

Risk Aversion and Religion

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Abstract

We use a dataset for a demographically representative sample of the Dutch population that contains a revealed preference risk attitude measure, as well as detailed information about participants' religious background, to study three issues. First, we find strong confirmatory evidence that more religious people, as measured by church membership or attendance, are more risk averse with regard to financial risks. Second, we obtain some evidence that Protestants are more risk averse than Catholics in such tasks. 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 CLASSIFICATIONS: C91, C93, D81, Z12

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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 attitudes. Studying this link is potentially an important element in gaining an understanding of how religion shapes economic outcomes.

The implications of risk attitudes for economic decision making have been one of the principal themes of the work of Professor Louis Eeckhoudt. His work has analyzed the theoretical 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). While Professor Eeckhoudt's work has been primarily theoretical, empirical work identifying the demographic correlates of risk attitudes in the population is important for establishing the domains in which theoretical models make specific predictions. One theme of his work has been the implications of particular higher order risk attitudes, and the results we obtain here suggest that preference over the skew of gambles may be an important element in the link between risk aversion and religion.

A positive relationship between risk aversion and religiosity has been observed in a number of studies (Dohmen et al., 2011; Hilary and Hui, 2009; Liu, 2010; Miller and Hoffmann, 1995). A few studies also find a negative association with religiosity and excessive gambling (Diaz, 2000; Ellison and McFarland, 2011; Hoffmann, 2000). The results with respect to differences in risk aversion between Christian denominations are mixed. Barsky et al. (1997) and Benjamin et al. (2010) find that Protestants are more risk averse, and Kumar et al. (2011) find that Protestants make safer financial investments than Catholics, while Renneboog and Spaenjers (2011) and Dohmen et al. (2011) observe the opposite. 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 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). Some relevant features of previous studies are listed in table B1 in Appendix B.

In this paper, we report new evidence of a relationship between religion and risk aversion in a demographically representative sample of the Dutch population. Our work differs from previous studies in two principal aspects. First, our data provide the first evidence for a link between an incentivized risk aversion measure and church membership at the individual level. Second, apart from a person's church membership, we also have access to an extensive set of variables concerning religious background and practice. These include parents' church membership, own and parents' church attendance, own and parents' denomination, own frequency of prayer, and own specific religious beliefs in God and core Christian theological concepts. Using our measure of aversion to financial risk, we test whether there are differences in risk aversion between church members and non-members, as well as between Protestants and Catholics. We also study the role of parental religious activity, religious beliefs, prayer, and church attendance as correlates of risk attitudes.

The Netherlands constitutes 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 and Jews from neighboring countries. There is a Muslim minority comprising roughly 4 to 6% of the population.

Identifying the nature of the connection between risk attitudes and religion is important for understanding the mechanism underlying the effects of culture on economic outcomes (Guiso et al., 2006; McCleary and Barro, 2006). In particular, it might clarify the nature of the link between religion and financial market behavior. Kumar et al. (2011) conjecture that differences in financial decisions between Protestant and Catholic regions are due to greater aversion to gambling 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 underdiversification. 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 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 those who are very active religiously. We also find evidence for differences in risk attitudes between denominations, with Protestants being more risk averse than Catholics. This effect is moderated by the form of incentives provided in the experiment, and suggests a special role for gambling aversion in the link between religion and risk aversion. Data on religious beliefs indicate that these beliefs are not related to risk aversion, in contrast to prayer and church attendance. Thus, the link between religion and risk attitudes appears to derive principally

from the social and institutional aspects of church membership, rather than from institution-free 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 9,000 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 are available, including data from a prior survey on religious beliefs and participation, and measures of risk attitudes from a study by Noussair et al. (2011). The sample consists of 2,304 individuals of whom 906 were in a real payoff condition in which the risk preference elicitation involved monetary incentives.

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 an expected value of €35, and a sure payoff that differed by trial. The sure payoff varied from €20 to €40 in steps of €5. 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, the first decision consisted of a choice between the lottery and a sure payment of €20, the second decision was between the lottery and €25, etc. For the other half of subjects, the first decision consisted of a choice between the lottery and a sure payment of €40, the second decision 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 Appendix A for an example of a screen shot illustrating the format). 906 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).¹ The 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 718 subjects made the same decision, but with hypothetical payoffs. Additionally, another 680 subjects made the same choices, but with hypothetical payoffs scaled up by a factor of 150. There are no differences in observed average risk aversion levels between hypothetical and real payoffs of the same nominal stake size ($z=.124$, $p=.90$, Mann-Whitney-U test).

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 choices, and more than two safe choices indicates risk aversion. More safe choices indicates greater risk aversion.

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: about 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

¹ 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). The procedure leverages incentives, and avoids the potential problem of relatively linear utility for small payoffs when measuring risk attitude. While typically for the population as a whole no differences are observed between preferences elicited by different incentive methods (e.g. von Gaudecker et al. 2011, Noussair et al. 2011), in Section 3.2 we show that certain groups of the population may nevertheless be affected, for example due to specific religious doctrines.

frequency at age 15. We define denomination dummies for adherence to the Catholic and Protestant faiths. The variable “degree of belief” 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 belief in God. These ranged from 1: “*I do not believe in God*” to 6: “*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, (ii) existence of heaven, (iii) the Bible as the word of God, (iv) existence of 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 or a foreign 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, 42.4% of respondents are affiliated with either the Catholic or a Protestant church. This compares to 66.3% of respondents’ parents at the time they were 15 years old, illustrating the decline in church membership over the last several decades in The Netherlands (Dekker et al, 1997). Almost all of the respondents who currently are affiliated -- more than 94% -- report that their parents were church members when they were 15 years old. On average, Protestants attend church services more often, 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

3.1. 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. We give data for the whole sample, as well as separate results for participants in the real stakes and in the hypothetical condition.

< Tables 2 and 3: About Here >

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 3.43 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. Both patterns are more pronounced for participants in the real stakes condition. Parents' membership exerts no effect beyond a correlation between current membership status and parents' membership status (Spearman's $\rho=.499$, $p<.01$). 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: about here>

Table 4 gives Tobit regression results for the whole sample (indicated in the columns labeled "All") and the subsamples of subjects who received real contingent cash payments (in the "Real" columns), or hypothetical questions (in the "Hypo" columns). 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. We also include controls in all regressions to account for potential treatment effects, as well as controls for the counterbalancing in the presentation of the choices. 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 15.² The regression analysis confirms that the link between church membership and revealed risk attitude is most pronounced for participants in the real stakes condition.³

Overall, these results clearly show a positive relationship between risk aversion and current religiosity. We thus confirm previous findings in the literature, using a unique combination of a representative population sample and experimental decision tasks with both real and hypothetical stakes. We state our first result.

Result 1: There is a positive relationship between risk aversion and active church membership.

3.2. 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,

² More reporting errors for church 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.

³ In the next subsection we note that this effect might be caused by Protestants behaving in a more risk-averse manner in the real stakes than in the hypothetical conditions, and we discuss the possible implications of this finding.

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.

One might expect, based on the results from Section 3, that religious activity of Protestants would be associated with stronger risk aversion on the part of Protestants relative to Catholics, in particular in the real stakes conditions.⁴ Table 5 shows that this is the case. 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. Catholics and Protestants are almost equally risk averse on average for the full sample. The table suggests that Protestants are more risk averse under the Real payment condition. Catholics are more risk averse in the Hypothetical payment condition, and are also similar to members of other religious groups in all conditions.

<Table 5: About Here>

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 Controls A and B discussed earlier as independent regressors. The upper panel of Table 6 compares the adherents of religious groups to non-members. We find evidence that Protestants are more risk averse than non-members in the full sample and the real stakes sample. In the real stakes sample, the coefficient for Protestants significantly exceeds that for Catholics. In contrast, in the hypothetical stakes sample, the coefficient for Protestants is smaller than that for Catholics, but this difference is not statistically significant. The lower panel of Table 6 restricts the sample to Protestants and Catholics only. We find that Catholics are less risk averse in the full and the real stakes samples, but more risk averse in the hypothetical sample. Including the full set of controls, we find a significant change from Catholics being less risk averse under real incentives, to Catholics being more risk averse under hypothetical incentives.

These results suggest that compared to adherents of other religions, Protestants are especially risk averse in the real stakes condition. For hypothetical incentives, they hold similar risk attitudes as those who are not members of a church, and are on average even less risk averse than Catholics. Our findings have interesting implications. First, while the

⁴ Note, however, that the share of very active participants is small in both denominations.

literature has considered both risk aversion and gambling attitudes in their relation to religion, the result supports the view that compared to Catholics, Protestants are more averse to gambling, but not to risk per se: the real stakes condition might have been perceived as gambling because of either the real payoffs flowing from the decision, or the potential skewness introduced by the random payment mechanism.⁵ Second, these findings also shed light on the mixed results obtained in the previous literature. While Kumar et al. (2011) find that Protestants are more risk averse when considering gamble-like outcome measures, Renneboog and Spaenjers (2011) find that Catholics are more risk averse than Protestants in a self-reported hypothetical survey question. Our findings suggest that these differences are systematically related to Protestant theological doctrine regarding gambling. That Protestants behave in a relatively risk averse manner is our second result.

Result 2: Protestants are more risk averse than adherents of other faiths in our real stakes gambling task.

< Table 6: About Here >

3.3. Believing vs. Belonging

In Section 3.1 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 participation in religious institutions (see Iannaccone, 1998; Liu, 2010; McCleary and Barro, 2006). McCleary and Barro (2006) and Barro and

⁵ In principle, the fact that only some individuals were selected for payment, and that in that event only one of the decisions they made was chosen for payment, meant that the choices that individuals faced were actually compound lotteries. Both the random payment of decision tasks and the random selection of individuals for payment are accepted techniques in experimental economics that do not induce systematic effects on decisions. However, if individuals make their decisions in consideration of the compound lotteries the randomization procedures induce, the choices are between positively skewed lotteries in the real stakes treatments. This positive skew is a feature that is also present in many activities that are considered as gambling, such as racetrack betting and playing the lottery, that Protestant doctrines typically discourage or forbid. Thus it is possible that differences between the behavior of members of different religious groups, or between decisions in the Real and Hypothetical treatments, could be due to an aversion to skewed lotteries, with this aversion possibly resulting from their similarity to proscribed gambling tasks.

McCleary (2003) suggest that the positive economic effects of religion are driven by religious beliefs, rather than pure communal social and cultural effects of participation and membership. They find a positive correlation between religious beliefs and economic growth, but a negative correlation between church attendance and economic growth. They interpret church attendance as a costly input and religious beliefs as a valuable output of a production process. 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 2, and is referred to as “Religious Belief Indicator” in Table 7. Belonging, the social effects of religious affiliation, is captured with church attendance (Section 3.1). 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 expose the individual to the specific doctrines of the particular church (Filistrucchi and Prüfer, 2013; Kelley and De Graaf, 1997). 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 3.1 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 subsamples of people who received real cash payments or hypothetical payments, with either the full set of controls (Controls A and 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. Overall, the positive effects for church attendance and for prayer, and the absence of effects for pure belief indicators, all suggest that the link between risk aversion and religion is driven by the social aspects of belonging to, and being exposed to the doctrines and institutions of, a religious group rather than by the religious beliefs themselves. This constitutes our third result.

Result 3: Belief in God and important Christian theological concepts is not correlated with risk aversion. Church attendance and prayer outside services are positively correlated with risk aversion.

One potential explanation for this pattern is that risk-averse individuals are more likely to belong to social organizations in general. However, this is not the case, and membership and participation in a religious group does not merely seem to capture the risk sharing effect of belonging to any form of organization. We use survey questions on social integration, with the same population, to test for the relation between risk aversion and organizational membership for a large variety of organizations (see Appendix C). We replicate the finding that members of religious organizations are more risk averse, but we do not find a general tendency of organizational membership being positively related to risk aversion. Thus, the effect of higher risk aversion for church members is likely related to the doctrines and teachings of the church, and not merely the membership in a social organization. This result is reported as our result 4.

Result 4: While the social aspects of church membership seem to play an important role in the relationship between religiosity and risk aversion, the effect is not merely due to the fact that organizational membership is correlated with risk aversion more generally. Membership in non-religious organizations does not exhibit a consistent relationship with risk aversion.

< Table 7: About Here >

6. Conclusion

Our study is the first to consider the relationship between decisions in an incentivized financial risk task and religiosity with individual level data. 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 confirm the previously obtained result that religious people, as measured by church membership or attendance, are more risk averse. We document the new finding that 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 degree of 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, we obtain some evidence that there are differences in risk aversion between major Christian denominations. Our data suggest that Protestants are more risk averse than Catholics when risk attitudes are measured with a real cash payoff gamble. This result may not be that robust however, as we observe that for hypothetical decisions, Catholics are sometimes more risk averse under some specifications. These findings do reconcile some previous results, as they suggest that Protestants might not be more risk averse than Catholics, but rather are more averse to lotteries with positive skew, a feature of many types of gambles that Protestant churches discourage (see Kumar et al., 2011).

Third, our data suggest that the link between risk aversion and religion is driven by social aspects of church membership, rather than by beliefs in religious teachings (see Gebauer et al., 2012). We find clear effects of active religious practice, i.e. church attendance and prayer outside church, correlating with greater risk aversion. These activities are likely to expose the individual to the specific doctrine and institutions of his or her church, which is not the case for those individuals who are strong believers, but practice their faith mostly in private. We also show that religious activities and church membership behave differently in terms of their relationship to risk aversion than memberships in other social organizations that may potentially serve as risk-sharing institutions. That is, religious groups and organizations are likely to socialize their members according to certain doctrines that relate to risk aversion, or as discussed above, avoidance of gambling and skewed risks. More detailed surveys are required to establish the potential channels of transmission of these attitudes.

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Appendix A: Screenshot of Risk Attitude Elicitation

CentER data LISS

Deel 1, vraag 1 van 5

Optie L	Optie R
 123 € 65 456 € 5	 123 € 20 456 € 20

[Bekijk de instructie](#)

Kiest u "Optie L" of "Optie R"?

Ik kies Optie L

Ik kies Optie R


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Appendix B: Relation to Previous Studies

Table B1: Features of Prior Empirical Studies on Religiosity and Risk Attitude

Reference	Risk/skewness attitudes	Method	Country/Sample	Findings
Dohmen et al. (2011)	Risk (general, driving, finances, sports, career and health)	Hypothetical questions (0-10) + lottery	Germany (SOEP)	Catholics are more risk averse than Protestants only on general risk question – not on others
Hillary and Hui (2009)	Risk (variance of equity returns and variance of return on assets)	Cross county variation	US	Firms in more religious counties are less exposed to risk. Protestants are more risk averse than Catholics (Table 7)
Liu (2010)	General risk	Hypothetical question	Taiwan	No relationship with affiliation, negative with participation
Diaz (2000)	Skewness – frequency and amount gambled	Telephone survey	US, Las Vegas	No differences between Catholics and Protestants in gambling frequency and amount bet
Ellison and McFarland (2011)	Skewness – frequency of gambling for money (lotteries, betting, card games etc.)	Survey	US	Catholics and mainline Protestants gamble more than conservative Protestants. Belief and attendance are negatively correlated with gambling. Praying has no correlation with gambling (Table 1).
Barsky et al. (1997)	Risk aversion	Hypothetical questions	US (HRS)	Catholics are more risk seeking than Protestants (Table 3)
Benjamin et al. (2011)	Risk aversion	Small stake and large stake lottery	US (students)	Lower risk premium for Catholics. No difference between Catholics and Protestants.
Renneboog and Spanjers (2009)	Risk aversion /financial risk	Hypothetical question 1-7	Netherlands (Center panel)	Catholics are more risk averse than non-religious. No difference between Catholics and Protestants.
Kumar et al. (2011)	Skewness / financial risk	Stock returns/ ownership	US county/ state	Catholic counties' residents own more lottery type stocks
Shu et al. (2010)	Risk aversion / financial risk		US county/ state	Mutual funds in Catholic counties have higher volatility

Appendix C: Risk Aversion and Organizational Membership

In this appendix we test whether membership in non-religious organizations is positively correlated with risk aversion. We make use of a question available on the LISS panel, asking about membership in a wide range of organizations. We report results for the full sample, for the real and hypothetical stakes conditions separately, and for both sets of control variables used in the analysis in the main text. The results are in Table B1. The data replicate the finding that membership in religious organizations is positively correlated with risk aversion, especially in the real payment conditions. There is no across-the-board positive correlation between organizational membership and risk aversion. Membership in some organizations is unrelated to risk attitude, while in others it is negatively correlated.

Table C1: Risk Aversion and Organizational Membership

	All	All	Real	Real	Hypo	Hypo
Controls A	Yes	Yes	Yes	Yes	Yes	Yes
Controls B	No	Yes	No	Yes	No	Yes
Type of Organization						
Religious	.284 (1.66)*	.218 (1.27)	.527 (2.22)**	.467 (1.96)*	.097 (.40)	.026 (.11)
Sports	-.209 (1.52)	-.209 (1.51)	-.074 (.36)	-.066 (0.32)	-.279 (1.53)	-.282 (1.53)
Cultural	.512 (2.64)***	.485 (2.50)**	.258 (.92)	.233 (.84)	.719 (2.68)***	.677 (2.52)**
Union	-.119 (.64)	-.138 (.73)	-.112 (.41)	-.172 (.62)	-.060 (.24)	.036 (.14)
Professional	.023 (.10)	.083 (.36)	.086 (.24)	.211 (.59)	-.026 (.09)	-.007 (.02)
Consumer/ Automobile	-.284 (1.74)*	-.291 (1.76)*	-.547 (2.30)**	-.547 (2.13)**	-.085 (.40)	-.129 (.60)
Humanitarian	-.386 (1.34)	-.404 (1.41)	-1.211 (2.69)***	-1.187 (2.64)***	.094 (.25)	.107 (.28)
Environmental	.176 (.79)	.154 (.69)	.626 (2.10)**	.599 (2.02)**	-.177 (.56)	-.241 (.75)
Political	-.085 (.28)	-.078 (.26)	-.211 (.50)	-.199 (.46)	-.128 (.30)	-.147 (.35)
Scientific/ Educational	-.083 (.33)	-.163 (.65)	-.212 (.61)	-.240 (.68)	-.019 (.06)	-.135 (.38)
Social	.008 (.03)	.008 (.03)	-.239 (.70)	-.227 (.67)	.153 (.43)	.142 (.40)
Other	-.029 (.13)	-.049 (.21)	-.227 (.80)	-.220 (.76)	.139 (.38)	.069 (.19)
N	2304	2304	906	906	1398	1398

Notes: dependent variable: risk aversion; tobit regressions, coefficients reported, t-values based on robust s.e. in parentheses; membership of “Other organizations” is the baseline category, */**/** indicate significance at 10%, 5% and 1% level.

Table 1: Summary Statistics

Variable	# obs.	mean	Catholics	Protestants	Δ^f
<i>Religion</i>					
Church member	2304	42.4%			
Parents church member ^a	2304	66.3%	94.6%	94.1%	
Roman Catholic	2304	22.3%			
Protestant	2304	16.1%			
Attendance >1 per week	2297	3.7%	1.2%	14.2%	p<.01
Attendance =1 per week	2297	6.9%	6.5%	27.4%	p<.01
Attendance =1 per month	2297	7.0%	14.5%	16.9%	
Attendance >1 per week (age 15)	2297	10.8%	13.5%	23.7%	p<.01
Attendance =1 per week (age 15)	2297	32.4%	56.6%	46.6%	p<.01
Attendance =1 per month (age 15)	2297	6.9%	7.1%	8.1%	
Pray >1 per week	2294	25.5%	36.1%	68.7%	p<.01
Pray =1 per week	2294	3.8%	7.0%	5.4%	
Pray =1 per month	2294	5.2%	10.5%	4.3%	p<.01
Degree belief in God (min 1, max 6) ^b	2302	3.48	4.37	5.10	p<.01
Belief indicators (min 0, max 7) ^c	757	2.47	3.12	5.79	p<.01
<i>Controls A^d</i>					
Female	2304	51.9%	53.9%	56.2%	
Age	2304	49.60	54.20	54.30	
<i>Controls B</i>					
Married	2304	63.3%	71.4%	76.3%	
Divorced	2304	8.2%	7.6%	4.3%	p<.01
# children	2304	0.83	0.73	0.77	
Gross monthly income (€)	2304	2211	2377	1903	
Home owner	2304	75.0%	79.6%	78.2%	
Health status (1=worst, 5=best)	2304	3.17	3.12	3.18	
High education (college or more)	2304	30.8%	27.4%	29.0%	
Civil Servant	2304	10.1%	10.3%	11.0%	
Self-employed	2304	4.3%	3.5%	3.8%	
Dutch Passport ^e	2304	98.1%	97.5%	100.0%	p<.01
Foreign Passport ^e	2304	2.7%	3.1%	0.3%	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 2: Parental and Own Church Membership

Parents in church	Subject in church	All respondents		Real stakes		Hypothetical stakes	
		# obs.	Avg. risk aversion ^a	# obs.	Avg. risk aversion ^a	# obs.	Avg risk aversion ^a
Yes	Yes	917	3.54	371	3.47	546	3.58
Yes	No	611	3.36	250	3.04	361	3.58
No	Yes	61	3.56	23	3.57	38	3.55
No	No	715	3.35	262	3.18	453	3.45

Note: Parents in church refers to parents' membership status when respondent was aged 15; a: on scale from 0 (least risk averse) to 5 (most risk averse).

Table 3: Attendance at Church Services

Attendance	All respondents		Real stakes		Hypothetical stakes	
	# obs.	Avg. risk aversion ^a	# obs.	Avg. risk aversion ^a	# obs.	Avg. risk aversion ^a
<i>Current</i>						
More than once a week	86	3.83	38	3.76	48	3.88
Once a week	159	3.65	60	3.62	99	3.67
Once a month	160	3.39	71	3.42	89	3.37
Less often	1892	3.40	733	3.20	1159	3.52
<i>During Childhood: at age 15</i>						
More than once a week	247	3.43	110	3.31	137	3.53
Once a week	744	3.44	287	3.19	457	3.60
Once a month	159	3.43	61	3.20	98	3.57
Less often	1147	3.43	443	3.32	704	3.49

Note: a: on scale from 0 (least risk averse) to 5 (most risk averse).

Table 4: Risk aversion, Church Membership and Attendance

	All	All	Real	Real	Hypo	Hypo	All	All	Real	Real	Hypo	Hypo
Controls A	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls B	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Church membership												
Own	.335 (2.47)**	.290 (2.12)**	.595 (3.0)***	.514 (2.52)**	.131 (.72)	.100 (.55)						
Parents'							.271 (1.88)*	.248 (1.72)*	.207 (.93)	.180 (.81)	.306 (1.61)	.283 (1.50)
N	2304	2304	906	906	1398	1398	2304	2304	906	906	1398	1398
Attendance ^a												
>1 per week	.664 (2.07)**	.569 (1.77)*	.874 (1.80)*	.713 (1.42)	.483 (1.16)	.436 (1.06)						
≈1 per week	.539 (1.98)**	.491 (1.80)*	.640 (1.53)	.546 (1.31)	.486 (1.34)	.478 (1.31)						
≈1 per month	.087 (.33)	.056 (.22)	.459 (1.29)	.398 (1.11)	-.204 (.55)	-.216 (.58)						
>1 per week (age 15)							.160 (.70)	.100 (.44)	.016 (.05)	-.078 (.23)	.253 (.84)	.200 (.67)
≈1 per week (age 15)							.167 (1.07)	.150 (.95)	-.185 (.80)	-.210 (.90)	.403 (1.91)*	.371 (1.76)*
≈1 per month (age 15)							.032 (.12)	.061 (.22)	-.184 (.43)	-.131 (.31)	.135 (.38)	.140 (.39)
N	2297	2297	902	902	1395	1395	2297	2297	901	901	1396	1396

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

Table 5: Risk Aversion by Denomination

Denomination	All respondents		Real stakes		Hypothetical stakes	
	# obs.	Avg. risk aversion ^a	# obs.	Avg. risk aversion ^a	# obs.	Avg. risk aversion ^a
Roman Catholic	514	3.51	211	3.39	303	3.60
Protestant	372	3.56	143	3.62	229	3.53
Other faiths	92	3.55	40	3.42	52	3.65

Note: a: on scale from 0 (least risk averse) to 5 (most risk averse).

Table 6: Risk aversion and denomination

	All	All	Real	Real	Hypo	Hypo
Controls A	Yes	Yes	Yes	Yes	Yes	Yes
Controls B	No	Yes	No	Yes	No	Yes
All subjects						
Roman Catholic	.288 (1.76)*	.252 (1.53)	.392 (1.66)*	.320 (1.34)	.191 (.85)	.176 (.78)
Protestant	.404 (2.12)**	.343 (1.80)*	.951 (3.33)***	.861 (2.98)***	.017 (.07)	-.021 (.08)
Other Churches	.321 (.99)	.290 (.88)	.453 (.95)	.361 (.71)	.268 (.62)	.190 (.43)
N	2304	2304	906	906	1398	1398
$\beta(\text{Catholic})=\beta(\text{Protestant})$	F=.30	F=.18	F=3.24*	F=3.00*	F=.37	F=.47
Catholic and Protestant only						
Catholic	-.138 (.67)	-.125 (2.03)**	-.607 (2.04)**	-.593 (6.81)***	.168 (.60)	.186 (2.21)**
N	886	886	354	354	532	532

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

Table 7: Risk aversion and beliefs/prayer

	All	All	Real	Real	Hypo	Hypo
Controls A	Yes	Yes	Yes	Yes	Yes	Yes
Controls B	No	Yes	No	Yes	No	Yes
Religious belief indicator						
Stronger belief	.070 (1.62)	.046 (1.04)	.098 (1.45)	.069 (.98)	.038 (.69)	.024 (.42)
N	757	757	285	285	472	472
Degree of belief in God						
Stronger belief	.046 (1.26)	.041 (1.10)	.060 (1.11)	.047 (.83)	.033 (.67)	.029 (.59)
N	2302	2302	905	905	1397	1397
Praying (outside services)						
>1 per week	.532 (3.38)***	.512 (3.23)***	.482 (2.10)**	.435 (1.89)*	.539 (2.52)**	.518 (2.37)**
≈1 per week	-.560 (1.50)	-.599 (1.61)	.094 (.17)	.041 (.07)	-1.032 (2.10)**	-1.120 (2.26)**
≈1 per month	-.029 (.11)	-.053 (.19)	-.529 (1.34)	-.588 (1.48)	.351 (.93)	.319 (.85)
N	2294	2294	901	901	1393	1393

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