

Risk Aversion and Religion

Charles Noussair, Stefan T. Trautmann, Gijs van de Kuilen & Nathanael

Vellekoop^{*}

Tilburg University, the Netherlands

May 2012

Abstract:

Using a dataset for a demographically representative sample of the Dutch population, containing a revealed preference risk attitude measure, as well as very detailed information about participants' religious background, we study three issues raised in the literature. First, we find confirmatory evidence that more religious people, as measured by church membership or attendance, are more risk averse. Second, we obtain some evidence that Protestants are more risk averse than Catholics. Third, our data suggest that the link between risk aversion and religion is driven by social aspects of church membership, rather than by religious beliefs themselves.

KEYWORDS: risk aversion, religion, Catholicism, Protestantism

JEL CODES: C91, C93, D81, Z12

^{*} Correspondence to Stefan Trautmann, Department of Economics, Tilburg University, P.O.Box 90153, 5000 LE Tilburg, the Netherlands. E-mail: s.t.trautmann@uvt.nl.

1. Introduction

Recent microeconomic research has revealed some strong relationships between religion and economic behavior. Measures of religiosity and religious affiliation exhibit correlations with investment and managerial decisions, organizational behavior, and financial market outcomes (Hillary and Hui, 2009; Kumar et al., 2011). These studies provide a microeconomic foundation for macroeconomic cross-country research that finds evidence of an important role of religion in economic development and institutional structure (Barro and McCleary, 2003; 2006, Guiso et al., 2003; 2006).

One potential mechanism that could generate a relationship between religion and economic behavior is a correlation between religious belief, or practice, and risk aversion. The implications of risk aversion for economic decision making have been subject to extensive study and have been one of the principal themes of the work of Professor Eeckhoudt. His work has analyzed the link between risk aversion levels and behavior in the realms of saving (Eeckhoudt and Schlesinger, 2008), health policy (Bui et al., 2005), valuation of life (Eeckhoudt and Hammitt, 2001), and insurance demand (Eeckhoudt et al., 1997), among others. Studying the link between risk aversion and religion therefore is potentially an important ingredient in an understanding of how religion shapes economic outcomes.

A positive relationship between risk aversion and religiosity is observed in a number of studies (Miller and Hoffmann 1995; Liu, 2010; Dohmen et al., 2011; Hilary and Hui, 2009). A number of studies also find a negative association with religiosity and excessive gambling (Hoffmann, 2000; Diaz, 2000; Ellison and McFarland, 2011). The results with respect to differences in risk aversion between Christian denominations are mixed. Kumar et al. (2011), Barsky et al. (1997) and Benjamin et al. (2010) find that Protestants are more risk averse or make safer financial investments than Catholics, while Renneboog and Spaenjers, (2011) and Dohmen et al. (2011) observe the opposite.¹ While some of these studies control for a variety of social and economic variables that differ between the countries in which they were conducted (the United States, the Netherlands, and Germany), international differences in

¹ Sociologists have explored how differences in beliefs and practice between Catholicism and Protestantism might account for the some of the differences in economic outcomes between countries in which each is dominant. This line of inquiry was initiated with Weber (1905), who first proposed a connection between a work ethic originating in Protestant beliefs and economic growth in Northern Europe. The first economic model of church attendance was constructed by Azzi and Ehrenberg (1975). They used their model to hypothesize that females would be more likely to attend church than males, and that church attendance would decrease with income, and they found both effects empirically. In our analysis here, we control for income and gender when we consider the relationship between church attendance and risk aversion.

doctrine and history, particularly within the Protestant segments of the population, might account for the mixed results.

The studies listed above have used two different approaches. The first is to correlate data on religiosity with measures of financial risk taking at the individual level. Barsky et al. (1997), Dohmen et al. (2011), Renneboog and Spaenjers (2011), and Liu (2010) rely on hypothetical risk preference decisions in large population samples. Benjamin et al. (2009) use a student sample and a risky experimental decision task with monetary stakes. The second approach is to correlate county-or regional-level religiosity, or sectarian demography, with the financial conduct of individuals, companies, mutual funds, or CEOs (Hilary and Hui 2009; Kumar et al. 2011; Shu et al., 2010).

In this paper, we report direct evidence of a relationship between religion and risk aversion from incentivized experimental measures, in a demographically representative sample of individuals. For our sample, drawn from the Dutch population, we also have an extensive set of religious background variables. These include own and parents' participation, attendance, denomination, and own specific religious beliefs, at the individual level. Using our direct measure of risk aversion, we test whether there are differences in risk aversion between church members and non-members, as well as between Protestants and Catholics.

In our view, the Netherlands offers a good arena to study these questions. The country is characterized by religious diversity, with just over half of the population (51.6%) reporting an affiliation to an established religion. 27% are members of the Catholic Church, while 16.6% are members of a Protestant denomination. The southern and southeastern regions of the country, particularly the provinces of North-Brabant and Limburg, have a strong Catholic majority, while Zeeland, South-Holland, and the Northeast of the country have a clear Protestant majority. Religious identity has historically been important, due to the regional division, the role of Protestantism in the original war for independence against Spain in the 16th and 17th centuries, and the fact that the Netherlands has at times served as a refuge for Protestants, as well as Jews, from neighboring countries. There is a Muslim minority comprising roughly 4 – 6% of the population.

Identifying the nature of the connection between risk aversion and religion is important for understanding the mechanism underlying cultural effects on economic outcomes (Guiso et al. 2006; Barro and McCleary, 2006). In particular, it might clarify the nature of the link between religion and financial market behavior. Kumar et al. (2011) conjecture that the differences in financial decisions between Protestant and Catholic regions are due to greater

risk aversion on the part of Protestants. On the other hand, Shu et al. (2010) find no evidence that Protestants hold less risky stocks. Instead, they find that increased volatility of returns for mutual funds from Catholic regions is driven by aggressive trading and under-diversification. This suggests that it is not risk attitude per se, but other cultural differences between denominations, which may account for the observed differences in financial behavior. Similarly, Hong et al. (2004) show that churchgoers are more, rather than less, likely to participate in the stock market, contradicting the evidence showing that religious people are typically more risk averse. Uncovering the direct link between religiosity, religious affiliation, and risk aversion at the individual level can potentially shed light on the nature of the relationship between religion and financial decisions.

The data we have on self-reported religious beliefs and practices allow us to study whether links between risk aversion and religion are related to particular religious beliefs, or to the social aspects of activities associated with religious practice (Barro and McCleary 2003; Gebauer et al. 2012). Furthermore, we also have data on our subjects' exposure to religious beliefs and activities during their childhood, such as parents' church affiliation, intensity of religious practice, and church attendance. This allows us to study the role of the intergenerational transmission of risk attitudes through religious upbringing, and whether risk aversion is correlated with the decision to join or to leave the church.

We find robust evidence that risk aversion is positively correlated with religiosity, as measured by church membership. Moreover, risk aversion is positively correlated with attendance rates at religious gatherings, and the effect is mainly driven by religiously very active participants. We find less clear evidence for differences in risk attitudes between denominations, with Protestants being more risk averse than Catholics only in some specifications. The correlation between religion and risk aversion appears to derive principally from social interaction rather than the religious beliefs themselves.

2. Participants and Methodology

2.1. Participants

We use data from the LISS panel, managed by CentERdata, an organization affiliated with Tilburg University. The LISS panel consists of approximately 9000 individuals, who complete a questionnaire over the internet each month. Respondents are reimbursed for the costs of completing the questionnaires four times a year. Additionally, incentivized economic

experiments are conducted routinely on the LISS panel. A payment infrastructure is available to pay participants according to their decisions in experimental tasks.

In terms of observable background characteristics, the LISS panel is a representative sample of the Dutch population. A large number of background variables is available, including data from a prior survey on religious beliefs and participation. We have data on revealed risk preferences and religiosity for 2631 panel members. Of these, 1047 people were in a real payoff condition in which the risk preference elicitation involved significant monetary incentives.²

2.2. Measurement of Risk Attitudes

Risk attitudes were measured by letting each participant choose, in five trials, between a lottery that paid €65 or €5 with equal probability and thus had a expected value of €35, and a sure payoff that differed by trial. The sure payoff varied from €20 to €40 in steps of €5, and therefore had a price-list structure. Each of the five choices was presented on a separate screen, and the order of the sequence of sure payoffs was counterbalanced among subjects. That is, for one half of participants, decision 1 consisted of a choice between the lottery and a sure payment of €20, decision 2 was between the lottery and €25, etc. For the other half of subjects, decision 1 consisted of a choice between the lottery and a sure payment of €40, decision 2 was between the lottery and €35 for sure, etc. The side of the screen (left/right) on which the lottery and the sure payoff appeared was also counterbalanced, with one half of the subjects having the lottery always displayed on the left of their screen, and the other half having it always shown on the right. Subjects did not learn of the actual outcome of any of the lotteries during the experimental session.

Each lottery was presented in terms of a die roll, with the die representing a computerized equal probability draw (see the Appendix for an example of a screen shot illustrating the format). 1047 subjects made these choices for potentially real stakes. For each subject in the *Real* stakes condition, one decision problem she faced was randomly selected to potentially count as her earnings. The prize was paid to a given individual with a probability of 1/10. This allowed for significant payoffs to some individuals (Benjamin et al. 2009).³ The

² Sample sizes differ between analyses because not all participants answered all questions regarding religiosity.

³ Combining large payoffs with a random selection of participants for real payment is often done in large-scale studies with the general public (e.g., von Gaudecker et al. 2011). In a study of risk attitudes, the procedure leverages incentives, and avoids the potential problem of relatively linear utility for small payoffs (see Abdellaoui et al. (2010) and references therein). Abdellaoui et al. (2010) argue that random selection leads to

probabilities that an individual would be paid, and that any given decision would count conditional on her being paid, was known at the time she made her decisions. Another 807 subjects made the same decision, but with hypothetical payoffs. Additionally, another 777 subjects made the same choices, but with hypothetical payoffs scaled up by a factor 150. There are no differences in observed average risk aversion levels between hypothetical and real payoffs of the same nominal stake size ($z=.671$, $p=.5025$, Mann-Whitney-U test).

We include controls in all regressions to account for potential treatment effects, as well as controls for the counterbalancing in the presentation of the choices. Moreover, we present results both for the whole sample and for the sample of subjects making decisions for real payments. Our measure of individual risk aversion is the number of instances in which a subject chose the sure payoff. Thus, our *risk aversion* measure ranges from a lowest possible value of 0 to a highest possible value of 5. A risk neutral agent would make either one or two safe choices, out of the five opportunities, and more than 2 safe choices indicate risk aversion. More safe choices indicate greater risk aversion. Because choices were presented on separate screens, it was possible for a respondent to violate monotonicity by choosing the risky lottery for some sure amount x , and also choosing the sure payment for a lower amount $y < x$. We did not exclude subjects who behaved in a non-monotonic manner in the analysis reported in sections 3 - 5, but doing so does not affect any of our conclusions.

2.3. Measurement of Religiosity and Religious Participation

The survey on religion that participants had completed earlier contains data on religious activities and beliefs of the survey participants at the date of the survey, as well as responses reporting their parents' activities when the participant was 15 years old. Table 1 provides summary statistics of responses to each question for each religious group.

<table 1 here>

The religiosity variables we employ are the following. We define dummy variables for frequency of church attendance. The categories are church/service attendance of more than once a week, once a week, and once a month. We also use the same categories of attendance

stronger incentives than a downscaled payoff scheme, where all subjects are paid with certainty. Starmer and Sugden (1991) provide evidence that selecting one decision for payment, rather than all decisions, does not affect behavior.

frequency at age 15. We define denomination dummies for adherence to the Catholic and Protestant faiths. The variable “degree of belief in God” is measured in two ways. The first is with the response to a question in which the respondent was asked to indicate one of six degrees of religious belief. These ranged from “*I do not believe in God*” to “*I believe without any doubt in God.*” The second measure of the strength of religious belief is a count of the number of affirmative answers on a set of seven questions asking the subjects whether they believe in specific Christian theological concepts. These are (i) life after death, existence of (ii) heaven, (iii) the Bible as the word of God, (iv) hell, (v) the devil, (vi) that Adam and Eve existed, and (vii) that it makes sense to pray. Finally, we include dummy variables for the frequency of prayer *outside* of religious services.

Table 1 also shows the average values for two sets of independent variables that we use in our analysis. Controls A consist of the purely exogenous variables of gender, age, treatment, and counterbalancing in the presentation. Controls B consist of a set of socioeconomic background variables. These consist of marital status, number of children, income, homeownership and health status, educational and occupational status, and whether one has a Dutch passport. The table also provides averages of the responses to the religiosity questions and of the control variables, for Catholics and Protestants separately.

A number of interesting patterns are evident from the table. Overall, 42.5% of respondents are affiliated to either the Catholic or a Protestant church. This compares to 66.1% of respondents’ parents at the time they were 15 years old, illustrating the decline in church membership over the last several decades, typical in most of Europe (Dekker et al, 1997). Almost all, more than 94%, of respondents who currently are affiliated, report that their parents were church members when they were 15. On average, Protestants attend church services, pray more, and indicate stronger religious beliefs than Catholics. The demographics are similar between the two groups. The religiously affiliated are somewhat more likely to be female and older than average. Church members are more likely to be married and less likely to be divorced than the overall population.

3. Results: The Effect of Church Membership and Participation

We first consider whether there is an overall correlation between risk aversion and religiosity, as measured with both current religious activity and exposure to religion during childhood. Table 2 gives an overview of measured risk aversion depending on current church membership status and membership of the subject’s parents during her childhood. Table 3

shows similar data for attendance at religious services. In both tables, the risk aversion measure is the number of safe choices, out of a maximum possible of five.

Table 2: Parental and Own Church Membership

Parents in church	Subject in church	# obs.	Avg. risk aversion (0-5)
Yes	Yes	1016	3.49
Yes	No	665	3.35
No	Yes	69	3.55
No	No	798	3.34

Note: Parents in church refers to parents' membership status when respondent was aged 15

Table 3: Service attendance

Attendance	# obs.	Avg. risk aversion (0-5)
<i>Current</i>		
More than once a week	101	3.77
Once a week	180	3.59
Once a month	185	3.35
Less often	2154	3.39
<i>During Childhood: at age 15</i>		
More than once a week	286	3.43
Once a week	828	3.42
Once a month	180	3.37
Less often	1321	3.42

The first pattern that is evident from the tables is that the average person is risk averse. Making more than two safe choices is incompatible with risk neutrality, and indicates risk aversion. Overall, individuals make an average of 3.41 safe choices. Table 2 shows that current church members are more risk averse than non-members. Table 3 confirms that current attendance correlates positively with risk aversion while attendance during childhood seems to have no effect. Parents' membership exerts no effect beyond a correlation between current membership status and parents' membership status (Spearman's $\rho=.508$, $p<.01$). A respondent who renounced the church after age 15 is comparable in risk attitude to one whose parents were not church members. Thus, it does not appear that exposure to religion itself permanently affects risk attitudes (unless there are key variables affecting the decision to leave the church that are not controlled for). Otherwise, parents' membership would exert an influence on those who are not religious as adults (Guiso, Sapienza, and Zingales 2003,

2006). On the other hand, the pattern we observe is also consistent with relatively risk tolerant individuals being more likely to opt out of the church.

<table 4 here>

Table 4 gives Tobit regression results for the whole sample (indicated in the column labeled “All”) and the subsample of subjects who received real contingent cash payments (in the “Real” column). The dependent variable is the number of safe choices and each individual constitutes one observation. The estimates include either a smaller set of independent variables, Controls A, or a larger set consisting of Controls A and B. Controls A consist of gender and age, which are exogenous. Controls B are background variables, listed in section 2.3, which in principle are subject to endogeneity. The table reports only the findings for the covariates of interest.

The upper panel of the table shows that church members are more risk averse than non-members. For parents’ membership at the time the subject was aged 15, a directionally identical effect is found, which becomes insignificant under real incentives. This suggests that parents’ membership may exert an indirect influence by affecting current membership, which is correlated with risk aversion. The lower panel of table 4 corroborates these findings. Higher frequency of attendance at religious gatherings is related to higher risk aversion, with the strongest effects for highly religiously active respondents. This effect is insignificant, however, for the attendance at age 15.⁴ Overall, these results clearly show a positive relationship between risk aversion and current religiosity.

4. Catholics and Protestants

The previous section establishes a positive correlation between overall religiosity and risk aversion. We now consider whether there are differences in average risk attitude between Catholics and Protestants. From Table 1, it is clear that there are differences between the two denominations in terms of the intensity of religious activities and beliefs. On average, Protestants hold stronger religious beliefs, and the share of practitioners who are very active in terms of church attendance and frequency of prayer is greater.

⁴ More reporting errors for attendance at age 15 than for current attendance, due for example to imperfect recall of one’s status at age 15, could lead to a downward bias, in the direction of less significance, in the coefficient.

One might expect, based on the results from section three, that religious activity of Protestants would be associated with stronger risk aversion on the part of Protestants relative to Catholics.⁵ However, in Table 5, it can be seen that Catholics and Protestants are almost equally risk averse on average, and are also similar to members of other religious groups. The table shows the average risk aversion measure for Catholics, Protestants, and members of other faiths in our data. The last category includes members of Eastern churches, Jews, Muslims, Hindus, Buddhists, and members of other faiths, but does not include the religiously unaffiliated.

Table 5: Risk Aversion by Denomination

Denomination	# obs.	Avg. risk aversion (0-5)
Roman Catholic	562	3.49
Protestant	423	3.47
Other faiths	109	3.50

The raw averages in Table 5 fail to control for other influences on risk aversion, which may fall differentially between the two groups. Table 6 contains tests for denomination differences, derived from Tobit regressions that include as independent regressors, the A and B variables discussed earlier. The table reports regressions that include two different samples (All participants and those who had Real monetary payoffs), and two sets of controls, A, and A + B. The upper panel of Table 6 compares the adherents of religious groups to non-members. In three specifications we find evidence that Protestants are more risk averse than non-members. However, the coefficients for Catholics and Protestants are significantly different only in the Real payment condition with both sets of controls. Restricting the sample to Protestants and Catholics only, we find that Catholics are less risk averse in both samples if we include the full set of controls.

⁵ Note, however, that the share of very active participants is small in both denominations.

Table 6: Risk aversion and denomination

	All	All	Real	Real
Controls A	Yes	Yes	Yes	Yes
Controls B	No	Yes	No	Yes
<hr/>				
All subjects				
Roman Catholic	.250 (1.61)	.246 (1.52)	.284 (1.30)	.283 (1.22)
Protestant	.184 (1.03)	.332 (1.77)*	.548 (2.10)**	.829 (2.93)***
Other Churches	.207 (.69)	.208 (1.12)	.384 (.87)	.324 (.66)
N	2581	2338	1020	922
$\beta(\text{Catholic})=\beta(\text{Protestant})$	F=.11	F=.17	F=.85	F=3.18*
<hr/>				
Catholic & Protestant				
Catholic	.047 (.24)	-.122 (2.01)**	-.306 (1.10)	-.602 (7.10)***
N	985	897	396	360

Notes: dependent variable: risk aversion; tobit regressions, coefficients reported, t-values based on robust s.e. in parenthesis; */**/** indicate significance at 10%, 5% and 1% level.

Thus on balance, there is some evidence that Protestants are more risk averse than Catholics. Indeed, considering only the most active members, defined as those who attend church at least once a week, Protestants are significantly more risk averse ($P=3.71$, $C=3.26$, $p<.05$ Mann-Whitney-U test) than Catholics. This is consistent with the findings of Kumar et al. (2011), but does not corroborate Renneboog and Spaenjers' (2011) finding that Catholics are more risk averse than Protestants. As Table 5 shows, the isolation of differences between Protestants and Catholics requires the inclusion of control variables.

5. Believing vs. Belonging

In section 3 we found evidence supporting a positive correlation between risk aversion and religiosity, measured in terms of church membership and service attendance. An important question regarding this correlation concerns whether the relationship is driven by religious beliefs per se, or by the social effects of religious participation (see Liu 2010, Iannaccone 1998, McCleary and Barro 2006). McCleary and Barro (2006) and Barro and McCleary (2003) suggest that many of the real economic effects of religion are driven by religious beliefs rather than pure communal social and cultural effects of participation and membership. In this section, we study the extent to which variation in risk aversion is associated with beliefs or alternatively with social aspects of religious activity.

We measure the strength of religious beliefs for an individual in two ways, as described earlier. The first is with one direct question asking the individual to report her degree of belief

on a six-point scale, and is referred to as “Degree of Belief in God” in Table 7. The second measure is constructed from the responses to a set of questions regarding religious belief as described in section two, and is referred to as “Religious Belief Indicator” in Table 7. Belonging, the social effects of religious affiliation, is captured with church attendance. While church attendance is an injunction in both Catholic and Protestant Christianity, church services are also an opportunity to experience and organize social interaction among members of the community, and thus have a clear social aspect. We also use data on the frequency that individuals pray outside of church services in some specifications. Prayer has aspects of both believing and belonging, since prayer is done both privately and in groups. The frequency of prayer outside of services is presumably correlated with stronger beliefs, but also might be associated with greater interaction with other church members.

We have already shown in section 3 that church attendance correlates with risk aversion for active members. Using participants’ religious beliefs instead of attendance, we test whether a similar pattern exists for religious beliefs. Table 7 shows regression results. Measured risk aversion is the dependent variable and the strength-of-belief metrics are among the independent variables. Included in the table are regressions using the whole sample as well as the subsample of people who received real cash payments, with either the full set of controls (controls A+B), or only the smaller, unambiguously exogenous set of controls (controls A).

As Table 7 illustrates, we find no significant effect of the strength of religious beliefs on risk aversion. On the other hand, we find effects of praying outside of church services, with people praying more than once a week being more risk averse than the ones praying less frequently. Although this variable measures a religious activity that occurs outside of religious gatherings, it would typically involve prayer in a group or family setting, as well as alone. Thus, as argued earlier, in contrast to pure religious beliefs, prayer outside of church gatherings arguably includes a social component. Overall, the positive effects for attendance (presented earlier in section three) and prayer, and the absence of effects for pure belief indicators, suggest that in our sample the link between risk aversion and religion is driven by the social aspects of belonging to a religious group rather than by the religious beliefs themselves.

Table 7: Risk aversion and beliefs/prayer

	All	All	Real	Real
Controls A	Yes	Yes	Yes	Yes
Controls B	No	Yes	No	Yes
Religious belief indicator				
stronger belief	.037 (1.00)	.046 (1.12)	.051 (.87)	.068 (1.06)
N	1037	934	408	364
Degree of belief in God				
stronger belief	.024 (.71)	.040 (1.10)	.043 (.88)	.040 (.75)
N	2629	2377	1046	944
Praying (private)				
>1 per week	.436 (2.95)***	.503 (3.26)***	.356 (1.72)*	.409 (1.88)*
≈1 per week	-.502 (1.45)	-.645 (1.76)*	.110 (.22)	.030 (.05)
≈1 per month	.106 (.40)	-.002 (.01)	-.210 (.55)	-.475 (1.22)
N	2617	2367	1041	939

Notes: dependent variable: risk aversion; tobit regressions, coefficients reported, t-values based on robust s.e. in parenthesis; */**/** indicate significance at 10%, 5% and 1% level.

6. Conclusion

Using a dataset containing a revealed preference risk attitude measure, as well as detailed information about participants' religious background, beliefs, and practice, we study three issues. First, we find confirmatory evidence that religious people, as measured by church membership or attendance, are more risk averse. This risk aversion correlates strongly with current religiosity, and only weakly, if at all, with whether one had a religious upbringing. This suggests either that relatively risk tolerant individuals select out of the church, or that leaving the church makes one less risk averse. It is tempting to speculate that as religious membership has been declining in Europe over the last several decades, there may be a corresponding decline in the risk aversion of the average individual. This could be the case as either a cause or as a consequence (or both) of the decline in religious affiliation. In our view, this is an interesting line of inquiry for future research to consider.

Second, there is some weak evidence that there are differences in risk aversion between denominations. Our data show that, if anything, Protestants are somewhat more risk averse than Catholics. However, the identification of this difference depends on the specification and the inclusion of a large set of controls, and is thus not very robust. Thus, controlling for

individual characteristics seems important to identify differences in risk aversion that are directly related to differences in religious affiliation. Moreover, given the differences among different Protestant churches, it seems likely that Protestants' views on risk taking are diverse, with not all denominations being more risk averse than Catholics (see Iannaccone 1998, p. 1477). It is also unclear whether our results on religious differences generalize beyond the Netherlands, and this is an obvious avenue for future work. For example, The Netherlands differs from most nations in that no religion has majority or dominant status (see Colvin 2010), and thus the results may differ in other countries merely because one denomination has a dominant position over others.

Third, our data suggest that the link between risk aversion and religion is driven by social aspects of church membership, rather than by pure religious beliefs (see Gebauer et al., 2012). There are a number of mechanisms whereby social effects could influence risk attitude, and our results here do not allow us to distinguish between them. It may be the case that risk-averse individuals are naturally drawn to those who are risk averse. Or it may be the case that risk aversion is transmitted to others that one has contact with, and a desire to conform to other individuals' behavior may reinforce risk aversion among the faithful. It is also possible that risk-averse people are attracted to religious organizations in part because church membership can provide a supplemental safety net for individuals, if and when they become elderly, poor or ill. While such benefits may not necessarily be considered a social aspect, their attractiveness would be based on pragmatic considerations rather than religious beliefs. It may also be the case that repeated exposure to sermons reminding attendees of the Calvinist and Lutheran prohibitions on gambling have an effect on risk aversion with regard to monetary lotteries and account for the greater risk aversion on the part of Protestants than Catholics. More detailed survey questions are required to establish the strength of these forces.

References

- Abdellaoui, Mohammed, Aurélien Baillon, Laetitia Placido, and Peter P. Wakker (2011). The Rich Domain of Uncertainty: Source Functions and Their Experimental Implementation. *American Economic Review* 101, 695–723.
- Barro, Robert J. and Rachel M. McCleary (2003) Religion and Economic Growth across Countries. *American Sociological Review* 68, 760–781.

- Barsky, Robert B., F. Thomas Juster, Miles S. Kimball, & Matthew D. Shapiro (1997). Preference Parameters and Behavioral Heterogeneity: An Experimental Approach in the Health and Retirement Study. *Quarterly Journal of Economics* 112, 537–579.
- Benjamin, Daniel, James J. Choi, and Geoffrey Fisher (2009). Religious Identity and Economic Behavior. Working paper, Cornell.
- Colvin, Christopher L. (2010) God and risk: The role of religion in rural cooperative banking in early twentieth century Netherlands. Working paper, LSE.
- Diaz, Joseph (2000). Religion and Gambling in Sin-City: A Statistical Analysis of the Relationship Between Religion and Gambling Patterns in Las Vegas Residents. *Social Science Journal* 37, 453-458.
- Deaton, Angus (2009). Aging, Religion and Health. Working paper, Princeton.
- Dekker, Gerard, Joep de Hart and Jan Peters (1997), *God in Nederland*, 2nd edition, Anthos: Amsterdam.
- Dohmen, Thomas, Armin Falk, David Huffman, Uwe Sunde, Jürgen Schupp, and Gert G. Wagner (2011). Individual Risk Attitudes: Measurement, Determinants and Behavioral Consequences. *Journal of the European Economic Association* 9, 522–550.
- Eitle, David (2011). Religion and Gambling Among Young Adults in the United States: Moral Communities and the Deterrence Hypothesis. *Journal for the Scientific Study of Religion* 50, 61-81.
- Ellison, Christopher G. and Kathleen A. Nybroten (1999). Conservative Protestantism and Opposition to State-sponsored Lotteries: Evidence from the 1997 Texas Poll. *Social Science Quarterly* 80, 356–369.
- Gebauer, Jochen E., Constantine Sedikides, and Wiebke Neberich (2012). Religiosity, Social Self-Esteem, and Psychological Adjustment: On the Cross-Cultural Specificity of the Psychological Benefits of Religiosity. *Psychological Science*, forthcoming.
- Guiso. Luigi, Paola Sapienza, and Luigi Zingales (2003). Does Culture Affect Economic Outcomes? *Journal of Monetary Economics* 50, 225–282.
- Guiso. Luigi, Paola Sapienza, and Luigi Zingales (2006). Does Culture Affect Economic Outcomes? *Journal of Economic Perspectives* 20, 23–48.

- Hilary, Gilles and Kai Wai Hui (2009). Does religion matter in corporate decision making in America? *Journal of Financial Economics* 93, 455–473.
- Hoffmann , John P. (2000). Religion and Problem Gambling in the U.S. *Review of Religious Research* 41, 488-509.
- Hong, Harrison, Jeffrey D. Kubik and Jeremy C. Stein (2004). Social Interaction and Stock Market Participation. *Journal of Finance* 59, 137–163.
- Iannaccone, Laurence R. (1998). Introduction to the Economics of Religion. *Journal of Economic Literature* 36, 1465–1496.
- Kumar, Alok, Jeremy K. Page, and Oliver G. Spalt (2011). Religious Beliefs, Gambling Attitudes, and Financial Market Outcomes. *Journal of Financial Economics* 102, 671–708.
- Liu, Eric Y. (2010). Are Risk-Taking Persons Less Religious? Risk Preference, Religious Affiliation, and Religious Participation in Taiwan. *Journal for the Scientific Study of Religion* 49, 172–178.
- McCleary, Rachel M. and Robert J. Barro (2006). Religion and Economy. *Journal of Economic Perspectives* 20, 49–72.
- Miller, Alan S. and Rodney Stark (2002), Gender and Religiousness: Can Socialization Explanations Be Saved? *American Journal of Sociology* 107, 1399–1423.
- Noussair, Charles N., Stefan T. Trautmann, and Gijs van de Kuilen (2011). Higher Order Risk Attitudes, Demographics, and Financial Decisions. Working paper, CentER, Tilburg.
- Renneboog, Luc and Christophe Spaenjers (2011). Religion, economic attitudes and household finance. *Oxford Economic Papers* 64, 103–127.
- Shu, Tao, Johan Sulaeman, and P. Eric Yeung (2010). Mutual Fund Risk-Taking and Local Religious Beliefs. Working paper, University of Georgia.
- Starmer, Chris and Robert Sugden (1991). Does the Random-Lottery Incentive System Elicit True Preference? An Experimental Investigation. *American Economic Review* 81(4), 971–978.
- Von Gaudecker, Hans-Martin, Arthur van Soest, and Erik Wengstrom (2010). Heterogeneity in Risky Choice Behaviour in a Broad Population. *American Economic Review* 101, 664-694.

Acknowledgements

We thank Corrie Vis and Maarten Streefkerk of CentERdata for their support in collecting the data. Stefan Trautmann and Gijs van de Kuilen's research was supported by VENI grants from the Netherlands Organization for Scientific Research (NWO).

Appendix

A Screenshot Risk Attitude Elicitation

The screenshot shows a web-based questionnaire interface for risk attitude elicitation. The interface is titled "Deel 1, vraag 1 van 5" (Part 1, question 1 of 5). It features two options, "Optie L" and "Optie R", each represented by a red die icon and a probability distribution. For "Optie L", the die shows a 123 on top and a 456 on the bottom, with a probability of € 65 and a probability of € 5. For "Optie R", the die shows a 123 on top and a 456 on the bottom, with a probability of € 20 and a probability of € 20. Below the options, there is a question: "Kiest u 'Optie L' of 'Optie R'?" (Do you choose 'Option L' or 'Option R?'). There are two radio buttons: "Ik Kies Optie L" and "Ik Kies Optie R". A "Verder" (Next) button is located below the radio buttons. The interface also includes the CentER data logo in the top left, the LISS logo in the top right, and the Universiteit van Tilburg logo at the bottom center. A blue link "Bekijk de instructie" (View the instructions) is located to the right of the options.

Table 1: Summary Statistics

Variable	# obs.	mean/%	Catholics	Protestants	Δ^f
<i>Religion</i>					
Church member	2586	42.5%			
Parents church member ^a	2592	66.1%	94.8%	93.8%	
Roman Catholic	2581	21.8%			
Protestant	2581	16.4%			
Attendance >1 per week	2620	3.9%	1.1%	13.7%	p<.01
Attendance =1 per week	2620	6.9%	6.4%	27.2%	p<.01
Attendance =1 per month	2620	7.1%	14.8%	17.7%	
Attendance >1 per week (age 15)	2615	10.9%	13.4%	23.8%	p<.01
Attendance =1 per week (age 15)	2615	31.7%	55.7%	45.2%	p<.01
Attendance =1 per month (age 15)	2615	6.9%	6.8%	8.3%	
Pray >1 per week	2617	25.7%	36.0%	68.0%	p<.01
Pray =1 per week	2617	3.7%	7.2%	5.2%	
Pray =1 per month	2617	5.1%	10.5%	4.2%	p<.01
Degree belief in God (min 1, max 6) ^b	2629	3.48	4.40	5.10	p<.01
Belief indicators (min 0, max 7) ^c	1037	2.36	2.93	5.58	p<.01
<i>Controls A^d</i>					
Female	2631	52.2%	53.9%	56.3%	
Age	2631	49.02	53.78	53.24	
<i>Controls B</i>					
Married	2631	62.6%	70.8%	75.2%	
Divorced	2631	8.1%	7.3%	4.5%	p<.01
# children	2631	.86	.75	.84	
Gross monthly income (€)	2508	2169	2342	1891	
Home owner	2631	75.0%	77.8%	79.5%	
Health status (1=worst, 5=best)	2550	3.17	3.13	3.18	
High education (college or more)	2631	30.1%	26.9%	28.6%	
Civil Servant	2576	9.6%	10.0%	10.6%	
Self-employed	2631	4.6%	3.7%	5.0%	
Dutch Passport ^e	2631	98.1%	97.2%	100%	p<.01
Foreign Passport ^e	2631	2.6%	3.4%	.2%	p<.01

Notes: a: when respondent was aged 15; b: based on one question; c: counts the number of confirmatory answers in seven questions; d: in regression analyses, Controls A also includes controls for counterbalancing and treatment in the risk elicitation task; e: multiple passport possible; f: difference between Catholics and Protestants.

Table 4

Table 4: Risk aversion, Church Membership and Attendance

	All	All	Real	Real	All	All	Real	Real
Controls A	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls B	No	Yes	No	Yes	No	Yes	No	Yes
Church membership								
Own	.231 (1.81)*	.280 (2.09)**	.412 (2.24)**	.489 (2.47)**				
Parents'					.23 (1.72)*	.284 (1.98)**	.198 (.98)	.218 (.99)
N	2586	2341	1024	925	2592	2344	1028	928
Attendance^a								
>1 per week	.626 (1.97)**	.624 (1.97)**	1.074 (2.28)**	.930 (1.90)*				
≈1 per week	.361 (1.43)	.436 (1.63)	.301 (.82)	.487 (1.21)				
≈1 per month	-.005 (.02)	.053 (.21)	.263 (.81)	.42 (1.20)				
>1 per week (age 15)					.171 (.79)	.178 (.79)	.070 (.21)	.058 (.17)
≈1 per week (age 15)					.127 (.87)	.150 (.97)	-.201 (.98)	-.183 (.82)
≈1 per month (age 15)					-.064 (.25)	.077 (.29)	-.376 (.97)	-.118 (.29)
N	2620	2369	1042	940	2615	2366	1038	939

Notes: dependent variable: risk aversion; tobit regressions, coefficients reported, t-values based on robust s.e. in parenthesis; */**/** indicate significance at 10%, 5% and 1% level. a: excluded category=less active than once a month