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Testing theories of secularization and religious belief in the Czech Republic and Slovakia

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ABSTRACT

Several theoretical approaches have been proposed to explain variation in religiosity, including versions of secularization hypotheses, evolved cognitive biases, and cultural transmission. In this paper we test several theories that aim to explain variation in religiosity and compare them in a representative sample collected in the Czech Republic and Slovakia (N = 2022). These two countries represent a natural experiment in religiosity; despite their high level of historical, institutional and cultural similarity, their populations differ markedly in the rate of religious belief. We examine the predictive power of cognitive biases (anthropomorphism, dualism, teleology, mentalizing, and analytic thinking); institutional insecurity; and exposure to credibility displays of belief in childhood on various factors of religious belief. We find that individual differences in cognitive biases predicted 8% of the variance belief in God, but predicted 21% of the variance in paranormal beliefs and almost no variance in religious participation. Perceived institutional insecurity explains little variance in any of these variables, but cultural transmission, measured as exposure to credibility enhancing displays (CREDs) and church attendance in childhood, predicted 17% of the variance in belief in God and 30% of religious participation, and mediated 70% of the difference between these two countries in belief in God and 80% of the difference in religious practice. These findings suggest cognitive biases may explain the existence of belief in the supernatural generally, but cultural transmission through credible belief displays is a more plausible explanation for why people adopt and maintain a specific set of religious beliefs and practices.

1. Introduction

Religion exists in some form or another in every human culture and appears to have done so for all of human history (Bellah, 2011; Wright, 2009). This observation has led to several theories about the evolutionary origin of religion in the human species (e.g. Atran, 2002; Barrett, 2004; Boyer, 2001, 2008; Johnson, 2015). Many of these theories claim that religion is a natural by-product of our evolved cognition (see Atran & Norenzayan, 2004)—it is a consequence of how we perceive and interpret the world around us.

Despite the cultural prevalence of religion, not everyone in every culture is religious and there are an increasing number of cultures that claim a non-religious majority (see Lanman, 2012; Zuckerman, 2008). This seems to fly in the face of the 'religion is natural' hypothesis and has sparked some debate over whether anyone can truly be an atheist (Barrett, 2010; Bering, 2010; Geertz & Markússon, 2010). Though an evolved capacity for religion does not preclude individual differences in religiosity (see Willard & Norenzayan, 2013), the religious landscape is much more complex than this (Gervais, Willard, Norenzayan, & Henrich, 2011; Norenzayan & Gervais, 2013).

Alongside theories looking at the biologically based evolutionary origin of religion, a different set of theories have developed examining the variation in religious decline (e.g. Bruce, 2002; Norris & Inglehart, 2004; Stark & Bainbridge, 1985). These theories are founded in 'the secularization hypothesis', which proposed that as levels of economic development, education, and modernization increased, religious beliefs and practices in the general population would decline (see Berger, 1967; Durkheim, Cosman, & Cladis, 1912; Martin, 1968; Weber, 1904; Wilson, 1966). Other perspectives have drawn on cultural transmission and evolution to account for this variation in belief (Atran & Henrich, 2010; Gervais et al., 2011; Norenzayan et al., 2016).

All of these theoretical perspectives focus on different aspects of religion and they should not be seen as rival hypotheses. Rather, they are likely to all uniquely contribute to the mosaic of traits that make up religious belief. Up until now, published studies have focused on showing how these factors individually play a role in the explanation of religiosity. However, no study has looked at these theories together and empirically gauged the relative contribution each of these theories makes to the overall variation in religious belief. Instead of asking whether there is evidence to support the significant effect of any given

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theoretical perspective taken in isolation, a more fruitful approach to understand religion and religious decline would be to evaluate the magnitude of these effect within a single sample. This is the goal of the present study—to look at which components of religiosity are explained by each theory and examine the strength these theories have in predicting these components. We do so in the unique environments of the Czech Republic and Slovakia, two historically and culturally very similar countries with marked differences in religiosity.

1.1. Existing theoretical perspectives and evidence

1.1.1. Secularization hypotheses

There is evidence to support some causes of secularization put forth by secularization theorists. Education does seem to contribute to lower levels of religiosity (Hungerman, 2014). This effect appears to be stronger for non-science education than for science education (Kimball, Mitchell, Thornton, & Young-Demarco, 2009), and is weaker for people who were raised in highly religious families (Ganzach, Ellis, & Gotlibovski, 2013).

More support has been found for versions of the secularization hypothesis that take the role of religious emotions into account (Gorski, 2000, 2003; Sommerville, 1998, 2002). This includes the noteworthy work of Norris and Inglehart (2004) who reframed the secularization hypothesis as the existential insecurity hypothesis. Religion here is taken as an emotional buffer against the existential fears of things such as death, disease and destitution. As societies modernize, most begin to address the roots of these fears by making the environment more secure with institutional programs like insurance, healthcare, and welfare. The existential insecurity hypothesis gives a functional explanation for the variation in the effects of development on religiosity around the world. According to this hypothesis, religion should decline in places where secular institutions reduce the fear of personal catastrophes (Norris & Inglehart, 2004). Correspondingly, there is some evidence to suggest that suffering can increase religiosity (Gray & Wegner, 2010; Sibley & Bulbulia, 2012), which supports the idea that reducing suffering (or the fear of suffering) may reduce religiosity.

1.1.2. Cognitive bias theories

Cognitive bias theories claim that religious beliefs are by-products of our innate cognitive systems (see Atran & Norenzayan, 2004; Barrett, 2004; Bloom, 2005). These theories propose that supernatural beliefs reliably emerge from how we perceive and interpret the world around us. Supernatural beliefs exist because they are based in intuitions that arise out of the heuristic functions of theory of mind (Barrett, 2004; Guthrie, 1993). The idea that religion is based in intuition has been supported with a couple of recent studies. These studies found people who are less intuitive and more analytic are less religious on average, and that making people think analytically reduces their ratings of religiosity (Gervais & Norenzayan, 2012; Shenhav, Rand, & Greene, 2012).

Cognitive bias theories suggest that the number of people who follow a specific set of religious traditions can be pushed around by culture, but most people will retain some supernatural beliefs (including belief in God) even if they consider themselves 'non-religious' (Geertz & Markússon, 2010). Those who maintain supernatural beliefs will be, in part, determined by individual differences in the strength of these cognitive biases (Willard & Norenzayan, 2013). Cognitive biases should not be able to explain why one population is more religious than another—this is the responsibility of culture (see Gervais et al., 2011). These theories aim to explain why supernatural beliefs including religious ones exist in every culture across human history. As potentially biologically based mechanisms, we should expect variation in how prone people are to these intuition to predict variance in religiosity across population, but not between them, particularly in highly related populations.

1.1.3. Cultural transmission through credible displays

The third set of theories—theories based on biases for cultural learning—broadens the potential reasons for individual religiosity by introducing a different type of cultural factor: the exploitation of evolved cultural learning mechanisms (Atran & Henrich, 2010). Though many different cultural learning mechanism are likely at play (e.g. Henrich & Boyd, 1998; Henrich & Gil-White, 2001), one in particular, credibility enhancing displays (CREDs; Henrich, 2009), deals specifically with the type of non-verifiable beliefs that make up much of religion (Willard, Henrich, & Norenzayan, 2016). This theory proposes that when a new member of a culture—such as a child—is faced with learning a new belief, that new member will look at how others behave to determine the truth and importance of learning that belief among other potential beliefs. Behaviors that credibly display the authenticity of that belief will increase the likelihood that the learner will adopt and maintain that belief. Participating in potentially costly rituals—such as church attendance, tithes, and sacrifices—signals to others you hold your religious belief as both true and important. This, in turn, increases the chance that those beliefs are adopted and maintained by the next generation (i.e. increases the fidelity of transmission).

1.2. Czech Republic and Slovakia

The Czech Republic and Slovakia offer a unique opportunity to test the role of these different theories in religious belief and secularization. These two countries share similar recent histories, cultures, languages, and institutions. They were the same country from 1918 to 1993, when they peaceably split into two separate republics. Soviet communists ruled both countries between 1945 and 1989. Despite this, their religious trajectories in the past half-century have differed dramatically; Slovakia maintains a religious majority while the Czech Republic is one of the least religious countries in the world. Notably, the Czech Republic seems to be the outlier in the region; most other previously communist countries are similar to Slovakia in that they maintained high levels of religious belief after the fall of communism (Froese, 2004). The similarities between the Czech Republic and Slovakia, paired with their enduring difference in religious belief, make them an ideal natural experiment for testing theories of religious belief.

The Czech Republic and Slovakia do have some basic demographic differences. The Czech Republic is more urban, has a higher population density, and is somewhat wealthier with a more educated population than Slovakia. Slovakia also has a higher unemployment rate than the Czech Republic (Eurostat, 2016). Though some of these factors, especially urbanity and education, have been related to declines in religious belief (see Albrecht & Heaton, 1984), the differences here are not large enough to account for the vast difference in religiosity (Froese, 2005). What is more, the Czech Republic is by no means the wealthiest or the most urban country in Europe, yet it still boasts rates of disbelief that are much higher than its more economically developed neighbors.

There are some important historical differences between these two countries. The communist regime actively suppressed both public and individual religiosity during their rule in Czechoslovakia and tried to substitute it with the party-oriented Marxist ideological propaganda. Religion played only a minor role in public life during this time, and two generations in both countries had limited exposure to religion and religious rituals. However, in Slovakia and Poland, the Roman Catholic Church served as a symbol of opposition and sanctuary against the oppressing regime. This was not the case in what is now the Czech Republic. This tie with national identity and resistance appears to have maintained the importance and credibility of the church during the communist oppression. This was manifest in the religious revivals in these two countries in the 1990s. In contrast, the Czech Republic showed only a minor temporary increase after the fall of the iron curtain, and has continued to decline in recent years (Hamplova & Nespor, 2009; Lužný & Navrátilová, 2001; Minarik, 2014; Nešpor, 2004).

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A history of skepticism towards Catholicism may partially explain why the communist suppression of religion had such a different impact in ongoing religiosity in the Czech Republic than it did in either Slovakia or Poland. The Czech people had a history of separation between church and state and were skeptical of the political power of the church (Hamplova & Nespor, 2009; Lužný & Navrátilová, 2001; Minarik, 2014; Nešpor, 2004). Still, despite this history of skepticism, 76.4% of Czechs considered themselves Catholic and 93.9% belonged to a religious group as recently as 1950 (See Fig. 1.1) (Hamplova & Nespor, 2009). Even in 1991, shortly after the fall of communism, 43.7% of Czechs claimed a religious affiliation in the nation census. This suggests that a large portion of adult Czechs today were raised in religious households or their parents were raised in religious households. Most of the abandonment of religion has happened in the past 65 years.

2. Current research

Whatever the potential historical impacts on the religiosity in the Czech Republic and Slovakia, the present day difference can be exploited to assess different theories of religiosity. With this goal in mind, we collected individual difference measures on perceptions of equality and security in government institutions, cognitive biases (anthropomorphism, dualism, teleology, mentalizing, and analytic thinking), and credibility enhancing displays (CREDs) in the Czech Republic and Slovakia. We additionally collected local area differences in secular institutions, crime rate, and unemployment. We used these data to evaluate which of these theories could best explain the variance in religious beliefs and religious practices across and between these countries.

The analysis is split into five sections. Within each section we use relevant variables to predict belief in god (a predominantly conventional religious belief), paranormal belief (supernatural beliefs that are not tied to religious traditions), and religious participation (attendance, prayer, and rating of religiousness). This allows us to evaluate if different theories predict different aspects of religion and supernatural belief. For each outcome variable in each section, a model containing the theory-relevant variables was compared to a base model containing only demographic control variables. With this, we can assess how much variance was explained by each theory above and beyond demographic, regional, and country level differences. For variables that showed a substantive country level difference *and* predicted one or more of our outcome variables, mediation analyses were used to assess if these variables could account for any of the country level difference in religiosity.

2.1. Analysis 1

In the first analysis we used only demographic variables to predict belief in God, religious participation, and paranormal beliefs. These models look at the role of education, income, urbanity and other relevant demographic variables in predicting belief.

2.2. Analysis 2

In the second analysis, we looked at the existential insecurity hypothesis by looking at district level differences in institutional insecurity. We assess the impact of difference in secular institutions in each participant's local area, as well as the perceptions of these institutions, on religious participation, belief in God, and paranormal beliefs.[1] Since the secular institutions in these two countries are similar, it is unlikely that differences in these institutions can account for the difference in religiosity between these countries. Still, there is sizable regional variation in these predictors and people in these two nations have somewhat differing beliefs about the strengths and potential failures of their institutions. This gave us an opportunity to explore whether institutions and perceptions of institutions may account for some of the difference.

2.3. Analysis 3

In the third analysis we assessed the role of cognitive biases in predicting different types of beliefs. We assessed both the country level difference in these cognitive biases and the amount of the overall variance in belief these biases explain. Since these biases are thought to be innate rather than learned, we expect no country level differences. Since these theories are aimed at why people create and adopt supernatural beliefs, we expected these biases to be more predictive of paranormal belief than religious belief, and more predictive of religious belief than religious practice. These cognitive biases support the intuitiveness of supernatural belief, but people are religious for many reasons beyond their intuitions towards the supernatural.

2.4. Analysis 4

The fourth analysis examined the role of credibility enhancing displays in supernatural belief and religious practice. Since this theory is about cultural learning, we expect these variables to explain variance in individual belief, and to explain some of the country level difference. We include an additional analysis that examines only those who were raised religiously and used the CREDs scale and childhood church attendance to predict the likelihood of current religious belief. This tests the effectiveness of CREDs beyond the effects of being raised religiously.

2.5. Analysis 5

Finally, we look at all variables in a single model to see if predictions from all theories remain relevant when tested together. In addition, we use these variables to predict adult religiosity in those who were raised religiously (remained religious) and those who were raised non-religiously (converted).

2.6. Methods

Data was collected as self-report questionnaires by the Czech branch of IPSOS market research firm on behalf of the researchers. The questionnaires were translated into Czech and Slovakian by bilingual researchers familiar with the theories and scales aided by a professional translator, and then back translated into English. Additional country and district level data was gathered from census and other government agencies (see SOM). Measures were presented in a randomly generated order. All belief and religion questions came at the end of the survey after all other measures had been completed. Demographic variables were collected by IPSOS separately.

The predictor variables used in each analysis section are described at the beginning of that section. Since the belief measures are used as dependent variables in all of the analysis sections below, we briefly describe them here.

2.7. Belief and practice

2.7.1. Belief in God

Belief in God was measured with a three-question scale (I believe in God; I believe in a divine being who is involved in my life; There is no god or higher power in the universe; $\alpha = 0.71$; see Willard & Norenzayan, 2013).

[1] The original level of analysis in Norris and Inglehart (2004) was country level with the aim to explain the cross-country population variation. However, as the authors claim in Chapter 1, the principle of the existential insecurity hypothesis should be applicable to the intra-country variation in religiosity as well. They mention that groups more vulnerable segments of a society, like the poor, the elderly or the less educated, should have stronger religious beliefs. Therefore we assume that this methodological difference does not affect our results.

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2.7.2. Religious participation

This included rating of frequency of church attendance and prayer, and a measure of religiosity (do you consider yourself a religious person?), each measured on a 7-point scale ($\alpha = 0.92$).

2.7.3. Paranormal belief

Paranormal belief was measured using the revised paranormal belief scale (Tobacyk, 2004). The religiosity subscale was removed because it overlapped with the other belief measures. The mystical animals subscale was also removed due to its cultural specificity ($\alpha = 0.94$).

2.8. Participants

Two representative samples were collected by IPSOS from their paid subject pool (Czech: $N = 1010$; Slovakia: $N = 1012$). Representativeness corresponded to age, gender, income, and region in both countries. Both the Czech and Slovak samples consist of 50% females and have a mean age of 40.6 years ($SD = 13.23$) and 41.3 years ($SD = 13.22$) respectively.

2.9. Religious profiles of the two countries

As expected, the Slovakian sample had far higher ratings of religious belief than the Czech sample (Czech: M = 2.88, SD = 1.29; Slovakia: M = 4.11, SD = 1.58; Welch $t(1917.60) = -19.02$, $p < 0.001$, $d = -0.85$). Both samples held similar levels of paranormal beliefs (Czech: M = 3.32, SD = 1.16; Slovakia: M = 3.24, SD = 1.14; Welch $t(2001.10) = 1.58$, $p = 0.11$, $d = 0.07$). Though only 17% of the Czech sample said they were religious, 40% claimed to believe in 'a spiritual life force'. A further 15% believed God to be 'within them'. Only 8% believed explicitly in a personal God (see Fig. 2.1). Though the Czech Republic is a largely non-religious country, many Czech people still hold supernatural beliefs.

3. Analysis 1: demographic model

Three regression models were run to test the impact of demographic variables on three outcome variables: belief in God, paranormal belief, and religious practice. These models contained relevant demographic variables (see Table 1) to assess how much variance is explained by these demographics alone. We were specifically interested in the role of income, level of education, and urbanity (measured as size of place of residence) in explaining variance in religious belief and practice. These serve as a proxy for the more general modes of secularization, such as declining social significance, put forth by some secularization theorists (Wilson, 1998).

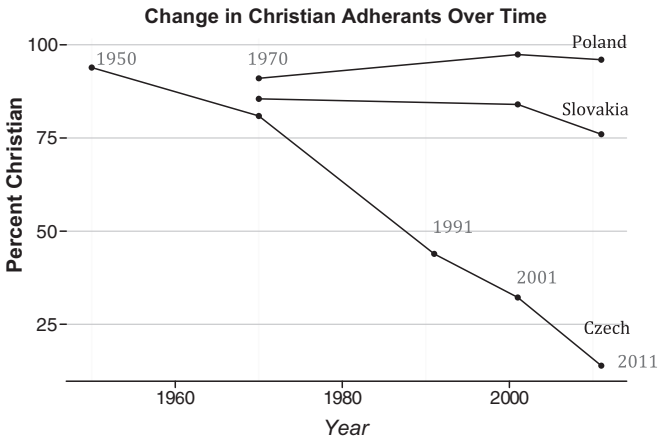

Fig. 1.1. Percentage of religiously affiliated based on census data from 3 countries. The data from 1970 is an estimate from the World Christian Encyclopedia (Barrett, 2001). Reliable census data is not available for this time point.

3.1. Results

First, we ran a model containing only the country level difference in these variables. Living in Slovakia rather than the Czech Republic accounts for 14% of the variance in religious participation (Adj. $R^2 = 0.14$, $F(1, 1841) = 305.60$, $p < 0.001$), 11% of the variance in belief in God (Adj. $R^2 = 0.11$, $F(1, 1841) = 225.70$, $p < 0.001$), and no variance in paranormal belief (Adj. $R^2 = 0.001$, $F(1, 1841) = 2.54$, $p = 0.11$). Country, age (in decades), gender, marital status, number of children, income bracket, education, and urbanity were included in the full models. Marital status, income bracket, education level, and urbanity were all collected as categorical variables (e.g. income between €20,000 and €39,999 per year) and included as dummy-coded fixed effects. The addition of these variables to the country-only model accounted for an additional 4 percentage points of variance in religious practice ($\Delta R^2 = 0.04$, $F(22, 1819) = 4.38$, $p < 0.001$, partial $\eta^2 = 0.05$), 4 percentage points of variance in belief in God ($\Delta R^2 = 0.04$, $F(22, 1819) = 3.82$, $p < 0.001$, partial $\eta^2 = 0.04$), and 5 percentage points in paranormal belief ($\Delta R^2 = 0.05$, $F(22, 1819) = 4.83$, $p < 0.001$, partial $\eta^2 = 0.06$).

To look at the effects of education, income and urbanity on each of our dependent variables, we ran a regression with each of the ordered categories as continuous variables (see Table 1). Betas can be interpreted as the standard deviation change in the dependent variable for movement from one category to the next. A mediation analysis was run to test if urbanity could explain a proportion of the country level difference in belief in God (indirect effect = 0.01, SE = 0.005, 95% CI: 0.001 to 0.02; proportion mediated: 0.015) and if urbanity and income could explain any of the difference in religious practice (urbanity indirect effect = 0.02, SE = 0.006, 95% CI: 0.004 to 0.03; income indirect effect = −0.02, SE = 0.01, 95% CI: −0.03 to −0.005; proportion mediated: −0.007). For religious practice, urbanity is acting as an inconsistent mediator or suppressor variable (MacKinnon, Fairchild, & Fritz, 2007). It increased rather than decreased the predicted country level difference.

3.2. Discussion

The country a person resides in was the strongest demographic predictor of belief in God and religious practice in these models, but has no effect on paranormal belief. There are some differences in what these demographic variables explain across our three dependent variables. Living in a more urban environment accounted for a small decrease in both religious practice and belief in God, but had no effect on paranormal belief. Though increased education does seem to decrease in paranormal belief, it does not account for a reduction in religious beliefs. Across these two countries, the variables relevant to secularization hypotheses are not strong predictors of the variability of religiosity or paranormal beliefs.

4. Analysis 2: institutional insecurity and the existential insecurity hypothesis

Next we turn to another type of secularization hypothesis: the existential insecurity hypothesis (Norris & Inglehart, 2004). As secular institutions replace many of the roles of religious institutions, and systems like welfare and healthcare assuage basic fears, the importance of religion in people's lives declines. One immediate problem with applying this hypothesis to explain differences between these countries is that both the Czech Republic and Slovakia have very similar institutions (Froese, 2004). Relatedly, both countries have a stable Gini Coefficient of approximately 26.1 (data for 2012; World Bank, 2016), ranking them in the top-5 most equitable countries. The similarity in institutions across these two countries suggests that the strength of institutions is also unlikely to explain the religious variation.

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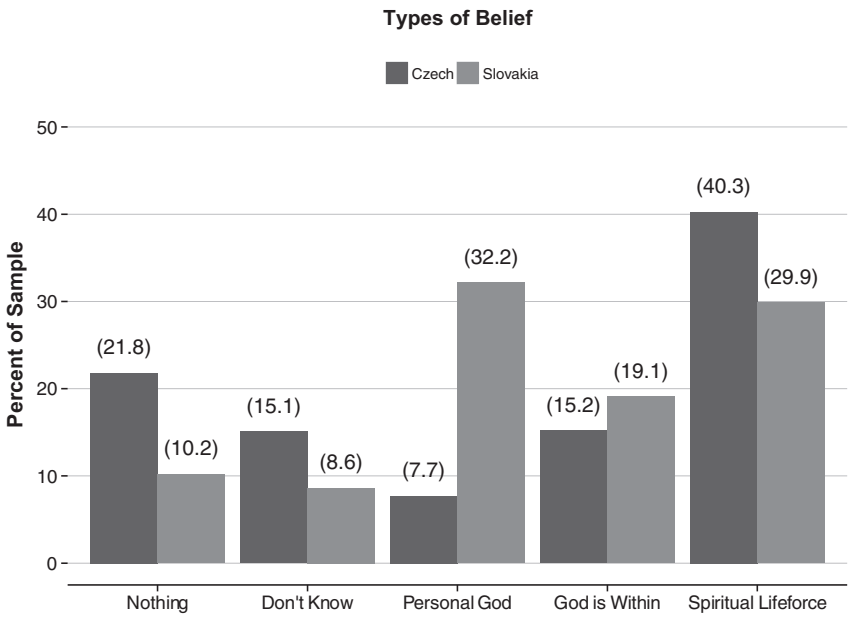

Fig. 2.1. Percentage of participants from each country for each type of belief, based on forced choice answers. Choices were: "I don't believe in any kind of God, spirit, or life force" (nothing); "I don't really know what to believe" (don't know); "I believe in a God with whom I can have a personal relationship" (personal god); "I believe more that God is something within each person rather than something out there" (god is within); "I believe in a spirit or life force" (spiritual life force). Percentages are in parenthesis.

If it is the reduction in anxiety associated with strong institutions that causes the decline in religiosity (Norris & Inglehart, 2004), then variance in religiosity should be predicted by an individuals' *perception* of the strength of their institutions and how much they worry about them failing. Even in a place with high levels of institutional support, people may differ in how much they believe these institutions really look out for them. A person who thinks that the welfare and healthcare systems will not support them when they are in need may still rely on religion for additional help and to decrease the existential insecurity these beliefs produce, even if these beliefs are entirely unfounded. We included both institutions and the perception of institutions on religious belief in these analyses. These models were compared to the demographics only model from analysis 1.

4.1. Materials

We measured people's perceptions of insecurity with three questions for each of: *Financial insecurity* assessed participant's fears of not having enough money or becoming destitute ($\alpha = 0.84$); *Physical insecurity* assessed feelings of personal safety and fear of crime ($\alpha = 0.76$); *Social insecurity* assessed fears about social services, such as welfare and healthcare failing ($\alpha = 0.76$); *Inequality* assessed perceptions and feelings about the gap between the rich and poor ($\alpha = 0.79$); *Trust* assessed participant's general trust in other people in their society ($\alpha = 0.64$).

Additional data on institutions was collected for each participant's district from census and other government data (see SOM). Levels of unemployment, crime rate, number of doctors, and number of social facilities per 1000 people were collected for each participant's local district. These variables give an objective assessment of institutional support at a local level.

4.2. Results

Though there are some significant country level differences in the perception of insecurity variables, all the effects are negligible (*d*s < 0.20, see Table 2). The difference in actual institutions is greater, especially unemployment ($d = -1.04$). These institutional differences should be compared with some caution, as slight differences in how these variables are measured in each country may slightly bias these results (i.e. how doctors or social facilities were counted).

Table 1
Impact of demographic variable on religious practice, belief in God, and paranormal belief.

	Practice			God			Paranormal		
		95% CI			95% CI			95% CI	
	B(SE)	Lower	Upper	B(SE)	Lower	Upper	B(SE)	Lower	Upper
Intercept	−0.21 (0.15)	−0.51	0.10	−0.34 (0.16)*	−0.65	−0.03	0.54 (0.17)**	0.21	0.87
Slovakia	0.73 (0.04)***	0.64	0.82	0.63 (0.05)***	0.54	0.71	0.02 (0.05)	−0.08	0.11
Age	−0.01 (0.02)	−0.05	0.04	−0.03 (0.02)	−0.07	0.02	−0.06 (0.02)*	−0.10	−0.01
Female	0.13 (0.04)**	0.05	0.22	0.21 (0.05)***	0.12	0.02	0.24 (0.05)***	0.15	0.34
Children	0.08 (0.02)***	0.03	0.12	0.07 (0.02)**	0.02	0.30	−0.02 (0.03)	−0.07	0.03
Married	−0.03 (0.06)	−0.15	0.09	0.01 (0.06)	−0.11	0.14	0.09 (0.07)	−0.04	0.22
Separated	−0.16 (0.06)*	−0.29	−0.04	−0.05 (0.07)	−0.18	0.08	−0.12 (0.07)	−0.27	0.01
Education	0.002 (0.02)	−0.03	0.04	0.03 (0.02)	−0.01	0.07	−0.11 (0.02)***	−0.15	−0.07
Income	−0.02 (0.01)*	−0.04	−0.002	−0.01 (0.01)	−0.03	0.01	−0.02 (0.01)	−0.04	0.001
Urbanity	−0.07 (0.02)***	−0.10	−0.04	−0.04 (0.02)**	−0.08	−0.01	0.01 (0.01)	−0.03	0.04
	Adj. $R^2 = 0.17$, $F(9, 1833) = 43.24$, $p < 0.001$			Adj. $R^2 = 0.13$, $F(9, 1833) = 31.17$, $p < 0.001$			Adj. $R^2 = 0.04$, $F(9, 1833) = 9.53$, $p < 0.001$		

* $p < 0.05$.
** $p < 0.01$.
*** $p < 0.001$.

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Table 2
Means and effect sizes of mean differences between countries for all insecurity variables. Positive *d*'s mean the Czech Republic has higher scores than Slovakia.

		d 95% CI	
	Cohen's *d*	Lower	Upper
Financial insecurity	0.02	−0.07	0.11
Physical insecurity	0.09*	0.004	0.18
Social insecurity	−0.08	−0.16	0.01
Inequality	0.05	−0.04	0.14
Trust	−0.19***	−0.28	−0.11
Unemployment	−1.04***	−1.13	−0.95
Doctors	−0.12**	−0.21	−0.04
Crime	0.71***	0.63	0.81
Social facilities	0.76***	0.67	0.86

* $p < 0.05$.
** $p < 0.01$.
*** $p < 0.001$.

Perceptions of physical insecurity and insecurity of social services, and local unemployment rate were significantly and positively related to religious participation (Table 3). Still, the amount of overall variance institutions and perceptions of institutions account for compared to the base model is minimal ($\Delta R^2 = 0.03$, $F(9, 1810) = 8.98$, $p < 0.001$, partial $\eta^2 = 0.04$). If we look at belief in God, only trust is significant ($\beta = 0.06$, 95% CI: 0.02 to 0.11), and the increase in variance explained is extremely small ($\Delta R^2 = 0.007$, $F(9, 1810) = 1.72$, $p = 0.08$, partial $\eta^2 = 0.009$). The effects of institutions and perceived security on paranormal belief are more apparent. Despite this, the additional variance explained by these variables is once again small ($\Delta R^2 = 0.03$, $F(9, 1810) = 7.41$, $p < 0.001$, partial $\eta^2 = 0.03$).

Unemployment rate does account for some of the country level difference in religious practice in a multiple mediation analysis but no significant indirect effect of physical insecurity[2] (unemployment indirect effect = −0.08, SE = 0.02, 95% CI: −0.12 to −0.04; phys. insec. indirect effect = 0.005, SE = 0.003, 95% CI: −0.002 to 0.01; proportion mediated: 0.09).

4.3. Discussion

We found that the perception of insecurity does impact the strength of religious practice and belief in these two countries, but only in a small way. People in our sample who feel safe in their environment and their secular institutions are less likely to participate in religion, but this does not seem to affect their belief in God. This fits with the perspective that people turn to the institution of religion for the security it can provide; it is about participating in the religious community, not necessarily belief. On the other hand, when participants feel unsafe they do seem more likely to hold paranormal beliefs. Unemployment rate has a small effect on religious participation. The higher the local unemployment rate is, the more likely a participant is to participate in their religion. There is also a small mediation effect. The difference in local unemployment rates between the Czech Republic and Slovakia accounts for 9% of difference in religious practice between these two countries.

There are several things that may have led to such small effects in this sample, the most obvious being the high level of social services in both of these countries. The lack of variance on these variables reduces the ability to detect effects that might be present in a more diverse sample (see Norris & Inglehart, 2004). Still, we can conclude that with the exception of an effect of the unemployment rate, neither perceptions nor the realities of safety and security can account for the religious differences between these two countries and account for very little variance in religiosity in the sample as a whole.

[2] Social security was not included in the mediation analysis because there was no country level difference in this variable.

5. Analysis 3: Cognitive biases as a basis for belief

In this section we look at the impact of analytic thinking and cognitive biases on religious practice, belief in God, and paranormal belief. Model 1 adds a measure of analytic thinking to the base model to test if higher levels of analytic thinking leads to lower levels of religious belief (Gervais & Norenzayan, 2012; Pennycook, Cheyne, Seli, Koehler, & Fugelsang, 2012; Shenhav et al., 2012). Model 2 includes dualism, anthropomorphism, teleology, and mentalizing. Analytic thinking is left in and functions as a control variable to account for any effect analytic thinking may have in predicting these content biases.

If cognitive biases predict supernatural belief generally, rather than religious belief specifically, then these cognitive biases should have more explanatory power in predicting paranormal belief than religious practice or belief in God. Belief in God is often a specific institutionally sanctioned belief (Gervais et al., 2011). In both the Czech Republic and Slovakia, cultural and historic circumstance may strongly determine religious belief regardless of a participant's intuitions towards the supernatural. Paranormal beliefs are also shaped by culture, but have less history of institutional control in this sample making the adoption of these beliefs much more flexible and potentially more influenced by individual differences in reliance on intuition.

5.1. Materials

5.1.1. Anthropomorphism

We measured anthropomorphism with the "Individual Differences in Anthropomorphism Quotient" (IDAQ; Waytz, Cacioppo, & Epley, 2010). This scale measures the tendency to project human like mental states onto machines, nature, and animals (e.g., To what extent does the ocean have consciousness? To what extent do cows have intentions? $\alpha = 0.87$).

5.1.2. Dualism

We measured dualism with Stanovich's (1989) "Dualism Scale". This scale was chosen because it has no content that could be interpreted as overtly religious in nature (e.g., The mind is not part of the brain but it affects the brain; Mental processes are the result of activity in my nervous system (reverse scored); $\alpha = 0.77$).

5.1.3. Teleology

Since there is no existing scale to measure individual differences in teleological intuitions we used a series of statements created by Kelemen and Rosset (2009). These items were originally created to test adult teleological tendencies in experimental tasks (e.g., Earthworms tunnel underground to aerate the soil; The sun makes light so that plants can photosynthesize; see Willard & Norenzayan, 2013). Levels of agreement were recorded using a seven point Likert scale ($\alpha = 0.92$).

5.1.4. Mentalizing

We used the "Empathy Quotient" to measure mentalizing (Baron-Cohen & Wheelwright, 2004). This measure has been previously related to belief in God (e.g. Norenzayan, Gervais, & Trzesniewski, 2012) (e.g., I often find it difficult to judge if someone is rude or polite (reverse scored); I am good at predicting how someone will feel; $\alpha = 0.87$).

5.1.5. Analytic thinking

We used the Cognitive Reflection Task, which consists of three questions designed to have both incorrect intuitive answers and correct analytic answers to evaluate analytic thinking abilities (Frederick, 2005).

5.2. Results

There was no difference between these two countries in analytic thinking, mentalizing, dualism, or teleology. Participants from Slovakia

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Table 3
Perceptions of Insecurity and institutions predicting practice and belief. Each model represents a different DV (religious practice, belief in God, and paranormal belief) (N = 1842).

	Religious practice			God			Paranormal		
		95% CI			95% CI			95% CI	
	B(SE)	Lower	Upper	B(SE)	Lower	Upper	B(SE)	Lower	Upper
Intercept	−0.39 (0.20)*	−0.79	−0.002	−0.38 (0.21)	−0.76	−0.003	0.09 (0.22)	−0.51	0.33
Slovakia	0.64 (0.06)***	0.52	0.75	0.53 (0.06)***	0.42	0.65	−0.07 (0.06)	−0.19	0.06
Age	−0.01 (0.02)	−0.06	0.03	−0.03 (0.02)	−0.08	0.01	−0.06 (0.03)*	−0.11	−0.01
Female	0.11 (0.05)*	0.02	0.21	0.17 (0.05)***	0.07	0.27	0.20 (0.05)***	0.10	0.30
Financial insec.	−0.00 (0.02)	−0.05	0.05	0.01 (0.03)	−0.04	0.06	0.09 (0.03)**	0.03	0.14
Physical insec.	0.05 (0.02)*	0.01	0.10	0.01 (0.02)	−0.03	0.06	0.08 (0.03)**	0.03	0.13
Social insec.	0.14 (0.02)***	0.10	0.19	0.04 (0.02)	−0.01	0.08	0.07 (0.02)**	0.02	0.12
Inequality	−0.03 (0.03)	−0.08	0.02	−0.003 (0.02)	−0.05	0.04	−0.07 (0.03)**	−0.12	−0.02
Trust	0.04 (0.02)	−0.002	0.09	0.06 (0.02)**	0.02	0.11	0.05 (0.02)*	0.001	0.10
Unemployment	0.01 (0.005)*	0.003	0.02	−0.01 (0.01)	−0.003	0.02	0.01 (0.005)	−0.002	0.02
Doctors	−0.02 (0.02)	−0.06	0.02	−0.01 (0.01)	−0.02	0.03	0.002 (0.03)	−0.01	0.08
Crime	0.02 (0.03)	−0.03	0.08	−0.01 (0.03)	−0.04	0.06	0.06 (0.03)*	0.003	0.12
Social facilities.	−0.15 (0.25)	−0.63	0.33	−0.13(0.25)	−0.62	0.36	0.01 (0.26)	−0.57	0.47
	Adj. $R^2 = 0.21$, $F(32, 1810) = 15.99$, $p < 0.001$			Adj. $R^2 = 0.14$, $F(32, 1810) = 10.43$, $p < 0.001$			Adj. $R^2 = 0.07$, $F(32, 1810) = 5.52$, $p < 0.001$		

Additional control variables included in models: number of children, marital status, education, income, and size of place.
* $p < 0.05$.
** $p < 0.01$.
*** $p < 0.001$.

scored lower on anthropomorphism than participants from the Czech Republic ($\beta = -0.23$, 95% CI: −0.32 to −0.14). This is consistent with previous findings that show living in a more Christian area decreases anthropomorphism (Willard & Norenzayan, 2013).

In model 1, we found that people with higher analytic thinking scores were less likely to hold paranormal beliefs ($\beta = -0.15$; Table 4), and less likely to engage in religious practices ($\beta = -0.08$). No effect was observed for belief in God ($\beta = -0.01$). There also is a small difference in the amount of variance of paranormal beliefs explained by model 1 over the base model ($\Delta R^2 = 0.02$, $F(1, 1818) = 32.40$, $p < 0.001$, partial $\eta^2 = 0.02$). When the cognitive bias variables are added in model 2, we find a significant difference between the base model and model 2 in belief in God ($\Delta R^2 = 0.08$, $F(5, 1814) = 37.72$, $p < 0.001$, partial $\eta^2 = 0.09$), paranormal belief ($\Delta R^2 = 0.21$, $F(5, 1814) = 105.16$, $p < 0.001$, partial $\eta^2 = 0.22$) and a smaller effect for religious practice ($\Delta R^2 = 0.04$, $F(5, 1814) = 17.29$, $p < 0.001$, partial $\eta^2 = 0.05$). The only cognitive predictor that predicts religious practice is dualism ($\beta = 0.17$), but this effect disappears if belief in God is controlled for ($\beta = 0.003$, 95% CI: −0.03 to 0.03). No variables met the criteria for mediation analysis.

5.3. Discussion

When the baseline demographic model is compared to the full cognitive model (model 2), the prediction that cognitive biases explain more variance in paranormal belief (21 percentage points) than belief in God (8 percentage points) is supported. Belief in God, in this sample, can be considered a primarily Christian belief. Cultural pressure in a country with a high number of believers may push people to adopt or abandon religious beliefs regardless of how intuitive they find them. Paranormal beliefs, on the other hand, have less specific cultural pressure on them in this sample (this is likely different in other cultures). Supernatural beliefs that people can adopt or not adopt without fear of sanction should be more contingent on an individual's intuitions than strongly institutionalized beliefs. When we examine religious practice, dualism remains significant but the additional variance explained is only 3 percentage points. The dualism effect disappears if belief in God is added into the model suggesting that this relationship can be accounted for by the shared variance between religious practice and belief in God. In sum, cognitive biases do predict supernatural belief, but have little or no additional affect on a person's tendency to adopt religious practices.

The lack of country level differences in any cognitive bias other than anthropomorphism gives some support to the predicted causal direction of these variables. If religious belief were the cause of these cognitive tendencies, then there would be a corresponding country level difference in cognitive biases. Instead, the similar level of these cognitive biases in both countries suggests that these variables are largely unaffected by changes in religious beliefs. Overall, this analysis makes the case that individual differences in these cognitive biases are a foundation for individual differences in supernatural belief.

6. Analysis 4: credibility enhancing displays

An individual's intuitive sense of the supernatural or the functional roles religion plays in reducing existential insecurity might explain some part of religiosity, but much of the strength and believability of these beliefs comes from social learning cues (Gervais et al., 2011). New members of society learn what to believe and the importance of these beliefs from observing their parents and their broader social network. At the same time, there is variability in the fidelity with which cultural practices are transmitted from one generation to the next. Here we examine how credibility enhancing displays (CREDs) can affect the maintenance of religious belief and practices since childhood (see Henrich, 2009). According to the CREDs theory, credible behavioral displays (or CREDs) of a cultural trait are important in determining the fidelity with which that cultural trait is transmitted; CREDs establish a belief as true and important to maintain. Exposure to religious rituals can function as a way of signaling the commitment and importance of a belief or practice, and therefore can increase the likelihood that observers will adopt the same beliefs and practices.

In addition to the analysis seen in the previous sections, we use CREDs to predict the likelihood of being a religious adult among participants who were raised in religious households. This allows us to assess if the sincere behaviors measured by the CREDs variables predict religiosity above and beyond simply being raised in a religious household.

6.1. Material

To measure CREDs we employ the CREDs scale (Lanman & Buhrmester, 2016) which consists of five questions about exposure to parents' religious displays when participants were children (e.g. To what extent did your parents or caregivers engage in religious volunteer or charity work? $\alpha = 0.92$). Lanman and Buhrmester (2016) have

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Table 4
Cognitive biases predicting belief and practice. The base model contains only demographic variables; model 1 contains both demographic variables and analytic thinking; model 2 contains all variables in model 1, plus the cognitive bias variables (N = 1842).

	Model 1			Model 2		
		95% CI			95% CI	
	B(SE)	Lower	Upper	B(SE)	Lower	Upper
Religious practice						
Intercept	−0.31 (0.16)*	−0.62	−0.00	−0.35 (0.16)*	−0.65	−0.04
Slovakia	0.68 (0.05)***	0.59	0.78	0.68 (0.05)***	0.58	0.77
Age	−0.003 (0.02)	−0.05	0.04	0.01 (0.02)	−0.04	0.05
Female	0.09 (0.05)	−0.002	0.19	0.06 (0.05)	−0.03	0.16
Analytic	−0.08 (0.02)***	−0.12	−0.03	−0.05 (0.02)*	−0.10	−0.004
Mentalizing				0.03 (0.02)	−0.01	0.07
Anthro				0.04 (0.02)	−0.01	0.08
Dualism				0.17 (0.02)***	0.13	0.21
Teleology				0.01 (0.02)	−0.03	0.06
	Adj. $R^2 = 0.18$, $F(24, 1818) = 17.79$, $p < 0.001$			Adj. $R^2 = 0.21$, $F(28, 1814) = 18.55$, $p < 0.001$		
God						
Intercept	−0.40 (0.16)*	−0.72	−0.09	−0.44 (0.15)**	−0.74	−0.14
Slovakia	0.58 (0.05)***	0.49	0.68	0.57 (0.05)***	0.48	0.66
Age	−0.03 (0.02)	−0.07	0.02	−0.01 (0.02)	−0.05	0.04
Female	0.17 (0.05)***	0.08	0.27	0.11 (0.05)*	0.02	0.20
Analytic	−0.01 (0.02)	−0.06	0.04	0.03 (0.02)	−0.02	0.08
Mentalizing				0.09 (0.02)***	0.05	0.14
Anthro				0.05 (0.02)*	0.01	0.09
Dualism				0.25 (0.02)***	0.20	0.29
Teleology				0.02 (0.02)	−0.02	0.06
	Adj. $R^2 = 0.14$, $F(24, 1818) = 13.22$, $p < 0.001$			Adj. $R^2 = 0.22$, $F(28, 1814) = 19.21$, $p < 0.001$		
Paranormal						
Intercept	0.23 (0.17)	−0.10	0.56	−0.03 (0.15)	−0.27	0.32
Slovakia	−0.04 (0.05)	−0.14	0.06	−0.02 (0.04)	−0.11	−0.07
Age	−0.06 (0.02)*	−0.11	−0.01	0.02 (0.02)	−0.06	0.02
Female	0.18 (0.05)***	0.08	0.28	0.12 (0.05)*	0.03	0.21
Analytic	−0.15 (0.03)***	−0.20	−0.10	−0.06 (0.02)*	−0.10	−0.01
Mentalizing				0.04 (0.02)*	0.004	0.09
Anthro				0.29 (0.02)***	0.25	0.33
Dualism				0.29 (0.02)***	0.25	0.33
Teleology				0.06 (0.02)**	0.02	0.11
	Adj. $R^2 = 0.06$, $F(24, 1818) = 5.97$, $p < 0.001$			Adj. $R^2 = 0.26$, $F(28, 1814) = 23.79$, $p < 0.001$		

Additional control variables included in models: number of children, marital status, education, income, and size of place.
* $p < 0.05$.
** $p < 0.01$.
*** $p < 0.001$.

previously demonstrated this scale measures a separate factor of religious socialization from explicit (verbal) teaching of religion, and that it had more predictive power than explicit teaching of religion. Since this scale deals solely with parental displays, and not the CREDs associated with community exposure to religion, we also included a measure of childhood church attendance (How often did you attend church when you were 12 years old).

6.2. Results

There was a large country level difference in the CREDs scale ($d = -0.89$, 95% CI: −0.98 to −0.79) and childhood church attendance ($d = -1.03$, 95% CI: −1.12 to −0.93). Across the whole sample, the CREDs scale and childhood church attendance are strong predictors of current religious participation and current belief in God (Table 5). The

Table 5
CREDs predicting practice and beliefs. Each model represents a different DV (religious practice, belief in God, and paranormal belief) (N = 1842).

	Participation			God			Paranormal		
		95% CI			95% CI			95% CI	
	B(SE)	Lower	Upper	B(SE)	Lower	Upper	B(SE)	Lower	Upper
Intercept	−0.07 (0.14)	−0.32	0.18	−0.24 (0.14)	−0.52	0.04	0.27 (0.17)	−0.07	0.60
Slovakia	0.14 (0.04)***	0.06	0.22	0.17 (0.05)***	0.07	0.26	−0.43 (0.05)*	−0.25	−0.03
Age	−0.05 (0.02)**	−0.09	−0.01	−0.06 (0.02)**	−0.11	−0.02	−0.08 (0.02)**	−0.12	−0.03
Female	0.08 (0.04)*	0.01	0.16	0.16 (0.04)***	0.07	0.24	0.21 (0.05)***	0.12	0.32
Church 12 yo	0.44 (0.02)***	0.39	0.48	0.30 (0.03)***	0.25	0.35	0.05 (0.03)	−0.01	0.11
CREDs	0.15 (0.01)***	0.12	0.17	0.13 (0.01)***	0.10	0.16	0.06 (0.02)***	0.03	0.10
	Adj. $R^2 = 0.48$, $F(25, 1817) = 69.42$, $p < 0.001$			Adj. $R^2 = 0.32$, $F(25, 1817) = 34.90$, $p < 0.001$			Adj. $R^2 = 0.06$, $F(25, 1817) = 5.80$, $p < 0.001$		

Additional control variables included in models: number of children, marital status, education, income, and size of place.
* $p < 0.05$.
** $p < 0.01$.
*** $p < 0.001$.

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Table 6
CREDS predicting the probability of remaining religious using logistic regression among those who were raised in religious households (N = 898).

			95% CI	
	B(SE)	Odds	Lower	Upper
Intercept	−0.03 (0.66)	0.96	0.26	3.57
Slovakia	0.56 (0.20)**	1.78	1.18	2.67
Age	−0.15 (0.09)	0.86	0.71	1.04
Female	0.27 (0.19)	1.31	0.91	1.91
Church 12 yo	0.51 (0.11)***	1.67	1.33	2.09
CREDs	0.22 (0.06)***	1.24	1.10	1.41

Additional control variables included in models: number of children, marital status, education, income, and size of place.
** $p < 0.01$.
*** $p < 0.001$.

addition of these variables accounted for a substantial amount of the variance explained (religious participation: $\Delta R^2 = 0.30$, $F(2, 1817) = 538.22$, $p < 0.001$, partial $\eta^2 = 0.37$; God: $\Delta R^2 = 0.18$, $F(2, 1817) = 236.55$, $p < 0.001$, partial $\eta^2 = 0.21$). Though the CREDs scale was a significant predictor of paranormal belief, this effect is small, explaining very little additional variance (Paranormal: $\Delta R^2 = 0.02$, $F(2, 1817) = 17.09$, $p < 0.001$, partial $\eta^2 = 0.02$).

In a mediation analysis, we found a partial mediation for the county level difference in both religious participation (CREDs indirect effect = 0.21, SE = 0.02, 95% CI: 0.17 to 0.25; attendance indirect effect = 0.39, SE = 0.03, 95% CI: 0.34 to 0.45; proportion mediated: 0.80) and belief in God (CREDs indirect effect = 0.17, SE = 0.02, 95% CI: 0.13 to 0.22; attendance indirect effect = 0.29, SE = 0.03, 95% CI: 0.23 to 0.34; proportion mediated: 0.70).

Finally, as a stricter test of the CREDs hypothesis, we employ a multinomial logistic regression to look at the impact of the CREDs scale and childhood church attendance on the tendency to remain religious among those who were raised religiously ($N = 921$). Both variables significantly predicted still being religious as an adult (Table 6). Further, religiously raised participants were exposed to more CREDs ($\beta = 0.48$, 95% CI: 0.24 to 0.72), and went to church more in childhood ($\beta = 0.21$, 95% CI: 0.09 to 0.34) if they lived in Slovakia, controlling for all demographic variables. A mediation analysis run only these participants shows similar effects to those found across the whole sample (CREDs indirect effect = 0.08, SE = 0.02, 95% CI: 0.03 to 0.12; attendance indirect effect = 0.11, SE = 0.03, 95% CI: 0.05 to 0.16; proportion mediated: 0.53) and belief in God (CREDs indirect effect = 0.05, SE = 0.02, 95% CI: 0.02 to 0.09; attendance indirect effect = 0.07, SE = 0.02, 95% CI: 0.03 to 0.11; proportion mediated: 0.50).

6.3. Discussion

The exposure to religious rituals and parental displays of religious commitment in childhood accounts for more variance than any other set of variables in our sample. Though we do not measure verbal endorsements of religion here, previous findings have shown that the CREDs scale is an independent predictor and separate factor from other forms of religious socialization, giving credence to the idea that religious actions speak louder than words (Lanman & Buhrmester, 2016). This effect is not specific to only religious practice, but also affects belief in God.

Further, this effect is not solely about being raised religiously. When we look at only religiously raised participants, those who recall their parents making more credible displays of religious belief and attended church more regularly are more likely to maintain their religious affiliation in adulthood. Making sacrifices for one's religion convinces other people that one holds strong beliefs about that religion and increased the likelihood that others adopt and maintain those beliefs (Henrich, 2009; Lanman, 2012). Religiously raised participants in Slovakia were exposed to higher levels of CREDs than their Czech counterparts, supporting the proposition that higher levels of CREDs in Slovakia are supporting the maintenance of religiosity. CREDs variables accounted for a substantial amount of the country level difference in both belief in God and practice, even when the sample was restricted to only religious raised participants.

It is worth noting that CREDs function as a mechanism of change, but is not a distal cause. Another cause is needed to explain the initial decrease in religious displays. Existential insecurity could function as this distal cause (Lanman, 2012). If increases in feelings of security have a small impact on religious participation in one generation, even if there is no impact on levels of religious belief, this change in participation may substantially decrease the participation and belief of the next generation. At the same time, this idea of CREDs as a mechanism allows for a much larger spectrum of potential causes above and beyond the secularization theories we have discussed above. Single unique events in history, or even random cultural drift (Centola, Gonzalez-Avella, Eguiluz, & San Miguel, 2007), can set off this type of change, not just species-wide psychological effects like those produced by changes in levels of education and existential security. In the case of the Czech Republic, a history of skepticism of the Catholic Church as an institution paired with the communist ban on public religiosity may have been the spark that precipitated the decline in religiosity (Hamplova & Nespor, 2009; Lužný & Navrátilová, 2001).

7. Analysis 5: combined model

In the final analysis we combine all the predictors into one model to see if the relevant predictors keep their explanatory power. This allows us to test the prediction that these theories all independently contribute to religiosity. We look that the overall variance explained, and predictors of who remains religious or converts to religion as an adult.

7.1. Results

With all the variables in the model (Table 7) the amount of variance explained above the base model is 32 percentage points for religious practice ($\Delta R^2 = 0.32$, $F(16, 1803) = 75.21$, $p < 0.001$, partial $\eta^2 = 0.40$), 23 percentage points for belief in God ($\Delta R^2 = 0.23$, $F(16, 1803) = 41.47$, $p < 0.001$, partial $\eta^2 = 0.27$), and 23 percentage points for paranormal belief ($\Delta R^2 = 0.23$, $F(16, 1803) = 35.52$, $p < 0.001$, partial $\eta^2 = 0.24$).

We ran a logistic regression model using all variables to predict who remained religious among only those who were raised religiously (Table 8). Childhood church attendance, the CREDs scale and dualism positively predicted remaining religious, and analytic thinking negatively predicted remaining religious. A similar model was run on those who were raised non-religiously predicting those who became religious as adults. Because of the low rates of conversion to religion in this group (8.3%) a penalized logistic regression was used (Firth, 1993). Despite this correction, these results should be interpreted with some caution.

7.2. Discussion

There is little change in the relevant predictors when all the variables are included in a single model. This suggests that each of these theories functions as an independent predictor of religious practice, belief in God, and paranormal belief. Overall, these models explain 50% of the variance in religious practice, 36% of the variance in belief in God, and 27% of the variance in paranormal belief. The difference in belief in God and religious practice between the Czech Republic and Slovakia, although greatly reduced, remains significant in this model, suggesting there are relevant predictors that have not been included in this model.

When we predict adult religiosity in a restricted sample of either people who were raised religiously or non-religiously, we find that dualism is a significant predictor in both groups. Those who are higher in dualism are more likely to be religious, regardless of how they were

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Table 7
All variables predicting religious practice and belief. Each model represents a different DV (religious practice, belief in God, and paranormal belief) (N = 1842).

	Practice			God			Paranormal		
		95% CI			95% CI			95% CI	
	B(SE)	Lower	Upper	B(SE)	Lower	Upper	B(SE)	Lower	Upper
Intercept	−0.17 (0.15)	−0.48	0.14	−0.22 (0.17)	−0.57	0.13	−0.13 (0.19)	−0.51	0.24
Slovakia	0.11 (0.05)*	0.01	0.21	0.15 (0.05)**	0.04	0.26	−0.11 (0.06)	−0.23	0.01
Age	−0.04 (0.02)*	−0.08	−0.01	−0.05 (0.02)*	−0.09	−0.01	−0.02 (0.02)	−0.06	0.03
Female	0.06 (0.04)	−0.02	0.13	0.10 (0.04)*	0.02	0.19	0.11 (0.05)*	0.01	0.20
Church 12 yo	0.43 (0.02)***	0.38	0.47	0.29 (0.03)***	0.24	0.34	0.03 (0.03)	−0.03	0.08
CREDs	0.13 (0.01)***	0.10	0.15	0.11 (0.01)***	0.08	0.14	0.02 (0.02)	−0.01	0.05
Financial insec.	−0.01 (0.02)	−0.04	0.03	−0.002 (0.02)	−0.05	0.04	0.05 (0.02)*	0.004	0.10
Physical insec.	0.02 (0.02)	−0.02	0.05	−0.01 (0.02)	−0.05	0.03	0.05 (0.02)*	0.00	0.09
Social insec.	0.07 (0.02)***	0.03	0.10	−0.02 (0.02)	−0.07	0.02	0.02 (0.02)	−0.03	0.06
Inequality	−0.03 (0.02)	−0.06	0.01	−0.01 (0.02)	−0.05	0.03	−0.07 (0.02)**	−0.12	−0.03
Trust	0.02 (0.02)	−0.01	0.05	0.03 (0.02)	−0.01	0.07	0.02 (0.02)	−0.02	0.06
Unemployment	0.01 (0.004)**	0.003	0.02	0.004 (0.004)	−0.004	0.01	0.005 (0.005)	−0.004	0.01
Doctors	0.002 (0.01)	−0.02	0.02	0.01 (0.01)	−0.02	0.03	0.02 (0.01)	−0.02	0.03
Crime	0.04 (0.02)	−0.00	0.07	−0.002 (0.02)	−0.04	0.04	0.02 (0.02)	−0.03	0.06
Social facilities.	−0.23 (0.19)	−0.61	0.15	−0.12 (0.22)	−0.54	0.31	−0.12 (0.23)	−0.57	0.34
Analytic	−0.03 (0.02)	−0.07	0.01	0.04 (0.02)	−0.002	0.08	−0.04 (0.02)	−0.09	0.001
Mentalizing	0.04 (0.02)*	0.01	0.08	0.09 (0.02)***	0.05	0.13	0.05 (0.02)**	0.01	0.11
Anthro	−0.002 (0.02)	−0.04	0.03	0.04 (0.02)	−0.002	0.08	0.27 (0.02)***	0.24	0.31
Dualism	0.09 (0.02)***	0.06	0.13	0.19 (0.02)***	0.15	0.23	0.27 (0.02)***	0.24	0.32
Teleology	−0.00 (0.02)	−0.04	0.03	0.01 (0.02)	−0.03	0.05	0.06 (0.02)**	0.02	0.11
	Adj. $R^2 = 0.50$, $F(39, 1803) = 52.02$, $p < 0.001$			Adj. $R^2 = 0.36$, $F(39, 1803) = 28.05$, $p < 0.001$			Adj. $R^2 = 0.27$, $F(39, 1803) = 18.22$, $p < 0.001$		

Additional control variables included in models: number of children, marital status, education, income, and size of place.
* $p < 0.05$.
** $p < 0.01$.
*** $p < 0.001$.

raised. This supports the theory that dualism, as a cognitive bias, does increase the likelihood of adopting and maintaining religious beliefs.

Childhood church attendance similarly predicts adult religiosity in both groups. It is possible that religious family members other than their parents or other religious community members brought children in non-religious households to church. Whatever the cause, even this small amount of exposure to church in childhood appears to increase the likelihood of adopting religion even if one was raised in a non-religious household. Unsurprisingly, the CREDs scale only predicts adult religiosity in those raised religiously. Those raised non-religiously were exposed to very low levels of religious behaviors by their parents because their parents were not religious (averaging 0.86 on a 0–6 scale).

8. General discussion

The theories presented in this article all contribute to explaining the package of beliefs and practices we call "religion" across these two countries in different ways. Cognitive biases predict individual

Table 8
All variables predicting those who are religious adults among those who were raised religiously or non-religiously. Logistic regression is used for participants who were raised religiously. Penalized logistic regression was used for those who were raised non-religiously because of a strong zero skew (only 65 people who were raised non-religiously became religious adults).

	Raised religious				Raised non-religious		
			95% CI			95% CI	
	B(SE)	OR	Lower	Upper	B(SE)	Lower	Upper
Intercept	−0.16 (0.51)	0.85	0.32	2.31	0.41 (1.30)	−2.25	3.02
Slovakia	0.47 (0.15)	1.60	1.19	2.14	0.32 (0.44)	−0.57	1.18
Age	−0.06 (0.06)	0.94	0.84	1.05	0.01 (0.16)	−0.31	0.33
Female	0.15 (0.12)	1.16	0.92	1.46	−0.19 ().34)	−0.89	0.52
Church 12 yo	0.29 (0.07)***	1.33	1.16	1.53	0.77 (0.24)**	0.30	1.23
CREDs	0.14 (0.04)***	1.15	0.06	1.23	0.04 (0.11)	−0.21	0.26
Financial insec.	−0.06 (0.06)	0.94	0.83	1.06	0.17 (0.17)	−0.17	0.52
Physical insec.	0.003 (0.06)	1.00	0.89	1.13	−0.13 (0.16)	−0.46	0.20
Social insec.	0.08 (0.06)	1.08	0.96	1.21	−0.08 (0.16)	−0.41	0.24
Inequality	−0.07 (0.06)	0.93	0.83	1.04	−0.10 (0.16)	−0.42	0.21
Trust	0.07 (0.06)	1.07	0.96	1.20	0.12 (0.15)	−0.18	0.43
Unemployment	−0.002 (0.01)	0.99	0.98	1.02	−0.03 (0.04)	−0.11	0.05
Doctors	−0.03 (0.04)	0.97	0.89	1.06	0.08 (0.12)	−0.20	0.35
Crime	−0.01 (0.06)	0.99	0.88	1.12	−0.30 (0 21)	−0.74	0.12
Social facilities.	1.11 (0.64)	3.04	0.87	10.55	−3.71 (2.01)	−8.02	0.37
Analytic	−0.15 (0.06)*	0.86	0.77	0.97	−0.19 (0.16)	−0.57	0.16
Mentalizing	−0.01 (0.05)	0.99	0.89	1.10	0.02 (0.14)	−0.29	0.32
Anthro	0.02 (0.06)	1.02	0.91	1.14	−0.01 (0.16)	−0.34	0.32
Dualism	0.16 (0.05)**	1.17	1.05	1.30	0.66 (0.17)***	0.32	1.02
Teleology	−0.07 (0.06)	0.93	0.82	1.04	−0.44 (0.15)**	−0.76	−0.13
	$N = 898$				$N = 714$		

Additional control variables included in models: number of children, marital status, education, income, and size of place.
* $p < 0.05$.
** $p < 0.01$.
*** $p < 0.001$.

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difference in supernatural beliefs, but not participating in religious practice in our sample. The idea that certain innate biases leave us prone to supernatural belief explains why religion would arise in every culture but cannot explain the persistent diversity in religious beliefs and practices around the world; this diversity is cultural (Gervais et al., 2011). Our finding that cognitive biases are more predictive of paranormal beliefs than belief in God lends some support to this idea. These sorts of intuitions are a better candidate for explaining the tendency to adopt a wide range of seemingly unrelated supernatural beliefs than for the adoption of a specific set of religious beliefs and practices.

Dualism was the only cognitive bias to reliably predict religious belief. The robustness of this effect suggests that certain cognitive processes may pre-dispose people to believe in God, but may have little impact on their participation in religion. Though dualism predicts belief, it is unlikely that this tendency alone could maintain religious institutions through generations. Similarly, education may reduce supernatural belief without having much impact on religious practice. It may often be the case that a decline in supernatural beliefs more broadly leads to a decline in religious beliefs specifically and eventually to a decline in religious practice. Still, this seems to only be the case for those raised in households that are already less religious, suggesting that being exposed to high levels of religiosity in childhood can reduce or nullify this effect (Ganzach et al., 2013).

Ultimately, the cultural environment is the biggest predictor being part of a religion and believing in the teachings of that religion. In support of this claim, cultural transmission through credibility enhancing displays (CREDs) remains the strongest predictor of differences in religiosity both across the sample and between these two countries. We found that exposure to others' religious activities in childhood increased the likelihood that participants had maintained religious belief into adulthood. Further, a combination of the CREDs scale and childhood church attendance mediate 70% of current difference between these two countries in belief in God, and 80% of the difference in religious practice. If we restrict this sample to only those that were raised religiously, these effects are still present: these variables explain 50% of the current difference in belief in God and 53% of the current difference in religious practice. Humans learn how to behave and what to believe from the broader culture in which they live. Religious traditions are no exception.

A lack of credibly behavioral displays could explain broad trends in religious decline, but may explain the circumstances that caused the initial change. Still, the strength of CREDs as a predictor of religious belief even within a lifetime makes a strong case for considering mechanism of cultural transmission and cultural evolution in any theory of religion and religious change. Though education and institutional security can increase secularization, we should expect these effects to be dependent on other cultural factors and vary across different cultural settings. When evaluating individual cases, like this one, it is worth investigating if a single idiosyncratic cause can explain the decline of a specific religion separately from supernatural belief more generally. In this case, the most likely cause was the differing impacts of the communist restrictions on religious practice within these two countries.

Though the religious difference between the Czech Republic and Slovakia offers a valuable natural experiment for researching these types of theories, it is a single example and may not adequately represent global trends. For example, the lack of explanatory power of the existential insecurity hypothesis in this sample does not diminish other, more global, findings (Norris & Inglehart, 2004). Still, this case does highlight variation in these effects. Even if this theory does explain broad trends, it may only account for a small part of the story in a specific example like the Czech Republic and Slovakia. It cannot account for the high level of religiosity in Slovakia, given the relatively the high levels of security in this country. What broad theories like this do not always reflect is the inherent cultural nature of people. In the quest to find singular theories that can explain these complex processes, the psychological and evolutionary sciences can often miss the important role of culture and how much we, as humans, learn from others. Further research across more diverse religious groups is needed to fully assess the impact of these trends.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at http://dx.doi.org/10.1016/j.evolhumbehav.2017.01.002.

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