S. climate change public opinion is important for a few reasons. First, public opinion sometimes exerts a direct influence on policy outcomes.[9] Policy-makers weigh several factors when making policy decisions: scientific advice, economic feasibility, moral concerns, and the will of the people, among others.[10] *Ceteris paribas*, strong public support increases the likelihood of resulting policy action. Politicians do not often vigorously oppose policy proposals enjoying high levels of public support or strongly promote policy proposals that have very low levels of public support.[11]

Second, determining the social bases of climate change public opinion helps us identify which individuals in the American public are more or less influenced by climate change communication and climate policy education efforts. Third, at the same time, determining the social bases also can identify challenges to the high level of broad-based public support likely necessary for successful implementation of a comprehensive federal policy to mitigate climate change. Briefly, the breadth and depth of our infrastructural, economic, social, and household

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8. Works in this broader literature identify the social, political, and demographic predictors of individuals' (a) attitudes and beliefs about climate change; and (b) support for different climate policy alternatives. Also informative are publications on trends in aggregate public opinion on climate change. *See generally* ANTHONY LEISEROWITZ, YALE UNIV., GALLUP & CLEARVISION INST., AMERICAN OPINIONS ON GLOBAL WARMING (2007), *available at* http://environment.research.yale.edu/documents/downloads/a-g/AmericansGlobalWarmingReport.pdf [hereinafter LEISEROWITZ, AMERICAN OPINIONS] (summarizing the results of a 2007 Gallup Poll); ANTHONY LEISEROWITZ ET AL., YALE UNIV. & GEORGE MASON UNIV., CLIMATE CHANGE IN THE AMERICAN MIND: AMERICANS' CLIMATE CHANGE BELIEFS, ATTITUDES, POLICY PREFERENCES, AND ACTIONS (2009), *available at* http://research.yale.edu/environment/uploads/CCAmericanMind.pdf (summarizing a 2008 poll of Americans' views on several global warming topics); ANTHONY LEISEROWITZ, U.N. DEV. PROGRAMME, INTERNATIONAL PUBLIC OPINION, PERCEPTION, AND UNDERSTANDING OF GLOBAL CLIMATE CHANGE (2007), *available at* http://hdr.undp.org/en/reports/global/hdr2007-2008/papers/leiserowitz_anthony6.pdf [hereinafter LEISEROWITZ, INTERNATIONAL PUBLIC OPINION] (comparing the results of international studies on global warming); PORTER NOVELLI, GEORGE MASON UNIV., WHAT ARE AMERICANS THINKING AND DOING ABOUT GLOBAL WARMING: RESULTS OF A NATIONAL HOUSEHOLD SURVEY (2008), *available at* http://www.climatechangecommunication.org/images/files/PN_GMU_Climate_Change_Report.pdf (surveying Americans, both children and adults, on their views of global warming); Matthew C. Nisbet & Teresa Myers, *The Polls—Trends: Twenty Years of Public Opinion about Global Warming*, 71 PUB. OPINION Q. 444 (2007) (analyzing the results of numerous surveys conducted over a twenty-year span).

9. *See, e.g.*, Paul Burstein, *Bringing the Public Back In: Should Sociologists Consider the Impact of Public Opinion on Public Policy?*, 77 SOC. FORCES 27, 41 (1998).

10. *Id.* at 37-40.

11. *See generally* Jon A. Krosnick et al., *The Impact of the Fall 1997 Debate About Global Warming on American Public Opinion*, 9 PUB. UNDERSTANDING OF SCI. 239 (2000) (discussing the general policies that presidential administrations follow as influenced by national opinion).

changes to meet near future targets of greenhouse gas emissions reductions may require buy-in from nearly all Americans. Thus, the social bases of climate change public opinion help identify existing limitations to more widespread public support for proposed climate policies. I will return to this topic in Part V.

This Article accomplishes six objectives. First, I report aggregate trends in climate change public opinion within the American public between 2001 and 2008, utilizing nationally representative Gallup Polls from March of each year. Second, I examine the social bases of climate change knowledge, focusing specifically on political identification (both ideology and party affiliation). Third, I then examine the social bases of climate change concern, again analyzing the effect of political identification. Both analyses allow us to see the extent to which climate change public opinion within the general public follows trends seen in our two major parties, in environmental organizations, and in the conservative movement over the past two decades. Fourth, I then examine the social bases of public support for four federal policy proposals to mitigate climate change, specifically analyzing how knowledge and concern affect support for policy proposals.

Fifth, by examining data from eight nationally representative Gallup Polls, I increase the temporal and geographic breadth of many past studies of the social bases of climate change knowledge, concern, and policy support. Most existing publications on the social bases of climate change public opinion have analyzed data from only one year, or two years at best.[12] Several past studies have traded a national focus for a more limited geographical scope.[13] While these surveys allow researchers greater flexibility to pursue theoretically significant regional variation (for example, between residents of Michigan and Virginia), they nevertheless are limited in their ability to speak to national public opinion. My combination of multiple years and nationally representative samples gives us a good sense of robust trends in this area, thus allowing us to test the generalizability of past findings about climate change

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12. *See, e.g.*, Lawrence C. Hamilton, *Who Cares About Polar Regions?: Results from a Survey of U.S. Public Opinion*, 40 ARCTIC, ANTARCTIC, & ALPINE RES. 671, 672 (2008); Krosnick et al., *supra* note 11, at 239; B. Dan Wood & Arnold Vedlitz, *Issue Definition, Information Processing, and the Politics of Global Warming*, 51 AM. J. POL. SCI. 552, 555 (2007); Jon A. Krosnick et al., *American Opinion on Global Warming: The Impact of the Fall 1997 Debate*, RESOURCES, Fall 1998, at 5, 5-6.

13. *See, e.g.*, Thomas Dietz et al., *Support for Climate Change Policy: Social Psychological and Social Structural Influences*, 72 RURAL SOC. 185, 192 (2007); Robert E. O'Connor et al., *Who Wants to Reduce Greenhouse Gas Emissions?*, 83 SOC. SCI. Q. 1, 5 (2002); Rachael Shwom et al., *The Effects of Information and State of Residence on Climate Change Policy Preferences*, 90 CLIMATIC CHANGE 343, 346, 348 (2008).

public opinion. For the sake of space, I only present the results of analyses using pooled data.

Sixth, I examine the robustness of hypothesized interaction effects (between political identification and education and between political identification and self-reported understanding) on climate change knowledge and concern. A few existing studies find that more formal education and greater self-reported understanding about climate change have different effects for conservatives and Republicans than for liberals and Democrats.[14] Yet, to date, these relationships have just been observed with one or two data sets at a specific moment in time.[15] Replicating these analyses with eight years of nationally representative data will allow us to test the robustness of these effects. These results may identify basic limitations to the often taken-for-granted notion that simply educating the public about climate change will significantly shift public opinion in the desired direction.

## II. EXISTING RESEARCH ON THE U.S. GENERAL PUBLIC

### *A. Climate Change Knowledge and Concern*

Recent years have witnessed a significant increase in the number of studies on climate change knowledge and concern. Nisbet and Myers offer a recent review of twenty years of public opinion data about global warming and are worth summarizing here.[16] Briefly, public awareness of global warming has increased over the last two decades, largely in correlation with increased media attention.[17] Few Americans express confidence in their understanding of climate change, and this is represented in low scores on questions measuring scientific knowledge about climate change.[18] Nevertheless, a solid majority of Americans believe global warming is real, mean global temperatures are rising, and human greenhouse gas emissions are a cause.[19] Yet, compared to other national problems, and even other environmental problems, global warming ranks low in lists of people's worries.[20]

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14. *See* PEW RESEARCH CTR. FOR THE PEOPLE & THE PRESS, GLOBAL WARMING: A DIVIDE ON CAUSES AND SOLUTIONS 2-3 (2007), http://people-press.org/reports/pdf/303.pdf [hereinafter PEW RESEARCH CTR.]; Hamilton, *supra* note 12, at 674, 676-77; Krosnick et al., *supra* note 11, at 253; Krosnick et al., *supra* note 12, at 8-9.

15. *But see generally* Dunlap & McCright, *supra* note 7 (comparing survey results falling in a ten-year period).

16. Nisbet & Myers, *supra* note 8, at 445.

17. *Id.* at 445.

18. *Id.* at 447.

19. *Id.* at 450.

20. *Id.* at 459.

Existing studies have identified the robust social bases of climate change knowledge and concern.[21] The following paragraphs focus on those most robust factors, which are analyzed in this study. Only a few studies examine predictors of climate change knowledge, so most of what follows deals with climate change concern.

When the following indicators are included in predictive models, measures of environmental group membership[22] and pro-environmental values[23] have quite strong positive effects on climate change concern. Results are less consistent for self-reported understanding of global warming. While a few studies find a positive relationship between self-reported understanding and climate change concern,[24] at least one study reports the existence of a negative relationship.[25]

Much research on environmental risk perceptions reveals that females and non-whites perceive greater environmental risks than do males and whites.[26] For the most part, these trends hold also for global warming. For instance, most past research finds that women express more concern about global warming risks than do men.[27] Also, much past research points out that non-whites express more concern about global warming risks than do whites.[28] Another major finding is that education is inversely related to concern about global warming risks,[29] with greater educated people perceiving lower risk.

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21. *See, e.g.*, Samuel D. Brody et al., *Examining the Relationship Between Physical Vulnerability and Public Perceptions of Global Climate Change in the United States*, 40 ENV'T & BEHAV. 72, 88 tbl.4 (2008); Anthony Leiserowitz, *Climate Change Risk Perception and Policy Preferences: The Role of Affect, Imagery, and Values*, 77 CLIMATIC CHANGE 45, 57-58 (2006).

22. *See, e.g.*, Leiserowitz, *supra* note 21, at 57-59.

23. *See, e.g.*, Brody et al., *supra* note 21, at 87-88; Paul M. Kellstedt et al., *Personal Efficacy, the Information Environment, and Attitudes Toward Global Warming and Climate Change in the United States*, 28 RISK ANALYSIS 113, 119 (2008).

24. *See* Ariel Malka et al., *The Association of Knowledge with Concern About Global Warming: Trusted Information Sources Shape Public Thinking*, 29 RISK ANALYSIS 633, 639 (2009); Wood & Vedlitz, *supra* note 12, at 559-60.

25. Kellstedt et al., *supra* note 23, at 120.

26. *See, e.g.*, Debra J. Davidson & William R. Freudenburg, *Gender and Environmental Risk Concerns: A Review and Analysis of Available Research*, 28 ENV'T & BEHAV. 302, 332 (1996); James Flynn et al., *Gender, Race, and Perception of Environmental Health Risks*, 14 RISK ANALYSIS 1101, 1105-06 (1994).

27. Brody et al., *supra* note 21, at 88; Hamilton, *supra* note 12, at 676; Leiserowitz, *supra* note 21, at 57-58; Malka et al., *supra* note 24, at 640 tbl.II; Robert E. O'Connor et al., *Risk Perceptions, General Environmental Beliefs, and Willingness to Address Climate Change*, 19 RISK ANALYSIS 461, 467 (1999).

28. *See, e.g.*, Malka et al., *supra* note 24, at 640 tbl.II; Wood & Vedlitz, *supra* note 12, at 558-59.

29. Malka et al., *supra* note 24, at 640 tbl.II; O'Connor et al., *supra* note 27, at 468 tbl.III; Wood & Vedlitz, *supra* note 12, at 559.

The effects of other social characteristics are less consistent. Income most often has no effect on global warming concern,[30] but at least one study finds income positively related to global warming concern.[31] While some studies report that younger adults express greater global warming concern than do older adults,[32] other studies find age to have no statistically significant effect on global warming concern.[33] Finally, at least one study documents that religiosity has no statistically significant effect on global warming concern.[34]

Given the political dynamics of climate change in the United States over the last two decades,[35] it seems reasonable to expect that this well-documented conflict between liberal elites and organizations and the Democratic Party on one side, and conservative elites and think tanks and the Republican Party on the other, might manifest itself in the climate change knowledge and concern of American laypeople.[36] Unfortunately, several studies fail to include both the political ideology and party affiliation of respondents in their models predicting global warming concern.[37] A few do include political ideology but not party affiliation,[38] and a few include party affiliation but not political ideology.[39] All of this makes it difficult to identify trends regarding the effects of political identification on climate change knowledge and concern.

Nevertheless, several studies report that laypeople on the left are more concerned about climate change than are those on the right. A few studies find that self-identified conservatives express less concern about

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30. Brody et al., *supra* note 21, at 88 tbl.4; Kellstedt et al., *supra* note 23, at 119; Wood & Vedlitz, *supra* note 12, at 559 tbl.2.

31. Hamilton, *supra* note 12, at 676.

32. *See, e.g.*, Kellstedt et al., *supra* note 23, at 119-20; Malka et al., *supra* note 24, at 640 tbl.II.

33. *See, e.g.*, Wood & Vedlitz, *supra* note 12, at 558 tbl.1.

34. Kellstedt et al., *supra* note 23, at 119, 120 tbl.III.

35. Aaron M. McCright & Riley E. Dunlap, *Anti-Reflexivity: The American Conservative Movement's Success in Undermining Climate Change Science and Policy*, 27 THEORY, CULTURE, AND SOC'Y (forthcoming 2010) (manuscript at 8-10, on file with the Hofstra Law Review) [hereinafter McCright & Dunlap, *Anti-Reflexivity*]; McCright & Dunlap, *Challenging Global Warming*, *supra* note 4, at 500, 507; McCright, *supra* note 5, at 204; McCright & Dunlap, *Defeating Kyoto*, *supra* note 4, at 354-55.

36. *See* Dunlap & McCright, *supra* note 7, at 26-27, 30-33.

37. *See, e.g.*, Brody et al., *supra* note 21, at 80-81 tbl.1; O'Connor et al., *supra* note 27, at 468 tbl.4; Sammy Zahran et al., *Climate Change Vulnerability and Policy Support*, 19 SOC'Y & NAT. RESOURCES 771, 781 tbl.3 (2006).

38. *See, e.g.*, Hamilton, *supra* note 12, at 676 tbl.3; Leiserowitz, *supra* note 21, at 58 tbl.II.

39. *See, e.g.*, Lawrence C. Hamilton & Barry D. Keim, *Regional Variation in Perceptions About Climate Change*, 29 INT'L J. CLIMATOLOGY 2348, 2351 tbl.1 (2009); Malka et al., *supra* note 24, at 640 tbl.II.

global warming risks than do their liberal counterparts,[40] though one study reveals that political ideology has no effect on concern.[41] Also, a few studies document that self-identified Republicans express less concern about global warming risks than do their Democratic counterparts,[42] though one study points out that party affiliation has no effect on concern.[43]

Several studies discover that political identification moderates the influence of self-reported understanding and education on climate change knowledge and concern, consistent with the expectations of the elite cues hypothesis[44] and the information-processing theory.[45] For instance, both Hamilton and Keim[46] and the Pew Research Center[47] reveal that individuals' party affiliation moderates the influence of their level of education on their knowledge of global warming. Also, Krosnick and colleagues document that individuals' party affiliation moderates the effect of their self-reported understanding of climate change on their level of concern about global warming.[48] Finally, Hamilton finds that individuals' political ideology moderates the influence of their level of education on their concern about global warming.[49]

In each of these cases, greater education or self-reported understanding of climate change *increases* climate change knowledge or concern for laypeople on the political left and *decreases* climate change knowledge or concern for laypeople on the political right.[50] While these findings are compelling, they do typically result from analysis of a single model predicting a single dependent variable with data from a single survey.[51] The analyses reported in this Article help us test the generalizability of this general interaction effect by examining multiple items in multiple models with data from eight nationally representative surveys.

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40. *See, e.g.*, Hamilton, *supra* note 12, at 676; Wood & Vedlitz, *supra* note 12, at 557.

41. Leiserowitz, *supra* note 21, at 58 tbl.II.

42. *See, e.g.*, Krosnick et al., *supra* note 12, at 7-8; Wood & Vedlitz, *supra* note 12, at 557, 558 tbl.1, 559 tbl.2.

43. Malka et al., *supra* note 24, at 640 tbl.II.

44. *See, e.g.*, Krosnick et al., *supra* note 12, at 7-8.

45. *See, e.g.*, Wood & Vedlitz, *supra* note 12, at 557, 558 tbl.1, 559 tbl.2.

46. Hamilton & Keim, *supra* note 39, at 2351 tbl.1.

47. *See* PEW RESEARCH CTR., *supra* note 14, at 2.

48. *See, e.g.*, Krosnick et al., *supra* note 12, at 8-9; Krosnick et al., *supra* note 11, at 253; Malka et al., *supra* note 24, at 640.

49. Hamilton, *supra* note 12, at 676-77.

50. PEW RESEARCH CTR., *supra* note 14, at 2-3; Hamilton & Keim, *supra* note 39, at 2351; Hamilton, *supra* note 12, at 676; Malka et al., *supra* note 24, at 640, 643.

51. *See e.g.*, PEW RESEARCH CTR., *supra* note 14, at 1-3; Hamilton, *supra* note 12, at 676.

### *B. Public Support for Climate Policy Proposals*

Many recent studies also have examined public support for climate policy proposals and have produced several robust findings. In general, most policy proposals enjoy substantial public support; though, as Dietz, Dan, and Shwom point out, a small percentage of respondents in most surveys opposes all proposed policies.[52]

An extremely high percentage of Americans believes the United States should reduce its greenhouse gas emissions,[53] and a slightly smaller percentage—though still a solid majority—supports ratification of international treaties such as the Kyoto Protocol.[54] "Public support [is] strongest for regulations that require emission limits on industry and automobiles . . . ."[55] Americans strongly support national policies to develop renewable energy sources and improve energy efficiency.[56] This is especially the case for proposals shifting subsidies away from fossil fuels and towards sustainable energy strategies—such as developing solar and wind energy.[57] While most Americans (80% to 90%) are willing to pay significantly higher prices for automobiles and electricity that utilize renewable energy sources, many Americans (65% to 70%) oppose higher taxes on gasoline and electricity.[58]

Past research identifies several robust correlates of public support for climate policy proposals to reduce our nation's carbon dioxide emissions. Climate change knowledge[59] and climate change concern[60] have a positive effect on support for climate policy proposals. Also, both membership in an environmental group[61] and pro-environmental values[62] positively influence climate policy support.

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52. Dietz et al., *supra* note 13, at 206.

53. *See, e.g.*, LEISEROWITZ, INTERNATIONAL PUBLIC OPINION, *supra* note 8, at 26.

54. *See, e.g.*, Nisbet & Myers, *supra* note 8, at 466-67, 468 tbl.32.

55. *Id.* at 460.

56. *See, e.g.*, LEISEROWITZ, INTERNATIONAL PUBLIC OPINION, *supra* note 8, at 27.

57. *See, e.g.*, Dietz et al., *supra* note 13, at 196 tbl.2; Nisbet & Myers, *supra* note 8, at 465.

58. *See, e.g.*, LEISEROWITZ, AMERICAN OPINIONS, *supra* note 8, at 7 fig.10, 8 fig.11, 9 figs.13 & 14; Dietz et al., *supra* note 13, at 197 tbl.2.

59. *See, e.g.*, Richard J. Bord et al., *In What Sense Does the Public Need to Understand Global Climate Change?*, 9 PUB. UNDERSTANDING SCI. 205, 215 (2000); Dietz et al., *supra* note 13, at 206 tbl.4; O'Connor et al., *supra* note 27, at 469 tbl.V; O'Connor et al., *supra* note 13, at 12 tbl.2; Zahran et al., *supra* note 37, at 781 tbl.3.

60. *See, e.g.*, Bord et al., *supra* note 59, at 215; O'Connor et al., *supra* note 27, at 469 tbl.V; Zahran et al., *supra* note 37, at 781 tbl.3.

61. *See, e.g.*, Leiserowitz, *supra* note 21, at 60 tbl.III, 61 tbl.IV.

62. Bord et al., *supra* note 59, at 215; Dietz et al., *supra* note 13, at 203; O'Connor et al., *supra* note 27, at 469; O'Connor et al., *supra* note 13, at 12 tbl.2; Zahran et al., *supra* note 37, at 781 tbl.3.

The existing literature finds mostly inconsistent effects for several socio-demographic variables. For instance, a few studies report no statistically significant effect for gender,[63] while Leiserowitz[64] and O'Connor, Bord, and Fisher[65] find males to have greater support for climate policies, and Zahran, Brody, Grover, and Vedlitz report that females have greater support.[66] O'Connor, Bord, Yarnal, and Wiefek reveal that age has no effect on climate policy support,[67] while Krosnick, Holbrook, Lowe, and Visser report that younger adults express greater support than do older adults,[68] and Dietz, Dan, and Shwom[69] and O'Connor, Bord, and Fisher[70] find that older adults express greater support. In some studies race has no effect,[71] but in others non-whites report greater support for climate policies than do whites.[72]

The results for education and income are just as inconsistent. While some studies report education to have a positive effect on policy support,[73] others find a negative effect.[74] Also, while one study reports a positive effect of income on policy support,[75] others show no such statistically significant effect.[76]

Finally, a few studies do examine the effects of political identification on climate policy support, and they consistently find that laypeople on the left express stronger support for climate policies than do laypeople on the right. Compared to conservatives, liberals have greater support for climate policy proposals,[77] and Democrats express greater support for government efforts to reduce emissions than do Republicans.[78]

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63. *See, e.g.*, Jon A. Krosnick et al., *The Origins and Consequences of Democratic Citizens' Policy Agendas: A Study of Popular Concern About Global Warming*, 77 CLIMATIC CHANGE 7, 26 tbl.V (2006); O'Connor et al., *supra* note 13, at 12 tbl.2.

64. Leiserowitz, *supra* note 21, at 60 tbl.III.

65. O'Connor et al., *supra* note 27, at 468.

66. Zahran et al., *supra* note 37, at 782.

67. O'Connor et al., *supra* note 13, at 12-13.

68. Krosnick et al., *supra* note 63, at 26 tbl.V.

69. Dietz et al., *supra* note 13, at 203, 206 tbl.4.

70. O'Connor et al., *supra* note 27, at 468, 469 tbl.V.

71. *See, e.g.*, Krosnick et al., *supra* note 63, at 26 tbl.V.

72. *See, e.g.*, Dietz et al., *supra* note 13, at 205, 206 tbl.4; Leiserowitz, *supra* note 21, at 61 tbl.IV.

73. *See, e.g.*, Leiserowitz, *supra* note 21, at 61 tbl.IV; O'Connor et al., *supra* note 27, at 469 tbl.V; O'Connor et al., *supra* note 13, at 12 tbl.2; Zahran et al., *supra* note 37, at 781 tbl.3.

74. *See, e.g.*, Krosnick et al., *supra* note 63, at 26 tbl.V.

75. *See, e.g.*, Dietz et al., *supra* note 13, at 206 tbl.4.

76. *See, e.g.*, O'Connor et al., *supra* note 13, at 12 tbl.2; Zahran et al., *supra* note 37, at 781 tbl.3.

77. *See, e.g.*, Krosnick et al., *supra* note 63, at 26 tbl.V; Leiserowitz, *supra* note 21, at 61 tbl.IV, 62.

78. *See, e.g.*, O'Connor et al., *supra* note 13, at 12 tbl.2.

## III. THE STUDY

This study examines the social bases of climate change knowledge, concern, and policy support. In the process, I analyze the effects of several key political, social, and demographic predictors identified in the relevant literature. Data come from the March 2001-2008 Gallup Polls that focus specifically on environmental issues.[79] Each of the eight Gallup surveys is based on telephone interviews with nationally representative samples of adults (age eighteen years or older) in the United States.[80] Table Two presents trends for key climate change knowledge, concern, and policy support variables across the years of the study.[81] For the multivariate statistical analyses, I combined the data from the eight years into a pooled sample. The March 2001 survey was the first to include key variables used in this study.[82] Also, 2001 saw the publication of the Intergovernmental Panel on Climate Change's

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79. Gallup interviewers begin each telephone interview with well-established questions on a range of general topics before turning at the end of their interviews to specific questions on environmental issues. *See, e.g.*, Riley E. Dunlap & Lydia Saad, *Only One in Four Americans Are Anxious About the Environment*, GALLUP, Apr. 16, 2001, http://www.gallup.com/poll/1801/only-one-four-americans-anxious-about-environment.aspx?version=print. These nationally representative surveys have sample sizes ranging from 1000 to 1060. *Id.* (surveying 1060 adults); Frank Newport, *Little Increase in Americans' Global Warming Worries*, GALLUP, Apr. 21, 2008, http://www.gallup.com/poll/106660/Little-Increase-Americans-Global-Warming-Worries.aspx?version=print (surveying 1012 U.S. adults); Lydia Saad, *Americans See Environment as Getting Worse*, GALLUP, Apr. 20, 2006, http://www.gallup.com/poll/22471/Americans-See-Environment-Getting-Worse.aspx?version=print (surveying 1000 U.S. adults); Lydia Saad, *Americans Still Committed to Environmental Protection, But Less Concerned Than Last Year*, GALLUP, Apr. 22, 2002, http://www.gallup.com/poll/5848/Americans-Still-Committed-Environmental-Protection-Less-Concer.aspx?version=print [hereinafter Saad, *Americans Still Committed*] (surveying 1006 U.S. adults); Lydia Saad, *Environmental Concern Down This Earth Day*, Apr. 17, 2003, http://www.gallup.com/poll/8209/Environmental-Concern-Down-Earth-Day.aspx?version=print (surveying 1003 U.S. adults); Lydia Saad, *Environmental Concern Holds Firm During Past Year*, GALLUP, Mar. 26, 2007, http://www.gallup.com/poll/26971/Environmental-Concern-Holds-Firm-During-Past-Year.aspx?version=print (surveying 1009 U.S. adults); Lydia Saad, *Environment Not a Pressing Concern*, GALLUP, Apr. 19, 2004, http://www.gallup.com/poll/11380/Environment-Pressing-Concern.aspx?version=print (surveying 1005 U.S. adults); Lydia Saad, *Public's Environmental Outlook Grows More Negative*, GALLUP, Apr. 21, 2005, http://www.gallup.com/poll/15961/Publics-Environmental-Outlook-Grows-More-Negative.aspx?version=print (surveying 1004 U.S. adults).

80. As is typical in most national surveys, the Gallup Organization employs weighting procedures on the sample data to ensure that the samples are representative of the American adult population. *See, e.g.*, Saad, *Americans Still Committed*, *supra* note 79 (noting that "maximum error attributable to sampling and other random effects is plus or minus 3 percentage points"). I do not employ data weights when performing multivariate analyses, because weighting can lead to inflated standard errors and misleading tests of significance. *See, e.g.*, Christopher Winship & Larry Radbill, *Sampling Weights and Regression Analysis*, 23 SOC. METHODS & RES. 230, 253 (1994).

81. *See infra* tbl.2.

82. *See* Gallup, Environment, http://www.gallup.com/poll/1615/Environment.aspx?version=print (last visited Oct. 8, 2009).

("IPCC") *Third Assessment Report*[83] and the National Research Council's ("NRC") *Climate Change Science*.[84] Both publications clearly establish a strong scientific consensus that human activities are almost certainly contributing to current global warming, and that we will almost certainly experience an increase in global average temperatures by several degrees Celsius by 2100.[85]

Table One provides the description, coding, mean, and standard deviation of each variable used in this study.[86] Two variables were used to measure knowledge about climate change: the timing of climate change effects and the cause of recent global warming.[87] Since the 2001 IPCC and NRC reports, the strong scientific consensus maintains that the effects of global warming have already begun to happen and that recent global warming is due more from greenhouse gas emissions from human activities than from natural processes.[88] The sole measure of concern about global warming asked respondents how much they worry about global warming.[89] Malka, Krosnick, and Langer support the use of such a straightforward measure of global warming concern—essentially a risk perception indicator.[90] Finally, between 2001 and 2008, Gallup asked respondents whether they favor or oppose four policy proposals dealing specifically with reducing greenhouse gas emissions: (1) setting higher auto emissions standards; (2) setting high emissions and pollution standards for business; (3) spending more government money to develop solar and wind power; and (4) spending government money to develop alternative sources of auto fuels.[91] While the first two raise the bar on existing regulations, the second two expand government investment in alternative energy sources.

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83. *See* G.O.P. Obasi & K. Töpfer, *Foreword* to INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, CLIMATE CHANGE REPORT 2001: SYNTHESIS REPORT, at vii (Robert T. Watson et al. eds., 2001), *available at* http://www.ipcc.ch/ipccreports/tar/vol4/pdf/front.pdf [hereinafter IPCC] (providing a brief overview of the report).

84. *See* Bruce Alberts, *Foreword* to COMM. ON THE SCI. OF CLIMATE CHANGE, *supra* note 1, at vii.

85. COMM. ON THE SCI. OF CLIMATE CHANGE, *supra* note 1, at 9-12, 19; IPCC, *supra* note 83, at 5-6, 8, 31 tbl.SPM-3, 34 fig.9-1b.

86. *See infra* tbl.1.

87. *See infra* tbl.1.

88. *See, e.g.*, John Houghton, *Global Warming*, 68 REP. ON PROGRESS IN PHYSICS 1343, 1350 (2005) (noting over a 30% increase in carbon dioxide levels since the Industrial Revolution due to human industry and deforestation).

89. *Id.*

90. *See* Malka et al., *supra* note 24, at 634.

91. Gallup, *supra* note 82.

**Table One**: Coding, Mean, and Standard Deviation for Variables in the Study[a]

| Variable | Coding | Mean | SD |
|---|---|---|---|
| timing of global warming | 1 (will never happen) to 5 (already begun to happen) | 3.79 | 1.47 |
| cause of global warming[b] | 0 (other) to 1 (effects of pollution from human activities) | .60 | .49 |
| worry about global warming[c] | 1 (not at all) to 4 (a great deal) | 2.78 | 1.08 |
| auto emissions standards policy support[d] | 0 (oppose) to 1 (favor setting higher auto emissions standards) | .74 | .44 |
| business emissions standards policy support[d] | 0 (oppose) to 1 (favor setting high emissions and pollution standards for business) | .81 | .39 |
| solar/wind power policy support[e] | 0 (oppose) to 1 (favor spending more government money developing solar/wind power) | .79 | .41 |
| alternative auto fuels policy support[f] | 0 (oppose) to 1 (favor spending government money to develop alternative sources of auto fuels) | .86 | .35 |
| political ideology | 1 (very conservative) to 5 (very liberal) | 2.80 | .94 |
| party affiliation | 1 (Republican) to 5 (Democrat) | 3.05 | 1.68 |
| environmental movement identity | 1 (unsympathetic) to 4 (active participant in environmental movement) | 2.78 | .79 |
| self-reported global warming understanding | 1 (not at all) to 4 (a great deal) | 2.85 | .77 |
| educational attainment | 1 (high school graduate or less) to 4 (more than college graduate) | 2.03 | 1.06 |
| gender | 0 (male) to 1 (female) | .52 | .50 |
| age | number in actual years (18-95) | 46.74 | 17.33 |
| race | 0 (white) to 1 (non-white) | .17 | .37 |
| annual income | 1 (less than 20K) to 5 (more than 75K) | 3.25 | 1.37 |
| religiosity | 1 (never attend church) to 5 (attend once a week) | 3.11 | 1.52 |
| place of residence | 1 (rural) to 3 (urban) | 2.07 | .72 |

[a] data is weighted
[b] data for 2001, 2003, 2006-2008
[c] data for 2001-2004, 2006-2008
[d] data for 2001, 2002, 2003, 2006, 2007
[e] data for 2001, 2002, 2006, 2007
[f] data for 2006, 2007

Political ideology ("very conservative" to "very liberal") and party affiliation (Republican to Democrat) were measured using conventional five-point scales.[92] Given the environmental movement's efforts in putting climate change on the national agenda, I expect environmental movement identity ("unsympathetic" to "active participant") to be a strong predictor of climate change concern, knowledge, and policy support.[93] The straightforward measure of global warming understanding asked respondents to self-report how much ("not at all" to a "great deal") they understand the issue of global warming.[94] Educational attainment is a conventional measure of highest degree attained, ranging from "high school graduate or less" to "more than college graduate."[95]

I also created four slope interaction terms using centered scores: (1) political ideology X self-reported global warming understanding; (2) political ideology X educational attainment; (3) party affiliation X self-reported global warming understanding; and (4) party affiliation X educational attainment.[96] Utilizing higher-order (e.g., interaction) terms in regression models often leads to multicollinearity problems.[97] Interaction terms based on centered scores have a different scale than the original variables, thus greatly reducing these multicollinearity problems.[98]

Finally, at the end of each telephone interview, Gallup asks a series of questions to obtain socio-demographic information from the respondents.[99] These questions are standard ones employed in most general surveys. I examine the effects of these social and demographic

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92. *See supra* tbl.1.

93. This simple measure of environmental movement identity (unsympathetic to active participant) "significantly predicts membership in environmental movement organizations, assessment of environmental organizations and the overall movement, and performance of proenvironmental behaviors." Aaron M. McCright & Riley E. Dunlap, *Social Movement Identity and Belief Systems: An Examination of Beliefs About Environmental Problems Within the American Public*, 72 PUB. OPINION Q. 651, 658-59 (2008); *see also* Riley E. Dunlap & Aaron M. McCright, *Social Movement Identity: Validating a Measure of Identification with the Environmental Movement*, 89 SOC. SCI. Q. 1045, 1059-60 tbl.5 (2008).

94. Gallup, *supra* note 82.

95. *See supra* tbl.1.

96. *See infra* tbl.3. For each of the four original variables, I calculated an unweighted mean for the pooled sample before creating a centered score (raw score minus mean).

97. *See* Robert M. O'Brien, *A Caution Regarding Rules of Thumb for Variance Inflation Factors*, 41 QUALITY & QUANTITY 673, 674-75 (2007).

98. *See* Hamilton, *supra* note 12, at 674; *see also* LEONA S. AIKEN & STEPHEN G. WEST, MULTIPLE REGRESSION: TESTING AND INTERPRETING INTERACTIONS 130 (1991).

99. *See, e.g.*, Gallup Brain, Questionnaire Profile, Gallup Poll Social Series: The Environment, http://brain.gallup.com/documents/questionnaire.aspx?STUDY=P0603012 (last visited Oct. 19, 2009) (follow "Next" until "Questions 71 through 80" appear) (asking respondents of the March 2006 poll to provide information as to their race).

variables on global warming knowledge, concern, and policy support: gender, age, race, income, religiosity, and place of residence.

For each analysis predicting climate change knowledge, concern, and policy support, I report the results of two multivariate statistical models: a saturated model and a best-fit model. The former contains all independent variables in the study as predictors. I created the latter by removing independent variables from the saturated model via manual backwards elimination until all the remaining independent variables in the best-fit model were statistically significant. Thus, since the best-fit models optimize explanatory power (i.e., $R^2$) and parsimony, they are superior to their saturated model counterparts. As such, I interpret only the results of the best-fit models.

## IV. CLIMATE CHANGE PUBLIC OPINION IN THE UNITED STATES

Table Two displays the longitudinal trends for each of the key dependent variables in this study.[100] Two general trends are worth noting. First, while public knowledge about global warming is only moderate and public concern about global warming is relatively low, public support for the four climate policy proposals is nevertheless quite high.[101] Second, the variation of each of these public opinion indicators over the time period is relatively small.[102] There are not any substantial upward or downward trends in any of the variables over the time period.[103]

100. *See infra* tbl.2.
101. *See infra* tbl.2.
102. *See infra* tbl.2.
103. *See infra* tbl.2.

**Table Two**: Trends in Climate Change Public Opinion from 2001-2008

| Climate Change Opinion | 2001-2008 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 |
|---|---|---|---|---|---|---|---|---|---|
| % who believe the effects of global warming have already begun to happen | 54.93 | 54.29 | 53.03 | 50.85 | 50.55 | 53.49 | 57.74 | 58.73 | 60.83 |
| % who believe that changes in the Earth's temperature over the last century are due more to human activities than to natural changes in the environment | 59.69 | 60.98 | | 61.32 | | | 58.04 | 60.52 | 57.57 |
| % who worry about global warming a great deal | 32.88 | 33.27 | 28.80 | 28.12 | 25.77 | | 35.66 | 41.17 | 37.39 |
| % who favor setting higher auto emissions standards | 74.36 | 74.93 | 71.70 | 73.28 | | | 72.73 | 79.17 | |
| % who favor setting high emissions and pollution standards for business | 81.11 | 81.43 | 83.52 | 80.06 | | | 76.92 | 83.53 | |
| % who favor spending more government money to develop solar and wind power | 78.57 | 79.45 | 75.77 | | | | 77.32 | 81.45 | |
| % who favor spending government money to develop alternative sources of auto fuels | 85.66 | | | | | | 84.92 | 86.41 | |

Note: Data is weighted.

Slightly more than half of the Gallup respondents between 2001 and 2008 believe the effects of global warming have already begun to happen (54.93%) and that changes in the Earth's temperature over the last century are due more to human activities than to natural changes in the environment (59.69%)[104] In other words, a slight majority of Americans believe the scientific community's consensus position on the timing and primary cause of recent global warming.

Approximately a third of respondents (32.88%) between 2001 and 2008 worry about global warming a great deal.[105] Consistent with past research, global warming ranks relatively low on lists of environmental problems citizens worry about over the time period.[106] For instance, in 2008, global warming ranked ninth out of twelve environmental problems (tied with extinction of plant and animal species and above urban sprawl and acid rain).[107] For the most part, United States citizens worry much more about local air and water pollution problems than they do about global problems (such as the loss of tropical rain forests, damage to the earth's ozone layer, and global warming).[108]

At least three-quarters of respondents between 2001 and 2008 support the four climate policy proposals: 74.36% favor setting higher auto emissions standards; 81.11% favor setting high emissions and pollution standards for businesses; 78.57% favor spending more government money to develop solar and wind power; and 85.66% favor spending government money to develop alternative sources of auto fuels.[109] Thus, policy proposals for increased regulations and for increased government investments enjoy considerable public support, consistent with the findings of most studies of climate policy support during this time period.

### *A. The Social Bases of Climate Change Knowledge and Concern*

Past research on political organizations (e.g., think tanks and political parties) and elite actors (e.g., scientists and policy-makers) documents an enduring divide between the left and the right in America

104. *See supra* tbl.2.

105. *See supra* tbl.2.

106. Jeffrey M. Jones, *Polluted Drinking Water Was No. 1 Concern Before AP Report*, GALLUP, Mar. 12, 2008, http://www.gallup.com/poll/104932/polluted-drinking-water-no-concern-before_report.aspx?version=print.

107. *Id.*

108. *Id.*

109. *See supra* tbl.2.

over the issue of climate change.[110] Does this gulf exist in the general public? Very briefly, yes. As the three best-fit models (2, 4, and 6) in Table Three show, political identification (both ideology and party) significantly influences respondents' knowledge and concern about climate change—even when controlling for the effects of several other important variables.[111] Indeed, ideology and party have a separate effect independent of one another. Political liberals and Democrats hold more scientifically accurate beliefs about the timing and cause of global warming and express greater concern about global warming than do their politically conservative and Republican counterparts.[112] This robust finding is consistent with the results of several existing studies.[113] The consistency of these independent effects of political ideology and party affiliation across the three best-fit models in Table Three suggests that analytical models predicting climate change knowledge and concern are limited if they fail to include both measures of political identification.

110. Dunlap & McCright, *supra* note 7, at 30-31; Lahsen, *supra* note 5, at 207; Myanna Lahsen, *Technocracy, Democracy, and U.S. Climate Politics: The Need for Demarcations*, 30 SCI., TECH. & HUM. VALUES 137, 155-56 (2005); McCright & Dunlap, *Anti-Reflexivity*, *supra* note 35 (manuscript at 13); McCright & Dunlap, *Challenging Global Warming*, *supra* note 4, at 504-05; McCright, *supra* note 5, at 203; McCright & Dunlap, *Defeating Kyoto*, *supra* note 4, at 356-68.

111. *See infra* tbl.3.

112. *See infra* tbl.3.

113. *See, e.g.*, Hamilton, *supra* note 12, at 676; Krosnick et al., *supra* note 12, at 7-8; Wood & Vedlitz, *supra* note 12, at 557, 558 tbl.1.

**Table Three:** OLS and Logit Regression Models Predicting Concern and Knowledge about Global Warming

| Independent Variables | Belief about Timing of Global Warming | | Belief about Cause of Global Warming | | Worry about Global Warming | |
|---|---|---|---|---|---|---|
| | Saturated (1) | Best-Fit (2) | Saturated (3) | Best-Fit (4) | Saturated (5) | Best-Fit (6) |
| political ideology | .144*** | .143*** | .336*** | .343*** | .140*** | .138*** |
| | (.019) | (.018) | (.042) | (.041) | (.014) | (.014) |
| party affiliation | .139*** | .140*** | .205*** | .204*** | .130*** | .131*** |
| | (.010) | (.010) | (.022) | (.021) | (.008) | (.008) |
| environmental movement identity | .446*** | .448*** | .585*** | .590*** | .349*** | .348*** |
| | (.019) | (.019) | (.042) | (.042) | (.015) | (.014) |
| self-reported global warming understanding | .114*** | .113*** | .215*** | .240*** | .172*** | .171*** |
| | (.012) | (.021) | (.045) | (.044) | (.016) | (.016) |
| educational attainment | .069*** | .068*** | .048 | | -.073*** | -.072*** |
| | (.015) | (.015) | (.032) | | (.011) | (.011) |
| political ideology X self-reported understanding | .137*** | .144*** | .203*** | .229*** | .078*** | .079*** |
| | (.023) | (.022) | (.051) | (.050) | (.017) | (.017) |
| political ideology X educational attainment | .022 | | .083* | | .034** | .033** |
| | (.016) | | (.037) | | (.012) | (.013) |
| party affiliation X self-reported understanding | .081*** | .083*** | .116*** | .136*** | .057*** | .057*** |
| | (.013) | (.013) | (.028) | (.027) | (.010) | (.010) |
| party affiliation X educational attainment | .004 | | .060** | | -.002 | |
| | (.009) | | (.019) | | (.007) | |
| gender | .191*** | .193*** | .259*** | .257*** | .137*** | .137*** |
| | (.031) | (.031) | (.066) | (.065) | (.023) | (.021) |
| age | -.006*** | -.006*** | -.008*** | -.008*** | .001 | |
| | (.001) | (.001) | (.002) | (.002) | (.001) | |
| race | -.181*** | -.186*** | -.261** | -.266** | .111** | .105** |
| | (.045) | (.045) | (.096) | (.095) | (.034) | (.034) |
| annual income | .029* | .029* | .008 | | -.024** | -.026** |
| | (.012) | (.012) | (.027) | | (.009) | (.009) |
| religiosity | -.059*** | -.060*** | -.058** | -.061** | -.029*** | -.028*** |
| | (.010) | (.010) | (.022) | (.022) | (.008) | (.008) |
| place of residence | -.014 | | .046 | | .034* | .033* |
| | (.012) | | (.045) | | (.016) | (.016) |
| constant | 1.612*** | 1.573*** | -3.041*** | -2.986*** | .644*** | .704*** |
| | (.120) | (.114) | (.267) | (.239) | (.091) | (.081) |
| -2 log likelihood | | | 5871.183 | 5898.803 | | |
| Nagelkerke $R^2$ | | | .23 | .23 | | |
| adjusted $R^2$ | .20 | .20 | | | .25 | .25 |
| sample size | 8099 | 8099 | 5084 | 5084 | 7095 | 7095 |

* p<.05 ** p<.01 *** p<.001 (two-tailed tests)

Even controlling for political identification, respondents' self-reported environmental movement identity appears to be the strongest correlate with their climate change knowledge and concern.[114] Individuals self-identifying as active participants in the environmental movement report more scientifically accurate knowledge *and* express greater concern than do individuals unsympathetic to the movement.[115] This result extends earlier findings that environmental group membership[116] and pro-environmental values[117] have positive effects on climate change concern. This provides strong evidence that the problem of climate change remains highly associated with environmentalism and the environmental movement in the general public.

Individuals self-reporting greater global warming understanding express more scientifically accurate knowledge and greater concern than do individuals reporting lesser understanding.[118] The finding for climate change concern supports the results of Wood and Vedlitz,[119] but it is at odds with the results of Kellstedt, Zahran, and Vedlitz[120] and Malka, Krosnick, and Langer.[121] Most likely, these differences are due to variation in the measurement of these concepts across these studies. The positive effect of self-reported global warming understanding in models 2 and 4 in Table Three helps to validate this measure. Briefly, even controlling for the effects of several other important variables, individuals who self-report understanding global warming a great deal express more scientifically accurate beliefs than do individuals reporting lesser global warming understanding.[122]

Past research points out that greater education is associated with lower climate change concern.[123] The statistically significant negative effects of education and income in model 6 validate this robust trend.[124] Respondents with greater education and income report less concern about global warming.[125] Yet, as anticipated, greater education and

114. *See supra* tbl.3.
115. *See supra* tbl.3.
116. *See, e.g.*, Leiserowitz, *supra* note 21, at 57-58.
117. *See, e.g.*, Brody et al., *supra* note 21, at 87-88; Kellstedt et al., *supra* note 23, at 119.
118. *See supra* tbl.3.
119. Wood & Vedlitz, *supra* note 12, at 559-60.
120. Kellstedt et al., *supra* note 23, at 120.
121. Malka et al., *supra* note 24, at 639-40.
122. *See supra* tbl.3.
123. *See, e.g.*, Malka et al., *supra* note 24, at 640 tbl.II; O'Connor et al., *supra* note 27, at 468 tbl.IV; Wood & Vedlitz, *supra* note 12, at 559 & tbl.2.
124. *See supra* tbl.3.
125. *See supra* tbl.3.

income is associated with holding more scientifically accurate beliefs (though only about the timing of global warming).[126]

Consistent with much of the existing literature, non-whites and females express greater climate change concern than do their white and male counterparts.[127] In addition, females and whites hold more scientifically accurate climate change beliefs than do males and non-whites.[128] Past studies find that age has inconsistent effects on climate change concern.[129] Supporting the results of Wood and Vedlitz,[130] I find that age has no statistically significant effect on concern.[131] However, younger adults do hold more scientifically accurate climate change beliefs than do older adults,[132] perhaps due to their more recent educational experiences. At least one study finds that religiosity does not influence climate change concern.[133] I find that more religious adults not only report less climate change concern than their less religious counterparts but they also hold less scientifically accurate beliefs.[134] I further find that urban respondents are more concerned about climate change than are rural respondents, though place of residence has no effect on climate change knowledge.[135]

As discussed earlier, several recent studies document how political identification moderates the influence of self-reported understanding and education on climate change knowledge and concern.[136] The performance of the four interaction terms in Table Three allows us to assess the generalizability of these results. The statistically significant positive coefficients of the "party X understanding" interaction term validates the earlier findings of Krosnick and colleagues.[137] Yet, what is more crucial is the general moderating effect of political ideology and party affiliation on the influence of self-reported understanding on both climate change knowledge and concern. Briefly, greater self-reported understanding translates into *increased* knowledge and concern for liberals and Democrats and *decreased* knowledge and concern for

126. *See supra* tbl.3.
127. *See supra* tbl.3.
128. *See supra* tbl.3.
129. *See supra* notes 32-33 and accompanying text.
130. Wood & Vedlitz, *supra* note 12, at 558 tbl.1.
131. *See supra* tbl.3.
132. *See supra* tbl.3.
133. Kellstedt et al., *supra* note 23, at 119.
134. *See supra* tbl.3.
135. *See supra* tbl.3.
136. *See supra* notes 44-51 and accompanying text.
137. Krosnick et al., *supra* note 11, at 253; Malka et al., *supra* note 24, at 640; Krosnick et al., *supra* note 12, at 7-9.

conservatives and Republicans.[138] These results hold for national samples of adults across eight recent years,[139] thus increasing our confidence in the robustness of these effects.

Similar to the results of Hamilton,[140] I find that political ideology does moderate the effect of educational level on concern.[141] Greater education increases climate change concern for liberals but decreases concern for conservatives.[142] Yet, unlike previous studies[143] I do not find that party affiliation moderates the influence of education on climate change knowledge.[144]

### *B. The Social Bases of Support for Climate Policy Proposals*

Table Four displays the results of logistic regression models predicting support for four climate policy proposals: two for stronger regulations of emissions and two for increasing investments for alternative energy.[145] As before, I limit the following discussion to the results of the best-fit models (8, 10, 12, and 14).

138. *See supra* tbl.3.
139. *See supra* note 79 and accompanying text.
140. Hamilton, *supra* note 12, at 676 fig.4.
141. *See supra* tbl.3.
142. *See supra* tbl.3.
143. *See, e.g.*, PEW RESEARCH CTR., *supra* note 14, at 2-3; Hamilton & Keim, *supra* note 39, at 2351 tbl.1.
144. *See supra* tbl.3.
145. *See infra* tbl.4.

**Table Four:** Logistic Regression Models Predicting Support for Four Climate Policy Proposals

| Independent Variables | Setting Higher Auto Emissions Standards | | Setting High Emissions and Pollution Standards for Business | | Spending More Government Money to Develop Solar and Wind Power | | Spending Government Money to Develop Alternative Sources of Auto Fuels | |
|---|---|---|---|---|---|---|---|---|
| | Saturated (7) | Best-Fit (8) | Saturated (9) | Best-Fit (10) | Saturated (11) | Best-Fit (12) | Saturated (13) | Best-Fit (14) |
| political ideology | .171*** | .182*** | .075 | | .081 | | -.003 | |
| | (.050) | (.046) | (.054) | | (.060) | | (.083) | |
| party affiliation | .023 | | .081** | .097** | .037 | | .040 | |
| | (.028) | | (.031) | (.029) | (.034) | | (.049) | |
| environmental movement identity | .314*** | .316*** | .370*** | .371*** | .297*** | .308*** | .147 | |
| | (.053) | (.053) | (.057) | (.056) | (.064) | (.064) | (.087) | |
| self-reported global warming understanding | -.009 | | -.121* | | .176** | .173** | -.071 | |
| | (.054) | | (.058) | | (.065) | (.063) | (.093) | |
| educational attainment | .127** | .130** | .070 | | .103* | .098* | .073 | |
| | (.041) | (.040) | (.044) | | (.050) | (.049) | (.068) | |
| belief about timing of global warming | .138*** | .139*** | .186*** | .191*** | .084* | .100** | .106* | .125* |
| | (.031) | (.031) | (.033) | (.033) | (.037) | (.037) | (.052) | (.050) |
| belief about cause of global warming | .474*** | .478*** | .395*** | .404*** | .737*** | .769*** | .744*** | .796*** |
| | (.091) | (.091) | (.100) | (.099) | (.112) | (.111) | (.163) | (.160) |
| worry about global warming | .310*** | .315*** | .306*** | .296*** | .178** | .201*** | .209** | .231** |
| | (.045) | (.044) | (.049) | (.048) | (.055) | (.054) | (.077) | (.073) |
| gender | .296*** | .308*** | .383*** | .427*** | -.028 | | -.198 | |
| | (.083) | (.081) | (.091) | (.088) | (.102) | | (.141) | |
| age | -.001 | | -.008** | -.007** | -.003 | | -.010* | -.011** |
| | (.002) | | (.003) | (.003) | (.003) | | (.004) | (.004) |
| race | -.548*** | -.502*** | -.375** | -.366** | -.640*** | -.598*** | -.753*** | -.785*** |
| | (.116) | (.111) | (.129) | (.128) | (.140) | (.133) | (.186) | (.175) |
| annual income | .111** | .110*** | .071* | .081* | .083* | .087* | .081 | |
| | (.034) | (.033) | (.035) | (.033) | (.042) | (.040) | (.059) | |
| religiosity | .021 | | .025 | | -.046 | | .005 | |
| | (.028) | | (.030) | | (.034) | | (.047) | |
| place of residence | .050 | | -.009 | | -.028 | | -.128 | |
| | (.057) | | (.062) | | (.069) | | (.095) | |
| constant | -2.598*** | -2.516*** | -1.500*** | -1.539*** | -1.410*** | -1.605*** | .784 | 1.141*** |
| | (.332) | (.233) | (.358) | (.259) | (.406) | (.264) | (.574) | (.299) |
| -2 log likelihood | 3931.724 | 3933.833 | 3469.591 | 3478.518 | 2692.041 | 2700.849 | 1489.679 | 1501.423 |
| Nagelkerke $R^2$ | .19 | .19 | .20 | .20 | .16 | .16 | .12 | .11 |
| sample size | 4075 | 4075 | 5078 | 5078 | 5078 | 5078 | 2009 | 2009 |

* p<.05 ** p<.01 *** p<.001 (two-tailed tests)

Extending the results of several past studies,[146] greater climate change knowledge *and* greater climate change concern increases support for each of the four climate policy proposals.[147] Individuals expressing more scientifically accurate climate change beliefs and greater climate change concern more strongly support both increased government regulations and investments, compared to their lesser concerned and lesser knowledgeable counterparts.[148] These results show that knowledge and concern exert an effect independent of one another, signaling the importance of including both in future studies of policy support.

While political identification (ideology and party) has significant direct effects on both climate change knowledge and concern, it has only a modest direct effect on policy support.[149] Briefly, liberals express greater support for setting higher auto emissions standards than do conservatives, and Democrats express greater support for setting high emissions and pollution standards for business than do Republicans.[150] Yet, political identification has no statistically significant direct effect on public support for policies promoting increased government investments into alternative energy.[151] In other words, Republicans and conservatives express levels of support for those policy proposals similar to those expressed by Democrats and liberals. We should remember, though, that political identification does have a robust effect on climate change knowledge and concern,[152] two important predictors of policy support. Thus, the full (direct and indirect) effect of political identification on climate policy support is quite substantial.

Consistent with the results of several studies,[153] stronger identification with the environmental movement increases support for three climate policy proposals. That is, active participants in the environmental movement express greater support for the two regulatory policy proposals and for one of the investment policy proposals (spending more government money to develop solar and wind power) than do those unsympathetic to the movement.[154] Even controlling for

146. *See, e.g.*, Bord et al., *supra* note 59, at 215; Dietz et al., *supra* note 13, at 206 tbl.4; Krosnick et al., *supra* note 63, at 25 tbl.IV; O'Connor et al., *supra* note 27, at 469; O'Connor et al., *supra* note 13, at 12 tbl.2; Zahran et al., *supra* note 37, at 781 tbl.3.

147. *See supra* tbl.4.

148. *See supra* tbl.4.

149. *See supra* tbl.4.

150. *See supra* tbl.4.

151. *See supra* tbl.4.

152. *See supra* note 112 and accompanying text.

153. *See, e.g.*, Bord et al., *supra* note 59, at 215; Dietz et al., *supra* note 13, at 206 tbl.4; Leiserowitz, *supra* note 21, at 60 tbl.III; O'Connor et al., *supra* note 13, at 12 tbl.2; Zahran et al., *supra* note 37, at 781 tbl.3.

154. *See supra* tbl.4.

political identification, climate change knowledge, and concern, environmental movement identity exerts a robust, direct effect on climate policy support.[155] This is additional evidence that climate change remains quite associated with the environmental movement.

Past studies report that race has no effect on climate policy support[156] or that non-whites express greater support for climate policies than do whites.[157] Yet, I find that whites consistently express greater support for a range of climate policy proposals than do non-whites.[158] Such a robust effect across eight years of nationally representative data calls into question earlier studies' results for race.

The results of the best-fit models in Table Four provide mixed support for past studies' results for gender, age, education, and income. Women express greater support than men for the two regulatory proposals, yet gender has no statistically significant influence on support for the two investment-based proposals.[159] The positive influence of gender in models 8 and 10[160] affirms the results of Zahran, Brody, Grover, and Vedlitz[161] and contradicts Leiserowitz[162] and O'Connor, Bord, and Fisher[163]—who find men express greater support. Of course, the non-significant coefficients for gender in models 12 and 14[164] support the earlier results of Krosnick, Holbrook, Lowe, and Visser[165] and O'Connor, Bord, Yarnal, and Wiefek[166] that gender does not influence policy support. Thus, women more strongly support regulatory climate policies, but men and women express equally high levels of support for investment-based climate policies.

Younger adults more strongly support setting high emissions and pollution standards for businesses and spending government money to develop alternative sources of auto fuels.[167] This affirms the findings of Krosnick, Holbrook, Lowe, and Visser[168] and challenges the results of Dietz, Dan, and Shwom[169] and O'Connor, Bord, and Fisher.[170] The

155. *See supra* tbl.4.
156. *See, e.g.*, Krosnick et al., *supra* note 63, at 26 tbl.V.
157. *See, e.g.*, Dietz et al., *supra* note 13, at 206 tbl.4; Leiserowitz, *supra* note 21, at 61 tbl.IV.
158. *See supra* tbl.4.
159. *See supra* tbl.4.
160. *See supra* tbl.4.
161. Zahran et al., *supra* note 37, at 782.
162. Leiserowitz, *supra* note 21, at 60 tbl.III.
163. O'Connor et al., *supra* note 27, at 468, 469 tbl.V.
164. *See supra* tbl.4.
165. Krosnick et al., *supra* note 63, at 26 tbl.V.
166. O'Connor et al., *supra* note 13, at 12.
167. *See supra* tbl.4.
168. Krosnick et al., *supra* note 63, at 26 tbl.V.
169. Dietz et al., *supra* note 13, at 205, 206 tbl.4.

results of models 8 and 12[171] do provide partial support for O'Connor, Bord, Yarnal, and Wiefek, which find that age is not a significant predictor.[172]

Overall, socioeconomic status (education and income) has a positive effect on climate policy support, though not across all four proposals.[173] Yet, the trend is clear. Higher levels of education and higher income lead to stronger climate policy support.[174] This trend affirms the results of several studies,[175] while challenging those of Krosnick, Holbrook, Lowe, and Visser.[176]

It is fair to say that self-reported understanding of global warming has no robust effect on climate policy support. Individuals self-reporting greater global warming understanding do express greater support for spending more government money to develop solar and wind power; yet, global warming understanding has no statistically significant effect on support for three other climate policy proposals.[177] Finally, religiosity and place of residence have no statistically significant effect on climate policy support.[178] In other words, religious and non-religious individuals and those living in rural areas, suburbs, and urban areas express similar levels of support for these four policy proposals.

## V. CONCLUSION

This study increases the temporal and geographic breadth of much past research on the social bases of climate change knowledge, concern, and policy support. Several results of past research receive support, but a few—primarily those dealing with socio-demographic characteristics—are challenged.[179] Just as important, this study demonstrates that several variables commonly ignored in too much past research are significant predictors of climate change knowledge, concern, and policy support.

As reported in many existing studies, Americans express a relatively low level of concern about climate change, especially compared to their level of concern about other problems—even other

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170. O'Connor et al., *supra* note 27, at 468, 469 tbl.V.

171. *See supra* tbl.4.

172. O'Connor et al., *supra* note 13, at 13.

173. *See supra* tbl.4.

174. *See supra* tbl.4.

175. *See, e.g.*, Leiserowitz, *supra* note 21, at 61 tbl.IV, 62; O'Connor et al., *supra* note 27, at 469 tbl.V; O'Connor et al., *supra* note 13, at 12 tbl.2; Zahran et al., *supra* note 37, at 781 tbl.3.

176. *See* Krosnick et al., *supra* note 63, at 26 tbl.V.

177. *See supra* tbl.4.

178. *See supra* tbl.4.

179. *See supra* notes 156-78 and accompanying text.

environmental problems.[180] Regardless of this relatively low level of concern and a moderate degree of knowledge, at least three-fourths of Americans do support each of four climate policy proposals: two for increased regulation of emissions and two for increased government investment in alternative energy.[181]

Of particular interest, this study provides strong evidence that the political divide over climate change documented at the level of organizations and elites[182] also exists within the United States' general public. That is, regular citizens seem just as politically polarized over climate change as are leaders of the Republican and Democratic parties and as are conservative think tanks and environmental movement organizations.

To recap, liberals and Democrats report more scientifically accurate beliefs about climate change and express greater concern about climate change than do conservatives and Republicans.[183] Also, greater self-reported understanding translates into *increased* knowledge and concern for liberals and Democrats and *decreased* knowledge and concern for conservatives and Republicans.[184] While political identification exerts only a modest direct effect on climate policy support, it does nevertheless have a significant indirect effect on climate policy support through its substantial influence on climate change knowledge and concern.[185] Thus, liberals and Democrats express greater support for climate policy proposals than do conservatives and Republicans.

All of this is evidence that climate change is a highly politicized problem within the American public; citizens' beliefs about climate change are significantly influenced by their political identification. This political divide is not likely to close in the near future. Dunlap and McCright demonstrate that the polarization between Democrats (and liberals) and Republicans (and conservatives) over the issue of climate change has been increasing significantly since 2001, with climate change knowledge and concern actually decreasing for the political right in America.[186] Even if this increasing polarization slows down and perhaps reverses slightly in the next few years, the remaining political divide will

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180. *See supra* note 20 and accompanying text.

181. *See supra* note 109 and accompanying text.

182. Dunlap & McCright, *supra* note 7, at 27; Lahsen, *supra* note 5, at 205; McCright & Dunlap, *Anti-Reflexivity*, *supra* note 35 (manuscript at 8); McCright & Dunlap, *Challenging Global Warming*, *supra* note 4, at 504-05; McCright, *supra* note 5, at 203; McCright & Dunlap, *Defeating Kyoto*, *supra* note 4, at 352-54.

183. *See supra* note 112 and accompanying text.

184. *See supra* note 138 and accompanying text.

185. *See supra* notes 149-50 and accompanying text.

186. *See* Dunlap & McCright, *supra* note 7, at 26, 28 fig.1, 30-31.

still be much larger than it was in 2001—the year that the IPCC's *Third Assessment Report* clearly established the current, strong scientific consensus on climate change.[187]

Two characteristics of American news media may partially explain this degree of polarization over climate change within the general public. First, compared to news media in other countries, American news disproportionately focuses on (a) the uncertainty of climate science; (b) conflicts among scientists and between scientists and politicians; and (c) the economic costs of binding international action.[188] Exploiting journalists' norm equating balance and objectivity, the few United States climate change contrarians have achieved a sizable presence in American news media that would not be expected given the veracity and significance of their climate science contribution.[189] Thus, American citizens are regularly exposed to news sources and news stories that politicize climate change.

Second, the demise of the "fairness doctrine" in the late 1980s has facilitated a balkanization of media outlets that has exacerbated this politicization. As part of the 1949 Federal Communications Act, the fairness doctrine prohibited news stations with broadcast licenses from promoting a single perspective without presenting an opposing side.[190] The Reagan Administration's Federal Communications Commission systematically repealed parts of the fairness doctrine in the mid-1980s until it abolished the fairness doctrine altogether in 1987.[191] This policy shift has facilitated the increasingly partisan stance of several news networks—for example, first FOX News on the right and then MSNBC on the left. Conservative and liberal media outlets report on the issue of climate change in ways consistent with their guiding ideology, perpetuating—if not heightening—the political divide in the general public.

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187. *See* IPCC, CLIMATE CHANGE 2001: THE SCIENTIFIC BASIS, at 2-18 (J.T. Houghton et al. eds., 2001), *available at* http://www.grida.no/climate/ipcc_tar/wg1/pdf/WG1_TAR-FRONT.pdf.

188. *See, e.g.*, Dominique Brossard et al., *Are Issue-Cycles Culturally Constructed?: A Comparison of French and American Coverage of Global Climate Change*, 7 MASS COMM. & SOC'Y 359, 369 tbl.2 (2004); Jaclyn Marisa Dispensa & Robert J. Brulle, *Media's Social Construction of Environmental Issues: Focus on Global Warming—A Comparative Study*, 23 INT'L J. SOC. & SOC. POL'Y 74, 91-93 (2003); Aaron M. McCright & Rachael L. Shwom, *Newspaper and Television Coverage*, *in* CLIMATE CHANGE SCIENCE AND POLICY 408 (Stephen H. Schneider et al. eds., 2010).

189. *See, e.g.*, Maxwell T. Boykoff & Jules M. Boykoff, *Balance as Bias: Global Warming and the US Prestige Press*, 14 GLOBAL ENVTL. CHANGE 125, 129-31, 132 fig.3, 133 (2004); McCright & Dunlap, *Defeating Kyoto*, *supra* note 4, at 365-66.

190. Roland F.L. Hall, *The Fairness Doctrine and the First Amendment: Phoenix Rising*, 45 MERCER L. REV. 705, 708-09 (1994).

191. *Id.* at 710-12.

Indeed, these dynamics of American media may help explain the moderating effect of political identification on the relationship between self-reported understanding and climate change concern and knowledge. By reading *The New York Times*, listening to NPR, and watching MSNBC, left-leaning citizens are regularly exposed to claims from the IPCC and environmental organizations,[192] while right-leaning citizens who read the *Washington Times* and watch FOX News are regularly exposed to claims from climate change contrarians and conservative think tanks.[193] Individuals in both groups may feel they understand climate change a great deal, as story after story from their preferred media outlets convey the same claims on an almost daily basis. Yet, these individuals are likely receiving very different information about climate change, in ways that reinforce their existing ideological differences.

This brings us back to a potential policy implementation problem, mentioned briefly in the introduction. Effectively reducing our nation's greenhouse gas emissions enough to mitigate our contribution to climate change necessitates the implementation of some package of policies designed to re-craft our infrastructure and shift our corporate, government, and household activities from fossil fuel dependence to reliance upon carbon-neutral renewable energy. Arguably, successful implementation of this policy demands true long-term bipartisanship and buy-in from all parts of America. The existing political polarization may seriously inhibit the societal-wide implementation likely necessary for us to meet our greenhouse gas emissions reductions targets. After all, individuals who believe that climate change is not happening or that it is not caused by humans may be far less likely to make the behavioral and household changes necessary for us to meet our emissions reductions targets. Indeed, they may strongly resent a climate policy that requires such changes to be made, furthering the political divide even more.

Climate change communicators tasked with creating buy-in for an effective climate policy must realize that the enduring political divide over climate change—like the political-religious divide in America over evolution—is less about scientific evidence and more about competing

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192. *See, e.g.*, Al Gore, Op. Ed., *The Climate for Change*, N.Y. TIMES, Nov. 9, 2008, at WK10; MSNBC, Climate Experts: Risk of "Irreversible" Shifts, http://www.msnbc.msn.com/id/29658424/ (last visited Oct. 11, 2009); *Political Influences Trouble Top Scientists* (NPR radio broadcast Feb. 15, 2008), *available at* http://www.npr.org/templates/story/story.php?storyId=19085881.

193. *See, e.g.*, Tim Huber, *Coal CEO Blasts Climate Bill*, WASH. TIMES, Sept. 8, 2009, http://www.washingtontimes.com/news/2009/sep/08/coal-ceo-blasts-climate-bill//print/; Judson Berger, *Sen. Inhofe Calls for Inquiry Into 'Suppressed' Climate Change Report*, FOX NEWS, June 29, 2009, http://www.foxnews.com/politics/2009/06/29/gop-senator-calls-inquiry-supressed-climate-change-report/.

worldviews and value systems. Addressing these (e.g., libertarianism versus regulation; private property versus communal resources; etc.) may be more effective for reducing the political divide over climate change than trying to bombard laypeople with greater amounts of scientific information.

To date, climate change communicators have discussed environmental protection, sustainability, and governmental regulation—frames that align closely with the environmental movement and the left. Discussing climate change in such terms may immediately turn off large numbers of individuals on the right. In the short term, climate change communicators might engage different groups about climate change on their own terms. For instance, they might approach economic conservatives about the entrepreneurial opportunities and new markets that will be created in a national shift to alternative energy, and they might talk with fundamentalist Christians about the moral responsibility America has for immediate, decisive action—given our nation's disproportionate greenhouse gas contribution.

Ultimately, however, the best frames may likely be those that resonate with our country's core values and that highlight commonalities across most of America—for example, problem-solving, pragmatism, opportunity, competition, and investment to name a few. Promoting climate policy via tapping our nation's core values may just be enough to significantly reduce our existing political divide documented here.