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Short Communication

Scientific literacy, optimism about science and conservatism

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ABSTRACT

It is frequently asserted that conservatives exhibit a cognitive style that renders them less well disposed toward science than progressives, and that they are correspondingly less trusting of scientific institutions and less knowledgeable about scientific ideas. Here we scrutinize these assertions, using data from the U.S. General Social Survey. We distinguish between three different definitions of 'conservative': first, identifying as conservative, rather than as liberal; second, holding socially conservative views, rather than socially progressive views; and third, holding economically conservative views, rather than economically leftist views. We find that self-identified conservatives and social conservatives are less scientifically literate and optimistic about science than, respectively, self-identified liberals and social progressives. However, we find that economic conservatives are *as or more* scientifically literate and optimistic about science than economic leftists. Our results highlight the importance of separating different sub-dimensions of political orientation when studying the relationships between political beliefs, scientific literacy and optimism about science.

1. Introduction

A number of scholars have argued that conservatives exhibit a cognitive style that renders them less well disposed toward science than progressives,[1] and that they are correspondingly less trusting of scientific institutions and less knowledgeable about scientific ideas (Jost, Glaser, Kruglanski, & Sulloway, 2003; Mooney, 2005, 2012; Hennes, Nam, Stern, & Jost, 2012; Lewandowsky, Oberauer, & Gignac, 2013). Compared to progressives, conservatives tend to be inflexible and dogmatic, intolerant of uncertainty, obsessed with security, disposed toward prejudice, and prone to biased reasoning. This is said to explain why they are less likely to believe in widely accepted scientific ideas such as the theory of evolution (Kohut, Doherty, & Dimmock, 2009), and why they place less trust in the scientific community (Gauchat, 2012). Other researchers, however, have contested these claims (Ray, 1974; Greenberg & Jonas, 2003; Kahan, 2013; Duarte et al., 2014; Dixon & Jones, 2015). It has been averred that progressives are in fact no less prejudiced than conservatives; but rather, that they are simply prejudiced against different groups (Wetherell, Brandt, & Reyna, 2013; Crawford, 2014; Crawford, Kay, & Duke, 2015). For example, while conservatives tend to be less tolerant of welfare recipients, progressives tend to be less tolerant of religious people (Brandt, Reyna, Chambers, Crawford, & Wetherell, 2014). Another retort has been that progressives are actually no less prone to denying scientific facts than conservatives; it is simply that they deny different facts, namely those which conflict with progressive sacred values (Haidt, 2012; McRight, Dentzman, Charter, & Dietz, 2013; Berezow & Campbell, 2012). For example, many progressives deny even the possibility of statistical differences between the sexes or races, since such differences would be an affront to the progressive sacred value of equality (Pinker, 2002; Woodley, 2010; Winegard & Winegard, 2015; Cofnas, 2015).

Furthermore, recent evidence indicates that a single ideological axis running from progressive to conservative is insufficient to characterise the distribution of political beliefs in countries such as the United States (Terrizzi, Shook, & McDaniel, 2013; Feldman & Johnston, 2014; Carl, 2015a, 2015b; and see De Regt, Mortelmans, & Smits, 2011). For example, cognitive ability appears to have a positive relationship with both socially liberal beliefs and at least some measures of fiscally conservative beliefs (Carl, 2015a, 2015b; and see Weakliem, 2002; Oskarsson et al., 2014; Mollerstrom & Seim, 2014). Moreover, a recent cross-national study found that need for security and certainty is *negatively* associated with right-wing economic attitudes, despite being positively associated with socially conservative attitudes (Malka, Soto, Inzlicht, & Lelkes, 2014). Here we test the hypothesis that differences between conservatives and progressives on scientific literacy and optimism about science vary depending on how 'conservative' is defined.

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[1] In this article, we refer to 'progressives' rather than 'liberals', so to avoid confusion with the original meaning of 'liberal', which is still widely used in Europe, Australia and New Zealand (see Klein, 2015).

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2. Method

2.1. Data

Data are from the 2000–2014 waves of U.S. General Social Survey (GSS), a public opinion survey that has been administered to a nationally representative sample of American adults every 1–2 years since 1972 (see Smith et al., 2014). We utilise the 2000–2014 waves of the survey both for contemporary relevance and because very few of our outcome variables were administered in earlier waves.

2.2. Measures

The first definition of 'conservative' that we employ is simply: identifying as conservative, rather than as liberal. Respondents were asked to place themselves on a 7-point scale running from "extremely liberal" to "extremely conservative". Conservatives were defined as those answering "extremely conservative", "conservative" or "slightly conservative", and progressives as those answering "slightly liberal", "liberal" or "extremely liberal". (The ~39% of respondents who answered "moderate" were classified as missing.) This appears to be the most commonly employed definition of 'conservative' within the literature on political orientation and attitudes toward science.

The second definition of 'conservative' that we employ is: holding socially conservative views, rather than socially progressive views. We utilise two separate measures of socially conservative views. First, respondents were asked to state their position on abortion, with conservatives being defined as those who do not believe a woman should be able to get an abortion for any reason, and progressives as those who believe she should. Second, respondents were asked to state their position on marijuana legalisation, with conservatives being defined as those who believe marijuana should be illegal, and progressives as those who believe it should be legal.

The third definition of 'conservative' that we employ is: holding economically conservative views, rather than economically leftist views. We utilise two related, but not identical, measures of economically conservative views. First, respondents were asked to state their position on welfare spending, with conservatives being defined as those who believe it is too high and progressives as those who believe it is too low. (The ~36% of respondents who believe it is about right were classified as missing.) Second, respondents were asked to place themselves on a 7-point scale representing whether the government should do a lot or nothing to reduce income inequality. Conservatives were defined as those answering "5", "6" or "7", and progressives as those answering "3", "2", or "1". (The ~19% of respondents who answered "4" were classified as missing.)[2]

We utilise seven measures of scientific literacy, and eleven measures of optimism about science. All of these variables were standardised prior to analysis.

3. Results

3.1. Correlations between measures of conservatism

Table 1 displays correlations between our measures of conservatism. (Unweighted *n*'s for individual cells range from 2847 to 8499.) Although all 10 are significant, the correlations of conservative self-identity with social conservatism measures ($r = .32$, $r = .27$) and economic conservatism measures ($r = .32$, $r = .36$) are all considerably larger than the correlation between social conservatism measures and economic conservatism measures ($r = .07$, $r = .05$, $r = .05$, $r = .09$). This illustrates the fact that, at least in the United States, political orientation can be decomposed into at least two different sub-dimensions, namely social conservatism and economic conservatism (Terrizzi et al., 2013; Feldman & Johnston, 2014; Carl, 2015a, 2015b). It should be noted that the preceding values are likely somewhat lower than the true correlations between ideological self-placement, social conservatism and economic conservatism, given that our measures of conservatism are binary.

Table 1
Correlations between measures of conservatism.

	Conservative self-identity	Anti-abortion	Anti-marijuana	Anti-welfare	Anti-redistribution
Conservative self-identity	1				
Anti-abortion	.32***	1			
Anti-marijuana	.27***	.27***	1		
Anti-welfare	.32***	.07***	.05*	1	
Anti-redistribution	.36***	.05**	.09***	.33***	1

Notes: Estimates are from weighted OLS models. Significance levels, based on robust standard errors: *5%, **1%, ***0.1%.

3.2. Differences between conservatives and progressives on scientific literacy and optimism about science

Table 2 displays standardised differences between conservatives and progressives on measures of scientific literacy and optimism about science, separately for our five measures of conservatism. (Unweighted *n*'s for individual cells range from 313 to 10,034.) As the first three columns indicate, self-identified conservatives and social conservatives are less scientifically literate and optimistic about science than, respectively, self-identified liberals and social progressives. For example, they are less likely to have taken college-level science courses, have worse knowledge of scientific facts, report less interest in scientific discoveries, and are more likely to believe that we trust too much in science. One exception is the item pertaining to astrology, where self-identified conservatives are slightly but significantly more scientifically literate than self-identified liberals. Several of the other differences, such as those in reported usage of science websites, are non-significant.

As the fourth and fifth columns indicate, however, economic conservatives are *as or more* scientifically literate and optimistic about science than economic leftists. In the fourth column, all the differences except the one pertaining to astrology are non-significant, implying that individuals who believe welfare spending is too high are about as scientifically literate and optimistic about science, on average, as those who believe it is too low. But in the fifth column, 12 out of 18 differences are significant, and they are all in the direction favoring conservatives. This implies that individuals who do not believe the government should reduce income inequality are more scientifically literate and optimistic about science, on average, than those who believe it should reduce income inequality. For example, individuals who do not believe the government should reduce income inequality report a clearer understanding of scientific study, have a better grasp of the experimental method, are more likely to believe the benefits of science outweigh the costs, and are less likely to say that science makes our way of life change too fast.

4. Discussion

This study used data from the U.S. General Social Survey to examine whether differences between conservatives and progressives on scientific literacy and optimism about science vary depending on how 'conservative' is defined. It found that self-identified conservatives and social conservatives are less scientifically literate and optimistic about science than, respectively, self-identified liberals and social

[2] Results were highly similar when treating our first and fifth measures as linear scales rather than binary variables. In the case of our fourth measure, additional analyses revealed that respondents who believe welfare spending is about right tend to be the most scientifically literate and optimistic about science (see Carl, 2015a).

Table 2
Standardised differences between conservatives and progressives on measures of scientific literacy and optimism about science.

	Conservative self-identity	Anti-abortion	Anti-marijuana	Anti-welfare	Anti-redistribution
Measures of scientific literacy					
Taken college-level science courses (0–1)	−0.17***	−0.32***	−0.14***	0.07	0.20***
Informed about science and technology (1–5)	−0.30***	−0.17*	−0.19**	0.02	−0.02
Have a clear understanding of scientific study (1–3)	−0.19***	−0.28***	−0.26***	0.00	0.09**
Test on controlled trials (0–2)	−0.10*	−0.23***	−0.17***	0.06	0.09*
Test on the experimental method (0–2)	0.06	−0.19	0.05	0.16	0.49***
Quiz on scientific facts (0–11)	−0.28***	−0.68***	−0.35***	0.14	0.15*
Astrology is scientific (1–3)	−0.11**	0.07	−0.02	−0.19**	−0.26***
Measures of optimism about science					
Interested in scientific discoveries (1–3)	−0.20***	−0.21***	−0.20***	0.03	0.01
Visited a science museum recently (0–1)	−0.09	−0.14*	−0.10	0.17	0.10
Used a science website in past 30 days (0–1)	0.05	0.00	−0.15	−0.13	0.11
Confidence in scientific community (1–3)	−0.21***	−0.23***	−0.14***	0.06	0.04
Science gives opportunities to next generation (1–4)	−0.02	−0.06	0.03	−0.08	0.03
Benefits of science outweigh harmful results (1–3)	0.00	−0.20***	−0.11***	0.07	0.15***
Benefits of past research outweighed harmful results (0–1)	−0.04	−0.25***	−0.18***	0.14	0.16***
Science makes way of life change too fast (1–4)	0.13***	0.28***	0.18***	−0.04	−0.15***
We trust too much in science (1–5)	0.52***	0.73***	0.48***	−0.06	−0.19**
We believe too much in science over faith (1–5)	0.30***	0.47***	0.31***	−0.04	−0.14*
Science does more harm than good (1–5)	0.09	0.38***	0.20***	−0.06	−0.17***

Notes: Estimates are from weighted OLS models. Positive values indicate a higher mean for conservatives; negative values indicate a higher mean for progressives. Significance levels, based on robust standard errors: *5%, **1%, ***0.1%.

progressives; but that, in contrast, economic conservatives are as or more scientifically literate and optimistic about science than economic leftists. These results highlight the importance of separating different sub-dimensions of political orientation when studying the relationships between political beliefs, scientific literacy and optimism about science (see De Regt et al., 2011; Terrizzi et al., 2013; Feldman & Johnston, 2014; Carl, 2015a, 2015b; Malka et al., 2014).

Our findings are relevant to the ongoing debate over the dramatic underrepresentation of conservatives in American academia (Solon, 2014; Duarte et al., 2014; Carl, 2015c). For instance, it has been suggested that the near absence of non-progressive viewpoints within certain academic sub-disciplines (e.g., social psychology, sociology of stratification) has led to systematic biases in research, such as the imbuement of scientific theories with progressive values, and the marginalization of findings deemed politically unpalatable (Duarte et al., 2014; Martin, 2015; Cofnas, 2015). Our study indicates that the relationship between attitudes toward science and political orientation is more complicated than has often been supposed, contradicting the claim made by some scholars (Jost et al., 2003; Mooney, 2005, 2012) that conservatives are uniformly less well disposed toward science than progressives.

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