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EDUCATION, INTELLIGENCE, AND ATTITUDE EXTREMITY

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Abstract Education and general intelligence both serve to inform opinions, but do they lead to greater attitude extremity? The potential civic returns to education include not only the sophistication of citizen opinions, but also their moderation. We use questions on economic policy, social issues, and environmental issues from the General Social Survey to test the impact of education on attitude extremity, as measured by deviation from centrist or neutral positions, while controlling for intelligence. We use quantile regression modeling to identify effects on both the most extreme beliefs as well as the most ambivalent. We find that intelligence is a moderating force across the entire distribution in economic, social, and environmental policy beliefs. Completing high school strongly correlates to reduced extremity, particularly in the upper quantiles. College education increases attitude extremity in the lower tail, while postgraduate education increases extremity in the upper tail. Results are discussed in the context of enlightenment and motivated-reasoning theories of beliefs and education. The relevance to political party core and swing voters is briefly discussed.

Introduction

The literature on the returns to education is predominantly focused on private, as opposed to social, returns. Economists have focused specifically on

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the increase in private earnings attributable to education (see Card [1999] for a comprehensive overview of the literature). Within research estimating the social returns to education, the emphasis has been on "civic returns"; that is, the tendency of more educated individuals to have higher levels of civic engagement (Dee 2004; Milligan, Moretti, and Oreopoulos 2004; Hillygus 2005). Recently, the discussion of civic returns has included their impact on individuals' privately held beliefs regarding various economic policies (Caplan 2001; Caplan and Miller 2010). While the character of these attitudes is no doubt important, the extremity of these attitudes is also important. After all, attitude extremity (along with confidence) is connected with polarization, and deliberation does not lead individuals to reconsider their biases (Wojcieszak 2012).

The relationship between education and attitudes has been examined in many scholarly contexts, from pedagogical research on teaching and learning to cognitive psychology, political science, sociology, and economics. Despite this immense breadth, the literature tends to follow one of two trends: (1) the relationship between education and attitudes is seen as causative, where education is the mechanism by which individual attitudes become more informed and enlightened; and (2) the more cynical view that education provides ideologues with ammunition to support their views where convenient, and where inconvenient confirmation bias allows educated individuals to pick apart or dismiss evidence that is inconsistent with their priors. This view is consistent with the civic-returns literature in economics and political science (e.g., Dee 2004; Milligan, Moretti, and Oreopoulos 2004; Dee 2005; Hillygus 2005), which suggests that individuals with higher levels of education exhibit higher levels of political knowledge and interest. The same view is also consistent with more broad claims that individuals with higher levels of education exhibit a greater and more subtle range of effects, such as moderating *both* religiosity and narrow self-interest. Astin (1993) is one of the most cited and most comprehensive examples of this literature, and the two prior examples are among his many findings.

The second view, the more cynical view, relies on what is sometimes called "motivated reasoning" (see Kunda [1990] for a comprehensive overview of the concept and the evidence behind it). The motivated-reasoning view suggests that education may moderate beliefs, or it may not, depending on the individual's motives. In some cases, education may allow an individual to have greater access to evidence and examples that support her views. In other cases, education, that is, learning about various social and scientific theories and facts, may lead to cognitive dissonance when those theories and facts highlight a contradiction between one's beliefs and actions. In such cases, researchers have found that individuals tend to modify their beliefs to be more consistent with their actions (Wicklund and Brehm 1976).

We explore how education influences attitude extremity. Consistent with the definition advanced by Abelson (1995), we use a value-neutral method, calculating how far the respondent deviates from a middle or "neutral" position

on a variety of economic, social, and environmental policy opinion questions. Using both ordinary least squares (OLS) and quantile regression (QR), we analyze the impact of education on not only median attitude extremity in each policy category, but also the upper and lower tails of the distribution. While the median result is obviously important in a majority-rule democracy, the tails of the distribution take on an especially important character when discussing attitude extremity (see Visser, Bizer, and Krosnick [2006] for a discussion of the difference between attitude extremity and other forms of attitude strength). The stronger individuals' beliefs, the less likely they are to be persuaded away from their current attitudes (Wojcieszak 2012). Further, analysis of the upper tail of attitude extremity offers insight into political extremism broadly defined. The lower tail—the least extreme—is equally as important. For example, those who are most likely to choose "moderate" options in surveys have also been those with low measures of attitude strength in other areas, such as intensity and importance (Krosnick and Schuman 1988; Bishop 1990).

In labor economics, one concern in estimates of private returns has been the potential for "ability bias," that is, the omitted-variable bias due to an individual's education-independent ability, in education's impact on earnings (Card 1999, 1802–3). Most studies, especially those that use instruments for schooling, have found little evidence of ability bias in education's private returns (Angrist and Krueger 1991, 1999; Ashenfelter and Krueger 1994). Those studies typically take advantage of differences in compulsory schooling laws to create instruments that are uncorrelated with individuals' underlying ability. However, studies that include direct controls for ability measures, such as aptitude or IQ tests, tend to find that typical OLS estimates of education's private returns are ability biased upward by as much as 40 percent (Griliches and Mason 1972; Blackburn and Neumark 1995).

The issue of ability bias has been considered not only in the case of private (i.e., internal) returns, but also in the case of education's social returns. For example, in estimating education's civic returns, Dee (2004) uses the General Social Survey (GSS) and the High School and Beyond (HS&B) longitudinal study to examine the causal effect of education on civic behavior (such as likeliness to vote, newspaper readership, and political group membership). Because of the problem of unobservables such as ability or family upbringing, which also likely correlate with both civic behavior and education, Dee uses instruments (proximity to two-year colleges for the HS&B data and variations in child-labor laws for the GSS data) to disambiguate education's civic returns. With the use of instruments, education's estimated impact on civic behavior does not appreciably decrease, and in the case of some civic behaviors, the coefficient on education actually increases dramatically (Dee 2004).

The potential for ability bias, however, also exists when examining education's impact on beliefs. While Caplan (2001) finds that education is the strongest determinant of beliefs about economics, later work finds that intelligence measures actually are a better predictor of economic belief than is

education (Caplan and Miller 2010). Further, the addition of a direct control for an intelligence measure significantly decreases the education's coefficient. This Caplan-Miller (CM) result also indicates that estimates of education's impact on belief are likely ability biased upward without an intelligence control. CM go so far as to argue that their ordered-logit estimates of intelligence's impact on economic beliefs are biased downward because the intelligence proxy in the GSS (WORDSUM) has a lower estimated reliability than education. Using an error-in-variable model correction, CM report that the average effect of intelligence increases by about 50 percent, while the average effect of education decreases by roughly 5 percent (Caplan and Miller 2010, 645). To account for potential ability bias, and because intelligence likely plays a part in motivated reasoning, we use similar survey questions to those used by CM to separately identify education and intelligence as determinants of attitude extremity.

Our analysis of attitude extremity has two primary goals: (1) to test whether education actually increases or decreases attitude extremity; and (2) to test whether intelligence has the same effect as education and to control for any ability bias behind education's estimated effect. If education is associated with less extremity, this suggests that one form of education's civic returns would be reduced political polarization, and is generally supportive of the enlightenment view. If education is associated with increased extremity, then that finding supports the motivated-reasoning view.

We find distinct patterns of attitude extremity across age and political ideology. Mean extremity of economic policy beliefs increases with age and decreases with years of education. Strongly conservative respondents hold significantly more extreme economic beliefs than do strongly liberal respondents. Quantile regression analysis reveals differing effects of education and intelligence on the upper and lower tails of the extremity distribution. In all of our modes of analysis, intelligence serves as a moderating force, reducing the extremity in all policy categories and at all points of the distribution. While completing a high school education reduces the extremity of economic, social, and environmental beliefs, further education often increases extremity. Education often correlates positively with extremity, particularly in the upper quantiles, but it is a noisy correlation with larger standard errors. Both OLS and QR analysis point toward completion of high school as the single most salient determinant of attitude extremity—failure to complete high school correlates to significantly *more* extreme economic, social, and environmental beliefs.

Data

We use data on beliefs from the General Social Survey (see Smith et al. [2011]; henceforth GSS). The GSS is a survey of non-institutionalized US adults administered roughly every two years (28 rounds) since 1972 by the

National Opinion Research Center under a grant from the National Science Foundation as part of the National Data Program for the Social Sciences. Initially with approximately 1,500 respondents, in 1994 it became a biennial survey, increasing to roughly 3,000 respondents. Since 1977, it has employed a full probability household sample, designed to be representative of the adult population.[1] It is the largest national public opinion survey in the United States (in terms of the number of questions posed to respondents), including thousands of questions on numerous topics, and includes a wide variety of demographic information. Relevant to our purposes, the GSS contains a large number of economic, social, and other policy-relevant questions, often on a Likert-type scale that allows for our method of measuring extremism as distance from a neutral answer. Our data selection began with every question in the GSS that covered respondents' views on economic, social, and environmental issues. We first cut questions in each area that did not meet our scale-answer requirements for our extremity measure. We then cut out questions that were redundant, that is, that addressed the same issue as another available. When dealing with redundant questions, we favored those that were asked in multiple years, or failing that, that were asked of the largest number of GSS respondents in a particular year. Because of asymmetries in the numbers of questions that met our criteria, each subcategory (economic, social, and environmental issues) had varying numbers of questions that fit our criteria. For this study, we found eight non-redundant questions on economic issues that fit our scale-answer requirements and provided a large sample size with our preferred controls. We also found seven such questions on social issues and 11 on environmental issues. While we use the cumulative 1972–2010 data set, most of the questions we use were asked in only one or two different iterations in surveys in and after 1990, as different questions were asked of different waves of the study. Respondents who answered at least three questions from each category (economic, social, and environmental) were included in our analysis. As many of the questions we used were asked only in certain years to a portion of that year's respondents, this requirement reduced our total sample size for each question to approximately 2,000–2,300 observations, depending on which controls are used. The full text of the questions used in this study is included in the appendix, and sample sizes and summary data are reported in tables 1 through 5.

In this study, our primary concern was to examine the impact of a variety of individual factors on attitude extremity. Our predictor variables include education, intelligence measured by WORDSUM, age, sex, race, real income,

1. The GSS includes English-speaking adults before 2006, and English- and Spanish-speaking adults since 2006. The GSS response rate, calculated using AAPOR RR5, from 1975 to 1985, varies between 73.1 and 79.9 percent; from 1986 to 1995, it varies between 73.9 and 82.4 percent. Individual-year response rates since then are 76.1 percent for 1996; 75.6 percent for 1998; 70.0 percent for 2000; 70.1 percent for 2002; 70.4 percent for 2004; 71.2 percent for 2006; 70.4 percent for 2008; and 70.3 percent for 2010.

Table 1. Summary Data

	N	Mean	S.D.	Min	Max
Mean belief extremity	2,303	0.350	0.148	0.038	0.883
-Economics	2,303	0.374	0.240	0	1
-Social	2,303	0.399	0.202	0	1
-Environmental	2,303	0.310	0.160	0	1
WORDSUM		6.103	2.129	0	10
Education	2,303	13.414	2.934	0	20
High school diploma	2,303	0.853	0.354	0	1
Bachelor's degree	2,303	0.266	0.442	0	1
Postgraduate	2,303	0.090	0.286	0	1
Age	2,303	45.884	17.156	18	89
Male	2,301	0.437	0.496	0	1
Black	2,303	0.133	0.340	0	1
Log income	2,303	9.929	1.065	5.557	11.857
Married	2,060	0.477	0.500	0	1
Religious attendance	2,303	3.655	2.720	0	8

marital status, and religious attendance. In the cumulative GSS data set, WORDSUM is available for the following years: 1974, 1976, 1978, 1982, 1987–1991, 1993–1994, 1996, 1998, 2000, 2004, and 2006.

As large national surveys go, the GSS has both advantages and disadvantages. One key advantage is that it does contain a proxy for IQ, known as WORDSUM. When the GSS is administered, half of all respondents, chosen at random, take a 10-word vocabulary subtest from the WAIS, a popular IQ test (Zhu and Weiss 2005). WORDSUM is the number correct out of 10.

If intelligence is conceived of as the ability to think, then WORDSUM is not a direct test of intelligence, but rather a test of vocabulary knowledge. However, vocabulary knowledge itself is highly correlated with general intelligence (Miner 1957; Alwin 1991; Zhu and Weiss 2005). The correlation between the WAIS Vocabulary subtest (which WORDSUM is taken from) and the overall WAIS score is .8 (Wechsler 1958). Using 20-question vocabulary subtests, later research found a similarly high correlation of .75 between vocabulary knowledge and general intelligence (Miner 1961). While the connection between vocabulary knowledge and cognitive ability is often questioned by laymen, intelligence researchers argue that knowledge is acquired only through the learning process, and those with the greatest learning ability tend to acquire the most knowledge (Wechsler 1958). Further, there is a literature that measures WORDSUM specifically against more comprehensive tests of ability. For example, the Army General Classification Test (AGCT) is highly correlated with WORDSUM (0.71) (Wolfle 1980). Huang and Houser (1996) and Rosenbaum (2000) have found that demographic studies using WORDSUM from the GSS have similar findings to those that use other measures of cognitive ability. Cattell (1987[1971]) argues that the proper way to

think of a vocabulary subtest such as WORDSUM is that it is a measure of "crystallized" intelligence, and that the development of vocabulary especially requires fluid intelligence (which is generally what is associated with cognitive ability), and thus is a strong predictor of performance on broader IQ tests.

To estimate the impacts of education, intelligence, age, and other factors on extremity, we construct a measure of extremity that sums the squared differences from central values in the opinion scales offered in each question. The differences from the middle are normalized such that the middle value always equals 0 and a maximum distance response always equals 1. As such, the extremity score is the average percentage of maximum distance from the middle in the respondents' answered questions, between 0 and 1.

$$\text{Attitude Extremity} = \Sigma\left(x_i - x_{mid}\right)^2 / \left(x_{max} - x_{mid}\right)^2 \quad (1)$$

We construct our index of attitude extremity across three subsets of question types—economic issues, social issues, and environmental issues—as well as the pooled set of questions. Summary data for our measures of extremity are included at the top of table 1. Histograms of each of the four extremity measures are presented in figure 1.

The distribution of extremity, across all questions, is unimodal with a slight positive skew. Economic extremity is considerably more skewed, while social issue extremity shows some signs of bimodality.[2] Environmental beliefs are skewed, but are also more peaked with fatter tails (kurtosis = 3.84). We are concerned with the importance of the individuals who make up the different portions of the distribution as potential voters in a political context and the forces shaping them. In the next section, we examine some broader patterns in the data.

A First Glance

We start with a handful of graphs of means from key subsets of the data. In figure 2, we can immediately see that attitudes become more extreme with age. The effects are most pronounced for economic issues and least pronounced for environmental issues. As age increases, the change in economic-belief extremity increases from 1.5 to 2.1, a difference of .6. This difference is roughly three times the impact of age on environmental-belief extremity, which is 1.0 in the youngest group and peaks at 1.2 among the older groupings (a difference of .2). The impact of age on social-belief extremity falls between economic and environmental beliefs, with a difference of .4 between the youngest and oldest age groups.

While there are obvious endogeneity issues examining extremity in the context of political ideology, it nonetheless merits a brief examination. We categorized subjects by self-identified ideology on a liberal-conservative spectrum. For each category of political ideology, economic beliefs are the most extreme, followed

2. This is not surprising in light of evidence that the US distribution of religious identity is bimodal (Makowsky 2011).

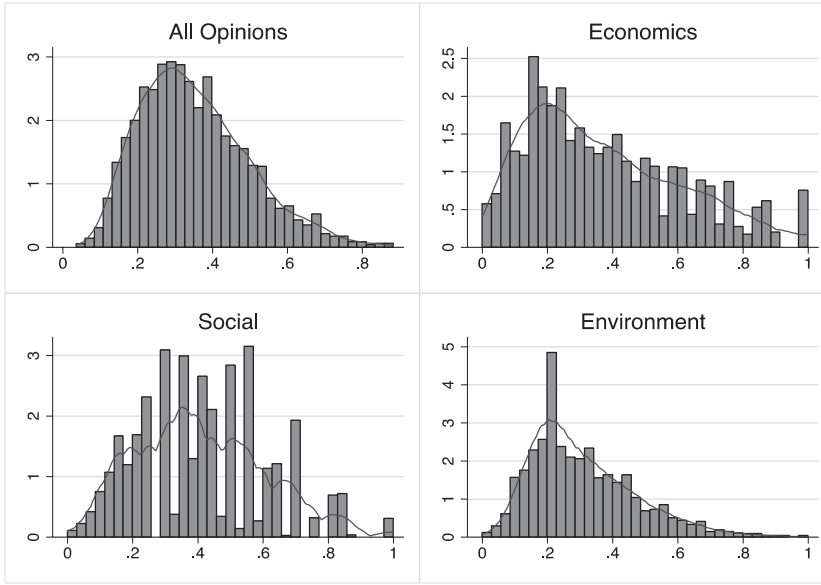

Figure 1. Histograms—Deviation from the Middle.

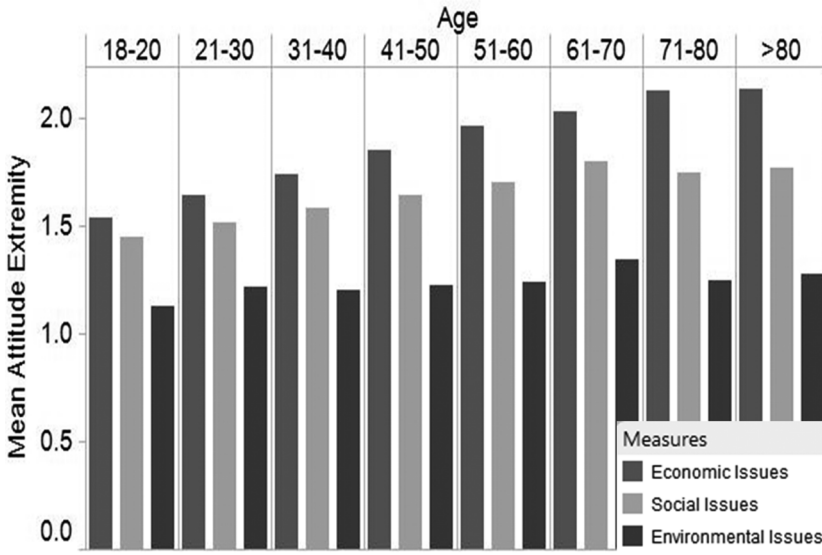

Figure 2. Attitude Extremity and Age.

by social, then environmental beliefs. Following standard intuition, all three belief types follow a U-shape across the ideology categories, with extreme liberals and extreme conservatives showing the most attitude extremity (figure 3). This lends support to our basic conjecture that there is a relationship between attitude extremity and overall strength of belief. Extreme attitudes are more likely to be found among strong conservatives and liberals, who are themselves more likely to be counted among one party or another's political core, while moderate attitudes are more likely to be found among the less ideologically strident.

In figure 4, which collapses education into categories that roughly correspond to major educational milestones, extremity increases given the first

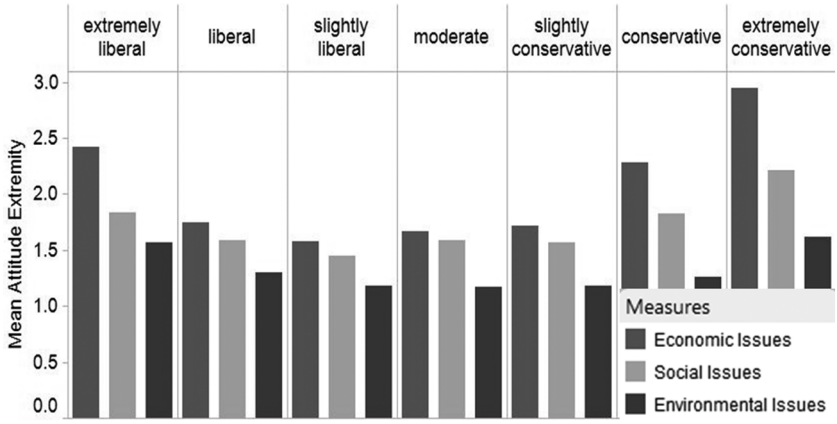

Figure 3. Extremity and Political Views.

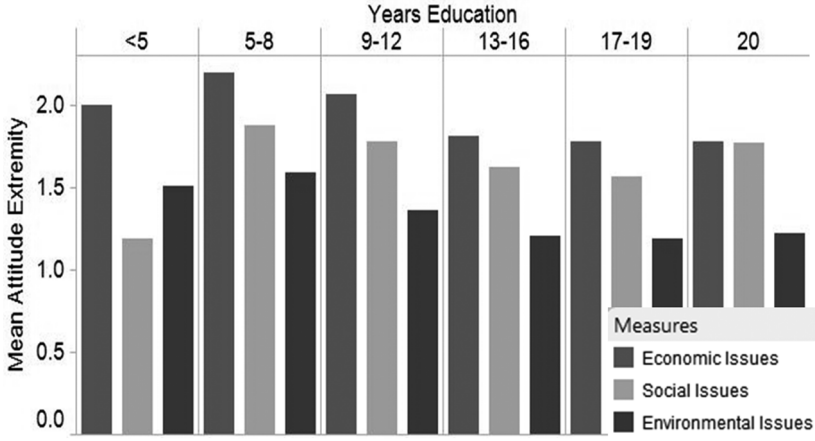

Figure 4. Extremity and Education.

eight years of education. After completion of the eighth grade, however, additional years of education have a moderating effect. In terms of magnitude, the effect is most pronounced for economic beliefs, and least pronounced for social issues.

Figure 5 reports mean extremity over the WORDSUM subtest. Higher scores on the WORDSUM subtest are associated with reduced extremity, most notably in economic and environmental issues. The effect appears to be weaker as scores climb higher.

Ordinary Least Squares and Quantile Regression Modeling

To simultaneously model the impact of education and ability, as well as control for other factors that might affect attitude extremity, we estimate the following ordinary least squares (OLS) regression model:

$$\begin{aligned} \textit{Attitude Extremity}^{\Phi}_{it} = {} & \alpha_0 + \alpha_{1\theta}\,\text{Education}_i + \alpha_{2\theta}\,\text{WordSum}_i \\ & + \alpha_{3\theta}\,\mathbf{X}_i + \text{Year}_t + \mu_{\theta it} \\ \Phi = {} & \{\text{All, Economics, Social, Environmental}\} \end{aligned} \tag{2}$$

$\textit{Attitude Extremity}^{\Phi}_{it}$ is estimated across all questions, as well as the economic, social, and environmental subsets. Education is included in two different forms—first, simply measured in years of schooling, and second, as a set of four dummy variables indicating the completion of eighth grade, high

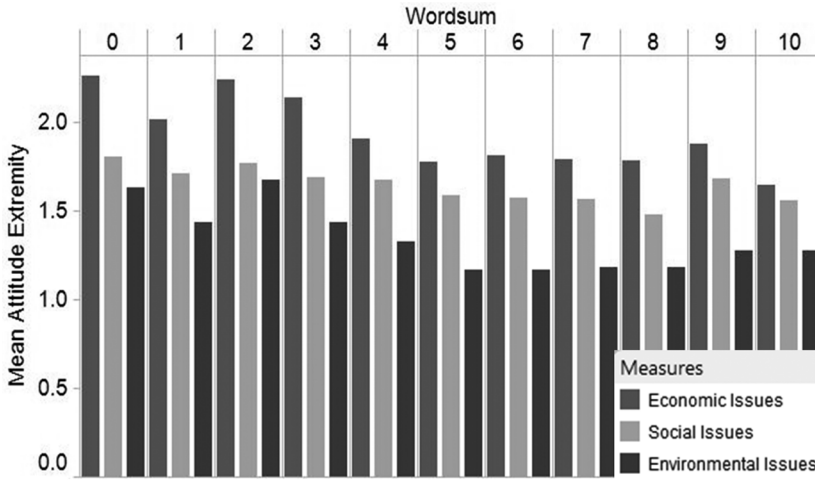

Figure 5. Extremity and Intelligence.

school, college, and a postgraduate degree. The dummy variable for the completion of eighth grade is the omitted category in all models estimated. $\mathbf{X}_i$ is a vector of control variables, including the respondent's age, gender, race, log income, marital status, and religious attendance. All specifications include robust standard errors and year-fixed effects.

While the OLS analysis of effects on the mean of the distribution is informative, it does not necessarily tell us the determinants of extremity in the tails. To model the determinants of attitude extremity across the entire distribution, we estimate the following quantile regression model:

$$\begin{aligned} \textit{Attitude Extremity}^{\Phi}_{it} &= \alpha_0 + \alpha_{1\theta}\,\text{Education}_i + \alpha_{2\theta}\,\text{WordSum}_i \\ &\quad + \alpha_{3\theta}\mathbf{X}_i + \text{Year}_t + \mu_{\theta it} \\ \text{with Quantile}_{\theta}\left(\textit{Attitude Extremity}_{it} \mid x_{it}\right) &= x'_{it}\alpha \\ \Phi = \{&\textit{All}, \textit{Economics}, \textit{Social}, \textit{Environmental}\}. \end{aligned} \tag{3}$$

The model is bootstrapped for 50 repetitions. All control variables are specified in the same manner in both the OLS and quantile regression models. Summary data for the dependent and independent variables are presented in table 1.

Results

ALL QUESTIONS

Table 2 presents the results of OLS regression models of $\textit{Attitude Extremity}^{\textit{All}}_{it}$. Columns 1 and 2 include education measured in years, which shows that while years of education has a negative coefficient, it is statistically significant only when additional control variables are not included. Columns 3 and 4, which include the education milestone dummy variables, indicate that the high school completion dummy variable is negative and statistically significant with and without additional controls. Completing high school correlates to 26 percent of a standard-deviation decrease in attitude extremity.

Intelligence negatively correlates to overall attitude extremity and is statistically significant across all four specifications. For the sake of comparison, a one-standard-deviation increase in correct answers (2.12) correlates to a quarter of the effect associated with completing high school.

Results reported in columns 2 and 4 reflect the positive correlation between age and extremity observed in figure 2 ($p < 0.01$). Extremity decreased with logged income in both specifications ($p < 0.01$). The coefficients of the male and black respondent dummy variables are both positive and statistically significant ($p < 0.01$). Neither marital status nor religious attendance is statistically significant.

Table 2. OLS – Mean Distance from Center: All Issues

	(1)	(2)	(3)	(4)
WORDSUM	–0.005**	–0.005**	–0.005**	–0.004*
	(0.002)	(0.002)	(0.002)	(0.002)
Education	–0.003*	–0.001		
	(0.001)	(0.001)		
High school diploma			–0.044**	–0.036**
			(0.009)	(0.010)
Bachelor's degree			–0.005	0.003
			(0.008)	(0.009)
Postgraduate degree			0.033**	0.024#
			(0.012)	(0.013)
Age		0.001**		0.001**
		(0.000)		(0.000)
Male		0.020**		0.018**
		(0.006)		(0.006)
Black		0.035**		0.036**
		(0.010)		(0.010)
Log family income		–0.012**		–0.012**
		(0.004)		(0.004)
Married		0.008		0.008
		(0.007)		(0.007)
Religious attendance		–0.002		–0.002
		(0.001)		(0.001)
Constant	0.416**	0.450**	0.417**	0.461**
	(0.015)	(0.038)	(0.011)	(0.040)
Observations	2,303	2,036	2,308	2,040
R-squared	0.028	0.060	0.038	0.068

NOTE.—Robust standard errors in parentheses.
**$p < 0.01$; *$p < 0.05$; #$p < 0.1$

The quantile regression results, regressing on the 10th through 90th quantiles, are reported in figures 6 and 7. Both specifications include the full battery of control variables. In figure 6, education is specified in years, while figure 7 reports the coefficients on the education milestone dummies. The coefficients on years' education in figure 6 reflects the same lack of statistical significance found in the OLS model, though the coefficients steadily decline with increasing quantiles. Intelligence is negative and significant across the bulk of the distribution, with the largest negative coefficients in the upper quartile.

Completing high school has a moderating effect across the entire distribution, with its largest (negative) magnitude in the upper quantiles (figure 7). Much like intelligence, completing high school has its greatest impact in moderating the most extreme portion of the belief distribution. The coefficient on college completion, on the other hand, is relatively small, but is statistically

significant at the lowest quantiles. Postgraduate education has a positive coefficient that is growing across the quantiles, and intermittently touches upon marginal statistical significance beyond the 60th quantile.

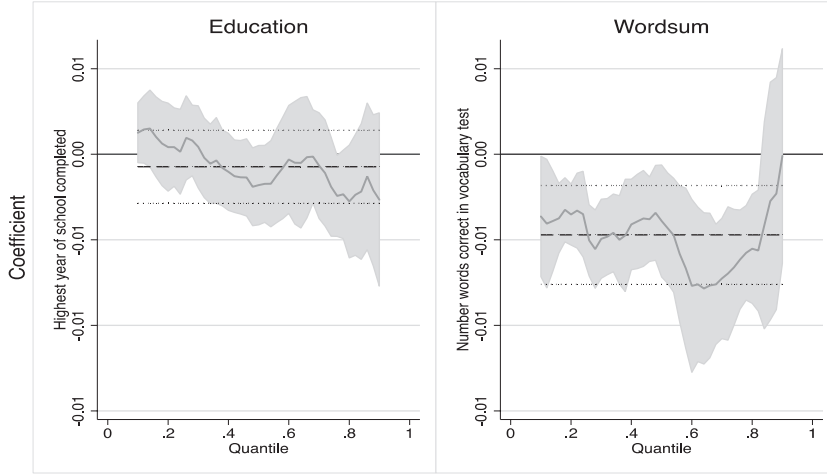

Figure 6. All Opinions. Quantile regression results (solid line) with 90 percent confidence interval (shaded gray), OLS result (dashed), and OLS 90 percent confidence interval (dotted).

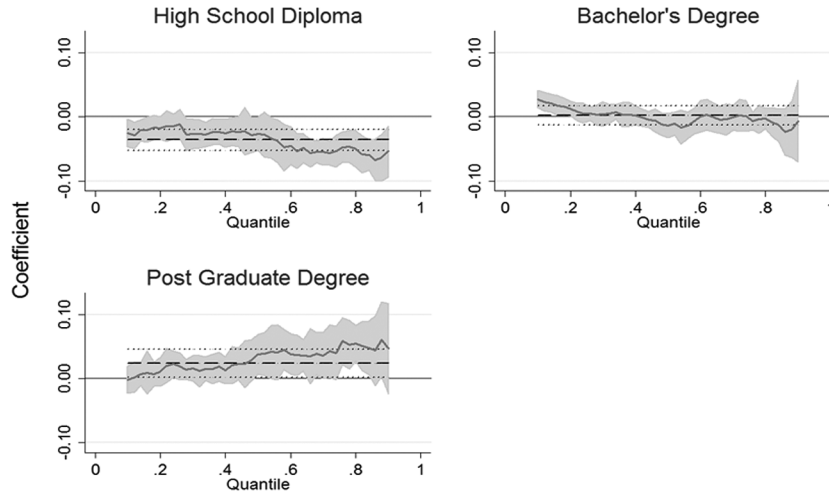

Figure 7. All Opinions. Quantile regression results (solid line) with 90 percent confidence interval (shaded gray), OLS result (dashed), and OLS 90 percent confidence interval (dotted).

ECONOMIC ISSUES

As shown in table 3, intelligence is correlated with lower economic attitude extremity in all four specifications. While education, as measured in years, is not statistically significant (columns 1–2), completing high school has a strong negative effect and completing a postgraduate degree has a strong positive effect (both $p < .01$). Completing a postgraduate degree has a coefficient magnitude equivalent to 17.5 percent of a standard-deviation increase in economic attitude extremity. Attitude extremity increases with age and when the subject is male or black ($p < 0.05$). Extremity increases with marriage and decreases with log household income, but both effects are only marginally significant ($p < 0.10$). Perhaps surprisingly, religious attendance, which was not a significant determinant of overall attitude extremity, has a small, marginally significant ($p < 0.10$) negative effect of extremity about economic issues.

Table 3. Mean Distance from Center: Economic Issues

	(1)	(2)	(3)	(4)
WORDSUM	–0.007**	–0.008**	–0.007**	–0.007*
	(0.003)	(0.003)	(0.003)	(0.003)
Education	–0.002	0.000		
	(0.002)	(0.002)		
High school diploma			–0.041**	–0.029#
			(0.015)	(0.016)
Bachelor's degree			–0.013	–0.004
			(0.014)	(0.015)
Postgraduate degree			0.053**	0.042#
			(0.020)	(0.022)
Age		0.002**		0.002**
		(0.000)		(0.000)
Male		0.047**		0.045**
		(0.011)		(0.011)
Black		0.041*		0.041*
		(0.016)		(0.016)
Log family income		–0.012#		–0.011#
		(0.006)		(0.006)
Married		0.019#		0.019#
		(0.012)		(0.012)
Religious attendance		–0.004#		–0.003#
		(0.002)		(0.002)
Constant	0.448**	0.411**	0.450**	0.429**
	(0.024)	(0.060)	(0.018)	(0.063)
Observations	2,303	2,036	2,308	2,040
R-squared	0.013	0.051	0.019	0.055

NOTE.—Robust standard errors in parentheses.
**$p < 0.01$; *$p < 0.05$; #$p < 0.1$

In the quantile regression models, the effect of years of education is small and never statistically significant (figure 8). Our intelligence proxy is negative for the upper three quartiles, and increases in magnitude with the quantiles. In figure 9, which includes education-milestone dummies, the negative coefficient

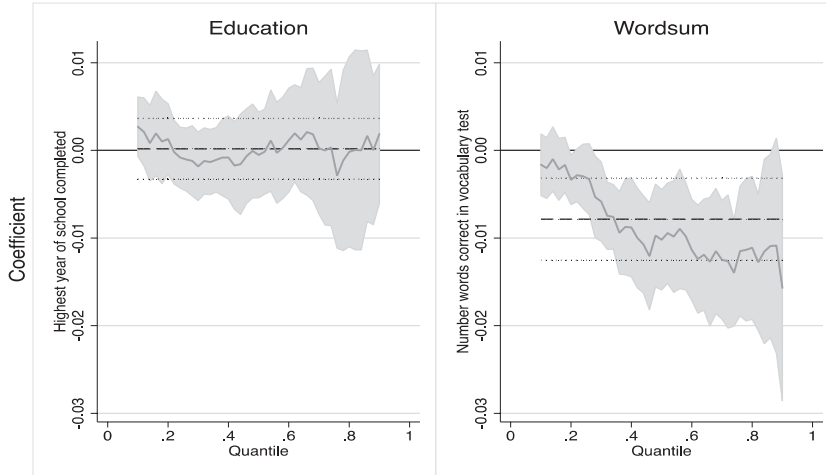

Figure 8. Economic Opinions. Quantile regression results (solid line) with 90 percent confidence interval (shaded gray), OLS result (dashed), and OLS 90 percent confidence interval (dotted).

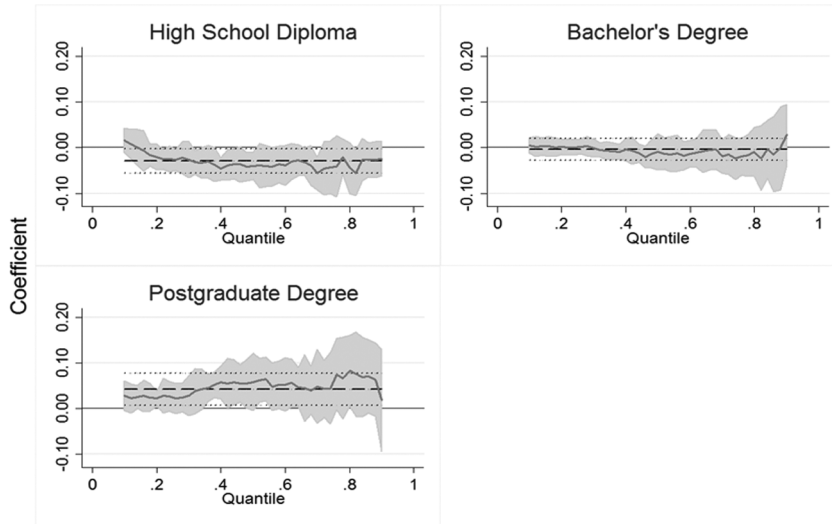

Figure 9. Economic Opinions. Quantile regression results (solid line) with 90 percent confidence interval (shaded gray), OLS result (dashed), and OLS 90 percent confidence interval (dotted).

for high school and the positive coefficient for postgraduate work are statistically significant over only intermittent portions of the middle of the distribution.

SOCIAL ISSUES

Table 4 shows the effect of education and intelligence on beliefs regarding social issues. Intelligence is correlated to lower extremity for social issues in all four specifications, though the coefficients are smaller than those observed in the models of economic beliefs, and are marginally statistically significant ($p < 0.10$) in columns 1, 2, and 3. While education, as measured in years, is not statistically significant (columns 1–2), completing high school has a statistically significant negative effect, with a coefficient magnitude equivalent to 16 percent of a standard-deviation decrease in attitude extremity on social issues. While age and gender remain statistically significant, income, race, and

Table 4. Mean Distance from Center: Social Issues

	(1)	(2)	(3)	(4)
WORDSUM	–0.004#	–0.005#	–0.004#	–0.004
	(0.002)	(0.002)	(0.002)	(0.002)
Education	–0.001	–0.000		
	(0.002)	(0.002)		
High school diploma			–0.034**	–0.031*
			(0.013)	(0.014)
Bachelor's degree			–0.006	–0.001
			(0.012)	(0.012)
Postgraduate degree			0.035*	0.021
			(0.017)	(0.018)
Age		0.001**		0.001**
		(0.000)		(0.000)
Male		0.019*		0.018#
		(0.009)		(0.009)
Black		0.019		0.019
		(0.014)		(0.014)
Log family income		–0.006		–0.005
		(0.005)		(0.005)
Married		0.019#		0.019#
		(0.010)		(0.010)
Religious attendance		–0.001		–0.001
		(0.002)		(0.002)
Constant	0.439**	0.411**	0.449**	0.417**
	(0.020)	(0.051)	(0.015)	(0.052)
Observations	2,303	2,036	2,308	2,040
R-squared	0.014	0.033	0.019	0.036

NOTE.—Robust standard errors in parentheses.
**$p < 0.01$; *$p < 0.05$; #$p < 0.1$

religious attendance drop out of significance. Social attitude extremity also increases, on average, when the subject is married.

Figures 10 and 11 reveal distinctly U-shaped patterns of the education-related coefficient across quantiles of social attitude extremity. The coefficient

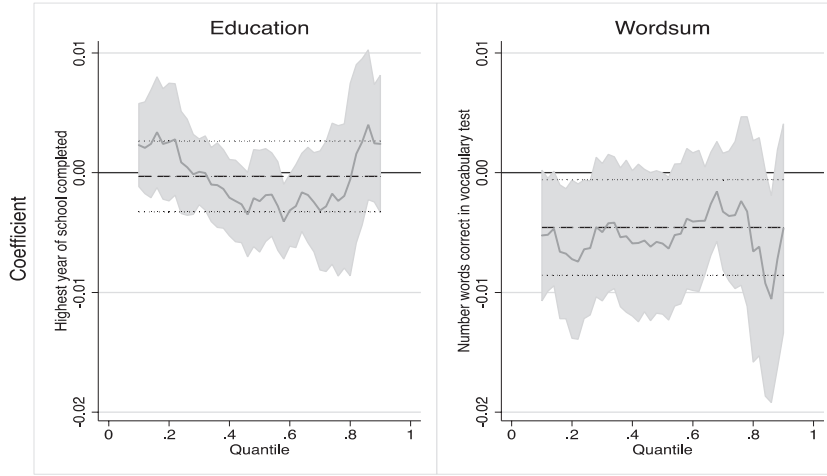

Figure 10. Social Opinions. Quantile regression results (solid line) with 90 percent confidence interval (shaded gray), OLS result (dashed), and OLS 90 percent confidence interval (dotted).

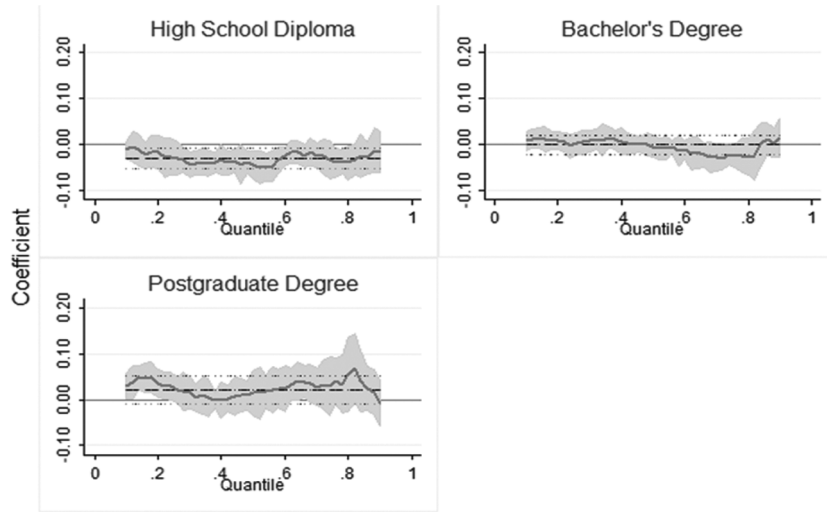

Figure 11. Social Opinions. Quantile regression results (solid line) with 90 percent confidence interval (shaded gray), OLS result (dashed), and OLS 90 percent confidence interval (dotted).

for education$_i$ is positive, though not significant, in the lowest decile ($p = .196$) and at the 85th quantile ($p = .218$), while at the same time negative (near zero) around the median ($p = .321$). The extremity of social beliefs of the upper tail and lower tail increase by 1.2 percent of a standard deviation with each additional year of schooling. This divergence of the distributional tails from the middle in response to education is, to some degree, sorted when we use milestone dummies in figure 11. The moderating effect of high school education on social beliefs is the strongest near the median of the distribution. Further, we observe a positive effect of postgraduate education in the lower tail.

ENVIRONMENTAL ISSUES

It is within environmental issues that we observe our measure of intelligence having its least moderating impact (table 5). Intelligence drops out of significance when control variables are included in columns 2 and 4. Education, in years, drops out of significance with controls (column 2), but the high school completion dummy correlates to 26 percent of a standard-deviation decrease in environmental attitude extremity ($p < 0.01$).

While age is still statistically significant, its magnitude is trivial when regarding environmental extremity. Gender drops out, while race remains relatively strong. Income is negative and significant. A 10 percent increase in income correlates to 9 percent of a standard-deviation decrease in environmental attitude extremity.

As shown in figures 12 and 13, the most significant divergence is in the direction of effect across the distribution. Education has a positive effect on the lowest decile and a negative effect in the middle, though its intermittent statistical significance reflects the lack of significance in the OLS model. The effect of intelligence here is negative, but only intermittently marginally statistically significant.

The quantile regression coefficients on the milestone dummies reported in figure 13, again, show a more nuanced effect of education. High school completion is consistently negative, with coefficient magnitude increasing with the quantile. College completion, on the other hand, has a positive impact on the lowest two deciles of environmental attitude extremity ($p < 0.01$ at the 10th and 20th quantiles). Postgraduate education is positive and significant between the 50th and 70th quantiles, and hovers at significance at the top of the distribution.

Conclusion

While education and intelligence are generally moderating forces, their effect is uniform across neither levels of education nor the distributions of attitude extremity. In that sense, our findings support both enlightenment *and*

Table 5. Mean Distance from Center: Environmental Issues

	(1)	(2)	(3)	(4)
WORDSUM	–0.005*	–0.003	–0.005*	–0.003
	(0.002)	(0.002)	(0.002)	(0.002)
Education	–0.003*	–0.002		
	(0.001)	(0.001)		
High school diploma			–0.049**	–0.042**
			(0.011)	(0.012)
Bachelor's degree			0.000	0.009
			(0.009)	(0.009)
Postgraduate degree			0.018	0.014
			(0.013)	(0.014)
Age		0.000*		0.000#
		(0.000)		(0.000)
Male		0.006		0.004
		(0.007)		(0.007)
Black		0.042**		0.043**
		(0.011)		(0.011)
Log family income		–0.016**		–0.016**
		(0.004)		(0.004)
Married		–0.006		–0.005
		(0.008)		(0.008)
Religious attendance		–0.001		–0.001
		(0.001)		(0.001)
Constant	0.383**	0.492**	0.379**	0.501**
	(0.017)	(0.041)	(0.012)	(0.042)
Observations	2,303	2,036	2,308	2,040
R-squared	0.021	0.045	0.029	0.053

NOTE.—Robust standard errors in parentheses.
**$p < 0.01$; *$p < 0.05$; #$p < 0.1$

motivated-reasoning arguments. This nuance in our results was unexpected: we anticipated a consistent effect of education on belief, with some reduction in education's coefficient when controlling for ability bias. While differences between *types* of beliefs were anticipated, the differences in the effects of high school, college, and postgraduate education were larger than expected.

A high school education is the single most moderating force in our study. Further, it has its greatest impact on the most extreme portion of the belief distribution. If we apply both the enlightenment view and the motivated-reasoning view, then the results support that a high school education, but not a college education, has an "enlightenment" effect on attitudes. A perhaps more generous interpretation would be that our results suggest that beyond high school, the motivated-reasoning effect *cancels out* the enlightenment effect. Also, when it comes to postgraduate study, the evidence suggests that the motivated-reasoning effect may overwhelm the enlightenment effect, leading

to greater attitude extremity. Where the motivated-reasoning effect is concerned, cognitive dissonance appears to be managed through cognitive biases such as confirmation bias, where evidence and arguments in favor of one's

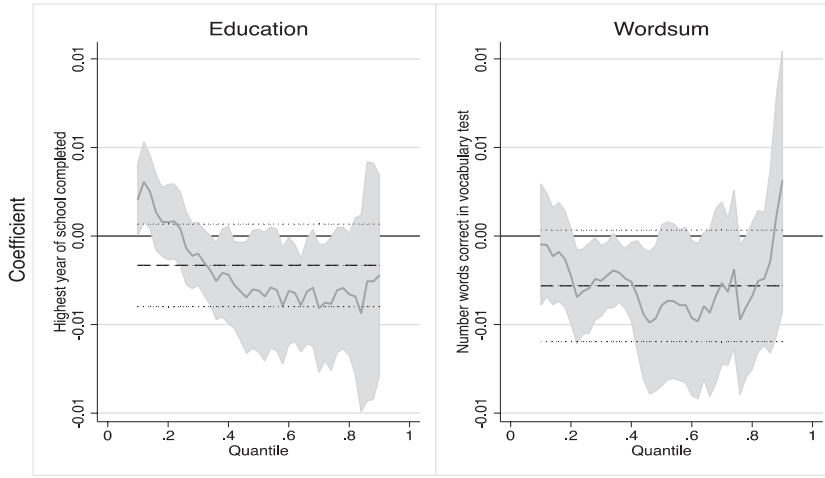

Figure 12. Environmental Opinions. Quantile regression results (solid line) with 90 percent confidence interval (shaded gray), OLS result (dashed), and OLS 90 percent confidence interval (dotted).

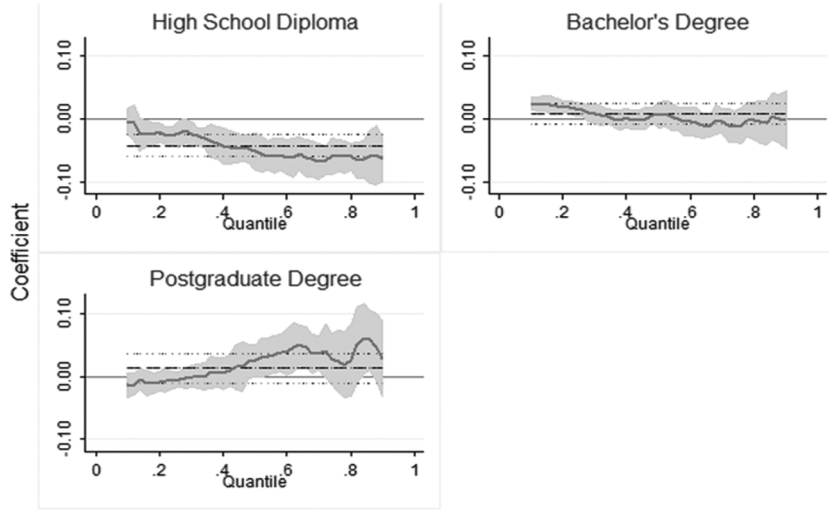

Figure 13. Environmental Opinions. Quantile regression results (solid line) with 90 percent confidence interval (shaded gray), OLS result (dashed), and OLS 90 percent confidence interval (dotted).

positions are weighed more heavily than evidence and arguments against. In other words, the highest levels of education do not appear only to moderate attitude extremity, but also to empower the highly educated to be even more convinced that their attitudes are justified.

One problem with the motivated-reasoning argument is that education and intelligence would be expected to push attitudes in the same direction. It is important to keep in mind, however, that the effects of education and intelligence are estimated in the regressions as *independent* effects. Despite the high correlation between intelligence and education, at higher degree levels they do push in the opposite direction. For intelligence, the enlightenment story holds—or perhaps the cognitive dissonance story holds. Either way, independently, intelligence is associated with lower attitude extremity across the extremity distribution. But once education's effect is separated from intelligence's effect, that is, after controlling for ability bias, it is only a moderator at the high school level.

Our speculation is that the change in education as a student progresses is itself driving our results. Through high school, students are exposed to a broad mix of facts in science and social studies that may conflict with their priors, leading to a moderation of their attitudes through a combination of response to cognitive dissonance and enlightenment. The same reasoning applies to intelligence, as both abstract and critical thinking tend to highlight contradictions in a student's attitudes and actions. But as higher education continues, particularly at the postgraduate level, education becomes more specialized and narrow, such that a student is no longer confronted with more and higher-quality objections to their preferred views, outside her area of expertise.

It is noteworthy that the economic beliefs of strong conservatives were the most extreme subset. Miller (2007, 54) found that strongly conservative respondents were more likely than self-identified "slightly conservative" respondents to support wage controls, price controls, and a number of other economic positions traditionally associated with the left. Indeed, for both liberals and conservatives, strong-ideologue status typically promotes anti-market attitudes. While prior GSS research has found that the general public is generally "anti-market" (Caplan and Miller 2010), both extreme liberals and extreme conservatives are more hostile to markets than the median GSS respondent. It is important to keep in mind that attitude extremity does not necessarily map onto beliefs aligning with standard political intuitions and stereotypes—that, perhaps ironically, extremity does not correlate with ideological purity.

It appears that even strong liberals are less extreme on economic and social issues than strong conservatives are, respectively, on those same issues. While the mean conservative is less confident on social issues than the mean liberal is on economic issues, the lower ends of the extremity distributions—the people most vulnerable to persuasion—tell a different story. The lower tail of the distribution of conservatives on social issues is more extreme than the lower tail

of liberals on economic issues. This suggests that overall, moderate liberals are more open to persuasion on economic issues than moderate conservatives are on social issues.

Political analysis, in terms of both scholarship and punditry, typically emphasizes the importance to candidates of rallying a party's political "core" (Cox and McCubbins 1986) versus the wooing of potential "swing voters" (Lindbeck and Weibull 1987). It is our conjecture that the lower tail—those whose responses generally resided nearer neutrality—is more likely to be pursued as potential swing voters. They are the constituents whose opinions are either (or both) less rigid or less personally salient, and whose preferences a campaign may be able to influence. At the other end of the spectrum, the upper tail is made up of individuals whose responses generally resided near the extremes, strongly agreeing and disagreeing with specific policy and opinion statements. Higher-extremity individuals are more likely to be counted among one party or another's political core—individuals who are not likely to be persuaded to a differing opinion. They are the individuals that a candidate needs to ensure come out to the poll and serve as grassroots spokesmen with their peers.

From a political-calculus point of view, this suggests that educational background, similar to religious identity, is an important consideration when a candidate wants to either pursue election-winning swing voters or rally their political core (Shapiro, Glaeser, and Ponzetto 2005). For example, while we did not identify as many statistically significant effects in the lower tail of the distributions, those we did find suggest that the population of swing voters will be sensitive to college graduation rates. College increases the overall extremity of opinions in the lower tail, but particularly on environmental issues. Given that intelligence and college completion are highly correlated, this might explain why environmental issues are a popular way of rallying voters who might otherwise be swing voters. Taken together, our findings suggest that the ideal pool of potential swing voters would be highly intelligent and rich in high school graduates, but with relatively few college degrees. As an indicator of how large that pool may be, in our sample from the GSS, 15.45 percent of individuals who did not complete college had a WORDSUM score of 8 or higher—certainly enough to swing an election for the statistically minded candidate.

Appendix 1. Full Text of Opinion Questions from the GSS

ECONOMIC ISSUES

EQWLTH: Some people think that the government in Washington ought to reduce the income differences between the rich and the poor, perhaps by raising the taxes of wealthy families or by giving income assistance to the poor. Others think that the government should not concern itself with reducing this

income difference between the rich and the poor. Here is a card with a scale from 1 to 7. Think of a score of 1 as meaning that the government ought to reduce the income differences between rich and poor, and a score of 7 meaning that the government should not concern itself with reducing income differences. What score between 1 and 7 comes closest to the way you feel?

HELPSICK: In general, some people think that it is the responsibility of the government in Washington to see to it that people have help in paying for doctors and hospital bills; they are at point 1. Others think that these matters are not the responsibility of the federal government and that people should take care of these things themselves; they are at point 5. Where would you place yourself on this scale, or haven't you made up your mind on this?

HELPPOOR: I'd like to talk with you about issues some people tell us are important. Some people think that the government in Washington should do everything possible to improve the standard of living of all poor Americans; they are at point 1 on this card. Other people think it's not the government's responsibility, and that each person should take care of himself; they are at point 5. Where would you place yourself on this scale, or haven't you made up your mind on this?

HELPNOT: Some people think that the government in Washington is trying to do too many things that should be left to individuals and private business; they are at point 5 on this card. Others disagree and think that the government should do even more to solve our country's problems; they are at point 1. Where would you place yourself on this scale, or haven't you made up your mind on this?

LETIN1: Do you think the number of immigrants to America nowadays should be increased a lot, increased a little, remain the same as it is, reduced a little, or reduced a lot?

GOVEQINC: Do you agree or disagree? It is the responsibility of the government to reduce the differences in income between people with high incomes and those with low incomes.

1 = "Strongly agree"; 2 = "Agree"; 3 = "Neither agree nor disagree"; 4 = "Disagree"; 5 = "Strongly disagree"

EQINCOME: It is the responsibility of the government to reduce the differences in income between people with high incomes and those with low incomes.

1 = "Strongly agree"; 2 = "Agree"; 3 = "Neither agree nor disagree"; 4 = "Disagree"; 5 = "Strongly disagree"

PRIVENT: Do you agree or disagree private enterprise is the best way to solve America's economic problems?

1 = "Strongly agree"; 2 = "Agree"; 3 = "Neither agree nor disagree"; 4 = "Disagree"; 5 = "Strongly disagree"

SOCIAL ISSUES

HELPBLK: Some people think that African Americans have been discriminated against for so long that the government has a special obligation to help improve their living standards; they are at point 1. Others believe that the government should not be giving special treatment to Blacks/Negroes/African Americans; they are at point 5. Where would you place yourself on this scale, or haven't you made up your mind on this?

WORKWAYUP: Irish, Italians, Jewish, and many other minorities overcame prejudice and worked their way up. Blacks should do the same without special favors.

1 = "Strongly agree"; 2 = "Agree"; 3 = "Neither agree nor disagree"; 4 = "Disagree"; 5 = "Strongly disagree"

HARMGOOD: How much do you agree or disagree with each of these statements? Overall, modern science does more harm than good.

1 = "Strongly agree"; 2 = "Agree"; 3 = "Neither agree nor disagree"; 4 = "Disagree"; 5 = "Strongly disagree"

SCIFAITH: How much do you agree or disagree with each of these statements? We believe too often in science, and not enough in feelings and faith.

1 = "Strongly agree"; 2 = "Agree"; 3 = "Neither agree nor disagree"; 4 = "Disagree"; 5 = "Strongly disagree"

HUBBYWRK: A husband's job is to earn money; a wife's job is to look after the home and family.

1 = "Strongly agree"; 2 = "Agree"; 3 = "Neither agree nor disagree"; 4 = "Disagree"; 5 = "Strongly disagree"

HOMOSEX: What about sexual relations between two adults of the same sex? Is it always wrong, almost always wrong, sometimes wrong, or not at all wrong?

MARBLK: What about having a close relative marry a black person? Would you be very in favor of it happening, somewhat in favor, neither in favor nor opposed to it happening, somewhat opposed, or very opposed to it happening?

ANTESTS: It is right to use animals for medical testing if it might save human lives.

1 = "Strongly agree"; 2 = "Agree"; 3 = "Neither agree nor disagree"; 4 = "Disagree"; 5 = "Strongly disagree"

ENVIRONMENTAL ISSUES

GRNECON: And please check one box for each of these statements to show how much you agree or disagree with it: We worry too much about the future of the environment, and not enough about prices and jobs today.

1 = "Strongly agree"; 2 = "Agree"; 3 = "Neither agree nor disagree"; 4 = "Disagree"; 5 = "Strongly disagree"

HARMSGRN: And please check one box for each of these statements to show how much you agree or disagree with it: Almost everything we do in modern life harms the environment.

1 = "Strongly agree"; 2 = "Agree"; 3 = "Neither agree nor disagree"; 4 = "Disagree"; 5 = "Strongly disagree"

GRNSOL: And how willing would you be to accept cuts in your standard of living in order to protect the environment?

1 = "Very willing"; 2 = "Fairly willing"; 3 = "Neither willing nor unwilling"; 4 = "Not very willing"; 5 = "Not at all willing"

GRNTAXES: And how willing would you be to pay much higher taxes in order to protect the environment?

1 = "Very willing"; 2 = "Fairly willing"; 3 = "Neither willing nor unwilling"; 4 = "Not very willing"; 5 = "Not at all willing"

GRNPRICE: How willing would you be to pay much higher prices in order to protect the environment?

1 = "Very willing"; 2 = "Fairly willing"; 3 = "Neither willing nor unwilling"; 4 = "Not very willing"; 5 = "Not at all willing"

GRWTHARM: How much do you agree or disagree with each of the following statements? Economic growth always harms the environment.

1 = "Strongly agree"; 2 = "Agree"; 3 = "Neither agree nor disagree"; 4 = "Disagree"; 5 = "Strongly disagree"

GRWTHELP: How much do you agree or disagree with each of the following statements? In order to protect the environment, America needs economic growth.

1 = "Strongly agree"; 2 = "Agree"; 3 = "Neither agree nor disagree"; 4 = "Disagree"; 5 = "Strongly disagree"

SCIGRN: How much do you agree or disagree with each of these statements? Modern science will solve our environmental problems with little change to our way of life.

1 = "Strongly agree"; 2 = "Agree"; 3 = "Neither agree nor disagree"; 4 = "Disagree"; 5 = "Strongly disagree"

DRIVLESS: And how often do you cut back on driving a car for environmental reasons?

1 = "Always"; 2 = "Often"; 3 = "Sometimes"; 4 = "Never"

TEMPGEN: In general, do you think that a rise in the world's temperature caused by climate change is extremely dangerous for the environment, very dangerous, somewhat dangerous, not very dangerous, or not dangerous at all for the environment?

1 = "Extremely dangerous for the environment"; 2 = "Very dangerous"; 3 = "Somewhat dangerous"; 4 = "Not very dangerous"; 5 = "Not at all dangerous"

NUKEGEN: Please check one box for each of the questions below to show what you think. In general, do you think that nuclear power stations are extremely dangerous for the environment, very dangerous, somewhat dangerous, not very dangerous, or not dangerous at all for the environment?

1 = "Extremely dangerous for the environment"; 2 = "Very dangerous"; 3 = "Somewhat dangerous"; 4 = "Not very dangerous"; 5 = "Not at all dangerous"

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