What Makes Constituencies Ideologically Heterogeneous?

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Abstract

Ideologically heterogeneous constituencies in the U.S. elect more extreme lawmakers, but it is unclear what factors make constituencies more ideologically heterogeneous. Explaining this variation across constituencies can help scholars understand the electoral roots of elite polarization. This article identifes aggregate education levels as a contributing factor. It is expected that greater educational attainment moves individuals further to the ideological extremes, increasing ideological heterogeneity in generally moderate populations. However, the relationship between education and ideological extremity is found to be asymmetric; higher educational attainment is associated with greater extremity among liberals but not among conservatives. Consequently, higher aggregate education levels are associated with greater heterogeneity in right-leaning constituencies but greater homogeneity in left-leaning constituencies. Data from the CCES, ANES and American Community Survey provide evidence. The results point to increasing education levels in the mass public as a potential contributing factor to increasing polarization among American elected representatives.

Why are some constituencies ideologically heterogeneous in the U.S. while other constituencies are ideologically homogeneous? Scholars have argued that greater demographic diversity in constituencies produces greater ideological heterogeneity, assuming that differences in issue-specific opinions or in the partisan leanings of social and economic groups aggregated to a wider distribution of ideological views in a constituency (Bailey and Brady 1998; Bishin, Dow, and Adams 2006; Fiorina 1974). However, some of the most demographically diverse locations in the U.S.—large cities—also tend to be the most ideologically homogeneous (and liberal). Likewise, scholars measuring ideological heterogeneity in state populations have found that some of the most demographically homogeneous states, such as Oregon and Iowa, are among the most ideologically heterogeneous (Kirkland 2014; Levendusky and Pope 2010).

Instead of traditional demographic variables, differences in the education levels of constituencies may help to explain the variation in ideological heterogeneity. Most Americans are inattentive to politics and lack a coherent ideology structuring their opinions across issues. Highly educated individuals are most likely to hold structured issue preferences (Converse 1964; Delli Carpini and Keeter 1996; Federico and Schneider 2007; Zaller 1992). Holding multiple issue preferences consistent with an ideology moves individuals to the extremes of the distribution of citizen ideology on a liberal-conservative dimension (Broockman 2016). If this were true at the individual level, we would expect populations to become more ideologically heterogeneous when individuals are distributed across that dimension more evenly, with relatively more individuals positioned at the extremes and relatively fewer positioned at the median than in a normal distribution.

However, college graduates have trended toward the ideological left in recent decades,[1] raising the possibility that the relationship between education and ideological extremity is asymmetric. If this were the case, then the relationship between ideological heterogeneity and education levels would be conditional on the average ideology of citizens in a con-

[1]Pew Research Center. (2016) "A Wider Ideological Gap Between More and Less Educated Adults." Accessed online 5 February 2018 at http://www.people-press.org/2016/04/26/a-wider-ideological-gap-between-more-and-less-educated-adults/

stituency. An increase in education levels would produce relatively greater heterogeneity in constituencies that are more conservative on average than it would in constituencies that are more liberal on average.

Analysis of data from the 2012 American National Election Study, multiple waves of the Cooperative Congressional Election Study, and the American Community Survey provides evidence for a conditional relationship between aggregate education levels and ideological heterogeneity. Results using individual-level data demonstrate that among self-identified liberals (or Democrats), more educated individuals hold more ideologically consistent issue opinions, placing them at the extremes of the ideological distribution. However, higher education does not predict more ideologically consistent issue opinions among self-identified conservatives (or Republicans).

Subsequent aggregate-level analysis of data from the 50 American states shows that, as a result, the association between education levels and ideological heterogeneity is conditional on mean citizen ideology in the state. In right-leaning states, higher education levels are associated with greater ideological heterogeneity. However, in left-leaning states, higher education levels are associated with greater ideological homogeneity. The findings have implications for our understanding of polarization, both in the mass public and among elected officials. Knowing the factors that produce ideologically heterogeneous constituencies can help scholars, political analysts, and policymakers identify the electoral conditions that will produce more extreme legislators.

Representation and Ideological Heterogeneity

Elected officials in the U.S. are expected to learn and represent the preferences of their constituencies in their lawmaking decisions. However, heterogeneity in public opinion complicates that task. Officeholders must make political decisions while taking into account competing political demands made on them by constituents who disagree with one another. Ideological heterogeneity in constituencies induces lawmakers to behave

differently in office than their colleagues who represent ideologically homogeneous constituencies (Bishin, Dow, and Adams 2006; Ensley 2012; Gerber and Lewis 2004; Harden and Carsey 2012; Jones 2003; Kirkland 2014; Levendusky and Pope 2010). Lawmakers in heterogeneous districts tend to respond less to average constituency preferences (Bishin, Dow, and Adams 2006; Gerber and Lewis 2004), side with their party's leadership more often when casting roll-call votes (Harden and Carsey 2012), and position themselves to mobilize supporters rather than persuade swing voters (Ensley 2012). Legislatures governing more ideologically heterogeneous states also tend to be more polarized (Kirkland 2014). Understanding why some constituencies are more ideologically heterogeneous than others can move scholars toward understanding the electoral causes of polarization among representatives in government.

Scholarship to date has taken ideological heterogeneity as a set feature of a political environment rather than a political phenomenon deserving attention and explanation in its own right. Early work tended to assume that demographic diversity produced greater ideological heterogeneity in constituencies (Bailey and Brady 1998; Bond 1983; Fiorina 1974). However, more recent studies have asserted that demographic variables poorly measure the concept (Gerber and Lewis 2004; Levendusky and Pope 2010: though see Bishin, Dow, and Adams 2006).

Further evidence contradicting the demographic diversity hypothesis is readily available from an examination of urban populations. Cities tend to host more diverse populations than suburban and rural areas in the U.S. both on economic and on racial and ethnic dimensions (Gimpel and Schuknecht 2003). However, cities have also become Democratic strongholds in elections in the last few decades (Pearson-Merkowitz and McTague 2008). Regardless of the mechanism, individuals loyal to one party are most likely to hold views that are internally consistent and that diverge from the views of loyalists in the other party. In order to understand ideological heterogeneity in constituencies, researchers must move beyond explanations based on demographic characteristics.

Explaining Ideological Heterogeneity

Broadly speaking, ideological heterogeneity could refer to a variety of opinions, preferences, values, or priorities on any number of issues or issue dimensions. But scholars have almost exclusively defined or operationalized ideological heterogeneity as variance in what Ellis and Stimson (2012) refer to as operational ideology (referring to the issue positions that citizens hold rather than how they self-identify[2]) on a single liberal-conservative dimension.[3] This dimension has been important to study, since scholars have repeatedly shown that ideological heterogeneity along this dimension produces extremity among politicians (Ensley 2012; Gerber and Lewis 2004; Harden and Carsey 2012; Kirkland 2014).

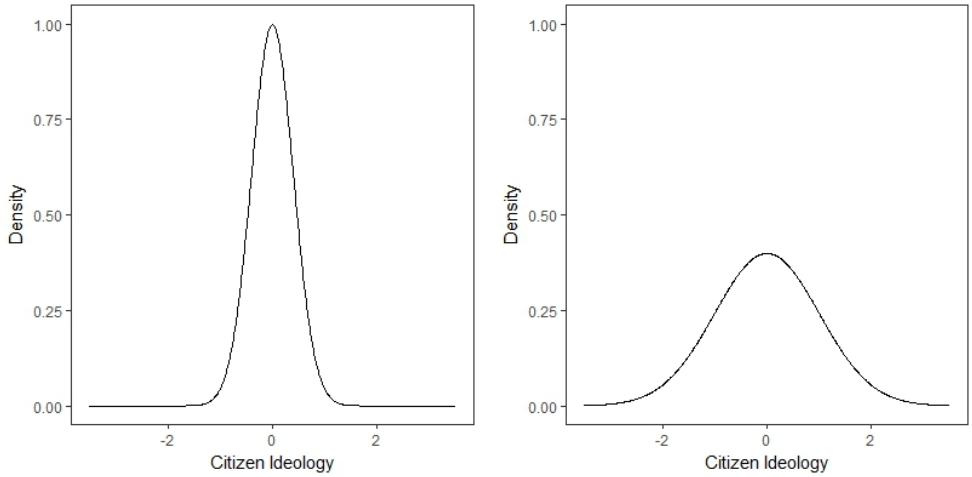
For a constituency to be ideologically heterogeneous, it requires the presence of some conservative citizens, some moderate citizens, and some liberal citizens. Figure 1 illustrates this in two hypothetical constituencies where citizen ideology is assumed to be normally distributed, with the horizontal axis representing ideology on a liberal-conservative spectrum and the vertical axis representing the density of voters. In Constituency A, citizen ideology is more homogeneous. Most voters are moderate and clustered tightly around the median ideological position. In Constituency B, citizen ideology is more heterogeneous. Constituency B contains a mixture of liberal, moderate, and conservative voters. The figure shows that constituencies are more ideologically heterogeneous when more citizens hold very liberal or very conservative ideological opinions.

The key to understanding ideological heterogeneity is understanding how some citizens come to hold extreme positions on both ends of a left-right ideological spectrum. However, extremity on the left-right spectrum does not necessarily mean that individuals hold radical views on individual issues. Rather, it means that individuals have aligned their

[2]Bishin, Dow, and Adams (2006) and Jones (2003) measure ideological heterogeneity using self-placement on ideology scales, though this might better capture heterogeneity on a symbolic dimension.

[3]Levendusky and Pope (2010) introduce a measure that can be adapted to fit any ideological dimension of interest by researchers. However, they demonstrate and validate a measure that captures a left-right economic dimension of ideology.

Figure 1: Ideological Heterogeneity in Two Hypothetical Constituencies



Constituency A Constituency B

opinions on individual issues to be consistent with elite stances on one side of the spectrum or the other (Broockman 2016).

Given this understanding, differences in ideological heterogeneity across constituencies could potentially be explained as the result of differences in education levels. Most voters are inattentive to politics and hold neither strong nor ideological views on most political issues (Campbell et al. 1960; Converse 1964; Delli Carpini and Keeter 1996). Ideology forms as individuals gather more information about politics and align that information with their preexisting beliefs. Motivated reasoning leads individuals to take cues on issue stances from political elites they already support (Lenz 2013; Taber and Lodge 2006). If their views conflict, individuals change their views to match those elite sources (Carsey and Layman 2006).

A necessary step in forming a coherent ideology is acquiring information about politics. While family ties and socialization predispose people to supporting one party's agenda or the other (Campbell et al. 1960), building an ideology requires familiarity with issues, politicians, and political events. Generally, more politically knowledgeable citizens hold more consistent or structured ideological views (Broockman 2016; Federico and Schneider 2007; Zaller 1992).

One way many people acquire information about politics in the early years of their lives is through education. As students move through years of schooling, they encounter formal and informal opportunities to gain information about politics. Formally, students take courses such as American history and civics, which in many states are required curriculum for graduation. In institutions of higher education, students are able to complete a broader variety of courses related to politics. Informally, students in secondary and higher education programs are exposed to social networks comprised of teachers and peers who hold and impart information about politics through casual discussion. Even after graduation, the social networks and learning habits that individuals acquire through formal education continue to shape their political thinking.

People who have completed more years of schooling also tend to know more about politics, all else equal (Delli Carpini and Keeter 1996; Zaller 1992). In his classic essay on belief systems in mass publics, Converse (1964) expected that gaining more information about politics, perhaps through higher education, helped citizens to form consistent ideological viewpoints. Converse wrote that "...as one moves from elite sources of belief systems downwards on such an information scale...the contextual grasp of 'standard' political belief systems fades out very rapidly, almost before one has passed beyond the 10% of the American population that in the 1950s had completed standard college training" (1964, 213). Subsequent research has also found that holding a college degree correlates with holding a more ideologically structured set of political beliefs (Federico and Schneider 2007; Sniderman, Brody, and Tetlock 1991).

Of course, an association between education and a more structured ideology does not mean that education *causes* individuals to developed ideologically structured issue opinions. Another possibility is that individuals who have qualities that help in forming ideologically principled views, such as intelligence or interest in politics, select into attaining higher education, with education itself adding little to individuals' understanding of politics (Luskin 1990). Moreover, formal education is not the only way for citizens to gain the information necessary to structure their own beliefs. Paying close attention to news

coverage or becoming personally involved in politics can also increase political knowledge, regardless of educational background (Barabas and Jerit 2009). However, recent evidence suggests that education does causally and positively affect knowledge (Dee 2004; Milligan, Moretti, and Oreopoulos 2004). Most pertinently, education constitutes the single strongest predictor of political knowledge among individuals, and that knowledge helps individuals to structure their views (Delli Carpini and Keeter 1996, though see Highton 2009).

If education causes individuals to develop ideologically structured issue opinions, then greater educational attainment would be associated with individual placement closer to the extremes of the distribution. Then again, not all highly educated people are ideologues. Moderates may maintain consistently moderate views as they obtain more formal education. However, consistent moderates would not increase the variance in citizen ideology due to their central location in the distribution of opinion.

Moving to the aggregate level, more individuals located at the extremes of the distribution (through education) would result in greater ideological heterogeneity. We would expect to observe little heterogeneity in a hypothetical constituency where all voters had little formal education or where all voters were committed moderates. However, conditional on a mixture of voters predisposed toward liberal, conservative, or moderate views being present in a constituency, higher education levels should further increase the variance in citizen ideology. Formally, I test the hypothesis:

H1: As education levels in a constituency increase, the ideological heterogeneity of the constituency increases.

Ideological Asymmetry in Educational Attainment?

A potential complication in the theory outlined above is the possibility that education is associated with ideological extremity to a greater degree for liberals than for conservatives.

A 2016 report from the Pew Research Center shows that college graduates have moved significantly toward holding consistently liberal issue opinions in the last two decades.[4] Meanwhile, the percent of Americans holding consistently conservative issue opinions has not varied by education level and has remained stable over the last two decades.

One possible explanation for this trend (and one commonly evoked by conservative commentators, e.g. Horowitz 2009) is that, through college attendance, students become exposed to and indoctrinated into a liberal worldview by their liberal professors. It is certainly the case that college professors are more liberal as a group than the general public (Gross 2013). But the causal evidence behind conservatives' claims are mixed. Classic studies tended to find liberalizing effects of higher education on student attitudes (Astin 1977; Newcomb 1943; Pascarella and Terenzini 1991), but more recent research complicates this narrative in three notable ways. First, research has pointed to the importance of institution-level effects in instilling more liberal or conservative views in students (Dey 1996; Mariani and Hewitt 2008). While there is evidence that students develop more liberal views while studying at liberal arts colleges (Hanson et al. 2012), few would expect students at avowedly conservative or fundamentalist Christian colleges to develop more liberal opinions on the issues during their studies. A second and related point is that students tend to select into attending institutions where their pre-existing political beliefs will be reinforced (Mariani and Hewitt 2008). As a consequence, a college education likely does not persuade students to adopt views that they are not already receptive to. Third, studies of the effect of college on ideology tend to measure student ideology using self-reports (e.g. Hanson et al. 2012), but students' individual issue opinions may move in either liberal or conservative directions. For example, a college education does seem to make students more tolerant of outgroup members (Hastie 2007), but students at economically privileged institutions are more likely to develop more economically conservative views over their course of their studies (Mendelberg, McCabe, and Thal 2016).

Though educational attainment itself does not seem to cause all students to develop

[4]See footnote 1.

more liberal positions on all issues, conservatives are not wrong in observing a positive (and growing) correlation between educational attainment and liberal ideology. This trend could be explained by more liberals than conservatives selecting into higher education, or by liberalizing institutions graduating a growing number of students compared to conservatizing institutions (or both). Another possible explanation is geographic sorting. College graduates have increasingly tended to take jobs in urban areas and cities (Carr 2009; Costa and Kahn 2000), areas conventionally considered home to more liberal thought. While it is possible that already-liberal college graduates prefer moving to cities precisely for their political environment, it could also be the case that college graduates sort into urban living for nonpolitical, strictly economic reasons, and once there, adopt the liberal views of their new communities.

It is beyond the scope of this paper to determine the exact cause of the trend in college graduates toward a more consistent liberal ideology. However, an empirical asymmetry between liberals and conservatives in the relationship between educational attainment and ideological extremity has an important implication for the research question at hand. It suggests a conditional relationship between education levels and ideological heterogeneity at the aggregate level.

If education were associated only with more extreme liberal ideology (and not conservative), then it should have a positive association with heterogeneity in conservative-leaning constituencies and a negative association with heterogeneity in liberal-leaning constituencies. Consider a hypothetical constituency where citizen ideology is normally distributed but conservative on average for reasons unrelated to education (e.g. influence of a political culture or predominant religion). Increasing education levels would expand the variance in citizen ideology by placing more extreme individuals on the left side of the distribution. The effect of increased education levels would be to transform the normal distribution into a left-skewed distribution, increasing the variance as a result. However, consider a different hypothetical constituency where citizen ideology is normally distributed but liberal on average for reasons unrelated to education. Increasing education levels would decrease

the variance by centering relatively more individuals on the left side of the distribution. I test the hypothesis:

H2: The positive association between education and heterogeneity decreases as mean citizen ideology becomes more liberal.

Individual Predictors of Ideological Extremity

Before testing the hypotheses using aggregate-level data, I examine the relationship between education and ideological extremity at the individual level for two reasons. First, conducting the individual-level analysis will provide evidence supporting the micro-level assumptions upon which the aggregate analysis is built. This should help to reassure readers that the aggregate-level findings do not suffer from the ecological inference fallacy. Second, individual-level analysis will indicate whether there is an asymmetry between liberals and conservatives in the relationship between education and ideological consistency.

I turn to two separate data sets for evidence. I use the 2010 Cooperative Congressional Election Study (CCES), which also serves as the source of data for the aggregate-level analyses in the next section. Using this data set brings the advantage of a large sample size that allows for reliable estimation of the substantive relationship between education and ideological extremity. I also replicate the individual-level analysis using data from the 2012 American National Election Study (ANES). If analysis of both data sets produces similar results, readers can be more confident in the generalizability of the results.

To measure individual ideological extremity, I factor analyzed individual responses to a battery of questions on six political issues. The issues were chosen to align with the issues chosen by Harden and Carsey (2012) in their analysis of ideological heterogeneity using CCES data (the same measure that will be used in the aggregate-level analyses below). Both the CCES and ANES asked respondents questions about their positions of four of the

six issues: affirmative action, environmental protection, abortion, and healthcare reform. The fifth question used in the CCES, on stem cell research, was not asked on the ANES. Instead, I substituted respondents' opinion on the issue of legalizing child adoption by gay couples.[5]

I calculated a factor score for each individual based on the first dimension principal component, which I assume captures the individual's placement on a single liberal/conservative ideological dimension. This created a measure of ideology with a mean of zero and a standard deviation of one, such that higher scores indicate a more liberal ideology and lower scores indicate a more conservative ideology. I created the dependent variable *Ideological Extremity* by calculating the absolute value of each individual's ideology factor score. Larger values indicate more extreme ideological positions, while values closer to zero indicate less extreme ideological positions.[6]

The independent variable of interest is respondents' level of education. For both surveys, I measure *Education* by relying on respondents' self-reports of their highest completed level of education. I use an ordinal scale ranging from 0 to 4: 0 indicates the respondent has less than a high school education; 1 indicates a high school diploma; 2 indicates some college but no degree; 3 indicates a four-year college degree; and 4 indicates a postgraduate degree. As an alternative measure, I use a simple indicator variable of *College* education, describing whether or not the respondent holds a four-year college degree.

I run a series of multiple regression models to test the expected positive association between ideological extremity and education while controlling for potential confounding

[5]The complete wording for all six questions on both surveys is provided in the supporting information. I assume that respondent opinions are positively correlated on the issues of stem cell research and gay adoption, given that disagreements are rooted in differences in religious values. Further analysis presented in the supporting information shows that, with only minor differences, the same political and demographic variables predict support for gay adoption and stem cell research.

[6]Broockman (2016) asserts that ideological extremity as measured using latent analysis techniques captures ideological *consistency* rather than extremity. However, I show in the supporting information that ideological consistency and extremity should nonetheless be treated as distinct concepts. I use extremity to refer to individuals who *both* hold consistent views *and* have either a liberal or conservative (but not moderate) worldview.

factors. First, I control for respondents' *Interest* in politics. Both surveys ask respondents how often they pay attention to news about government and politics. Responses for the variable are coded so that higher values represent greater interest in politics. Second I control for respondents' *Knowledge* about politics. The CCES does not ask respondents factual questions about politics, so I rely exclusively on the ANES for this control variable. I measure political knowledge using five questions capturing respondents' static knowledge about politics. I factor analyzed responses and calculated a factor score such that higher values represent more knowledgeable individuals. I assume that partisans have more extreme ideological positions than pure independents. I include indicators for both *Democratic* and *Republican* respondents. Independent leaners are included as partisans. Finally, I include a number of control variables for individual demographic factors that might influence one's ideological extremity: gender, age, race/ethnicity, income, and religion. [7]

The results of a full model including control variables are presented Table 1. Models 1 through 4 display results using ANES data, while models 5 through 8 display results from CCES data. All eight models provide evidence that more educated individuals hold more extreme ideological views on average across issues. In both data sets, higher levels of education are positively related to ideological extremity. This finding holds whether education is measured with an ordinal variable capturing level of education or an indicator variable for whether the respondent holds a four-year college degree. In fact, the sizes of the coefficient estimates for both variables are very similar across data sets. The coefficient estimates in all eight models are statistically significant.

The sign and significance of the education and college variables in the odd-numbered models remain consistent in both sets of results even after adding controls, though the coefficient size for the educational variables decreased. Generally speaking, results for the control variables align with expectations. Results from both surveys indicate that respondents more interested in politics hold issue positions that are significantly more

[7]Summary statistics for each of the variables are available in the supporting information.

Table 1: Education and Ideological Extremity

	ANES 2012				CCES 2010			
	Dependent variable: Ideological Extremity							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Education	0.06*	0.02*			0.06*	0.04*		
	(0.01)	(0.01)			(0.00)	(0.00)		
College			0.12*	0.05*			0.14*	0.09*
			(0.02)	(0.02)			(0.01)	(0.01)
Interest		0.11*		0.11*		0.08*		0.09*
		(0.01)		(0.01)		(0.00)		(0.00)
Knowledge		0.07*		0.07*				
		(0.01)		(0.01)				
Democrat		0.06*		0.06*		0.11*		0.11*
		(0.02)		(0.02)		(0.01)		(0.01)
Republican		0.19*		0.19*		0.096*		0.096*
		(0.028)		(0.028)		(0.010)		(0.010)
Male		0.01		0.00		0.05*		0.05*
		(0.02)		(0.02)		(0.01)		(0.01)
Age		0.01*		0.01*		0.01*		0.01*
		(0.01)		(0.01)		(0.00)		(0.00)
White		-0.03		-0.03		-0.05*		-0.05*
		(0.05)		(0.05)		(0.01)		(0.01)
Black		-0.03		-0.03		-0.02		-0.02
		(0.06)		(0.05)		(0.02)		(0.02)
Hispanic		-0.09		-0.09		-0.03		-0.03
		(0.05)		(0.05)		(0.02)		(0.02)
Income		-0.00		-0.00		0.00		0.00*
		(0.00)		(0.00)		(0.00)		(0.00)
Born Again Christian		0.15*		0.15*		0.07*		0.07*
		(0.024)		(0.024)		(0.01)		(0.01)
Constant	0.73*	0.37*	0.81*	0.40*	0.65*	0.31*	0.73*	0.35*
	(0.02)	(0.06)	(0.01)	(0.06)	(0.01)	(0.02)	(0.00)	(0.02)
N	4,717	4,516	4,717	4,516	47,281	47,217	47,281	47,217
R^2	0.01	0.14	0.01	0.14	0.02	0.10	0.02	0.10

Note: *p<0.05. Survey-adjusted coefficient estimates from OLS regression, with standard errors in parentheses. Significance tests are two-tailed. Data for models 1 through 4 come from the 2012 American National Election Study. Data for models 5 through 8 come from the 2010 Cooperative Congressional Election Study.

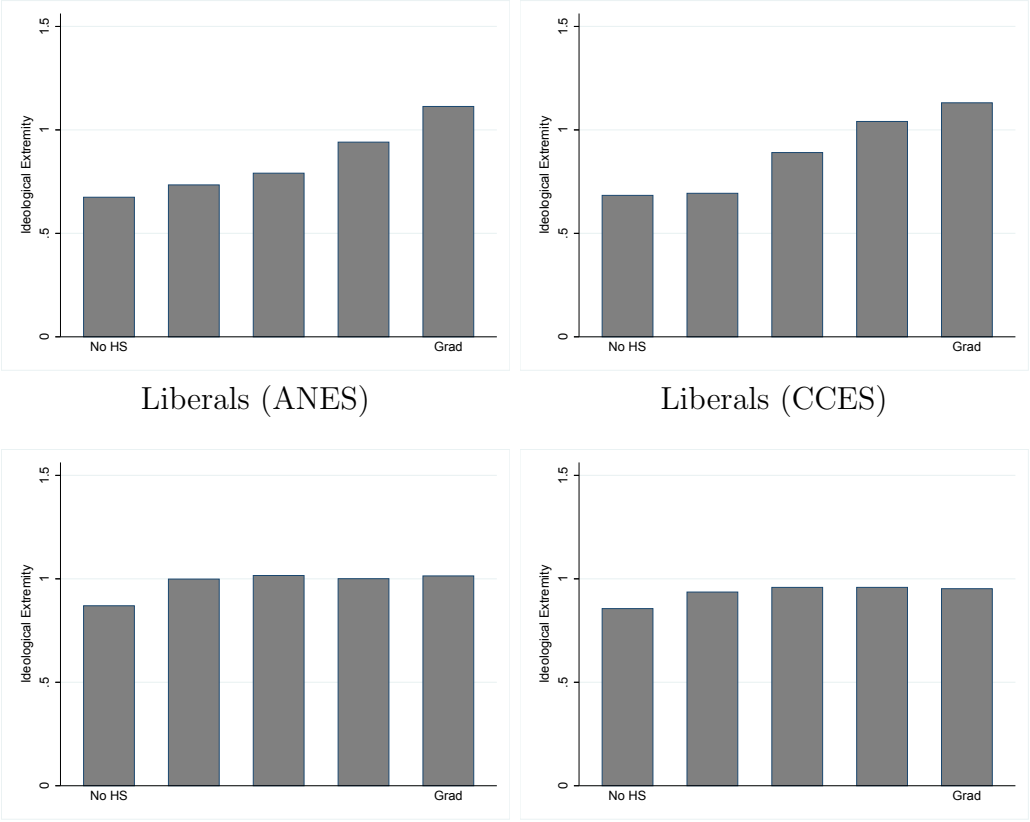
extreme. While the CCES and ANES results provide mixed evidence of gender and race effects in the responses, data from both surveys show that older individuals, partisans, and evangelical Christians hold more ideologically extreme positions on average.

While the results in Table 1 show an average positive association between education levels and ideological extremity, they do not speak to whether the association is asymmetric between liberals and conservatives. As an initial test of asymmetry, I estimate the association between ideological extremity and education among self-identified liberals and self-identified conservatives. Figure 2 displays the results using data from both surveys. In each plot, the x-axis represents the 5-point education measure while the y-axis represents ideological extremity as measured above. Each bar represents the average value of ideological extremity by education level.

The top panels show the results for self-identified liberals. As education levels increase, ideological extremity increases in a largely linear fashion, such that liberals without high school diplomas are the least extreme and liberals with graduate or professional degrees are the most extreme. Moving to the bottom panels for self-identified conservatives, no similar linear pattern exists. In both surveys, it appears that conservatives without a high school diploma are less extreme on average than other conservatives. However, there appears to be no relationship between educational attainment and ideological extremity among conservatives with at least a high school diploma. Tentatively, at least, these figures seem to show an asymmetric association between education and extremity between liberals and conservatives.

Again, confounding variables like political interest, political knowledge, or demographic characteristics could mediate this relationship. In Table A1 in the appendix, I replicate the fully specified models in Table 1 above but conduct the analysis among liberals and conservatives separately. The models confirm the bivariate results in Figure 2 that the association between education and extremity is stronger for liberals than for conservatives. According to the ANES data, education levels are positively and significantly associated with extremity among liberals, but not significantly associated with extremity

Figure 2: Ideological Extremity and Education by Self-Reported Ideology



Source: 2012 American National Election Study, 2010 Cooperative Congressional Election Study. Education is measured using a 5-point categorical variable: did not complete high school, high school graduate, some college (no degree), four-year college degree, and graduate/professional degree.

among conservatives. According to the CCES data, education levels are positively and significantly associated with extremity among both liberals and conservatives, but the size of the association is stronger for liberals. The coefficient estimate for liberals (0.06) is greater than that for conservatives (0.02).

I also estimate the same models but separate respondents by party identification instead of self-reported ideology in Table A2 in the appendix.[8] Using party ID instead of self-reported ideology yields largely the same result. In both data sets, educational

[8]Independents who describe themselves as leaning towards one party or the other in survey data are classified as partisans for this analysis.

attainment is positively and significantly associated with ideological extremity among Democrats but is not significantly associated with extremity among Republicans.

Overall, these results confirm a positive relationship between higher education levels and ideological extremity. However, they demonstrate an asymmetry across the primary political divide in the U.S., such that education is associated with extremity only among liberals (or Democrats) and not among conservatives (or Republicans). Keeping this asymmetry in mind, I move forward to analyzing the relationship between education and heterogeneity at the aggregate level.

Ideological Heterogeneity in the 50 States

A larger empirical challenge is determine the nature of the relationship between ideological heterogeneity and aggregate education levels at the constituency level. For evidence, I turn to a comparison of the fifty U.S. states. The states provide appropriate units of analysis for two principal reasons. First, states are meaningful political units that are represented in the U.S. Senate and that elect their own governments. Because more ideologically heterogeneous populations tend to elect more extreme candidates (Ensley 2012; Gerber and Lewis 2004; Harden and Carsey 2012) and more polarized legislatures (Kirkland 2014), comparing the sources of ideological heterogeneity in states helps us better understand the process by which disagreement in constituencies translates into polarization in government. Second, state populations are sufficiently large to allow for the measurement of variance in citizen ideology using responses to large-N national surveys (Carsey and Harden 2010; Norrander 2001).

In this analysis I test two competing hypotheses. First is the hypothesis that ideological heterogeneity increases (linearly) as educational attainment in the population increases. Second is the hypotheses that the relationship is conditional on citizen ideology, such that the association between heterogeneity and education decreases as populations become more liberal on average.

I follow the procedure established by Harden and Carsey (2012) to measure the dependent variable, *Ideological Heterogeneity*.[9] I produce a measure of ideology for each individual by factor analyzing responses to five different issue opinion questions put to respondents on the Cooperative Congressional Election Study (CCES). This measure uses the same technique to measure ideology as the individual-level analysis above, but I calculate the mean and variance of the ideology of all respondents within each state. I use the variance in citizen ideology as the dependent variable. Data are observed in every state for even years from 2006 to 2014. *A priori*, we should expect these estimates to show some variation within states over time as populations and political environments change. However, extreme variation might indicate unreliable estimates. Encouragingly, the biennial estimates within states are fairly stable over time.[10]

To measure education levels, I use observational data for each state-year from the U.S. Census Bureau's American Community Survey. Specifically, my independent variable *College* is measured as the percentage of the state population holding a four-year college degree in the year of observation. According to 2014 estimates from the American Community Survey, the percentage of residents holding a four-year college degree by state varied from 18.75% in West Virginia to 39.98% in Massachusetts.

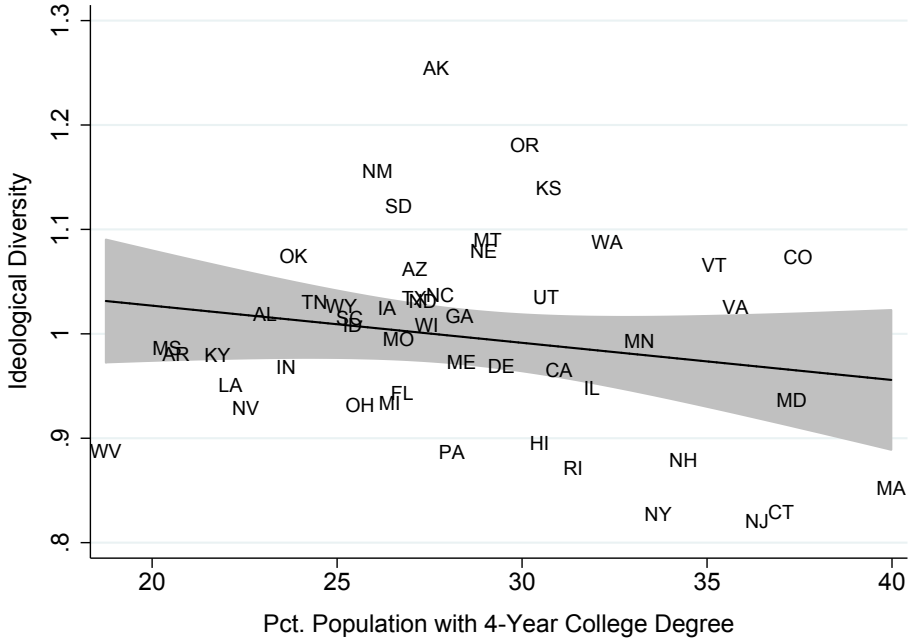
To measure average *Citizen Ideology*, I use the mean value of ideology for each state using the same data and technique that produced the estimates of ideological heterogeneity above. This mean value is equivalent to the measure of citizen ideology calculated and validated by Carsey and Harden (2010). Higher values of citizen ideology indicate a more liberal ideology.[11]

[9] I also considered using Levendusky and Pope's (2010) measure of ideological heterogeneity. However, their off-the-shelf estimates restrict ideology to an economic dimension, whereas Harden and Carsey's (2012) measure uses both social and economic issue questions to produce an estimate of left-right ideology. Nonetheless I replicated the findings in Table 2 using Levendusky and Pope's measure for the year 2006 (the only year for which they provide estimates) in Table A3 of the appendix. The results yield largely similar results to those using Harden and Carsey's measure.

[10] Full estimates of ideological heterogeneity for every state-year observed in the data and estimates of within-state variance are provided in the supporting information.

[11] To make sure the results were not dependent solely on this measure of citizen attitudes, I also estimated the results using presidential vote share for the years 2008 and 2012. The results, presented in Table A4 of the appendix, largely mirror the findings presented in Table 2 below.

Figure 3: Education Levels and Ideological Heterogeneity in the States



Source: 2014 American Community Survey, 2014 Cooperative Congressional Election Study

As a preliminary test of the first hypothesis, Figure 3 presents the bivariate relationship between education levels and ideological heterogeneity in the states for the year 2014. The horizontal axis presents the percent of the state's population that holds a four-year college degree, while the vertical axis presents the measure of ideological heterogeneity. In contrast with an expected positive relationship, there appears to be little relationship between state education levels and ideological heterogeneity. If any pattern appears, it is a negative association between the variables, but the association is not statistically significant.

To test the two hypotheses further, and to account for possible confounding factors, I estimate four multiple regression models in Table 2 below. In line with prior explanations of ideological heterogeneity (Bishin, Dow, and Adams 2006; Bond 1983), I control for two variables meant to capture demographic diversity. Previous analyses relied upon the Sullivan index (Sullivan 1973) to capture demographic heterogeneity on six component

variables: occupation, religion, foreign born status, education, housing type, and income. However, subsequent analyses discounted the index for failing to demonstrate that component variables adequately capture a latent variable of heterogeneity (Patterson and Caldeira 1984) and for failing to include politically relevant component variables (Koetzle 1998). Instead, I rely upon two separate measures of the diversity of state populations on racial and economic dimensions. Given the primacy of race and class to political cleavages in the U.S. (e.g. Hersh and Nall 2016; Miller and Schofield 2003), diversity on these two variables would be more likely than other demographic variables to be correlated with ideological heterogeneity. I measure *Racial Diversity* following Trounstine (2016) and *Income Inequality* using a Gini coefficient measuring income inequality in each state. Data for both variables come from the American Community Survey.

I further control for urban populations within states. Cities have voted overwhelmingly Democratic in recent decades (Pearson-Merkowitz and McTague 2008), suggesting more homogeneously liberal populations could find their home in states with larger urban populations. Moreover, college-educated populations tend to dwell disproportionately in urban areas. Estimating the precise relationship between education and heterogeneity requires controlling for the potentially confounding effect of urban environments. The variable *Urban* is measured as the percentage of all state residents living in an urban community. A community is considered urban if it is a Census-designated "urbanized area" with more than 50,000 residents, while all other places are considered rural.[12]

I control for the size of each state's *Population*. Larger populations tend to include individuals with a more diverse range of social characteristics, while smaller populations are more likely to be socially homogeneous (Hibbing and Alford 1990). Population estimates for each year come from the American Community Survey. I also control for *Inbound Migration*. An influx of residents from other states may produce greater heterogeneity

[12]Several of the variables (*College*, *Citizen Ideology*, and *Urban*) are positively correlated, but multicollinearity appears not to be a concern in estimating this model. When I regress the dependent variable on all independent variables and controls in a single model, the variance inflation factors (VIF) for the variables range between 1.91 and 2.73—well below the VIF value of 10 that conventionally indicates multicollinearity.

by introducing residents with ideological positions diverging from those already present in the state (e.g. Fiorina and Abrams 2009). Also drawing upon American Community Survey data, migration is measured as the percent of state residents who reported living in a different state one year prior to the survey's administration. Finally, I include fixed effects for years. [13]

I test the first hypothesis by estimating the linear model:

$$\textit{Ideological Heterogeneity} = \beta_0 + \beta_1 \cdot \text{Education} + \text{Controls} + \epsilon$$

If the first hypothesis is correct, I expect a positive, statistically significant coefficient estimate for the measure of education.

I use ordinary least squares (OLS) regression to analyze the data. Data from 2006 to 2014 are observed for each state. Because observations are clustered within states over time, I present results with bootstrap clustered standard errors. Regression results are presented in Table 2. Model 1 regresses ideological heterogeneity on education and includes fixed effects for the year of observation. In contrast to expectations from the first hypothesis, the coefficient estimate is negatively signed and not statistically significant. The result fails to provide evidence that education levels are positively associated with ideological heterogeneity.

In Model 2, I present the results from a fully specified model including the set of control variables listed above. Once controls are included, education levels are found to be positively associated with heterogeneity, as indicated by the positive sign on the coefficient estimate for the variable. However, the association is not significant. Turning to the control variables, more urban populations are found to be negatively associated with heterogeneity, whereas larger populations are found to be positively associated with heterogeneity. Both of these findings fall in line with expectations. However, none of the remaining variables are found to be significantly related to heterogeneity. In short, neither

[13] Summary statistics describing all variables included are presented in the supporting information.

Table 2: Education, Citizen Ideology, and Ideological Heterogeneity

	Dependent variable:			
	Ideological Heterogeneity			
	(1)	(2)	(3)	(4)
College	-0.21	0.38	0.05	0.36
	(0.23)	(0.31)	(0.28)	(0.29)
Citizen Ideology		-0.12	0.84*	0.68*
		(0.08)	(0.28)	(0.33)
College X			-3.44*	-2.86*
Citizen Ideology			(0.91)	(1.04)
Urban		-0.18*		-0.20*
		(0.09)		(0.08)
Racial		0.12		0.12
Diversity		(0.11)		(0.10)
Income		-1.16		-0.54
Inequality		(0.60)		(0.66)
Population		0.00*		0.00
(in millions)		(0.00)		(0.00)
Inbound Migration		0.02		0.01
		(0.01)		(0.01)
Year Fixed Effects	Yes	Yes	Yes	Yes
Constant	1.00*	1.34*	0.95*	1.13*
	(0.06)	(0.28)	(0.08)	(0.29)
N	250	250	250	250
Adj. R^2	0.02	0.20	0.15	0.25

Note: *p<0.05. Bootstrap clustered standard errors are presented in parentheses. Significance tests are two-tailed.

the simple bivariate model nor the fully specified model provides evidence supporting the first hypothesis.

I proceed to testing the second hypothesis, which predicts a conditional relationship between education and heterogeneity based on average citizen ideology. I estimate the linear model:

$$\textit{Ideological Heterogeneity} = \beta_0 + \beta_1 \cdot \text{Education} + \beta_2 \cdot \text{Citizen Ideology} +$$
$$\beta_3 \cdot \text{Education X Citizen Ideology} + \text{Controls} + \epsilon$$

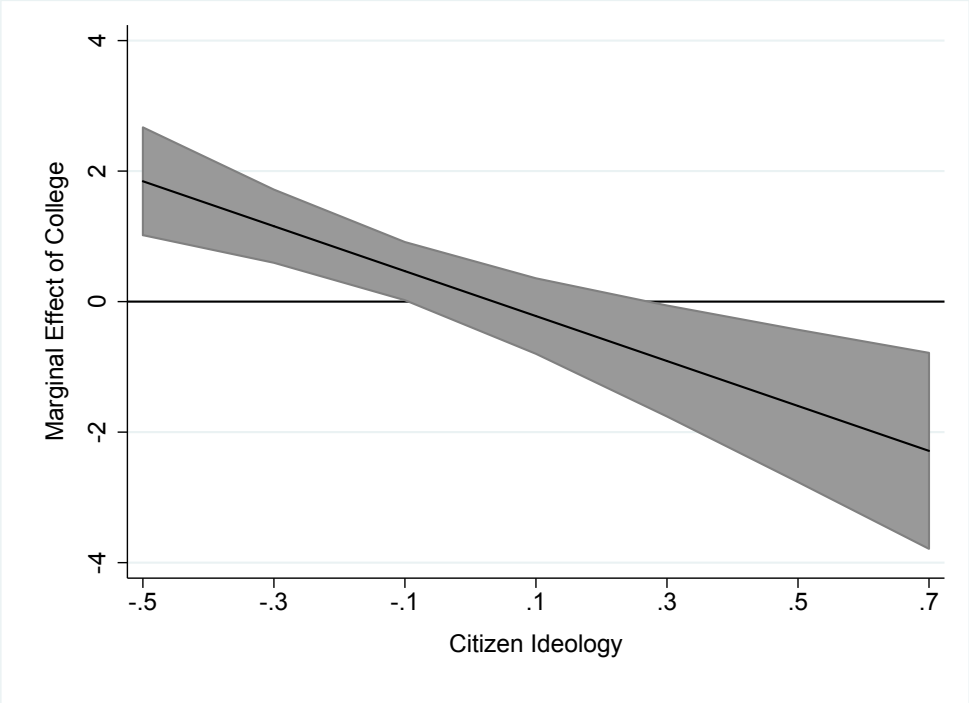
Because the higher values of citizen ideology indicate a more liberal ideology, I expect to observe a *negative* coefficient estimate for the interaction term between education and citizen ideology if the second hypothesis is correct.

I estimate a model including the interaction term and its component variables but without controls in Model 3 of Table 2. In line with expectations, the coefficient estimate for the interaction term in the model is negative. However, coefficient estimates for interaction terms are often difficult to interpret on their own. To further illustrate the finding, I present a marginal effects plot in Figure 4. The figure plots the marginal effect of education level on ideological heterogeneity (y-axis) across values of citizen ideology (x-axis). The plot shows that as citizen ideology increases (i.e. becomes more liberal), the marginal effect of education decreases. The association is statistically significant at the .05 level of confidence. In plain terms, the figure shows that in more conservative states, heterogeneity increases as more individuals obtain college degrees. However in liberal states, *homogeneity* increases as more individuals obtain college degrees.

In Model 4, I estimate a fully specified model including control variables. Even including controls, the coefficient estimate for the interaction term remains negatively signed and statistically significant. Among the controls, the negative and significant coefficient for the urban variable indicates that more urban populations are more ideologically homogeneous. However, none of the remaining variables are significantly related to heterogeneity. It is worth highlighting that neither of the variables meant to capture demographic diversity—racial diversity or income inequality—is statistically related to ideological heterogeneity.

The analysis in Table 2 uses repeated observations of states over time to provide

Figure 4: Marginal Effect of College on Heterogeneity Given Citizen Ideology



Source: American Community Survey, Cooperative Congressional Election Study. Higher values on the x-axis represent more liberal citizen ideology.

evidence. The time-series cross-sectional design adds statistical power to the analysis, but a potential concern is that the values of the dependent variable do not vary enough from year to year to justify observing each state several times. In Table A5 of the appendix, I report the results of Model 3 in Table 2 separately for each year of observation. The year-by-year findings largely mirror the findings reported above, though standard errors are generally larger in each model due to the reduced sample sizes. However, the balance of the evidence from the year-by-year results suggests that the same conditional relationship between education levels and heterogeneity holds within each year of observation.

A final concern to be addressed is the possibility that the analysis is hampered by the modifiable areal unit problem (MAUP)—a form of statistical bias resulting from the researcher's choice in the geographic grouping of individuals. The analysis above relies solely on estimates of ideological heterogeneity in states. However, the results may look

different if a different unit of analysis (such as a district or county) were used. Estimates of ideological heterogeneity at the state level are most reliable due to the larger number of survey responses from the CCES that can be used to estimate heterogeneity (Harden and Carsey 2012; Levendusky and Pope 2010). Technically, it is possible to estimate in smaller jurisdictions. Replicating the results at another geographic level can provide assurance that the results do not depend on the models using state-level data.

In Table A6 of the appendix, I replicate the results from Table 2 using 2010 CCES data at the congressional district level. The results parallel those obtained at the state level. While higher education levels alone are found to be associated with greater heterogeneity (in support of Hypothesis 1), the relationship between heterogeneity and education levels are still found to be conditional on citizen ideology in the expected direction (in support of Hypothesis 2). However, readers should exercise caution in interpreting these auxiliary results. There are reasons to doubt the accuracy of the heterogeneity estimates in districts—chief among them that estimates are created using less than 100 survey responses in some districts. Though they tentatively support the conclusion that results the generalize beyond the state level, the results from the states are much more reliable given their larger sample sizes for estimating heterogeneity

Overall, the evidence fails to support the first hypothesis that higher education levels are positively associated with greater heterogeneity. However, the evidence consistently supports the second hypothesis that higher education levels are associated with greater heterogeneity in more conservative states and greater homogeneity in more liberal states.

Discussion

This analysis provides evidence that the variation in ideological heterogeneity across constituencies can be explained in part by aggregate education levels. Individual-level results confirm previous findings that more educated liberals hold more extreme ideological positions, but that education and extremity are unrelated among conservatives. The

aggregate-level analysis shows that education is associated with greater heterogeneity in conservative states, but greater homogeneity in liberal states. However, it provides no evidence that racially or economically diverse constituencies are also more ideologically heterogeneous. These findings add to research showing that demographic diversity is not related to ideological heterogeneity empirically (Gerber and Lewis 2004; Koetzle 1998; Levendusky and Pope 2010), but advances a step further by providing an alternative explanation for why some constituencies are more ideologically heterogeneous than others.

The evidence here is better interpreted as suggestive of causal relationships than as establishing causality. Selection effects, such as the self-selection of individuals into higher levels of education or into state populations, undoubtedly exist in the data generating process. However, this work constitutes a first step towards understanding the variation in ideological heterogeneity across states using insights from the literature on education and ideology (Converse 1964; Delli Carpini and Keeter 1996; Zaller 1992). The results are contingent upon a narrow definition of ideological heterogeneity as variance in citizen positions along a left-right ideological spectrum. Alternative definitions of ideological heterogeneity could yield different results.

The findings also contribute to the literature on education and ideology by providing evidence that in the contemporary U.S., education helps liberals, but not conservatives, structure their issue opinions in an ideologically consistent manner. While I provide tentative explanations for why education is associated with liberal extremity above, another potential question of interest is why conservative extremity is *not* associated with education levels. A speculative answer lies in the development and growth of conservative media in a way not matched by media sources on the left (see Grossmann and Hopkins 2016). If information received through education drives extremity for liberals, then the development of alternative information sources helping conservatives to structure views might also contribute to the asymmetry. Although this research cannot provide a definitive explanation, it does beckon further investigation.

The present work has implications for polarization in the electorate. To the extent

that American voters have polarized, this study points out a potential contributing factor: increasing education levels. As Americans have become more educated over the last half century, largely through the expansion of access to institutions of higher education, they have been better able to absorb cues from political elites and align their views to consistently match those of their parties. Polarization in the American electorate may be aggravated by more highly educated citizens, especially on the left, adopting more ideological views.

Moreover, if education levels contribute to heterogeneity and heterogeneity creates electoral incentives for candidates and officeholders to take extreme positions, this research implies that increasing education levels could be another contributing factor to the polarization of elected officials in American politics. Certainly, polarization among elites and aggregate education levels in the U.S. have both been on the rise over the last half century. Though the correlation could be coincidence, investigating whether the link between education and polarization is causal could yield further insight.

Pundits and activists routinely tout civic education as a solution to contemporary political problems. However, this study suggests that increasing civic education may have a dark side. Though a more educated public certainly promises a number of positive social and economic outcomes, further educating the public on matters of politics may also serve to drive citizens into distinct ideological camps and to create electoral conditions that reward ideological extremity among officeholders.

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Appendix

Table A1: Education and Ideological Extremity by Self-Reported Ideology

	ANES 2012		CCES 2010	
	Dependent variable: Ideological Extremity			
	Lib.	Con.	Lib.	Con.
Education	0.07*	-0.03	0.06*	0.02*
	(0.02)	(0.02)	(0.01)	(0.01)
Interest	0.09*	0.12*	0.09*	0.13*
	(0.01)	(0.02)	(0.01)	(0.01)
Knowledge	0.06*	0.08*		
	(0.02)	(0.03)		
Male	-0.01	-0.03	0.04*	0.06*
	(0.03)	(0.04)	(0.01)	(0.01)
Age	0.01	0.02	0.01	0.00
	(0.01)	(0.01)	(0.00)	(0.00)
White	-0.11	0.04	-0.02	-0.05*
	(0.06)	(0.09)	(0.02)	(0.02)
Black	0.15*	-0.26*	0.08*	-0.20*
	(0.07)	(0.12)	(0.03)	(0.03)
Hispanic	-0.10	-0.14	0.03	-0.10*
	(0.07)	(0.11)	(0.03)	(0.03)
Income	0.00	-0.01*	0.01*	-0.00
	(0.00)	(0.00)	(0.00)	(0.00)
Born Again	-0.10*	0.30*	-0.08*	0.21*
Christian	(0.04)	(0.04)	(0.01)	(0.01)
Constant	0.49*	0.58*	0.34*	0.32*
	(0.09)	(0.12)	(0.03)	(0.04)
N	1,514	1,655	14,493	19,568
R^2	0.17	0.16	0.17	0.11

Note: *p<0.05. Survey-adjusted coefficient estimates from OLS regression, with standard errors in parentheses. Significance tests are two-tailed. Data for models 1 and 2 come from the 2012 American National Election Study. Data for models 3 and 4 come from the 2010 Cooperative Congressional Election Study.

Table A2: Education and Ideological Extremity by Party ID

	ANES 2012		CCES 2010	
	Dependent variable: Ideological Extremity			
	Dem.	Rep.	Dem.	Rep.
Education	0.07*	-0.02	0.07*	0.01
	(0.02)	(0.02)	(0.00)	(0.01)
Interest	0.10*	0.13*	0.08*	0.14*
	(0.01)	(0.02)	(0.00)	(0.01)
Knowledge	0.05*	0.08*		
	(0.02)	(0.03)		
Male	-0.04	-0.04	0.04*	0.06*
	(0.03)	(0.04)	(0.01)	(0.01)
Age	-0.02*	0.03*	0.01*	0.01
	(0.01)	(0.01)	(0.00)	(0.00)
White	0.03	-0.05	-0.07*	-0.01
	(0.08)	(0.13)	(0.02)	(0.02)
Black	0.14	-0.20	0.04	-0.14*
	(0.08)	(0.16)	(0.02)	(0.04)
Hispanic	-0.02	-0.21	-0.04	-0.04
	(0.08)	(0.16)	(0.03)	(0.04)
Income	0.00	-0.00	0.01*	-0.00*
	(0.00)	(0.00)	(0.00)	(0.00)
Born Again	-0.06	0.31*	-0.11*	0.22*
Christian	(0.03)	(0.05)	(0.01)	(0.01)
Constant	0.54*	0.51*	0.37*	0.22*
	(0.10)	(0.17)	(0.03)	(0.04)
N	1,778	1,130	21,441	19,621
R^2	0.14	0.16	0.14	0.12

Note: *p<0.05. Survey-adjusted coefficient estimates from OLS regression, with standard errors in parentheses. Significance tests are two-tailed. Data for models 1 and 2 come from the 2012 American National Election Study. Data for models 3 and 4 come from the 2010 Cooperative Congressional Election Study.

Table A3: Education, Citizen Ideology, and Ideological Heterogeneity Using Levendusky and Pope's Measure

	Dependent variable:			
	Ideological Heterogeneity			
	(1)	(2)	(3)	(4)
College	0.09*	0.01	-0.02	0.00
	(0.04)	(0.07)	(0.06)	(0.07)
Citizen Ideology		0.03	0.17*	0.16*
		(0.02)	(0.06)	(0.07)
College X			-0.53*	-0.50*
Citizen Ideology			(0.22)	(0.24)
Urban		0.00		-0.00
		(0.02)		(0.01)
Racial		-0.01		-0.02
Diversity		(0.02)		(0.02)
Income		-0.03		0.09
Inequality		(0.15)		(0.16)
Population		0.00*		0.00
(in millions)		(0.00)		(0.00)
Inbound Migration		0.00		0.00
		(0.00)		(0.00)
Constant	0.11*	0.13	0.14*	0.08
	(0.01)	(0.08)	(0.02)	(0.08)
N	50	50	50	50
Adj. R^2	0.07	0.13	0.20	0.19

Note: *p<0.05. Standard errors are presented in parentheses. Significance tests are two-tailed.

Table A4: Education, Presidential Vote Share, and Ideological Heterogeneity

	Dependent variable:			
	Ideological Heterogeneity			
	(1)	(2)	(3)	(4)
College	-0.25	0.25	2.86*	2.35
	(0.26)	(0.35)	(1.36)	(1.60)
Obama Vote Share		-0.00	0.01	0.01
		(0.00)	(0.01)	(0.01)
College X			-0.05*	-0.04
Obama Vote Share			(0.03)	(0.03)
Urban		-0.15		-0.17
		(0.10)		(0.10)
Racial		0.09		0.09
Diversity		(0.12)		(0.12)
Income		-1.43*		-1.04
Inequality		(0.69)		(0.79)
Population		0.00		0.00
(in millions)		(0.00)		(0.00)
Inbound		0.01		0.01
Migration		(0.02)		(0.02)
Constant	1.05*	1.68*	0.35	0.95
	(0.07)	(0.32)	(0.36)	(0.68)
N	100	100	100	100
Adj. R^2	-0.00	0.14	0.09	0.16

Note: *p<0.05. Standard errors are presented in parentheses. Significance tests are two-tailed. Observations for 50 states for 2008 and 2012.

Table A5: Year-by-Year Estimates of Table 2

	Dependent variable:				
	Ideological Heterogeneity				
	2006	2008	2010	2012	2014
College	-0.61	0.45	0.10	0.14	0.03
	(0.45)	(0.44)	(0.35)	(0.31)	(0.33)
Citizen Ideology	0.94*	0.78	0.80	0.70	1.16*
	(0.45)	(0.50)	(0.47)	(0.36)	(0.36)
College X	-3.17	-3.82*	-3.04	-3.00*	-4.74*
Citizen Ideology	(1.62)	(1.85)	(1.55)	(1.18)	(1.21)
Constant	1.13*	0.87*	0.97*	0.95*	1.01*
	(0.13)	(0.12)	(0.10)	(0.093)	(0.10)
N	50	50	50	50	50
Adj. R^2	0.04	0.09	0.04	0.19	0.30

Note: *p<0.05. Standard errors are presented in parentheses. Significance tests are two-tailed.

Table A6: Education, Citizen Ideology, and Ideological Heterogeneity in Congressional Districts

	Dependent variable:			
	Ideological Heterogeneity			
	(1)	(2)	(3)	(4)
College	0.15*	0.47*	0.58*	0.56*
	(0.07)	(0.07)	(0.07)	(0.07)
Citizen Ideology		-0.22*	-0.04	-0.01
		(0.03)	(0.06)	(0.06)
College X Citizen Ideology			-0.88*	-0.78*
			(0.19)	(0.20)
Urban		0.03		-0.02
		(0.24)		(0.24)
Racial Diversity		-0.05		-0.06
		(0.04)		(0.04)
Income Inequality		-0.82*		-0.60*
		(0.21)		(0.21)
Population (in millions)		0.06		0.03
		(0.09)		(0.09)
Inbound Migration		0.01		0.01*
		(0.01)		(0.01)
Constant	0.88*	1.13*	0.78*	1.03*
	(0.02)	(0.11)	(0.02)	(0.12)
N	435	435	435	435
Adj. R^2	0.01	0.31	0.31	0.33

Note: *p<0.05. Standard errors are presented in parentheses. Significance tests are two-tailed. Data come from the 2010 Cooperative Congressional Election Study and the 2010 American Community Survey.