

Why are some societies more religious than others?

Jeanet Sinding Bentzen*

Department of Economics, University of Copenhagen

April 3, 2018

1 Introduction

The world of today sees vast differences in religiosity. The most religious countries are Algeria and Pakistan, where 100% of the population believe in God.¹ At the opposite end of the spectrum lies China with 20% of the population believing in God. These differences appear to matter for important socioeconomic outcomes such as health, wealth, labour force participation, and education choices.² It therefore seems relevant to ask what explains these differences in religiosity across the globe. Providing answers may even help us understand why religion has not declined in many places of the world today as the secularization hypothesis otherwise suggests.³

While scholars have attempted to answer the question for centuries and numerous theories have been put forward, only recently has data availability and advances in programming technology made it possible to empirically test some of the theories.⁴ One of

*Contact: Jeanet.Bentzen@econ.ku.dk.

¹According to the most recent waves of the pooled World Values Survey and European Values Study.

²See Guiso *et al.* (2003), Scheve & Stasavage (2006), McCleary & Barro (2006), Gruber & Hungerman (2008), and Campante & Yanagizawa-Drott (2015) for empirical investigations or Iannaccone (1998), Lehrer (2004), and Kimball *et al.* (2009) for reviews.

³The secularization hypothesis predicts that religiosity falls as societies modernise. It has received mixed support, though. Norris & Inglehart (2011) show that while religion has become less important in many Western countries, it has increased in importance in other parts of the world, leading to a net-increase in the number of people with traditional religious views during the past fifty years. See also Stark & Finke (2000) and Iannaccone (1998) for discussions and Becker *et al.* (2017) for an empirical investigation of the influence of education on the secularization process.

⁴The particular programming technology referred to here is ArcGIS programming, which makes it feasible to exploit the spatial dimension of the data better than ever.

the key empirical challenges has been issues regarding external validity. For instance, conclusions from a study of Catholics in one country cannot necessarily be extended to the world at large. Since all societies were most likely religious at some point in their past (e.g., Murdock (1965), Brown (1991), Peoples *et al.* (2016)), a theory explaining differences in religiosity in general is only useful if it holds across all religious denominations and countries.

This chapter introduces a measure of religiosity that is globally comparable, which enables validity checks of the existing theories within all major religious denominations and countries, thus solving the challenge of external validity. Crucially, the religiosity measure is constructed in a way so that one does not have to compare religiosity across countries, but can stick with comparison within countries (across subnational districts). The chapter also shows a method to solve the second key empirical challenge, namely identification, via ArcGIS programming. This program makes it possible to construct variables from all thinkable spatial data. In particular, natural experiments can be exploited, providing exogenous variation in key variables of interest. The empirical insights will be based primarily on the data and analysis by Bentzen (2018). The next section first provides a brief overview of the main theories for differences in religiosity.

2 Theories

Theories abound for why religion emerged in the first place. These theories, however interesting and important they are, may not necessarily explain *current* differences in religiosity. Take, for instance, the theory that religion arose as a solution to cooperation problems (e.g., Norenzayan (2013)).⁵ According to this theory, beliefs in an almighty punishing god solved the problem of freeriding in pre-modern societies; God was believed to punish deterrents, thus inducing cooperation. Inhabitants in societies that developed punishing gods were better able to cooperate, and thus more likely to survive and multiply. Eventually, evolution selected societies that held beliefs in punishing gods. In keeping with this theory, the invention of formal policing institutions reduced the need for God as a policing institution, thus reducing the importance of religion (also emphasized by

⁵For other evolutionary theories of the origins of religion, see Boyer (2008). Another theory is that major religions arose as a tool for power legitimization (e.g., Bentzen & Gokmen (2017) for an empirical investigation).

Norenzayan (2013)). This theory, therefore, has no clear-cut prediction as to whether societies that developed religion earlier than others are more or less religious today.

Social scientists have applied microeconomic theory to explain patterns of current religious behavior among individuals, groups, and cultures.⁶ This work began with the model by Azzi & Ehrenberg (1975), where individuals allocate their time and goods among religious and secular commodities to maximize their lifetime and afterlife utility. Within this framework, the reasons for differences in religiosity can be grouped into demand and supply side factors (e.g., Finke & Stark (2005)).

One supply-side theory is that religious congregations compete for followers, thus increasing the quality of the religious services provided, which in turn increases religious participation (e.g., Finke & Stark (2005), Olson (2011)). However, empirical investigation of the supply-side drivers of religious intensity provides mixed results (see reviews by Chaves & Gorski (2001) and Hungerman (2010)).⁷ Furthermore, instead of competing with other congregations, a more important competitor from the viewpoint of the particular congregation could be secular organizations (e.g., Hungerman (2010) and Hungerman (2005)). In particular, Gruber & Hungerman (2008) show that the legalization of retail activity on Sundays led to lower church attendance and church donations across US states.

Demand-side theories point to factors that elevate the demand for religion, increasing the extent of religious engagement (e.g., Norris & Inglehart (2011)). The main proposed demand-side factors are the extent of stress and uncertainty in society, attempts to understand the world by referring to religion, or material aid obtained through the church. One demand-side theory that has received support in the data, is the idea that individuals use their religion to cope with stress and uncertainty. I will return to this theory and the empirical investigations in Section 4. Among the demand-side theories is the secularization hypothesis, where the idea is that religion will die out as countries develop. This, however, has received mixed support in the data.⁸

⁶See reviews by Iannaccone (1998) and Iyer (2016).

⁷Another supply-side based story is that religious organizations create incentives to encourage stigmatizing behaviors in order to screen out potential free-riders. Iannaccone (1992) considers this.

⁸Rather, religion seems to be on the rise in many societies, which some see as a rejection of the secularization hypothesis (e.g., Iannaccone (1998); Finke & Stark (2005); Norris & Inglehart (2011)). Some scholars have viewed rising religiosity in the US as a counter example of the secularization hypothesis. However, Voas & Chaves (2016) document that religiosity in the US has declined over the past decades when cohort effects are accounted for.

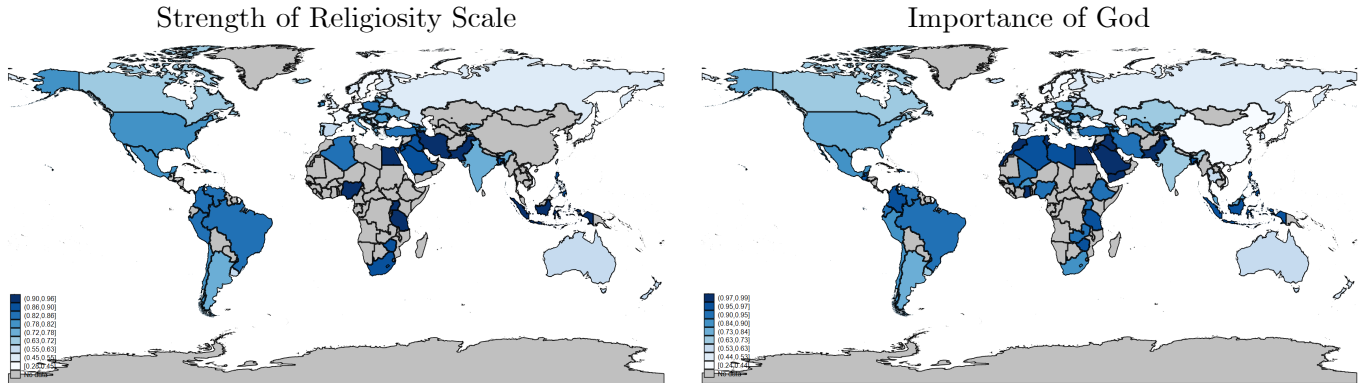
Another set of theories regard differences in the type of religious affiliation. For instance, scholars have documented various socioeconomic differences between Protestants and Catholics or between Christians and Muslims (e.g., Becker & Woessmann (2009), Weber (1905), Rubin (2017)). One could imagine that differences in religiosity could be explained by differences in people's religious denomination. While we shall see below that indeed Muslims are on average more religious than others, it turns out that differences in terms of religious denominations explain a miniscule part of differences in religiosity. The data used to investigate these tendencies and other theories is presented below.

3 Data on global religiosity

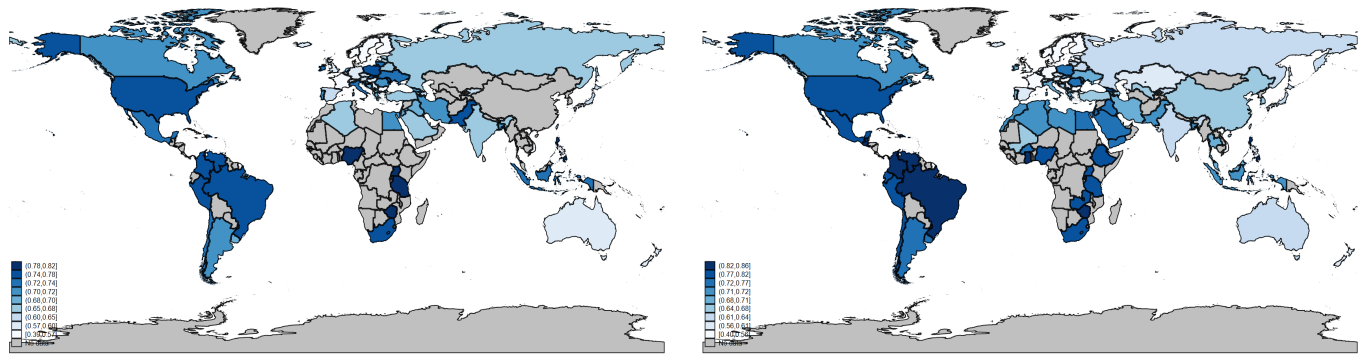
A first-order issue that applies to most of the empirical studies reviewed so far is the problem of external validity: Most existing studies investigate a sample of people from one or a few religious denominations in one country. This issue was also emphasized in a recent review of the economics of religion literature by Iyer (2016). A necessary (but not sufficient) fix is a globally comparable measure of religiosity. The World Values Survey and European Values Study provide just this for a total of 500,000 individuals from 109 countries interviewed over the period 1981-2014. These two surveys can be appended to one another, which has been done in the following.

One major concern with these data is that self-reported religiosity is affected by many things - for instance individuals' religious denomination and national institutions - which complicates comparison across religious denominations and countries. To make the religiosity measures comparable across religious denominations, one of the fathers behind the values surveys, Ronald Inglehart, identified, together with political scientist Pippa Norris, six measures of religiosity that span global religiosity (Inglehart & Norris (2003)). These measures include answers to the questions "How important is God in your life?", "Are you a religious person?", "How often do you attend religious services?", "Do you get comfort and strength from religion?", "Do you believe in God?", and "Do you believe in a life after death?" These questions are answered by 268,859 - 477,843 individuals from 82-105 countries, where the first three questions are answered by the largest amount of respondents. Inglehart and Norris suggest a composite measure constructed by factor component analysis, which they term the Strength of Religiosity Scale. This composite measure is available for 221,249 individuals interviewed in 80 different countries.

The country-averages of the Strength of Religiosity Scale are shown in the upper left panel of Figure 1. The upper right panel shows one of the religiosity measures available for the full sample: Answers to the question "How important is God in your life?". Both measures are scaled to lie between 0 and 1. The two measures show a very similar pattern of the spread of religiosity across the globe.



Upper panel. No control variables



Lower panel. Major religions accounted for

Figure 1. Average religiosity across the globe

Notes: Country averages across all waves 1981-2014 of the pooled WVS-EVS. Religiosity is measured using the Strength of Religiosity Scale in the left maps and answers to the question "How important is God in your life?" in the two maps to the right. The upper panels show the simple country averages without control variables. The lower panels shows the within denomination differences, i.e., the residuals of regressions where the religiosity measures are regressed on the five major religious groups: Christianity, Islam, Buddhism, Hinduism, and Other.

These patterns in religiosity cannot be explained by differences in individuals' religious

denominations. The lower panels show again country-averages, but now after differences across the major religious denominations have been removed.⁹ That is, these are the within denominations differences. The picture is nearly unchanged. The largest change occurs in the Middle East, Indonesia, and the Americas, where relative religiosity falls in the former two and increases in the Americas after holding religious denominations constant. This is particularly due to high religiosity among Muslims.¹⁰ One can investigate the importance of religious denominations more formally using analysis of variances, which shows that only 3.4% of the total variation in religiosity across the globe can be attributed to individuals' religious denomination. Equivalently, 96.6% of the variation in global religiosity comes from variation within religious denominations. This means that when we are searching for the reasons for differences in religiosity across the globe, we can disregard explanations concerning differences in the type of religion. The pattern is also unchanged if we take basic individual characteristics into account, such as gender, age, and marital status.

Another concern when constructing a global measure of religiosity is that individuals' understanding of the particular survey questions is potentially influenced by the general culture or national institutions in the country in which they live. This makes comparison across countries difficult. Bentzen (2018) addresses this concern by exploiting information on the subnational district in which the individuals were interviewed. This information is available for 90 of the countries in the pooled World Values Survey and European Values Study dataset shown above. There are 10 districts on average per country. Exploiting this information enables comparison of religiosity *within* countries, instead of having to compare across countries.¹¹ Thus, differences in individuals' understanding of the questions across countries is not a problem in such an analysis. Further, unobserved country-level factors, such as national institutions and - culture, can be removed from the analysis.

⁹The religious denominations accounted for are Christianity, Islam, Hinduism, Buddhism, and Other. Before aggregating the data, the two religiosity measures are regressed on religious denominations fixed effects. The residuals are saved, scaled between 0 and 1 and aggregated to the country level.

¹⁰The global average of the Strength of Religiosity Scale across all waves 1981-2014 is 0.78, which covers 0.59 for Buddhists, 0.76 for Christians, 0.78 for Hindus, 0.87 for Muslims, and 0.80 for Others. These differences are statistically different from one another.

¹¹Note that within-country analysis can be done without exploiting the subnational districts, if the analysis is restricted to information available in the pooled WVS-EVS. The subnational districts become particularly useful when the analysis involves linking the WVS-EVS data to data from other sources. See Section 4 for an application.

One could be concerned that we end up with too little variation in religiosity when removing the between-country variation. Lack of variation is an issue if we want to do econometric analysis, investigating for instance the reasons for varying religiosity levels as is the focus here. This does not seem to be a large problem, though. In fact, the within-country variation in religiosity amounts to 71% of the total variation in religiosity.¹² Thus, less than a third of the variation in religiosity is lost when throwing away the variation across countries.

4 Testing one theory: Religious coping

Equipped with these globally comparable measures of religiosity, we can return to the question of why religiosity differs across societies. The focus here is on a major theory within the demand-side models.¹³ Examples of so-called religious coping are seeking a closer relationship with God, praying, or finding a reason for the event by attributing it to an act of God. The religious coping hypothesis states that individuals draw on religious beliefs and practices to understand and deal with unbearable and unpredictable situations.¹⁴

Numerous empirical studies show that individuals hit by various adverse life events, such as cancer, heart problems, death in close family, alcoholism, divorce, or injury are more religious than others.¹⁵ In addition, prayer is often chosen by various hospitalised patients as a coping strategy above seeking information, going to the doctor, or taking prescription drugs (Conway (1985)). This literature faces the major challenge that being hit by adverse life events is most likely correlated with unobserved individual characteristics (such as lifestyle), which in turn may matter for the individual's inclination to be

¹²Calculated using analysis of variance, where the unit of analysis is individuals and the groups are countries.

¹³The reasons for focusing on the demand-side are the following. First, the supply-side theories have not received strong support in the data. Second, the supply side theories that have received support in the data (such as the theory based on secular competition) are most likely mainly suitable for development of religiosity in the US. This chapter explores global differences in religiosity. Third, the surveyed data allows for a test of the demand-side, not the supply-side. Last, when asked, the religious state that one of the main purposes of religion is to provide buffering against life stressors (see, e.g., Clark (1958) and Pargament (2001)).

¹⁴E.g., Pargament (2001), Cohen & Wills (1985), Park *et al.* (1990), Williams *et al.* (1991). The terminology "religious coping" stems from psychology, but other labels have been used. For instance, religious buffering, the religious comfort hypothesis, and psychological social insurance.

¹⁵See e.g., Ano & Vasconcelles (2005) and Pargament (2001) for reviews.

religious.

Norenzayan & Hansen (2006) addressed the endogeneity concern in a controlled experiment of 28 undergraduate students from the University of Michigan. They obtained exogenous variation in *thoughts* of death by asking half of the students questions such as "What will happen to you when you die?" After the experiment, the students primed with thoughts of death were more likely to reveal beliefs in God and to rank themselves as more religious. While solving the endogeneity issue, the conclusions based on 28 students in Michigan cannot necessarily be extended to the world at large. The study cannot tell us whether elderly from California or students from Pakistan would respond in the same way. Yet, the theory is that religious coping is not something peculiar to Christianity. For instance, Pargament (2001) notes that (p3) "*While different religions envision different solutions to problems, every religion offers a way to come to terms with tragedy, suffering, and the most significant issues in life.*"¹⁶ Performing lab experiments for a representative global population is rather tedious and costly. Instead one can exploit natural experiments to obtain exogenous variation in the extent to which individuals experienced an unpredictable adverse event.

4.1 Endogeneity

One adverse and unpredictable event is natural disasters, and especially earthquakes. Indeed, the belief that natural disasters carried a deeper message from God was the rule rather than the exception before the Enlightenment (e.g., Hall (1990), Van De Wetering (1982)). Later, the famous 1755 Lisbon earthquake has been compared to the Holocaust as a catastrophe that transformed European culture and philosophy. Penick (1981) documents more systematically that US states hit by massive earthquakes in 1811 and 1812 saw church membership increase by 50% in the following year, compared to an increase of only 1% in remaining states. More recently, Sibley & Bulbulia (2012) found that conversion rates increased more in the Christchurch region after the large earthquake in 2011, compared to the remaining four regions of New Zealand. Other disasters may have left an imprint on religiosity. For instance, Ager *et al.* (2016) find that church membership increased in counties affected by the Mississippi river flood of 1927.

¹⁶See also Feuerbach (1957), Freud (1927), and Marx (1867) for similar generalisations across all religions.

While the mentioned studies certainly solve the endogeneity issue relating to adverse life events, their conclusions are potentially not externally valid. Bentzen (2018) solves this issue by combining the mentioned globally comparable data on religiosity at the subnational level with data on earthquake risk and actual earthquakes.^{17,18}

The analysis by Bentzen (2018) first documents that individuals living in districts more frequently hit by earthquakes are indeed more religious than those living in areas with fewer earthquakes. Figure 2 shows the impact of earthquake risk on religiosity for the World on average and for each major religious denomination. Religiosity increases for Christians (both Protestants and Catholics), Muslims, Hindus, and others, but is statistically indistinguishable from zero for Buddhists. Note the very large standard errors for Hindus and Buddhists, reflecting few Hindus and Buddhists in the sample.

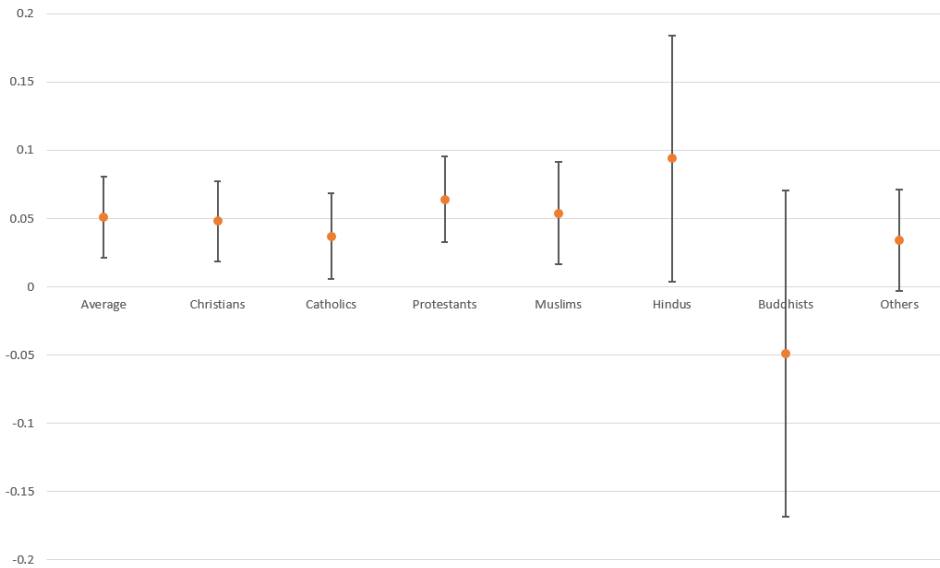


Figure 2. Impact of disaster risk on religiosity across religious denominations

Notes: The figure shows the parameter estimate on earthquake risk in a regression on religiosity, accounting for country by year fixed effects and a dummy for actual earthquakes during the past year.

In addition to being statistically large, the impact of earthquake risk on religiosity is also economically large: The size of the effect amounts to 70% of the well-established

¹⁷The data on earthquake risk measures the risk of getting hit by an earthquake of a certain size within the next 50 years. The data on earthquake events measures the exact location of actual earthquakes of various strengths. Larger earthquakes increase religiosity more. See more details in Bentzen (2018).

¹⁸Note, though, that increased religiosity after an earthquake could be due to other things unrelated to religious coping, which I will return to in Section 4.3.

gender difference in religiosity.¹⁹ The result is robust to various changes (see Bentzen (2018) for details). Similar results obtain for other unpredictable major disasters such as volcanic eruptions and tsunamis, and for different measures of earthquake risk.

A central concern is that important district-level factors are left out of the analysis, biasing the results. For instance, earthquakes are more likely along the coast where tectonic plates often meet. At the same time, being close to the coast may influence religiosity independently. In that case, omitting distance to the coast in the regression would create a spurious relation between earthquakes and religiosity. This is the reason why Bentzen (2018) includes a control for distance to the coast throughout. Broader geographic confounders are controlled for by including country-fixed effects and absolute latitude throughout. Additional district-level controls include recent actual earthquakes, population density, light intensity, the share of arable land, average temperature, average and variance of precipitation, district area, and a dummy equal to one if the district is often hit by earthquakes. Since the data is available at the individual level, various individual-level confounders can also be accounted for, such as age, gender, marital status, income, education, employment status, and various measures of other cultural values.

Unobservable time-varying factors are not accounted for in the cross-section analysis. To account for these factors, the time-dimension of the data can be exploited. The same individuals are not followed over time, but instead Bentzen (2018) exploits that a third of the subnational districts are followed over time. This enables constructing a so-called synthetic panel, where the districts are the panel dimension. It turns out that district-level religiosity increases when an earthquake hit in between the years of interview in keeping with the religious coping hypothesis. Investigating the effect of disaster on the individual measures of religiosity reveals that the religious become more religious, while evidence for conversion into religion is somewhat weaker.²⁰

Consistent with a literature on dynamic effects of various shocks on cultural values, the short-term spike in religiosity after an earthquake abates with time. Regarding the surprise element, an earthquake in a district that is otherwise rarely hit, increases religiosity

¹⁹This means that the standardized parameter estimate on earthquake risk amounts to 70% of the standardized parameter estimate on a gender dummy. It is a wellknown in the literature that women are more religious than men, e.g., Miller & Hoffmann (1995).

²⁰The result is robust to adding country-by-year fixed effects, individual and district level controls, and rather comforting, future earthquakes have no impact on current levels of religiosity.

more than an earthquake in a district that is often hit. The phenomenon that earthquakes can still, in the modern world, affect believing is further illustrated by a Gallup survey conducted in the aftermath of the great 1993 Mississippi River floods, which asked Americans whether the recent floods were an indication of God’s judgement upon the sinful ways of the Americans. 18 % answered in the affirmative (Steinberg (2006)).

4.2 Persistence in religiosity

The event analysis eliminates unobservable district-level factors, which is a great improvement of macroeconomic research in general, where eliminating country-level unobservables is even rarely achieved. However, one caveat of the event analysis is that it can say nothing about the long term effects on religiosity. Indeed, the fact that the effect abates with time speaks for an investigation of whether elevated uncertainty (earthquake risk) has a lasting effect on religiosity. If a lasting effect exists, parents must be transmitting religiosity to their children. In a model of cultural transmission, parents will choose to transmit a particular cultural trait to their children if this grants utility to either parents or children (e.g., Bisin & Verdier (2001)). Empirical evidence suggests that religiosity may be such a trait: Religion is likely to improve mental health, life satisfaction, abilities to cope with adverse life events, and deter deviant behavior.²¹ Thus, it seems theoretically likely that parents might choose to transmit their religion to their children.

Bentzen (2018) investigates whether the impact of earthquake risk transmits across generations by combining data on earthquake risk with a dataset with information on children of migrants currently living in Europe, but whose parents came from various countries across the globe.²² It turns out that children of migrants whose parents came from countries with high earthquake risk are more religious than those from low earthquake risk areas, independent of actual earthquake risk and level of religiosity in their current country of residence. It seems that living in high-earthquake risk areas instigates a culture of religiosity that is passed on to future generations like many other cultural values.

²¹For instance Miller *et al.* (2014), Campante & Yanagizawa-Drott (2015), Clark & Lelkes (2005), and Lehrer (2004). See also reviews by Smith *et al.* (2000) and Pargament (2001).

²²This analysis is based on the European Social Survey. The methodology used was coined the epidemiological approach by Fernandez (2011).

4.3 The mechanism

An effect of earthquakes on religiosity does not necessarily confirm the religious coping hypothesis. Instead of religion serving as psychological insurance, it could also act as physical insurance. Likewise, the effect of earthquakes on religiosity could cover that atheists move out in response to an earthquake or that earthquakes reduce development levels, increasing religiosity, etc. Additional characteristics of the data can be exploited to disentangle different explanations. It turns out that while other factors can explain *some* results, the psychological story is the only mechanism that explains *all* results.

For instance, if elevated religiosity levels after an earthquake is simply driven by people going to church for material needs, church going should increase after an earthquake. On the other hand, the literature on religious coping finds that people mainly use intrinsic religiosity (ones' personal relation to God) to cope with adversity, and to a lesser extent extrinsic religiosity (going to church).²³ Bentzen (2018) shows that only intrinsic religiosity increases in response to a recent earthquake, while church going is not affected in the short term. Church going is, however, over the long term. Therefore, physical insurance might explain some of the long term results, but not the short term results. Further, if the mechanism is physical insurance, other disasters that pose the same material losses should also increase religiosity. The degree of predictability should not matter much. On the other hand, the religious coping hypothesis states that individuals use religion more when faced with adverse *unpredictable* events, and less with *predictable* ones.²⁴ Major geophysical and meteorological disasters can be grouped in terms of predictability. For instance, meteorologists have a much easier time predicting storms than seismologists

²³E.g., Johnson & Spilka (1991) or review by Pargament (2001). Koenig *et al.* (1988) found that the most frequently mentioned coping strategies among 100 older adults dealing with three stressful events were faith in God, prayer, and gaining strength from God. Social church-related activities were less commonly noted. Similarly, a medical study by Miller *et al.* (2014) found that individuals for whom religion is more important experienced reduced depression risk (measured by cortical thickness), while frequency of church attendance was not associated with thickness of the cortices.

²⁴E.g., Norris & Inglehart (2011), Sosis (2008), Park *et al.* (1990). See also Mattlin *et al.* (1990) on how practical everyday problems are less likely to trigger religious coping compared to large bad events. Skinner (1948) found that this reaction to unpredictability extends into the animal world. Pigeons subjected to an unpredictable feeding schedule were more likely to develop inexplicable behaviour, compared to the birds not subject to unpredictability. Since Skinner's pioneering work, various studies have documented how children and adults in analogous unpredictable experimental conditions quickly generate novel superstitious practices (e.g., Ono (1987)).

have predicting earthquakes.²⁵ Also, earthquakes can be grouped into more or less surprising ones. Consistent with the religious coping literature, surprising disasters increase religiosity more than less surprising ones for equal amount of damage (Bentzen (2018)). For instance, elevated risk of earthquakes, tsunamis, and volcanic eruptions increase religiosity, while storm risk has no effect on religiosity. Storms result in comparable material and personal losses, and thus should instigate the same effect on religiosity if the explanation was physical insurance. Also, earthquakes in areas frequently hit by earthquakes affect religiosity less than earthquakes in areas otherwise rarely hit.

The effect of earthquakes on religiosity could also be due to atheists moving out in the face of disaster. This theory can potentially explain the short term effect per se, but not the tendency for the effect to abate with time. Explaining this tendency with population movements would mean that atheists move out in the immediate aftermath of the earthquake, but then choose to move into the district again after 6-12 years, only to move out again when the next earthquake hits. Perhaps a more plausible alternative story is that reconstruction workers move into the district after an earthquake. This tendency can explain the uncovered results if the reconstruction workers are more religious than the average person and if they stay for 6-12 years before moving out again. While this is plausible, it probably does not drive the entire effect. On the other hand, the fall in religiosity after a while is reconcilable with the idea that religion provides stress relief, reducing the need for religion after a while.

If the effect is due to a direct impact of earthquakes on income, the effect should fall when accounting for personal or regional development levels. This is not the case. Last, if religiosity is just part of the characteristics of a different type of people developing in earthquake areas, the effect should fall when controlling for other cultural characteristics stressed as important in the literature (e.g., trust, independence, thriftiness, preference for hard work, etc.). This is also not the case.

To sum up, some of the alternative explanations involving physical insurance, direct economic loss, migration/selection, or a special culture evolving in high-risk areas, can

²⁵The US Geological Survey (USGS) notes that earthquakes cannot be predicted (<https://www2.usgs.gov/faq/categories/9830/3278>). See also this post about our ability to forecast storms and their paths, as opposed to our inability to forecast earthquakes: <https://www.tripwire.com/state-of-security/risk-based-security-for-executives/risk-management/hurricanes-earthquakes-prediction-vs-forecasting-in-information-security/>

explain some of the results. Thus, each individual set of results is probably due to a combination. But the only explanation that can explain *all* uncovered results across all three analyses (cross-section, event study, and cross-generational) is religious coping.

5 Conclusion

Religion may matter for important socioeconomic outcomes. Thus, identifying its causes seems relevant. Economics of religion has taken us far in the understanding of the theoretical foundations. The next step is to disentangle and test the theories empirically. Supply-side theories have obtained only mixed empirical support. Likewise for the secularization hypothesis. However, these empirical investigations have been compromised by lack of global data and lack of proper identification.

Equipped with globally comparable data on religiosity and a novel identification strategy, Bentzen (2018) found evidence consistent with one of the major demand-side theories for differences in religiosity today. Religiosity increases in response to earthquakes, and the impact of living in high earthquake risk areas transmits across generations in the form of elevated religiosity. The reason is most likely that religion is used for psychological comfort, meaning that individuals hit by adverse and unpredictable life events can use their religion to gain comfort and understanding. In conclusion, one reason for the large differences in religiosity across the globe today is differences in unpredictability, caused in particular by differences in the risk and actual occurrence of earthquakes, tsunamis, and volcanic eruptions.

A path for future research is to link the presented globally comparable data on religiosity to other data available at the subnational district level in order to test remaining theories. Furthermore, once the causes of differences in religiosity have been identified more fully, a next step will be to properly investigate its socioeconomic consequences.

References

- Ager, P., Hansen, C. W., & Loenstrup, L. 2016. Church Membership and Social Insurance: Evidence from the American South. *University of Southern Denmark Discussion Papers on Business and Economics No. 7/2016*.
- Ano, Gene G, & Vasconcelles, Erin B. 2005. Religious coping and psychological adjustment to stress: A meta-analysis. *Journal of clinical psychology*, **61**(4), 461–480.

- Azzi, Corry, & Ehrenberg, Ronald. 1975. Household allocation of time and church attendance. *Journal of Political Economy*, **83**(1), 27–56.
- Becker, Sascha O, Nagler, Markus, & Woessmann, Ludger. 2017. Education and religious participation: city-level evidence from Germany’s secularization period 1890–1930. *Journal of Economic Growth*, **22**(3), 273–311.
- Becker, S.O., & Woessmann, L. 2009. Was Weber wrong? A human capital theory of Protestant economic history. *The Quarterly Journal of Economics*, **124**(2), 531–596.
- Bentzen, Jeanet Sinding. 2018. Acts of God? Religiosity and Natural Disasters Across Subnational World Districts.
- Bentzen, Jeanet Sinding, & Gokmen, Gunes. 2017. The Power of Religion: Political Origins of Religion Across the Globe. *Unpublished manuscript*.
- Bisin, Alberto, & Verdier, Thierry. 2001. The economics of cultural transmission and the dynamics of preferences. *Journal of Economic theory*, **97**(2), 298–319.
- Boyer, Pascal. 2008. *Religion explained*. Random House.
- Brown, D.E. 1991. *Human universals*. Temple University Press.
- Campante, Filipe, & Yanagizawa-Drott, David. 2015. Does religion affect economic growth and happiness? Evidence from Ramadan. *The Quarterly Journal of Economics*, **130**(2), 615–658.
- Chaves, Mark, & Gorski, Philip S. 2001. Religious pluralism and religious participation. *Annual review of sociology*, **27**(1), 261–281.
- Clark, Andrew, & Lelkes, Orsolya. 2005. Deliver us from evil: religion as insurance. *Papers on Economics of Religion*, **603**, 1–36.
- Clark, Walter Houston. 1958. How do social scientists define religion? *The Journal of Social Psychology*, **47**(1), 143–147.
- Cohen, S., & Wills, T.A. 1985. Stress, social support, and the buffering hypothesis. *Psychological bulletin*, **98**(2), 310–357.
- Conway, K. 1985. Coping with the stress of medical problems among black and white elderly. *The International Journal of Aging and Human Development*, **21**(1), 39–48.
- Fernandez, R. 2011. *Does culture matter?* The Netherlands: North-Holland.
- Feuerbach, Ludwig. 1957. *The essence of Christianity*. Barnes & Noble Publishing.
- Finke, Roger, & Stark, Rodney. 2005. *The churching of America, 1776-2005: Winners and losers in our religious economy*. Rutgers University Press.
- Freud, Sigmund. 1927. *The future of an illusion*. Broadview Press.

- Gruber, Jonathan, & Hungerman, Daniel M. 2008. The Church Versus the Mall: What Happens When Religion Faces Increased Secular Competition?*. *The Quarterly journal of economics*, **123**(2), 831–862.
- Guiso, L., Sapienza, P., & Zingales, L. 2003. People’s opium? Religion and economic attitudes. *Journal of Monetary Economics*, **50**(1), 225–282.
- Hall, D.D. 1990. *Worlds of wonder, days of judgment: Popular religious belief in early New England*. Harvard University Press.
- Hungerman, Daniel M. 2005. Are church and state substitutes? Evidence from the 1996 welfare reform. *Journal of Public Economics*, **89**(11), 2245–2267.
- Hungerman, Daniel M. 2010. Rethinking the study of religious markets. *Handbook of the Economics of Religion*, 257–75.
- Iannaccone, Laurence R. 1992. Sacrifice and stigma: Reducing free-riding in cults, communes, and other collectives. *Journal of political economy*, **100**(2), 271–291.
- Iannaccone, Laurence R. 1998. Introduction to the Economics of Religion. *Journal of economic literature*, **36**(3), 1465–1495.
- Inglehart, R., & Norris, P. 2003. *Rising tide: Gender equality and cultural change around the world*. Cambridge University Press.
- Iyer, Sriya. 2016. The new economics of religion. *Journal of Economic Literature*, **54**(2), 395–441.
- Johnson, Sarah C, & Spilka, Bernard. 1991. Coping with breast cancer: The roles of clergy and faith. *Journal of Religion and Health*, **30**(1), 21–33.
- Kimball, Miles S, Mitchell, Colter M, Thornton, Arland D, & Young-Demarco, Linda C. 2009. *Empirics on the origins of preferences: The case of college major and religiosity*. Tech. rept. National Bureau of Economic Research.
- Koenig, H.G., George, L.K., & Siegler, I.C. 1988. The use of religion and other emotion-regulating coping strategies among older adults. *The Gerontologist*, **28**(3), 303–310.
- Lehrer, Evelyn L. 2004. Religion as a determinant of economic and demographic behavior in the United States. *Population and development review*, **30**(4), 707–726.
- Marx, Karl. 1867. *Capital: A critique of political economy*. The Penguin Group.
- Mattlin, Jay A, Wethington, Elaine, & Kessler, Ronald C. 1990. Situational determinants of coping and coping effectiveness. *Journal of Health and Social Behavior*, 103–122.
- McCleary, R.M., & Barro, R.J. 2006. Religion and economy. *The Journal of Economic Perspectives*, **20**(2), 49–72.

- Miller, Alan S, & Hoffmann, John P. 1995. Risk and religion: An explanation of gender differences in religiosity. *Journal for the scientific study of religion*, 63–75.
- Miller, Lisa, Bansal, Ravi, Wickramaratne, Priya, Hao, Xuejun, Tenke, Craig E, Weissman, Myrna M, & Peterson, Bradley S. 2014. Neuroanatomical correlates of religiosity and spirituality: A study in adults at high and low familial risk for depression. *JAMA psychiatry*, **71**(2), 128–135.
- Murdock, G.P. 1965. *Culture and society: twenty-four essays*. University of Pittsburgh Press.
- Norenzayan, A., & Hansen, I.G. 2006. Belief in supernatural agents in the face of death. *Personality and Social Psychology Bulletin*, **32**(2), 174–187.
- Norenzayan, Ara. 2013. *Big gods: How religion transformed cooperation and conflict*. Princeton University Press.
- Norris, Pippa, & Inglehart, Ronald. 2011. *Sacred and secular: Religion and politics worldwide*. Cambridge University Press.
- Olson, Dan. 2011. Toward better measures of supply and demand for testing theories of religious participation. *In: The Oxford handbook of the economics of religion*.
- Ono, K. 1987. Superstitious behavior in humans. *Journal of the Experimental Analysis of Behavior*, **47**(3), 261.
- Pargament, K.I. 2001. *The psychology of religion and coping: Theory, research, practice*. Guilford Press.
- Park, C., Cohen, L.H., & Herb, L. 1990. Intrinsic religiousness and religious coping as life stress moderators for Catholics versus Protestants. *Journal of personality and social psychology*, **59**(3), 562.
- Penick, J.L. 1981. *The New Madrid Earthquakes*. University of Missouri.
- Peoples, Hervey C, Duda, Pavel, & Marlowe, Frank W. 2016. Hunter-gatherers and the origins of religion. *Human Nature*, **27**(3), 261–282.
- Rubin, Jared. 2017. *Rulers, Religion, and Riches: Why the West got rich and the Middle East did not*. Cambridge University Press.
- Scheve, K., & Stasavage, D. 2006. Religion and preferences for social insurance. *Quarterly Journal of Political Science*, **1**(3), 255–286.
- Sibley, Chris G, & Bulbulia, Joseph. 2012. Faith after an earthquake: A longitudinal study of religion and perceived health before and after the 2011 Christchurch New Zealand earthquake. *PloS one*, **7**(12), e49648.
- Skinner, B.F. 1948. 'Superstition' in the pigeon. *Journal of experimental psychology*, **38**(2), 168.

- Smith, Bruce W, Pargament, Kenneth I, Brant, Curtis, & Oliver, Joan M. 2000. Noah revisited: Religious coping by church members and the impact of the 1993 Midwest flood. *Journal of Community Psychology*, **28**(2), 169–186.
- Sosis, R. 2008. Pigeons, foxholes, and the book of Psalms. *Bulbulia et al., eds., Evolution of Religion*, 103–109.
- Stark, Rodney, & Finke, Roger. 2000. *Acts of faith: Explaining the human side of religion*. Univ of California Press.
- Steinberg, T. 2006. *Acts of God: The unnatural history of natural disaster in America*. Oxford University Press, USA.
- Van De Wetering, M. 1982. Moralizing in Puritan natural science: Mysteriousness in earthquake sermons. *Journal of the History of Ideas*, 417–438.
- Voas, David, & Chaves, Mark. 2016. Is the United States a counterexample to the secularization thesis? *American Journal of Sociology*, **121**(5), 1517–1556.
- Weber, M. 1905. *The Protestant Ethic and the Spirit of Capitalism*. Penguin Books.
- Williams, D.R., Larson, D.B., Buckler, R.E., Heckmann, R.C., & Pyle, C.M. 1991. Religion and psychological distress in a community sample. *Social Science & Medicine*, **32**(11), 1257–1262.