

Blinded by Religion? Religious School Graduates and Perceptions of Science in Young Adulthood

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Religious schools are often more rich in social capital and more communally oriented than are public schools (Bryk, Lee and Holland 1993, Coleman and Hoffer 1987, Van Pelt et al. 2012), and close achievement gaps by assigning students to more academically rigorous curricula (Lee and Bryk 1988). A common concern about religious schools is their impact on knowledge and views of science (Dwyer 1998, Rose 1993, Rose 1988). Controversy over religion and science is not unique to religious schools, but has included heated debates as well as court cases over the place of creation/evolution in public schools (Binder 2002, Dávila 2014, Reiss 2011, Schafersman and Anonymous 2007, Singleton 1987). Especially in the United States, there is an ongoing debate about the place of creation, evolution, or intelligent design in public school science courses (Arons 1986, Binder 2002, Masci and Lipka 2014, Numbers 1993). But in most areas of the U.S. and Canada, public schools draw a fairly rigid line between the study of religion and the study of science (Billingsley et al. 2014a, Binder 2002, Nord 1995). Most private religious schools do not face the same pressures to separate religion from science, though this independence in curriculum development prompts their critics to wonder what in God's name religious school students are learning (or not) about science (Peshkin 1986, Reich 2002).

While many of the social benefits and some academic advantages of religious schools are clear in the literature (Vryhof 2004), then, questions about science instruction and learning persist. In particular, critics often express concerns about what evangelical Protestant schools teach in science courses and worry about what religious school graduates ultimately believe about science, including beliefs about evolution (Riley 2006). Is there any evidence to allay these concerns? With few exceptions (Longest and Smith 2011, Reichard 2016, Risler, Duncan and Caruso 2014, Yasri and Mancy 2014), previous research has had little to say about how religious school graduates understand and appreciate science. Further, there has not been sufficient attention paid to how religious schools shape knowledge of and orientations to science. Little is known about the emphasis that religious schools place on their science curricula, or how they ensure that students take a variety of courses in science.

In theory, a lack of enthusiasm for the physical sciences may lead some religious schools, perhaps responding to weak student and parent demand, to reduce the number or strength of science course offerings. Evangelical schools in particular may spend less curricular effort in this area; science course-taking may be crowded out in evangelical schools in favor of a focus on the humanities and

biblical studies. Even if religious schools place students in science classes at rates similar to the public schools, the question remains whether socialization in class or through informal interaction with friends and teachers leads to negative views of science or scientists. That would alarm those concerned about preparation for science, technology, engineering, and mathematics (STEM) careers, which are seen as fundamental to economic success in the 21st Century. Are graduates of religious schools excited about further study and a career in scientific fields, or reticent to enter a field that they believe is antagonistic to religion and ultimately not of eternal significance? In this report, we focus on how schools influence orientations to science. We investigate whether evangelical schools form students through a rigorous sequence of science classes and by piquing interest in continuing education in science, such as paying attention to scientific issues and developments in the visual or print media. If science gets short shrift during high school, perhaps graduates are not only unprepared for STEM careers, but also uninterested in science and less likely to spend time learning about science in their everyday lives as adults.

To bring evidence to bear on these claims, this report offers the most comprehensive assessment of religious school graduates' orientations to science available to date. By using a wide-ranging science module available in the latest US and Canadian Cardus Education Study (CES) data, we analyze views of science, scientists, creation, evolution, high school course taking, and interest in science.

Belief discernment, attitudes, and to a lesser extent, high school course selection, are influenced by a constellation of factors. For instance, those who subscribe to evangelical religious beliefs or attend evangelical congregations are more likely to subscribe to creationist views than those from

other religious orientations, and those who are devoted to regular religious service attendance are more likely to hold to creationism than individuals who are less actively engaged (Hill 2014 Pew Research Center 2013). With CES data, we are able to incorporate statistical controls to account for the role of these and other factors that might contribute to the development of perspectives on science, scientists, or scientific findings. In other words, we are able to isolate the unique impact of religious school experiences by accounting for the role of demographic characteristics, religious background, and level of religious engagement.

Our inquiry is guided by two broad research questions:

1. Are there sector differences in science course-taking?

Do students at private religious high schools take the same science classes as students at public high schools? Do they take core science courses, such as biology, chemistry, or physics, at the same rate?

2. Does school sector have a lasting impact on graduates' perspectives and attitudes toward science?

As adults, do graduates of private religious schools express a similar level of esteem for scientists as do graduates of public schools? Are they more likely than those who attended public schools to believe that science inherently conflicts with their religious beliefs? Does the type of high school attended impact whether someone subscribes to the tenets of creation or evolution?

While we don't have comprehensive information on what it is about religious schools that might explain our findings on orientations to science among graduates, we do have information from respondents on the type of science courses taken during high school. From there, we look at broad patterns in views of science and scientists and offer theoretical explanations for these associations. We would expect, for example, that science classes in evangelical schools spend a good deal of time on the issue of the relation between God's creation of humans and theories of evolution. Thus we have reason to believe—but not concrete measures—that discussion in both religious and science classes in evangelical schools reinforced many students' suspicion of naturalism and evolution, and of "secular" scientists.

We draw on school sector research as well to explain why some sectors would have more positive effects on graduates' relation to science. The history of Catholic schools in the United States, for example, emphasizes their role in social mobility for Catholic immigrants. We would not expect Catholic schools to socialize students to avoid science, but, in the interests of social mobility and a rigorous academic curriculum for all students, may encourage more positive orientations to science. In contrast, many evangelical Protestant schools, especially in the US, carry the legacy of evangelical involvement in controversies over the teaching of evolution and creationism in public schools, including the Scopes Trial, in which William Jennings Bryan attempted to defend creationist views in the trial of a Tennessee public school teacher charged with teaching evolution. Catholics were on the sidelines in these debates, in part to maintain religious boundaries with fundamentalist Protestants. These historical legacies as well as other theories and evidence on school sector differences will be used to explain the correlations we find between school sector and orien-

tations to science.

This report will discuss our findings that religious school sector does matter for orientations to science, but the effects vary dramatically between the US and Canada and by type of school, whether evangelical or Catholic, and only extend to questions of the conflict of religion and science, trust in scientists, and views of creation/evolution. We show that, while science course-taking at Evangelical Protestant high schools (EPHS) is similar to that of other sectors, as adults EPHS attendees have a more negative view of scientists and a greater commitment to creationism than graduates of public high schools, even after accounting for the role of religious tradition.

Creationism, Evolution, and Conflicts between Science and Religion

The belief in a conflict between science and religion is often linked to competing understandings of human existence and, ultimately, to questions of the relation between religious explanations of creation and the scientific theory of evolution. Research has focused on the influence of science course-taking as well as on the sources of the belief that science and religion conflict. One research stream looks at students, attempting to explain differences in outcomes regarding views on science or to explain the impact of exposure to a science class (Hill 2014, Konnemann, Asshoff and Hammann 2016, Taber et al. 2011). A smaller set of studies looks at the learning environment and the impact of instructional processes in schools (Billingsley et al. 2016, Brickhouse et al. 2000, Shipman et al. 2002).

Ideally, science classes can help students evaluate theories and evidence according to scientific conventions. For some students, this approach to knowledge can lead to a convergence of religious and scientific thinking (Brickhouse et al. 2000).

For instance, a student might come to accept that species adapt over time and that there is value in studying these processes. At the same time she may conclude that science will have great difficulty explaining the origin of life or the universe, while her religious faith provides clear and satisfying answers to these ultimate questions.

Such convergence of scientific and religious thinking does not happen uniformly for all students. Students who are at either end of the continuum—more adamantly opposed to religion or to science—are more likely to perceive conflict between faith and science, while those who feel less strongly in either direction perceive less conflict (Konnemann et al 2015). In other words, students with a strong sense of commitment to either scientific or religious explanations chose frameworks consistent with this commitment when scientific and religious explanations seem to diverge. Other students, on the other hand, are able to reconcile conflicts in one of three ways: by synthesizing multiple frameworks, by cognitively accommodating inconsistencies between explanations, or by viewing science and religion as separate domains that do not intersect (Taber et al 2010).

Students are usually not equipped to integrate scientific and religious frameworks on their own. Billingsley and colleagues (2016) show that middle-school students perceive permeable boundaries across academic disciplines. They believe that course content in both science and religious studies courses are applicable to other courses. At the same time, they see the boundary between science and religious studies classes as impenetrable. Students believe that each subject has interdisciplinary potential, generally, but material learned specifically in science and religion courses are not applicable to each other (Billingsley et al 2016).

Other research has explored the role of instruction in the development or persistence of students' beliefs about creation, evolution, or the conflict between religion and science (Brickhouse et al 2000). While little is known about the secondary level, very little instructional time and few assignments in introductory college science courses are devoted to teaching students about “the variety of coherent viewpoints on the interface between science and religion” (Brickhouse et al. 2000). Qualitatively, students enrolled in a class that intentionally explored these topics were equipped to reconcile conflicts between science and religion or cognitively link scientific principles and religious faith in coherent ways (Brickhouse et al. 2000). The question is whether science classes in religious high schools would have a similar impact (Reichard 2016, Yasri and Mancy 2016).

Classroom instruction is not the only way that students are influenced regarding science. We expect differences in the adult perspectives on evolution, creation, and conflicts between religion and science among school sectors because of differences in student populations and varied opportunities for integrating religion and science instruction. Of course, classes at Evangelical Protestant high schools (EPHS) likely have a greater representation of students who subscribe to creationism than do those in traditional public schools.

The EPHS effect may vary between the U.S. and Canada however. While there are many similarities in the educational landscape of the United States and Canada, there are enough distinctions to warrant separate analysis. For example, the fundamentalist-modernist conflict in the early 20th Century, which culminated in the Scopes trial and its aftermath, was much more salient in U.S. than Canadian society and culture (Noll 2002). In addition, the relationship between religion and state funding is more complicated in Canada, in

which the presence of a large publicly-funded Catholic school sector poses questions of whether the religious mission of these schools would alter the impact of science formation compared to nonreligious publicly-funded schools.

In other ways, religious school effects may operate similarly on both sides of the border. Holding minority views on scientific issues may depend on a higher degree of religious homophily in friendship networks (a greater likelihood of having friends who are religiously similar). A higher level of homophily could impact student perspectives in two ways. First, it could reinforce students' commitment to creationism and the perspective that science and religion conflict. Young adults who are embedded in social networks of co-religionists who share their beliefs have been shown to retain their commitment to creationism (Hill 2014). For this reason, we might expect attending an EPHS to increase commitment to creationism and the belief that science and religion conflict.

Alternatively, private religious high schools could be better equipped to help students synthesize frameworks, cognitively accommodate inconsistencies, or separate scientific and religious domains. Teachers at these schools can integrate class instruction or assignments that interrogate relationships between scientific and religious frameworks in ways that teachers at public schools cannot. In

Table 1: Descriptive Statistics

Variable	Canada	US
School Sector		
Public	57.05	58.46
Catholic (private)		18.95
Catholic (public)	34.43	
Evangelical	4.47	7.88
Private, Non-Religious		6.97
Homeschool, Religious	1.95	5.01
Homeschool, Non-Religious	2.09	2.73
Years attended target HS	3.69 (.72)	3.59 (.80)
Race/Ethnicity		
White	71.57	65.08
Black	3.59	6.11
Asian	15.84	6.49
Hispanic/Latino	1.63	12.66
Other	2.5	5.28
Two or more ethnicities	4.86	4.39
Female	58.34	67.36
Age	33.24	31.18
Raised Evangelical Protestant	21.86	17.71
Raised Conservative Catholic	6.39	2.21
Frequency of Religious Service Attendance in HS	3.35 (2.31)	4.76 (2.61)
Parents' Highest Degree		
Parent Education Unknown	15.25	13.34
Parent less than High School	6.64	3.37
Parent High School Grad	25.04	24.81
Parent Associate's Degree	16.11	13.92
Parent Bachelor's Degree	19.71	21.32
Parent Graduate Degree	17.25	22.89
Parent Religious Service Frequency	23.77 (26.77)	36.31 (28.92)
3 or 4 High School Science Classes	37.84	41.68
Respondent's Religious Tradition		
Religious Tradition None	20.96	19.16
Evangelical Protestant	11.5	30.29
Mainline Protestant	5.79	8.1
Conservative Catholic	17.57	8.56
Traditional Catholic	15.93	14.68
Other	28.25	19.22
Respondent's Highest Degree		
High School	13.81	11.45
Some College	33.25	28.63
Bachelor's Degree	36.27	40.78
Graduate Degree	16.67	19.15
Respondent's Annual Income (in dollars of home country)		
Low Income (<\$25K)	9.89	16.28
Middle Low (\$25-49K)	23.25	25.45
Middle Income (\$50-74K)	22.42	22.39
Middle High (\$75-124K)	30.16	26.72
High Income (>\$125K)	14.28	9.16
Sample Size	2,507	1,572

this sense, the curricular autonomy and possible homophily of religious belief could be used as tools to decrease the perception of conflict and equip students to make sense of the relationship between claims in religious and scientific spheres.

Data and Methods

This project uses the most recent United States and Canadian administrations of the Cardus Education Study (CES). CES is a cross-sectional study of academic and spiritual outcomes of schooling in North America. Each phase of the CES utilizes a nationally representative sample of high school graduates between the ages of 24 and 39. Households were randomly selected to participate in Internet panels administered by Knowledge Networks/GfK (in the United States) and Vision Critical/Maus (in Canada). The CES strategically over-sampled graduates of private and religious high schools to provide a large enough sample to allow for analysis of differences among private school sectors and religious traditions.

In all, CES includes four cross-sectional surveys with nearly 7,300 total participants. The analysis in this study is built around science modules available in the two most recent fieldings of CES (US 2014 and Canada 2016), which ask respondents about their exposure to scientific information both in school and afterwards, and their perceptions of science and scientist as adults. These modules are supplemented with demographic characteristics, information on the religious environment of the home in which respondents' grew up, and indicators of social class (such as parental education).

We use these data to examine sector effects in both course-taking and beliefs about science and scientist. First, we calculate the proportion of graduates from each sector who report having complet-

ed coursework in biology, chemistry, physics, or engineering. Then, we "adjust" our estimates to account for the influence of parental education, religious orientation and intensity at home during high school, and demographic characteristics. In this way, we are able to account for the influence these elements have on the likelihood individuals enroll in a particular science class.

Next, we repeat the same process to calculate the proportion of graduates who took three or more types of science courses in high school. We found that school sector is unrelated to enrollment in engineering classes, but because high school engineering courses often focus on the application of material learned in the natural and physical sciences, we retained engineering courses in our calculation of the breadth of science class enrollment. All of our models also account for the duration that respondents report having been enrolled in the high school discussed in the CES data collection.

To address our second research question—Does school sector have a lasting impact on graduates' perspectives and attitudes toward science?—we modeled six measures of respondents' attitudes, beliefs, or engagement with science. As with the coursework analyses, we first estimate the sector averages or proportions for each attitude or behavior, depending on the specific outcome. Then, we adjust our estimates to account for all of the control variables used in the final models of our course-taking analysis. We also incorporate information about course-taking as a predictor, as well as measures of adult characteristics that might be related to our outcomes of interest; specifically income and level of education. For each outcome, the modeling technique we implement is determined by the nature of the outcome. Course enrollment and the belief that science conflicts with one's religion are dichotomous, taking on a val-

ue of 0 or 1 only, so we use logistic regression. Other attitudinal measures are either composite measures or responses measured with Likert-type scales. We believe that these measures represent respondents' approximate location on a continuum and estimate these outcomes using ordinary least squares regression.

To capture respondents' view of scientists, we combined two items from the CES science module. The first item asks, "Thinking about some different professions, how much you think the following contribute to the well-being of our society?" Following this prompt, scientists are listed among a bank of other professions. The second item is similar in format—asking respondents, "How much would you say that you trust the following people or groups?" Again, scientists are listed along with several other professions.

Our measures of creationism and belief in evolution reflect similar attitudinal scales. Creationism is captured by responses to the prompt, "Please tell us whether you, personally, agree or disagree with the following statements:... God created the world in six, 24-hour days." There are seven response options ranging from, "completely agree" to "completely disagree." Belief in evolution is measured on the same scale (completely agree to completely disagree) in response to the question, "To what extent do you agree or disagree with the following statements? Human beings, as we know them today, developed from earlier species of animals."

For perceived conflict between science and the respondents' religion, we use a question that asks, "Now thinking about your own religious beliefs, does science sometimes conflict with your own religious beliefs, or doesn't it?" Respondents were given two options: "Yes, science conflicts with my own beliefs," and "No, science does not conflict

with my own beliefs."

Separate analyses for each country also allow us to further investigate some of the unique features of education in each country. In our Canadian analysis, we are able to include publicly funded Catholic schools as a distinct sector in our models while there is no complementary sector in the United States. Non-religious private high schools constitute an analytical group in the US models, but due to the small sample size of non-religious private high school graduates in Canada, we were unable to include this group in the Canadian analysis.

Course-taking and Interest in Science

The first stop in ensuring that students are adequately prepared for scientific understanding, appreciation, and perhaps careers is to actually take a rigorous scientific course of study in high school. Religious schools may limit scientific course-taking either through the lack of offerings or requirements, busying students with courses outside of science, including religious education courses, or directly or indirectly discouraging students from considering educational or occupational careers that would require a strong background in the physical sciences. We wouldn't expect that Catholic schools would on average discourage science course-taking, given the historical role of these schools in social mobility, the relative lack of conflict with major scientific theories, such as evolution, and the tendency of these schools to ensure or even require that nearly all students take a similarly rigorous academic track. In addition, the emphasis in nonreligious and Catholic independent schools on attending a highly selective college puts pressure on students with high educational aspirations to take a rigorous sequence of science courses. But these reasons for science course-taking may differ in evangelical schools.

Figure 1: Proportion who Took Science Courses in High School in Canada

■ Sector averages ■ With controls for family characteristics I 95% confidence interval

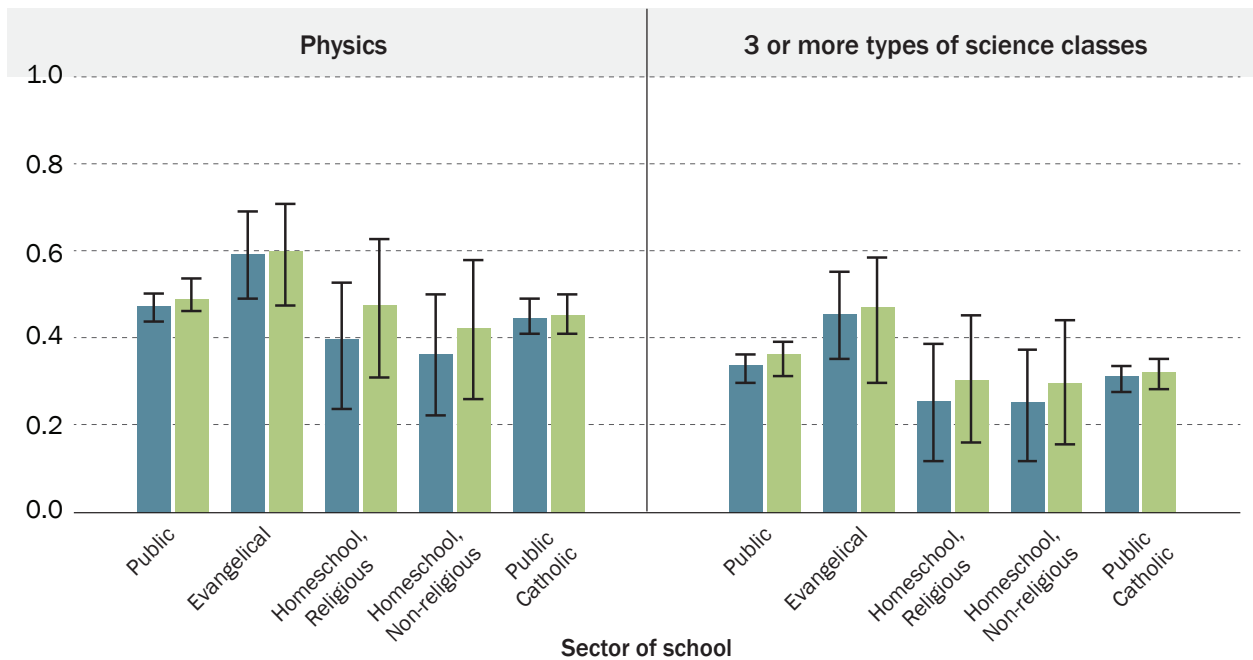
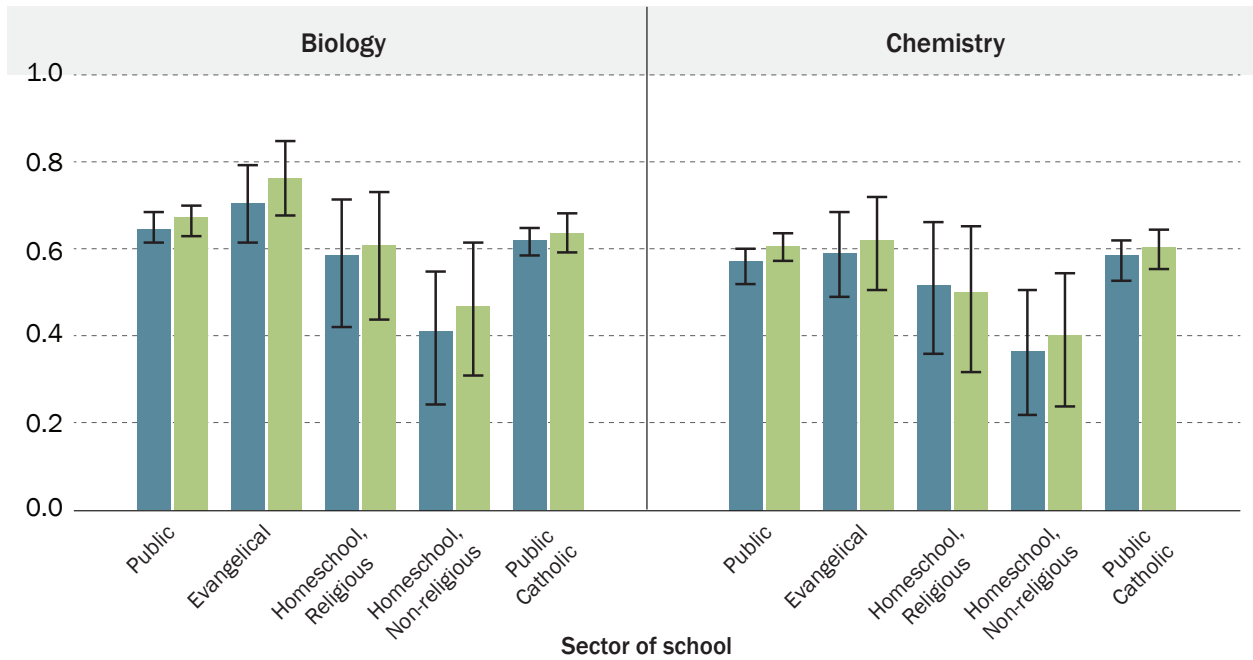
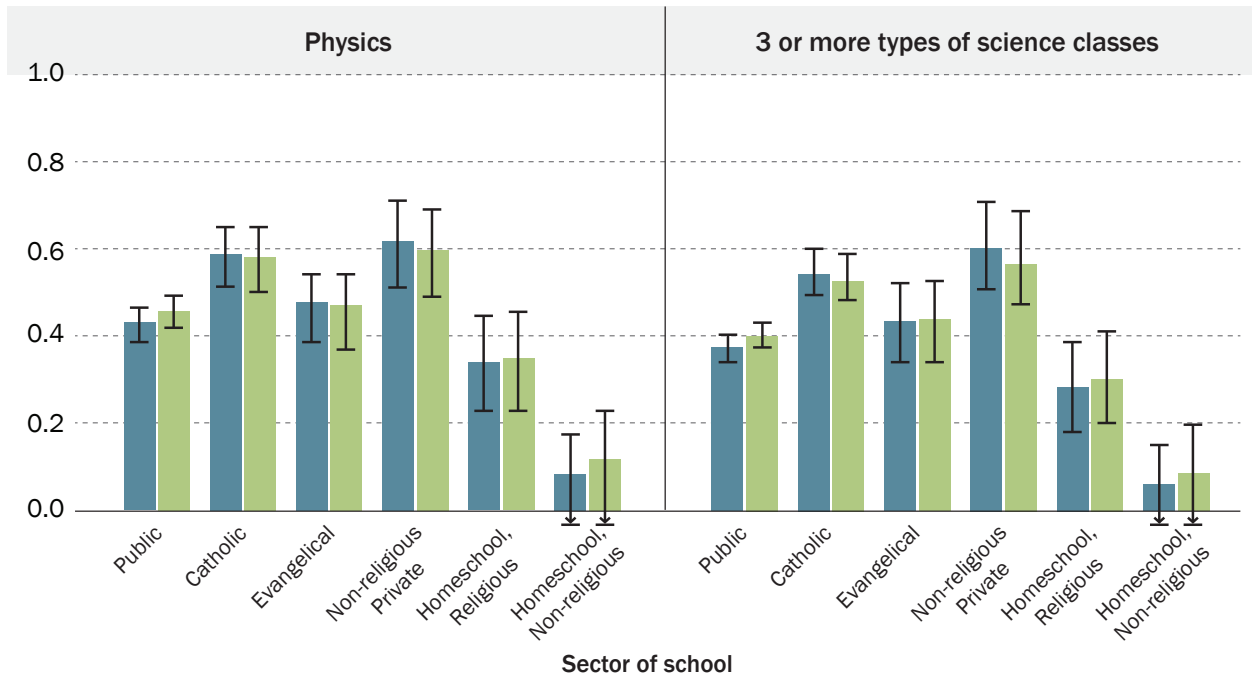
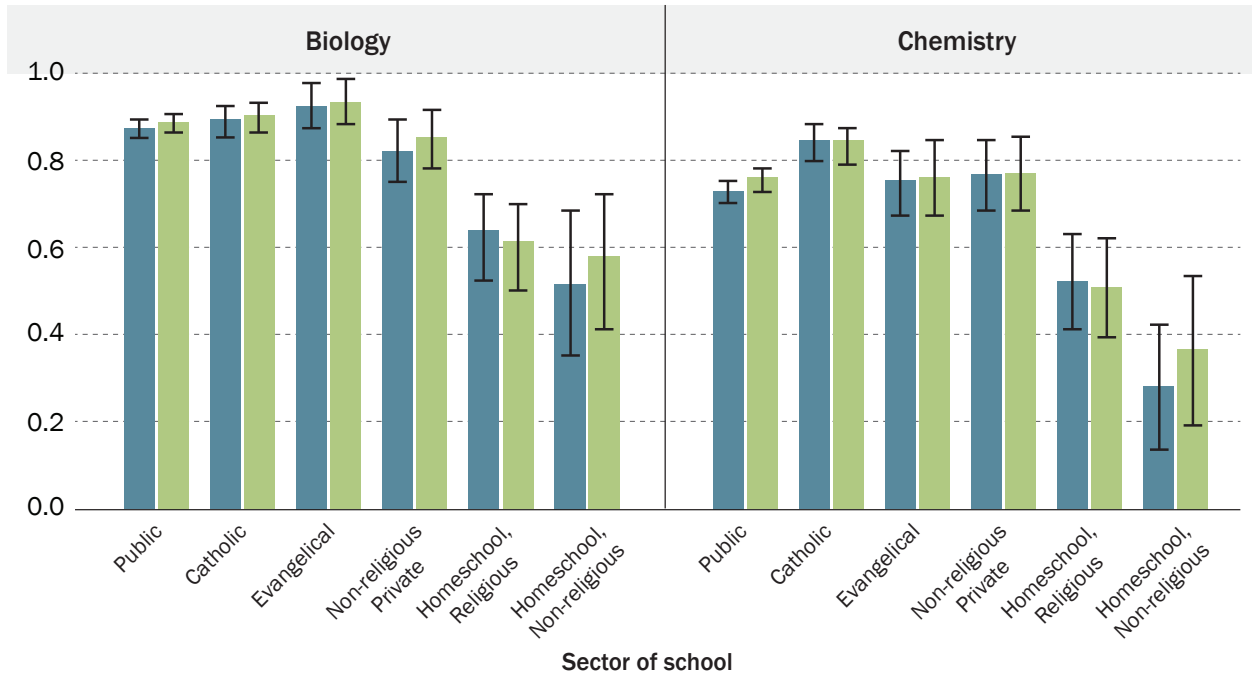


Figure 2: Proportion who Took Science Courses in High School in the United States

■ Sector averages ■ With controls for family characteristics I 95% confidence interval



By and large, however, we find limited support for sector differences in course-taking. In Canada, those who attended evangelical high schools are more likely to have taken physics and more likely to have enrolled in three or more science courses than are secular public high school graduates, but these differences can be attributed to respondent background characteristics and parental education and religiosity. This suggests that differences in course-taking are not a function of differences in opportunities offered by different types of schools or differences in motivations to pursue science education, but by family characteristics. Holding such characteristics constant, we find that students at private religious schools enroll in science classes at a similar rate to public school peers in Canada. We also find that non-religious homeschool graduates (as distinct from religious homeschool graduates, whose parents were frequent religious service attenders) were less likely to have taken either biology or chemistry.

This homeschool effect is found in the United States as well. US homeschool graduates from either religious or non-religious settings were less likely than graduates of all other sectors to have taken biology, chemistry, or physics, or to have had three or more science courses during high school.

In addition, graduates of Catholic schools are more likely to have taken chemistry and physics than are public school graduates, and are also more likely to have taken three or more types of science courses. This could be a function of the prevalence of common school curriculum in Catholic schools (see Bryk et al 1993), where students have fewer options and take a similar curriculum as they progress through high school. The lack of a significant creation-evolution conflict within Catholicism may also be reflected in how

Catholic schools approach science requirements. And this finding is consistent with claims that Catholic schools are increasingly oriented to a college prep program (Baker and Riordan 1998). These course-taking patterns persist, even after controls are added to the models for individual characteristics and parental education and religiosity. Catholic schools show evidence of a much stronger science curriculum than public schools.

Graduates of non-religious private schools in the US are also more likely than public school graduates to have taken physics and enrolled in three or more types of high school classes. As with Catholic graduates, these relationships persist, even after controls are incorporated into the estimation. Similar to the Catholic sector, these findings are consistent with the college prep orientation of most private nonreligious schools.

For respondents who did take science classes, we asked if their experience in science class increased or decreased their interest in science. In both the US and Canada, respondents who took three or four types of science courses in high school are more likely to report that these classes increased their interest in both math and science. Beyond that, there are few school sector differences in the impact of science classes on student interest in science. School sector differences in Canada are particularly small and insignificant, which could reflect a relative lack of heated controversy over religion in public life, especially regarding creation/evolution, as well as greater standardization of science curriculum and teacher certification for public and independent schools. In contrast, we find that evangelical schoolers in the US say that their science classes decreased their interest in science. We suggest two reasons for this. Classroom dynamics may be skewed toward skepticism of traditional science or “secular” scientists, and this

may be reinforced through interaction with peers. A stronger possibility is that the physical sciences are not the strong suit of evangelical schools in the US. That may result from a lack of resources available at the school or the department level, which may make it difficult to have well-equipped science classrooms, to attract and pay good teachers that specialize in science and have advanced training in science, etc. These dynamics may change as evangelical schools attempt to respond to parents increasingly concerned with social and educational mobility.

In our models, we also looked for evidence that science interest depended on taking a higher number of science classes. For the most part, we did not find much difference in science interest between students in a given sector who took a lot of science classes versus those who did not. The only exception is that in the US, religious homeschoolers who took a higher number of science classes report significantly higher levels of interest in science. That would suggest that homeschoolers are divided between those who emphasize science classes, for which the experience of science leads to increased interest, and those who do not. It may be that religious homeschoolers who take a higher number of science classes are working through schooling coops for these classes, which, for social and resource reasons, might be more effective in generating student interest.

Attitudes and Beliefs

When attempting to isolate the independent effect of religious school attendance on scientific attitudes and beliefs in adulthood, the results are mixed. In separate analyses, we found no sector differences in respondents' belief that science has the potential to make a positive impact on life and society. We created a composite impact measure

that accounts for the extent to which respondents believe that science has had a beneficial impact on life, food production, health, the environment, and the overall impact of science on society. Across all sectors, in both countries, (1) young adults believe that society benefits from science, and (2) the extent to which they view this benefit is the same across school sectors.

We estimated the frequency with which young adults engage with science by combining answers to questions about how often respondents watch science-related television programs or read about science in newspapers or magazines. Results indicate that graduates of Catholic high schools in the US are more likely to actively engage with science in the media (newspapers, TV, magazines), although later models indicate that this pattern could be attributed to differences in adult characteristics such as faith background or level of education. It is also possible that school sector has an indirect effect—such as the impact of sector on educational attainment. For instance, we find that graduates of Catholic high schools in the US complete more years of postsecondary education than do public school graduates, and those with higher educational credentials are more engaged with science. So it is not necessarily the case that there is no effect of sector, but rather that the effect operates through another variable in our model.

View of Scientists

Respondents' view of scientists is measured in our models with a composite variable reflecting the degree to which they believe that scientists can be trusted and the contributions that they believe that scientists make to society. Generally speaking, Canadians hold scientists in similar esteem regardless of their high school educational context. We did not find any differences among

sectors of formal schooling in respondents' views toward scientists. On average, adults who were homeschooled in a religious context had a more negative view of scientists than public school graduates, but this difference dissipated once religiosity of the household in which the respondent was raised were taken into account.

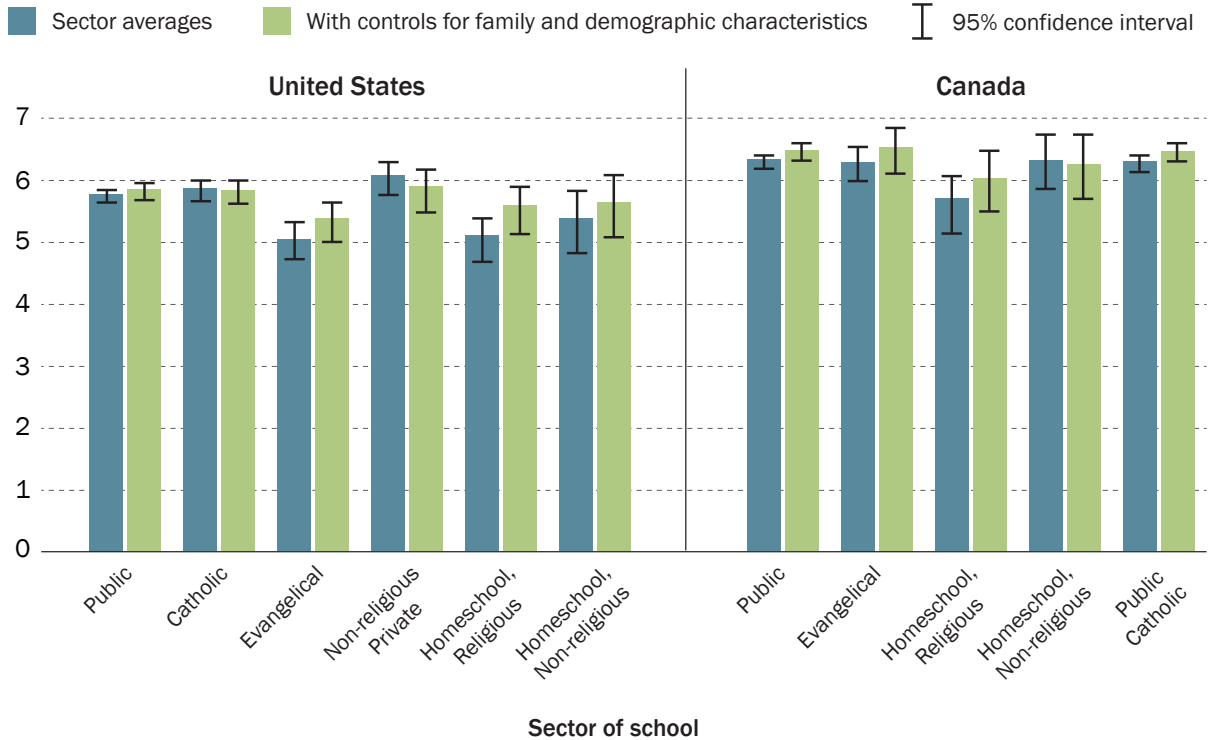
We do find a relationship between evangelical schooling in the United States and views of scientists in adulthood. Graduates of evangelical Protestant high schools in the US have a significantly more negative view of scientists than do graduates of public schools, even after controlling for religious tradition, religiosity, education, income, and upbringing. Further analysis indicates that this negative view is a function of a lack of trust (which approaches significance in models with full controls) to a certain extent, but it is more

strongly driven by the fact that evangelical high school graduates place less value on the contributions of scientists to society than graduates of public high schools.

Creationsim and Evolution

Creationism and struggles against the teaching of evolution has been largely rooted in the fundamentalist and evangelical movements, especially in the United States. This is reflected in our findings. In unadjusted estimates, graduates of evangelical schools disagree with the statement, "human beings, as we know them today, developed from earlier species of animals," to a greater extent than graduates of public high schools in both Canada and the US. Though we find that for Canadians this pattern is not related to school sector, but it can be explained by respondents'

Figure 3: Proportion who Believe Scientists Contribute Quite a Bit to the Well-Being of Our Society



religious tradition and family background. In contrast, school sector does matter in the United States. Graduates of evangelical high schools and of homeschools are less likely to believe in evolution than are public school graduates, even once religious and family variables are taken into account. In the US context, then, it seems that the high school setting is reinforcing skepticism about evolution for homeschool and evangelical Protestant high school graduates. According to our findings, school and family influence views of human evolution in the US.

Besides asking about evolution, the survey includes a question on whether the God created the world in six 24-hour days. In Canada, school sector does not on its own increase an individual's belief in literal versions of creationism, but the US

case differs. In the United States, relative to public high school graduates, those who attended evangelical high schools or who were homeschooled in a religious context more strongly adhere to six-day creationism. But do these results hold up when accounting for religion of family, which likely has a strong impact on creationist views? Not for homeschoolers. The relationship of creationism with homeschooling disappears after incorporating controls in the model, suggesting that homeschool graduates' beliefs about evolution and creation are likely in line with their parents' beliefs, which we would expect, since control over how and what students are taught about this topic is likely a primary reason families select into homeschool in the first place. This is not the case, however, for those educated in evangelical high schools. In our models there is a significant relationship between

Figure 4: Proportion who Believe God Created the World in Six 24-hour Days

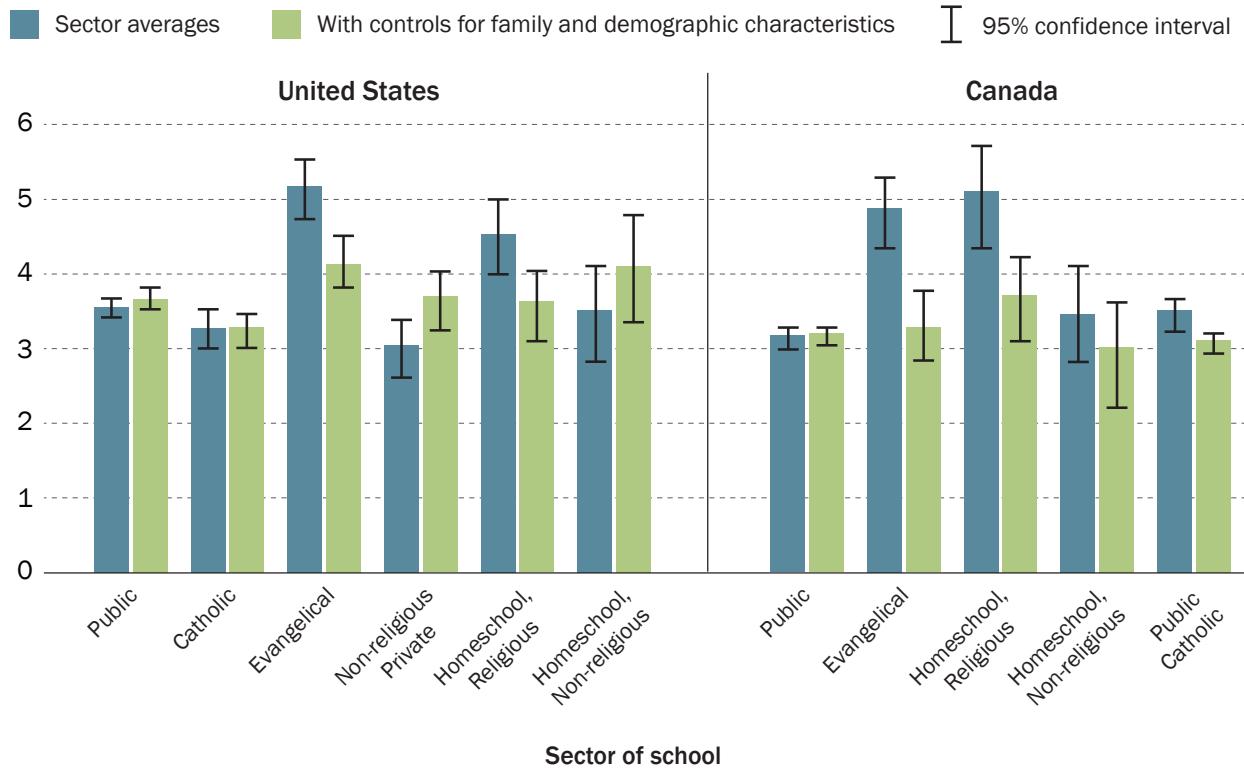
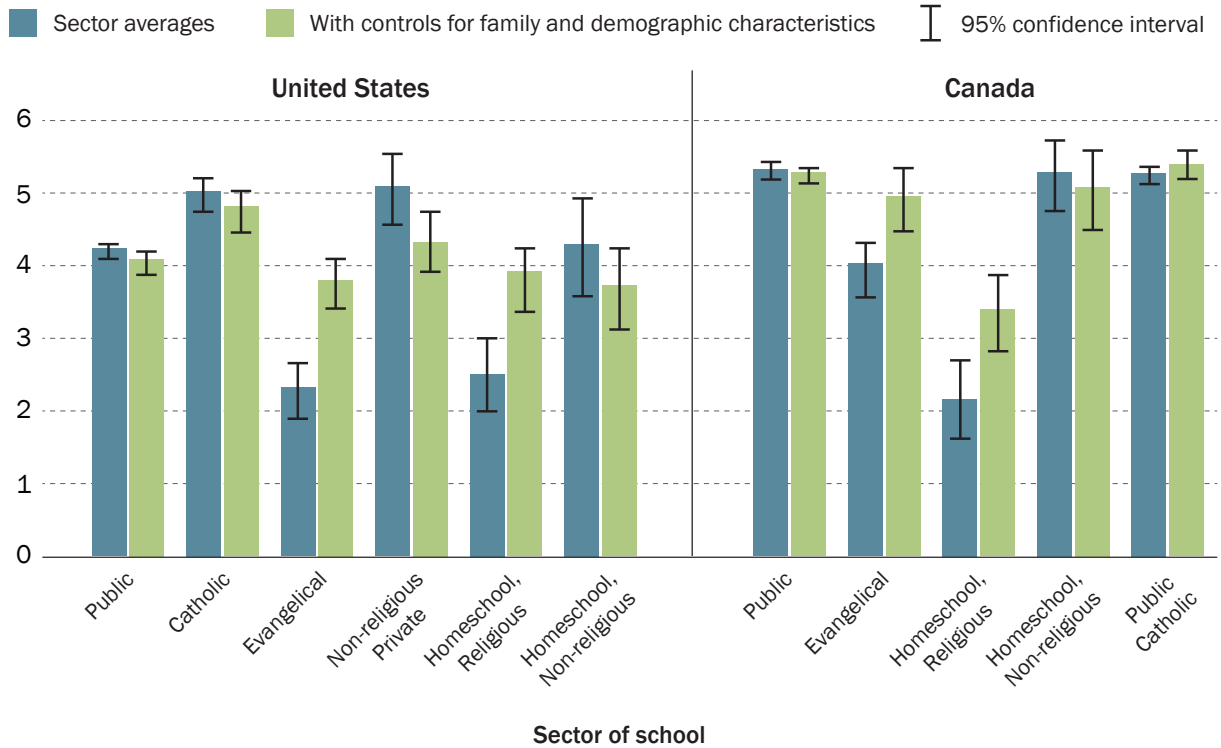


Figure 5: Proportion who Believe Human Beings Developed From an Earlier Species of Animals



belief in creationism and attending an evangelical high school. In other words, as adults, those who attended an EPHS are more likely to adhere to a literal version of creation than their public school peers, even after accounting for present and past faith traditions, the intensity of religious involvement, as well as all other controls in the model. What we don't know from this analysis is whether the effect on creationist views is the result of what is taught in science class, or an indirect effect mediated through changes in the religious and social lives of evangelical school graduates. Hill (2014) finds that the maintenance of creationist beliefs is strongest when individuals are embedded in a social network of alters who share their religious identity. Building on that insight, we expect that evangelical schooling influences support for creationism indirectly by increasing religiosity and

religious homophily in early adulthood. Future research will be necessary to pinpoint the processes through which evangelical schooling matters for creationist views.

Interestingly, US Catholic high school graduates not only express greater agreement with evolution than do public high school graduates, but also demonstrate a lower level of commitment to creationism. Further research on these findings is warranted. At this point it appears that Catholic schools socialize students to value science, perhaps through course-taking and encouraging careers in science either as a social good or as an effective social mobility strategy, which historically has been the role of Catholic schools in urban immigrant communities. And we should not discount the possibility that creationism within Catholic

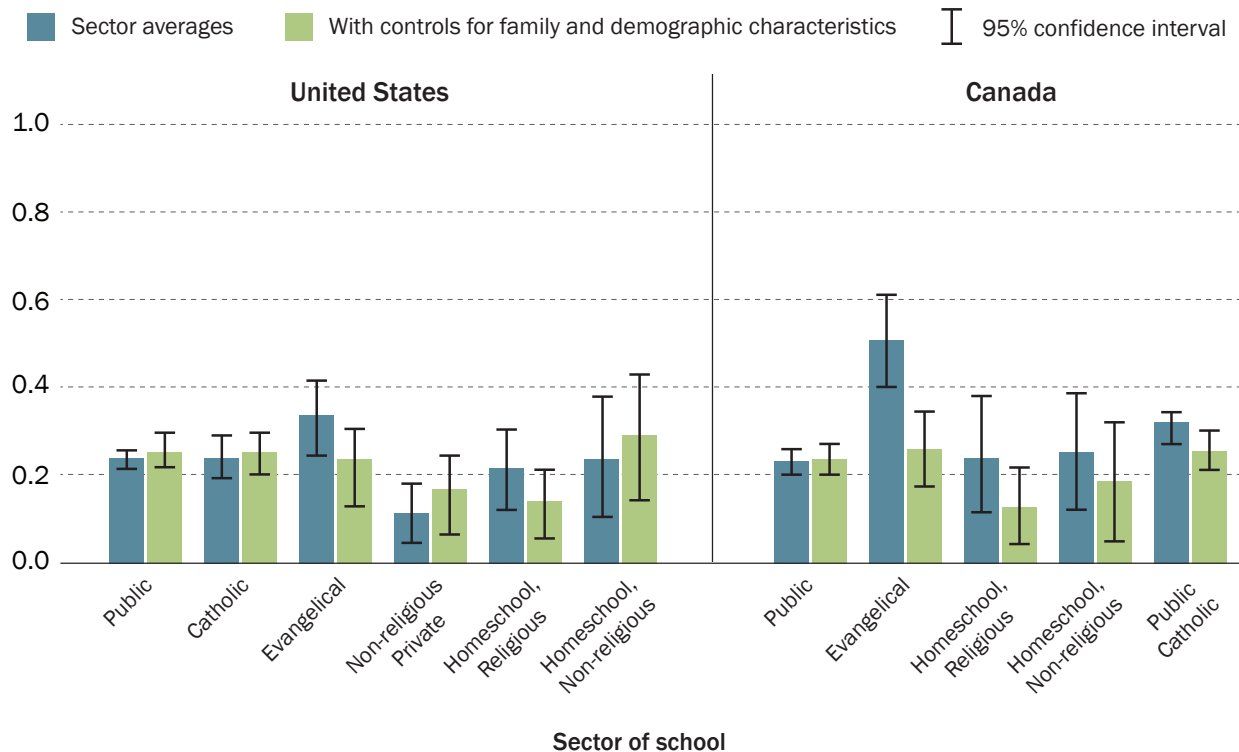
schools is viewed negatively in part because it has been most strongly associated with fundamentalist and evangelical Protestants; on the issue of creationism, Catholic schools may work to ensure strong symbolic boundaries with fundamentalism in particular.

Belief in evolution among private, non-religious high school graduates in the United States follows a related but inverse pattern to religious school graduates' adherence to creation. In unadjusted models, we find that those who attended non-religious private schools believe more strongly in evolution. Again, this pattern is explained by the (lower levels of) religiosity of the family in which one grows up—after accounting for that, there is no difference in the evolutionary beliefs of public and private non-religious high school graduates.

Science Conflicts with My Religion

Graduates of evangelical high schools in both Canada and the US are more likely to believe that science conflicts with their own religious beliefs than are public school graduates. After taking family characteristics and current denominational affiliation into account, however, we no longer observe a difference between evangelical and public school graduates. We find that the relationship between evangelical schooling and the belief that science conflicts with one's religion is a function of identifying with evangelical denominations as an adult. In other words, graduates of evangelical high schools perceive conflict between their faith and science because of their adherence to evangelical Protestantism. We do not find support for the proposition that attending an evangelical high school makes them more inclined to perceive sci-

Figure 6: Proportion who Believe Science and Their Religion Conflict



ence conflicts with their faith. At the same time, we have not analyzed the extent to which attending an EPHS impacts the religious affiliation of adults later in life. It is entirely possible that there is an indirect effect of attending an EPHS on the perception that science and religion conflict that is mediated by adults' religious identity.

Interestingly, we do find that in the US, religious homeschool graduates are less likely to say that science conflicts with their religious beliefs. This is rather striking given that these graduates are less likely to believe in evolution, and more likely to believe in six-day creation. We suggest that this negative relationship between the perception of a conflict between personal religion and science is due to considerable attention to the relation of religion and science in religious home school families. Bringing together the religious and educational sphere, so to speak, perhaps makes it easier for parents and children to discuss controversial religion and science issues. Alternatively, the kind of science curriculum in religious home schools may discount religion and science conflict in favor of creation science. The content of the science courses that religious homeschool graduates take might be presenting a view of the origins of life that are completely in line with literal biblical understandings. In fact, the choice of such science curriculum (as opposed to a more standard evolution-based curriculum) might have been one of the motivations for choosing homeschooling in the first place. Moreover, the lack of a sense of conflict may simply result from the relatively limited number of science courses taken by homeschoolers.

Effect of Taking Science Classes

We find convincing evidence that exposure to high school science classes improves adults' per-

ceptions of scientists. In both the US and Canada, taking three or more types of science classes improves one's view of scientists. This relationship is consistent across school sectors, but is particularly pronounced for graduates of non-religious private high schools in the United States. Interestingly, this applies to evangelical Protestant school graduates as well, which might indicate that any negative effect of experiences in this sector on views of scientists is not exacerbated in the science classroom.

In both Canada and the US, high enrollment in science courses is unrelated to adult commitment to creationism. The same is true of agreement with evolution in Canada. In the United States, however, those who took more types of high school science courses, regardless of high school sector, believe more strongly in evolution. This conclusion is perhaps most surprising for the evangelical Protestant sector, in which science instruction seems to have a similar effect on views of evolution/creation as it does in public schools.

Finally, we find that in Canada, exposure to more types of high school science increases the perception in adulthood that science and religion conflict. Relative to the US, Canadians express greater agreement with evolution and less with creationism. We posit that the relationships between science course taking and perception of conflict in Canada could reflect Taber and colleagues' finding that those with a greater degree of adherence to scientific explanations are more likely to perceive a conflict between science and religion (Taber et al 2011). In other words, Canadians generally express a greater adherence to scientific explanations of the origins of life (Brown and Delodder 2003), and broad exposure to science increases their perception that it conflicts with religion. With a higher concentration of scientific orientations in

Canadian classrooms, we posit that science classes might not be pressed to address possible conflicts between evolutionary and creationist perspectives. Teachers and curriculum may exacerbate the perception of conflict in how they deal with issues of religion and science. These patterns could explain an increased perception of conflict for individuals who subscribe to religious explanations. Ignoring conflict with religion in science instruction communicates to religious believers in creation that evolution is exclusively secular. A heavy focus on scientific authority may come across as an alternative sacred within a secular society, which likely increases the sense of science/religion conflict for religious believers. The fact that science as a form of knowing is strongly separated from religion in some contexts, especially public schools, may lie behind a strong sense of religion/science conflict in more secular societies (Billingsley et al. 2014b, Billingsley et al. 2016).

Summary and Conclusion

Our findings indicate that in some circumstances, religious school attendance has a direct, independent effect on adults' orientations toward science. These effects vary considerably in the US and Canada however. On the whole, EPHS graduates are not different in behaviors that show an interest in science, nor do they hold science in low esteem. But they do show some sense of conflict with science and, especially, scientists. While not avoiding science classes, EPHS in the US are more likely to feel that their courses reduced their interest in science. Evangelical schoolers in the US emerge less trusting of scientists as well. They more strongly believe that science and their own personal religious beliefs conflict, though this is explained by evangelical Protestant church affiliation in adulthood. We have not found that EPHS grads believe that science and religion inherently

conflict (Pennings et al. 2014). In other words, EPHS grads in the United States do not necessarily believe that scientific and religious explanations must conflict, but they do believe that in practice science does conflict with their personal religious beliefs. The sense of conflict for US evangelical schoolers is partly due to the lower belief in the evolution of humans and higher levels of support for creationism. Evangelical schoolers in the US likely experienced two forces that support these beliefs. During high school they were embedded in a homogenous environment with co-religionists, which makes them less likely to reconsider their perspective on evolution, creation, or conflicts between science and religion (Hill 2014). Second, when they enrolled in science classes, many were more likely to hold a strong commitment to creationist frameworks. Having a more well-formed position on religion and science questions may reduce the likelihood that they would come to synthesize, accommodate inconsistencies, or perceive religion and science as separate domains. However, the schooling effects on views of creationism and trust in scientists are weakened for all graduates through broad science course-taking, suggesting that exposure to formal science instruction in the US—whatever the sector—aids in broadening students' perspectives on science into adulthood.

The findings on orientations to science among homeschoolers are mixed. We find that homeschool graduates in the United States and nonreligious homeschool graduates in Canada have less broad science curricula than their formal school peers. In addition, religious homeschoolers in the States report less conflict between their personal religion and science. Potential explanations of this finding include limited exposure to science and objectionable scientific theories, or, alternatively, considerable attention to reconciling religion and sci-

ence within the family-schooling milieu. We also find that US religious homeschoolers who take a greater number of science classes, in contrast to those in other sectors, become more interested in science than those who do not. The conclusion seems to be that there is nothing inherent in religious homeschooling that hinders appreciation of science, but that appreciation varies considerably within the movement.

Independent Catholic school graduates, along with nonreligious private school graduates for some outcomes, have the most positive orientation to science of all the school sectors. When it comes to taking higher level science classes, Catholic and nonreligious school graduates are the only sectors that are distinctively higher. In Canada, Catholics appear more likely to pay attention to issues of science in the media. And Catholic school graduates in the US are surprisingly more likely to support evolutionary theories of human origins.

Finally, we reiterate the stark differences in sector effects in Canada and the US. We find in Canada, for example, that taking a high number of courses leads to a stronger sense of conflict between personal religious beliefs and science, but this effect applies to young adults from all high school sectors. A more secular society and perhaps a more secular classroom may exacerbate the perception of science/religion conflict for religious and non-religious alike. In Canada, we do not observe an independent effect of attending an EPHS on any of our measures of views on science and scientists. The strongest sector effects in Canada are for homeschool graduates, who took fewer types of science courses in high school (non-religious homeschool graduates in particular) and are less likely to believe in evolution as adults. With these exceptions, overall the sector differences regarding

science attitudes and behaviors are much more muted in Canada.

Future research should attempt to unlock the black box of scientific instruction in evangelical schools and in homeschool contexts, comparing differences across US and Canadian evangelical schools. Do EPHS teachers in Canada structure science curriculum in a way that helps students develop tools to reconcile religious and scientific frameworks? Does the context of religion and public life, or religion and science more specifically, vary across societies in ways that are reflected in evangelical schools? The cross-cultural difference in the impact of evangelical schools on orientations to science may indicate that what is often considered an evangelical school effect is highly conditioned by the broader social context. Along these lines, future research should consider variation within the evangelical school sector in the U.S., which may reveal additional variation rooted in religious movements, including the fundamentalist, Pentecostal, and evangelical wings of Evangelical Protestantism. Further, more can be known about how parents who homeschool make decisions about science curricula (McGraw, Bergen and Schumm 1993), and how homeschool graduates reconcile possibly incomplete scientific knowledge with inconsistencies between knowledge and experiences in adulthood.

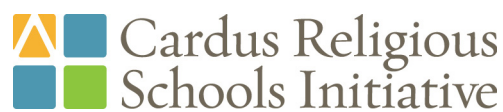
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