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ABSTRACT

The Effect of Religion on Cooperation and Altruistic Punishment: Experimental Evidence from Public Goods Experiments*

This paper experimentally examines how religious festivals and the degree of religiosity affect cooperation and altruistic punishment by using public goods experiments. We conducted the experiments in Turkey at different points in time; one on the most religious day during Ramadan (the Night of Power – Laylat al-Qadr) and the other at a time without any religious festivals other than the normal daily prayers. The overall results show no differences in cooperation or altruistic punishment among individuals during Ramadan, even when the degree of their religiosity varied. However, less religious people did change their cooperative behaviour in response to religious festivals. Most of the differences can, however, be explained by differences in beliefs about others contributions. By and large, this indicates the importance of conditional cooperation.

JEL Classification: C72, C91, H41

Keywords: cooperation, experiment, public goods, punishment, religion

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1. Introduction

Cooperation is an important feature in many situations of our daily life ranging from team work to environmental concerns. Although the selfish option of free-riding in these situations does exist, as characterized by a public goods problem, many people choose to cooperate even when living in large-scale, pluralistic societies among genetically unrelated people (e.g., Fehr and Fischbacher, 2003; 2004). One explanation for this is that our behaviour is guided by social norms, i.e., shared ideas about how we ought to behave in different situations, for example shared ideas related to littering or to being a member of a team of workmen (e.g., Elster, 1989). Public goods experiments are a frequently used tool when analysing degrees of cooperation *per se* as well as which factors and institutional arrangements enhance and sustain cooperation, (for an overview of public goods experiments, see e.g. Chaudhuri, 2011; Leyard, 1995; Zelmer, 2003). One of the key findings from previous public goods experiments is the identification of two main types of cooperative behaviour; free-riders and conditional cooperators, where the latter type's contribution depends positively on the contributions of others (e.g., Fischbacher and Gächter, 2010; Fischbacher *et al.*, 2001; Kocher *et al.*, 2008). However, in order for social norms to sustain cooperation, a threat of informal punishment when people ignore the social norms is often needed (e.g., Boyd *et al.*, 2003; Spitzer *et al.*, 2007). This type of punishment, which is costly for the punishers as well as for the punished, is referred to as altruistic punishment (e.g., Fehr and Gächter, 2002). This type of self-governance is an important instrument in reducing free-riding and enhancing cooperation in most cultures (e.g., Ostrom, 1992). The experimental evidence around altruistic punishment almost exclusively stems from public goods experiments that include the possibility of

monetarily punishing other group members.¹ The common finding in such experiments is that the possibility of punishment substantially increases cooperation, but also that the people who are punished are those who contribute smaller amounts, especially if they choose to free-ride (e.g., Fehr and Gächter, 2000; Herrmann et al., 2008 for cross-cultural studies; also see the overview in Chaudhuri, 2011 and references therein).²

For as long as they have existed, humans have created complex social structures operated through systems of social norms in order to manage social dilemmas. For many, religion is an important factor that influences social norms (Durkheim, 1976). Despite its important role both in shaping the societies in which we live as well as in affecting our behaviour, religion has only recently caught the attention of economists (see overviews in e.g., Hoffman, 2011; Iannaccone, 1998; Kumar, 2008).³ In addition to one of the main characteristics of a religion, that it contains a system of ideas and rules about how life should be lived, one other very

¹ Masclet *et al.* (2003) investigated the effect of non-monetary punishment. They found short-term effects on cooperation similar to those found when using monetary punishment, however the high levels of cooperation were not sustained over time.

² However, few experiments investigating altruistic punishment have been conducted across cultures. In an innovative and ambitious paper, Herrmann *et al.* (2008) present the results from a 10 period public goods experiment both with and without monetary punishment in 16 different locations worldwide. They found that cooperation and altruistic punishment differed greatly between countries. Interestingly, they found a positive correlation between the degree of altruistic punishment in free-riders and the degree of adherence to civic cooperation norms (measured as norms that do not condone littering, welfare fraud, tax evasion, and travelling without a ticket on public transport) as well as with the degree of abiding by the rules of law (measured as enforcement of laws as regulations and probabilities of crime) using data from the World Value Survey. Similarly, there is a negative correlation between misdirected punishment, (i.e. when subjects punish people who have contributed more than themselves) in countries with weaker rules of laws. In a one-shot public goods experiment in Russia, Gächter and Herrmann (2011) investigate the effect of place of residence (urban versus rural) and age, (i.e., they compare people who have lived the majority of their lives under a collectivistic ideology and those who have not) on cooperative behaviour and altruistic punishment. They found higher contributions among people living in rural areas and a higher degree of misdirected punishment compared with similar experiments comparing students in Western European universities. There are also other studies that have compared cooperation using public goods experiments, for example Kocher *et al.* (2008) across continents and Burlando and Hey (1997) between British and Italian subjects.

³ It has been noted in e.g. Hull and Bold (1994) that the role of religion in terms of establishing norms declines as the possibility of enforcing law and order increases in a country.

important characteristic of most religions is that they promote altruistic behavior, for example, in Christianity “You should love your neighbor as yourself” or in Islam the concept of *i'thar* of “preferring others to oneself”. In addition, among religious people, an all-knowing supernatural agent can also have the power to punish those who do not comply with norms (e.g., Johnson and Krueger, 2004; Norenzayan and Shariff, 2008). The objective of this paper is to investigate how religion affects cooperation and altruistic punishment, in particular between people of different degrees of religiosity and by large religious festivals.

There are several public goods experiments investigating the role of religious denomination and religiosity (see the excellent overview by Hoffman, 2011). Anderson and Mellor (2009) investigate whether the self-reported religious denomination and participation in religious services, used as a proxy for their degree of religiosity, of older US subjects (50+ years old) affect cooperation using a multi-period public goods experiment. They found that contributions are neither influenced by religious denomination nor by participation, but that the decline in contributions over time is less for subjects who described themselves as being religious.⁴ In a follow-up study among college students, Anderson *et al.* (2010) found similar insignificant effects. Benjamin *et al.* (2010) examined how religious identity norms, which were made salient in a sub-sample by using a sentence-unscrambling task, affect cooperation in a public goods experiment. They found a mixed effect on cooperation from the priming task. For instance, Protestantism is positively associated with contributions to public goods while Catholicism is negatively associated with

⁴ Another branch of the literature has investigated and shown a positive relationship between the degree of religiosity and volunteering (e.g. Hoge and Yang, 1994; Musick *et al.*, 2000; Wilson and Musick, 1997), while Park and Smith (2000) found that religiosity was positively correlated with volunteering within the church but negatively to non-church volunteering.

them, and has lower expectations about contributions to public goods by others. Similarly, Shariff and Norenzayan (2007) find that those who were assigned to a treatment with a scramble-sentence task aimed at priming religious concepts sent significantly more in a dictator game. However, in a similar experimental set-up, McKay *et al.* (2011) did not find a significant effect either on cooperation or on altruistic punishment after priming. In a related approach on culture, Gächter *et al.* (2010) use decomposition analyses for the determinants of contributions in public goods experiments conducted worldwide by Herrmann *et al.* (2008). They find that in the standard public goods experiment, contributions are mostly explained by group and individual behaviour while culture explains them only slightly. In contrast, they find that culture is an important factor when explaining differences in contributions to a public good when monetary punishment is possible, although this does not diminish the importance of group behaviour. Thus, cultural differences seem to be more important in explaining cooperation when punishment is available than in the standard case when it is unavailable.

This paper investigates the role of religion on cooperation and altruistic punishment, in particular between people with different degrees of religiosity and between times of differing religious importance. To do this, we conducted two one-shot public goods experiments, one standard public goods experiment and one public goods experiment with the possibility of punishing the other subjects in their own group monetarily by using an experimental design similar to the one used in e.g. Gächter *et al.* (2004) and Gächter and Herrmann (2011). Our experiment was conducted in Turkey, a secular country with a population that is 99% Muslim, with people having different degrees of religiosity. The timing of the experiments was planned so that they occurred both

during Ramadan, the main religious ritual among Muslims, and outside it. Degrees of religiosity as well as participation in religious festivals exhibit very large variations across different parts of Turkish society. According to the World Value Survey, 35% stated that they never attended any religious services. This fraction is likely to be higher in cities and among younger people. To capture the effect of religious festivals on cooperation and altruistic punishment, we chose to run our experiments during the month of Ramadan. More specifically, we selected the most important day of Ramadan, which is the Night of Power (*Leylat al-Qadr*). As a control, we chose a day outside the month of Ramadan when there are no other religious festivals. Thus, this design allows us to investigate our specific research hypotheses; (i) the degree of cooperation and altruistic punishment is unaffected by the degree of religiosity of an individual at given points in time, i.e. during the month of Ramadan and outside the month of Ramadan, and (ii) the degree of cooperation and altruistic punishment is unaffected by religious festivals on average, given the degree of religiosity among subjects.

Our results show that there are significant behavioural differences related to cooperation and altruistic punishment between Ramadan and non-Ramadan times. Contributions during Ramadan are much lower than during non-Ramadan. In a more detailed analysis, we find that this change is partially explained by altered behaviour in the less religious people, and that this can in turn be attributed to their altered beliefs about how much others will contribute to the public good. When controlling for beliefs about the contributions of others in the econometric analysis, the effects of the degree of religiosity and the presence of a religious festival vanish. Thus, although we observe differences in contribution between presence or absence of festival and

between degrees of religiosity, they seem to be explained by the fact that a significant proportion of subjects seem to be conditional co-operators, i.e., their own contribution is related to the expected contribution of others (e.g. Fischbacher and Gächter, 2010; Fischbacher *et al.*, 2001; Keser and van Winden, 1998). The rest of the paper is organized as follows. Section 2 describes our experimental design with details of the experimental setting and environment. Section 3 contains the results from our public goods experiments, and finally, section 4 concludes the paper.

2. Experiment

The experiment was conducted at Istanbul University, in Istanbul, Turkey. In each of the two experimental sessions, (i) during Ramadan and (ii) outside Ramadan, we recruited a sample of 90 first-year undergraduate students, with each subject only being permitted to participate in one of the sessions. The first experiment was conducted during the morning of the Night of Power of Ramadan. The second experiment was run two months later in the morning of a day that had no specific religious activity other than regular prayers, and moreover had no specific religious festivals on the days before or after it. As noted, both experiments were conducted early in the morning since hunger due to fasting during Ramadan could have had an additional confounding impact on the decision-making in the experiment that was run during Ramadan.⁵ The only difference between the two experimental sessions was the specific day it took place. Otherwise, we used exactly the same procedure and instructions as well as experimentalists in both experimental occasions.

⁵ Hunger can have important physiological and behavioural effects on human behaviour such as increased aggression and negative mood, forgetfulness, mental idleness, and confusion (e.g., Karaoglu and Yucecan, 2000).

2.1. Ramadan

Islam is the second largest religion in the world with approximately 1.5 billion believers worldwide. According to the holy book of Islam (*Quran*), Muslims are supposed to follow the five pillars of Islam.⁶ The fourth of these pillars lies in the heart of Ramadan: fasting (*sawm*). Ramadan is the ninth month of the Islamic calendar, starting with the new moon and lasting for 29 or 30 days.⁷ There are many sub-festivals during the month of Ramadan, but the most important festival is in the Night of Power (*Laylat al-Qadr*), which takes place on the 27th day in the month of Ramadan. It was during this night that the revelation of the *Quran* to the Prophet Mohammed began. According to the *Quran*, spending this night in prayer is “better than one thousand months [spent in prayer]”⁸ (*Quran*, 92: *Qadr*) and therefore religious activities peak on this day (both during the daytime and at night) as compared with any other time during Ramadan or indeed within the Muslim year as a whole.

Fasting is the most widely practiced form of prayer in Ramadan. It means strict avoidance of fluids, nourishment, smoking and sexual activities from dawn (*sahur*) to dusk (*iftar*). Fasting is mandatory for every Muslim who has reached puberty and is

⁶ ‘The five pillars of Islam’ is the term describing the five main duties incumbent on every Muslim. The five pillars are: (i) *Shahadah*, which is the tenet of Islam, meaning “I testify that there is no God except Allah, and testify that Mohammed is the messenger of Allah”, (ii) *Salah* is the practice of praying five times a day, (iii) *Zakah* is the practice of charitable giving and the amount to give is calculated according certain (complicated) rules given in the *Quran*, but basically determined by income and wealth, (iv) *Sawm* is the fasting which is obligatory during the month of Ramadan and (v) *Hajj* is the pilgrimage journey to the city of Mecca that every Muslim is obliged to do at least once in his or her life-time.

⁷ Since the Islamic calendar is based on the phases of the moon, religious festivals will occur at different times when expressed in dates based on the Gregorian calendar which follows the phases of the sun.

⁸ However, it should be noted that this does not imply that praying at other times of the year can be substituted.

capable of making rational judgments (*Quran*, 2:183-84).⁹ It is a highly demanding form of payer, but despite this, Muslim people continue with their normal daily activities. When the month of Ramadan ends, a big feast (*'id al-fitr*) is held, in which people give gifts to each other, visit the elder members of the extended family and if they have the economic means, are obliged to make charitable donations (*Zakat al-fitr*).

2.2. Experimental design and procedures

The experiment consisted of two parts; first a linear one-shot public goods experiment without punishment possibilities followed by a one-shot public goods experiment with punishment possibilities. In our experimental design, we used the same parameters as in e.g., Gächter *et al.* (2004) and Gächter and Herrmann (2011). The subjects were randomly allocated into groups consisting of three people. Each subject received an endowment of 20 Guilders. The marginal per capita return (MPCR) from investing in the public good is 0.5. If we assume that participants are rational and selfish, then it is obvious that any $MPCR < 1$ yields a dominant strategy for every group member to free-ride, i.e., to contribute nothing to the public good. However, from a social perspective, it is optimal to contribute the whole endowment because $MPCR \cdot n > 1$. Thus, this design replicates the key features of a public good. We can summarize subject i 's payoff in the public goods experiment without punishment possibilities as

$$\pi_i = 20 - c_i + 0.5 \sum_{j=1}^3 c_j, \quad (1)$$

⁹ Old people, children, and those who are sick are exempt from fasting. Travellers who undertake journeys lasting more than three days and pregnant women are also exempt from fasting during Ramadan, although they must fast as many days as the lost days at a later time during the same year.

where c is the amount invested in the public good.

In the second public goods experiment, the subjects took part in the same public goods experiment as described above, but in this experiment there was also a second stage with punishment possibilities. Each subject may then also punish the other group member(s) if they so wish after they have received information on the contributions to the public good by the other group members. We employ the same punishment technology as used in Gächter and Herrmann (2011), where the unit cost per punishment point is 1 Guilder, resulting in a deduction of 3 Guilders for the punished member of the group.¹⁰ A maximum of 10 punishment units can be assigned to any one member of the group. The pay-off function for subject i in the public good experiment with punishment is thus

$$\pi_i = \max(20 - c_i + 0.5 \sum_{j=1}^3 c_j - 3 \sum_{h \neq i} p_{hi}; 0) - \sum_{k \neq i} p_{ik}, \quad (2)$$

where p_{hi} is the deduction as a result of punishment from member h on member i , and p_{ik} is the cost of punishment by member i to member k . In our design, we choose a one-shot experimental design to have a clean measure of cooperation without potential confounding effects from strategic motives which would be the case if a multi-period experiment was conducted. Standard economic theory based on selfish and rational behaviour predicts neither any voluntary contributions to the public good nor any assignment of punishment points. However, the typical findings in this type of experiment is that subjects both contribute and punish even in a one-shot

¹⁰ Previous experiments have shown that when the cost of punishment increases then punishment declines, i.e., punishment follows the law of demand (e.g. Anderson and Putterman, 2006; Carpenter, 2007). For a discussion on the effect of punishment on cooperation in a static setting see e.g. Nikiforakis and Normann (2008).

experiment, where no strategic motives exist for doing so (e.g. Gächter and Herrmann, 2011; Gächter *et al.*, 2004).

In summary, the experiment with punishment possibilities has two stages, first the contribution to the public good experiment and second, the possibility to punish, where both decisions are taken simultaneously by all group members. At the beginning of the experimental session, the subjects were informed that the experiment consisted of two parts, but the exact information about the public goods experiment with punishment was only given when the first experiment was finished. It should be noted that the information from the public goods experiment without punishment was not revealed to the subjects before the punishment decision was made, furthermore, the intention to temporarily withhold this information was made known to the subject. From the instructions, it was made clear that the group composition would change between the two public goods experiments to rule out the influence of reputation (perfect stranger matching).

We also included questions on how much the subjects thought that others in their group had contributed. These questions were asked after the second experiment was conducted but before revealing the information about other group members' contributions. The subjects were monetarily rewarded for correct guesses following the design used in Gächter and Renner (2010) where they argue that incentivizing beliefs improves the accuracy of elicited beliefs. We used a similar incentive structure to the one used in their study in which the reward obtained in Guilders depends on how close a subject's guess about the average contribution comes to the actual figures. If a subject's guess is either exactly right or within 0.5 points from the actual

figure, he or she will earn 20 Guilders, whereas if the estimate is more than 0.5 points out, the subject will earn 10 Guilders divided by the (absolute) distance between his or her guess and the actual average contribution.

In total, 180 subjects participated in our experiments, half of them during Ramadan and the other half outside Ramadan. To guarantee privacy during the experiment, the subjects were randomly assigned to a seat in a huge lecture hall with a capacity of 250 people. First the subjects received a questionnaire containing some basic questions. Once the questionnaire had been completed and collected, the first experiment was handed out (the public goods experiment without punishment). The subjects were first given some time to read the instructions on their own, before one of the experimentalists read it aloud. Thereafter, all subjects were asked in writing to solve some questions related to the public goods experiment to ensure that they understood the experiment and its implications. In addition, the subjects were given the opportunity to ask questions in privacy. After the actual public goods experiment without punishment was conducted and the answer sheets had been collected, the instructions for the public goods experiment with punishment were given. The procedure in this experiment was the same as that described above for the public goods experiment without punishment up to the point where the punishment part began, with the exception, of course, that the instructions contained information about the punishment possibilities. Before the punishment stage was conducted but after the answer sheets from the public goods experiment with punishment had been collected, the subjects were asked about their beliefs about how much others on average had contributed in the two public goods. As described above, they were monetarily rewarded depending on the accuracy of their guesses. The punishment part of the

experiment was then conducted, which included information on the contribution by the other members of the group, followed by a post experimental questionnaire. Finally, the payments for the earnings from the experiments and guesses about contributions were done privately in cash using the identification number to link payment to subject. This was conducted in a neighbouring room before the subjects were free to leave. In the experiment, 1 Guilder was exchanged for 0.15 New Turkish Lira (TRY).¹¹ The experiment was calibrated in such a way that the average income should roughly correspond to slightly more than opportunity cost, which was related to paid work for students in Istanbul at that time. In total, the experiment lasted approximately 2 hours on average including the time taken to pay all of the subjects.

We chose to use the degree of fasting as a proxy for the degree of religiosity, considering it a better proxy than either self-reported degrees of religiosity or self-reported religious attendance in a mosque. First of all, fasting is a highly demanding form of praying since it requires strict avoidance of fluids and nourishment from dawn to dusk. Second, asking about days of fasting stands out less than asking questions directly related to an individual's degree of religiosity. Apart from the potential consequence producing strategic answers in response to a question about the degree of religiosity, avoiding such questions is particularly important in a country like Turkey where they are politically sensitive. The number of days of fasting is elicited via the question: "How many days do you normally fast during Ramadan". The more days a subject fasts, the stronger the degree of his or her religiosity. We classify subjects into three groups depending on their degree of religiosity: *low*, *medium* and *high*. A low degree of religiosity was attributed to those subjects who reported not fasting at all or

¹¹ The exchange rate at the time of the experiments were 1.48 TRY = 1 USD and 1.42 TRY=1 USD, respectively.

fasting fewer than 5 days during the month of Ramadan. A medium degree of religiosity was attributed to those subjects who usually fast between 6 and 29 days for males or 6 and 25 days for females (women are exempt from fasting during menstruation). Lastly, a high degree of religiosity was attributed to men who fasted for 30 days and to women who fasted for more than 25 days. In order to identify the effect of festival time on the contribution and altruistic punishment levels of the individuals, we compared the experimental results gained from within the month of Ramadan to those gained outside the month of Ramadan while controlling for the degree of religiosity in both cases.

3. Results

3.1. Cooperation

In Table 1, we show the contribution levels from the experiments separated for the two types of public goods experiment, presence of religious festival and degree of religiosity. The rows in Table 1 separate for different degrees of religiosity, while the columns separate for presence of a religious festival as well as type of public goods experiment. Under the heading non-punishment, we report the descriptive statistics from the standard public goods experiment separated for cooperation during Ramadan and non-Ramadan times. The average contributions to the public goods are 7.63 (38.2%) during Ramadan and 9.46 (47.3%) outside Ramadan, which corresponds to previously observed levels in this type of experiment (e.g. Gächter and Herrmann, 2009). The only public goods experiment from Turkey that we are aware of is Herrmann et al., (2008), in which a 10-period standard public goods experiment was

conducted that found an average contribution of 44.5% in the first period, which, again, is similar to our findings.

Our results show that the average contributions in our standard public goods experiment are higher outside the month of Ramadan. In a more detailed analysis, we begin to compare the effect of different degrees of religiosity (i.e., the religiosity effect) on contributions to the public good. The variation in contribution level between different degrees of religiosity is small within Ramadan; 7.28, 7.56 and 7.90 when ranked from low to high degrees of religiosity compared with outside Ramadan when there were wider variations in contribution level between degrees of religiosity; 10.19, 11.21 and 7.28, respectively. In table 2, we show the results for the significance tests of equal mean levels of contributions among subjects with different degrees of religiosity at one point in time. The test results reported in the first column of Table 2, i.e., the results for the non-punishment experiment, show that we can neither reject the null hypothesis of no differences in contribution levels between the three different degrees of religiosity during Ramadan using a Kruskal-Wallis test nor reject no differences in contribution levels in any pair-wise tests between different degrees of religiosity based on a Mann-Whitney test at conventional levels. However, in the public good experiment with no punishment possibility outside Ramadan time, these differences in contribution levels are significant. The mean contribution levels are significantly different between the three groups of religiosity (p -value=0.01). A more detailed analysis show that the difference is due to contribution differences between subjects with a medium degree of religiosity and the other two degrees of religiosity (low degree of religiosity: p -value=0.06, and high degree of religiosity: p -value<0.01).

In Table 1, we provide a more detailed analysis by also separating for the proportion of subjects that contribute zero and the average conditional contributions, i.e. the average contribution among those who contributed a positive amount. This table highlights that the difference found relates to changes in the average conditional contributions, i.e. the amount contributed is conditional on contributing a positive amount, rather than proportions of subjects contributing. The average conditional contribution levels are between 7.58 and 8.54 during Ramadan depending on the degree of religiosity. During non-Ramadan time, the average conditional contribution levels differ in the same way as the average contribution levels, where subjects of medium degree of religiosity conditionally contribute 11.50 compared to the lowest which was of 9.03 among those classified as high degree of religiosity. Thus, the main cause for the increased total average contributions during non-Ramadan time as compared with during Ramadan is due to increased conditional contributions among subjects with low and medium degrees of religiosity.

Next we compare subjects with the same degree of religiosity during Ramadan and outside Ramadan (the festival effect). The mean level of contributions in the non-punishment case is higher outside Ramadan among people with low and medium degrees of religiosity (7.28 vs. 10.19 and 7.56 vs. 11.21), while the contributions are slightly lower for people with a high degree of religiosity (7.90 vs. 7.28). In Table 3, column 1, we present the statistical test results of testing the null hypothesis of no difference in levels of contribution depending on presence of religious festivals when no punishment possibilities are available. In an overall test, we can reject the null hypothesis of no difference in contributions between non-Ramadan and Ramadan

time at a 1% significance level. In pair-wise tests, based on a Mann-Whitney test, we can reject the null hypothesis for subjects with both low and medium degrees of religiosity at a 5% significance level. The explanation for the festival effect is again explained by changes in the conditional contributions as shown in Table 1.

Table 1 about here

Table 2 about here

Table 3 about here

The contribution patterns between people with different degrees of religiosity during Ramadan in the public good experiment with the possibility of monetary punishment follow a similar pattern to that of the standard public goods experiment. Overall, however, we observe higher contributions when punishment possibilities are available, which is in line with previous experimental results. In the experiment during Ramadan, the average contribution was 9.14 (45.7%), while it was 10.58 (52.9%) during non-Ramadan time. These results can again be compared to the initial contributions in the 10-period public goods experiment with monetary punishment conducted in Istanbul by Herrmann et al. (2008), where initial contribution levels of 32.5% of endowment were found. Interestingly, they also found a reduction in contributions when punishment possibilities were introduced, while we observe the opposite. In the non-Ramadan time of the experiment with punishment possibility, we find, on average, a substantial increase in contributions among subjects with low and medium degrees of religiosity as compared with the non-Ramadan time experiment. These findings are similar to those of the standard public goods experiment (from 8.96 during Ramadan to 10.06 outside Ramadan for low degree and 8.16 to 11.92 for

medium degree), while the subjects with a high degree of religiosity were largely unaffected by the religious festival (9.88 to 9.36). In Table 2, we show the test of no religious effect on contributions when punishment is an available option. This shows that we can neither reject the null hypothesis of no difference in contributions between the three different degrees of religiosity either during or outside the month of Ramadan using a Kruskal-Wallis test nor can we reject it in any pair-wise test between different degrees of religiosity based on a Mann-Whitney test at conventional levels. In the second column of Table 3, we show the test results of the hypothesis of no effect from a religious festival. We can reject no difference both in an overall test, as well as for subjects with a medium degree of religiosity at a 5% significance level. In a more detailed analysis provided in Table 1, it is again shown that this increase seems to be explained by higher contributions among those who contributed a positive amount, but that it is also due to the fact that the proportion of free-riders is also reduced. However, the contribution levels of subjects with the highest degree of religiosity is similar both during and outside the month of Ramadan.

By and large, the descriptive statistics and test results above indicate that there seems to be a religious festival effect, but not a religiosity effect, in contributions to public goods. In a deeper analysis, we investigate whether expectations about contributions from other group members influences subjects' contribution levels significantly. One explanation that has been brought forward in the literature to explain the level of contributions is based on the idea that subjects are conditionally cooperative (e.g. Fischbacher and Gächter, 2010; Fischbacher et al., 2001). In Table 4, the elicited beliefs about the contributions of others to the public good are summarized in which we separate for degree of religiosity and religious festivals. The pattern of

expectations follows the same pattern as the actual contributions by the subjects as reported in Table 1, which indicates that on average subjects seem to be conditional cooperators. In a similar way to that in which we investigated contributions to public goods, we also analyze the expectations about the contributions of others to the public good. We test the null hypotheses of (i) no difference in the expectations about contributions from others depending on the degree of religiosity at a given point in time, i.e. during Ramadan and outside Ramadan time separately (i.e., no difference from the religiosity effect) and (ii) no difference in the expectations about contributions from others depending on presence or absence of religious festival given the degree of religiosity (i.e., no difference from the religious festival effect) by using the same non-parametric tests that were used in the above tests. The test results shown in Table 5 and 6 are similar to the results of the contributions reported in Table 2 and 3. In table 5, we show the results of the significance tests for equal mean levels of expected contributions from others among subjects with different degrees of religiosity at one point in time (i.e., the religiosity effect). The tests only reject the null hypothesis of equal mean levels during non-Ramadan time between the three different degrees of religiosity using a Kruskal-Wallis test, and the pair-wise test between subjects of medium and high degree of religiosity based on a Mann-Whitney test at conventional levels. Table 6 shows the test results of the null hypothesis of equal mean levels of expected contributions from others among subjects with the same degree of religiosity but between religious festivals. We can reject no difference both in an overall test, as well as for subjects with both low and medium degrees of religiosity at a 10% significance level.

Table 4 about here

Table 5 about here

Table 6 about here

In Table 7, we show the results from the Tobit regressions where we investigate which factors influence contributions to the public good. In the first set of regressions, we analyze the contributions in the standard public goods experimental setting with no possibility of monetary punishment followed by the same analysis when punishment is available. We find higher but insignificant contributions during Ramadan and also find that subjects with low and medium degrees of religiosity contribute significantly more than those with a high degree of religiosity. Thus, the findings correspond to the descriptive results presented above. When we include a control for expectations, i.e., in the second model, this variable is significant at 1% indicating that subjects on average are conditional cooperators. When we consider the interaction effects between Ramadan and the degree of religiosity and between Ramadan and expectations, only the expectations significantly explain contributions. We conduct similar analyses for contributions when punishment was possible, and the overall results are the same.

Table 7 about here

3.2. Altruistic Punishment

In Figure 1 and Figure 2, we present a descriptive analysis of the average punishment points assigned to other members of their own group during Ramadan and non-Ramadan time. We focus on the assignment of punishment points, and we separate the

descriptive statistics between degrees of religiosity and the presence or absence of religious festivals. The punished subject can deviate from the contribution levels of the punisher between the range of -20 to +20. In the case of -20, it means that the punisher contributed 20 (each subject's full endowment) to the public good while the other subject contributed 0. Thus, if punishment is not spiteful (or misdirected), we only expect punishment of subjects with a negative deviation, i.e., only those who contribute less than the subject who chooses to punish. The degree of spiteful punishment is calculated as the ratio between mean punishment points assigned to positive deviators (i.e. punishment of a subject who has contributed more than the one who punished) and mean punishment of negative deviations as in Gächter and Herrmann (2011). Thus, the lower the ratio is, the less spiteful punishment exists. In Figure 1, we show the assigned punishment points in a treatment during Ramadan, while Figure 2 shows the same during non-Ramadan time. In both figures, we separate for these three degrees of religiosity. By and large, the levels of punishment during non-Ramadan time follow what is normally found in this type of experiment with fairly severe punishments given for negative deviations. However, the punishment behavior during Ramadan is completely different with a lower amount of punishment being given overall in the case of negative deviation as compared with non-Ramadan time, while the levels of punishment for positive deviation is roughly the same in the non-Ramadan case as seen when comparing Figures 1 and 2. The degree of spiteful punishment is higher during Ramadan (0.71 as compared with 0.31 in non-Ramadan time) as shown in Table 8, which can be compared to the range of 0.35-0.78 as found in Gächter and Herrmann (2011).

Figure 1 about here

Figure 2 about here

Table 8 about here

In Table 9, we report the regression results from the analysis of the assigned punishment points using a Tobit regression since assignment of punishment points is censored between 0 and 10. We follow the approach by Gächter and Herrmann (2011) and include only the subject's own contribution, the sum of the contributions of the other group members and positive and absolute negative deviations from the subject's own contribution as explanatory variables in the first set. As expected, a negative deviation from one's own contributions as measured in absolute terms has a positive and significant effect on punishment points being assigned, while positive deviations have a negative effect. A higher level of contribution from the subject is negatively associated with the punishment and this effect is significant. Overall, the results are similar to those presented in Gächter and Herrmann (2011). In the second regression we add a set of explanatory variables to control for the presence or absence of the festival and the degree of religiosity. The effects reported above remain stable when also including festival and religiosity variables. Subjects punish more in the time of Ramadan. Both during and outside the month of Ramadan, it is the subjects with a low degree of religiosity who punish more.

Table 9 about here

4. Conclusions

This paper investigates the role of religion on levels of cooperation and altruistic punishment using two one-shot public goods experiments, one standard public good experiment and one public goods experiment with the possibility of monetary punishment. This paper brings new insights into cooperation and altruistic punishment related to the degree of religiosity and large religious festivals which temporarily affect the social environment and the social norms therein. We conducted our experiments both during and outside the month of Ramadan in Turkey to investigate the effect of the degree of religiosity and the presence of religious festivals on cooperation and altruistic punishment separately.

We find that the religious festival has a significant impact on cooperation and punishment levels, i.e. that there is a significant difference between Ramadan and non-Ramadan times,. The average amount contributed to the public good during Ramadan is much lower than that contributed outside the month of Ramadan. As expected, subjects with a high degree of religiosity are unaffected by religious festivals, while the subjects with low and medium degrees of religiosity changed their behaviour. In these two subgroups, subjects increased their contributions outside the month of Ramadan. The main explanation for our findings seems to be that on average a substantial proportion of subjects are conditional co-operators, i.e., their own contributions are correlated with expectations about the contributions of others. Thus, the higher contribution levels made by subjects with low and medium degrees of religiosity outside Ramadan are accompanied by higher expectations about the contributions of others outside Ramadan time as compared with during Ramadan. At a

general level, understanding the formation of expected behaviours in others seems to be one of the most important ingredients in furthering our understanding of contributions to public goods. This is particularly true if there are differences between sub-groups of people or specific social environments from within society.

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Table 1. Average contributions in the public goods experiments.

		Non-punishment						Punishment					
		Ramadan			Non-Ramadan			Ramadan			Non-Ramadan		
		Total contrib.	Proportion of zero contrib.	Contrib. if >0	Total contrib.	Proportion of zero contrib.	Contrib. if >0	Total contrib.	Proportion of zero contrib.	Contrib. if >0	Total contrib.	Proportion of zero contrib.	Contrib. if >0
Degree of religiosity	Low	7.28	0.04	7.58	10.19	0.07	10.9	8.96	0.12	10.2	10.06	0.13	11.5
	Medium	7.56	0.12	8.59	11.21	0.03	11.5	8.16	0.16	9.71	11.92	0.03	12.5
	High	7.90	0.08	8.54	7.28	0.20	9.03	9.88	0.05	10.4	9.39	0.14	10.9
	All subjects	7.63	0.08	8.27	9.46	0.10	10.5	9.14	0.10	10.2	10.58	0.09	11.6

Table 2. P-values from the test of the null hypothesis of no contribution differences between groups with different degrees of religiosity at the same point in time (no effect of own degree of religiosity).

	Non-punishment	Punishment
<i>H₀: No difference between low-, medium- and high-religiosity within experiments</i>		
Ramadan	0.66	0.28
Non-Ramadan	0.01	0.32
<i>H₀: No difference between low- and medium-religiosity within experiments</i>		
Ramadan	0.58	0.71
Non-Ramadan	0.63	0.57
<i>H₀: No difference between low- and high-religiosity within experiments</i>		
Ramadan	0.35	0.33
Non-Ramadan	0.06	0.54
<i>H₀: No difference between medium- and high-religiosity within experiments</i>		
Ramadan	0.77	0.11
Non-Ramadan	<0.01	0.13

Note. The statistical tests are based on the Kruskal-Wallis test between all three cases of religiosity and on Mann-Whitney-U tests in the pair-wise cases.

Table 3. P-values from the test of the null hypothesis of no contribution differences between Ramadan and non-Ramadan given the degrees of religiosity (no effect of religious festivals)

	Non-punishment	Punishment
<i>H₀: No difference between Ramadan and non-Ramadan (overall test)</i>	0.01	0.05
<i>H₀: No difference between low-religiosity in Ramadan and non-Ramadan</i>	0.04	0.42
<i>H₀: No difference between medium-religiosity in Ramadan and non-Ramadan</i>	0.01	0.01
<i>H₀: No difference between high-religiosity in Ramadan and non-Ramadan</i>	0.55	0.79

Note. The statistical tests are based on the Kruskal-Wallis test in the overall test, while Mann-Whitney-U tests were used in the pair-wise tests.

Table 4. Expectation of average voluntary contributions in the public goods experiments.

		Non-punishment		Punishment	
		Ramadan	Non-Ramadan	Ramadan	Non-Ramadan
Degree of belief	Low	8.52	10.63	9.92	12.25
	Medium	9.92	11.48	10.32	12.26
	High	9.83	9.31	11.38	11.31
	Average	9.49	10.46	10.68	11.88

Table 5. P-values from the test of the null hypothesis of no *expectation* differences between groups with different degrees of religiosity at the same point in time (no effect of own degree of religiosity on expectations)

	Non-punishment	Punishment
<i>H₀: No difference between the expectation of low-, medium- and high-religiosity within experiments</i>		
Ramadan	0.29	0.47
Non-Ramadan	0.03	0.33
<i>H₀: No difference between the expectations of low- and medium-religiosity within experiments</i>		
Ramadan	0.24	0.93
Non-Ramadan	0.21	0.86
<i>H₀: No difference between the expectations of low- and high-religiosity within experiments</i>		
Ramadan	0.13	0.33
Non-Ramadan	0.47	0.24
<i>H₀: No difference between expectations of medium- and high-religiosity within experiments</i>		
Ramadan	0.87	0.29
Non-Ramadan	0.01	0.19

Note. The statistical tests are based on the Kruskal-Wallis test between all three degrees of religiosity and on Mann-Whitney-U tests in the pair-wise cases.

Table 6. P-values from the test of the null hypothesis of no *expectation* differences between Ramadan and non-Ramadan given the degrees of religiosity (no effect of religious festivals on expectations)

	Non-punishment	Punishment
<i>H</i> ₀ : No difference between Ramadan and non-Ramadan (overall test)	0.03	<0.01
<i>H</i> ₀ : No difference between low-religiosity in Ramadan and non-Ramadan	0.05	0.05
<i>H</i> ₀ : No difference between medium-religiosity in Ramadan and non-Ramadan	0.06	0.01
<i>H</i> ₀ : No difference between high-religiosity in Ramadan and non-Ramadan	0.62	0.50

Note. The statistical tests are based on Mann-Whitney-U tests.

Table 7. Tobit regression results of cooperation.

Variable	Non-punishment		Punishment	
	(1)	(2)	(1)	(2)
Constant	6.762*** (0.953)	0.221 (1.335)	9.151*** (1.083)	1.061 (1.956)
Ramadan (religious festival)	0.998 (1.254)	0.654 (1.149)	0.658 (1.338)	0.581 (1.241)
Low degree of religiosity	3.428** (1.691)	2.530 (1.573)	0.748 (2.025)	0.151 (1.965)
Medium degree of religiosity	4.772*** (1.379)	3.264*** (1.200)	3.254** (1.483)	2.553* (1.365)
Ramadan*Low degree of religiosity	-3.862* (2.188)	-2.100* (2.045)	-1.732 (2.188)	-0.098 (2.371)
Ramadan*Medium degree of religiosity	-5.282*** (1.947)	-3.880** (1.719)	-5.182** (1.174)	-3.689* (2.138)
Expectations		0.701*** (0.131)		0.717*** (0.143)
Pseudo R-squared	0.018	0.055	0.010	0.035
Number of observations	180	180	180	180

Note: Robust standard errors are in parentheses

Table 8. Assignment of punishments and degree of spiteful punishment.

		Punishment points assigned		Conditional punishment		Degree of spiteful punishment	
		Ramadan	Non-Ramadan	Ramadan	Non-Ramadan	Ramadan	Non-Ramadan
Degree of religiosity	Low	1.86	1.03	3.94	2.56	0.53	1.08
	Medium	1.68	1.26	3.46	3.50	0.38	0.36
	High	1.31	0.77	2.77	2.81	1.38	0.04
	Average	1.57	1.03	3.33	3.08	0.71	0.31

Note. Degree of spiteful punishment is the ratio between the average punishment of non-negative deviators and the average punishment of negative deviators.

Table 9. Tobit regression results of punishment points assigned.

Variable	(1)	(2)
Constant	0.815 (0.909)	-1.298 (1.060)
Positive deviation from own contribution	-0.256** (0.102)	-0.224** (0.098)
Absolute negative deviation from own contribution	0.524*** (0.074)	0.550*** (0.076)
Own contribution	-0.369*** (0.087)	-0.355*** (0.086)
Sum of others' contributions	0.055 (0.045)	0.064 (0.044)
Ramadan (religious festival)		2.211*** (0.739)
Low degree of religiosity		1.640* (0.935)
Medium degree of religiosity		1.422* (0.074)
Ramadan*Low degree of religiosity		-1.284*** (1.238)
Ramadan*Medium degree of religiosity		-1.452 (1.116)
Pseudo R-Squared	0.060	0.072
Number of Observations	360	360

Note: Robust standard errors are in parentheses.

Figure 1. The structure of punishment by the degree of religiosity during Ramadan.

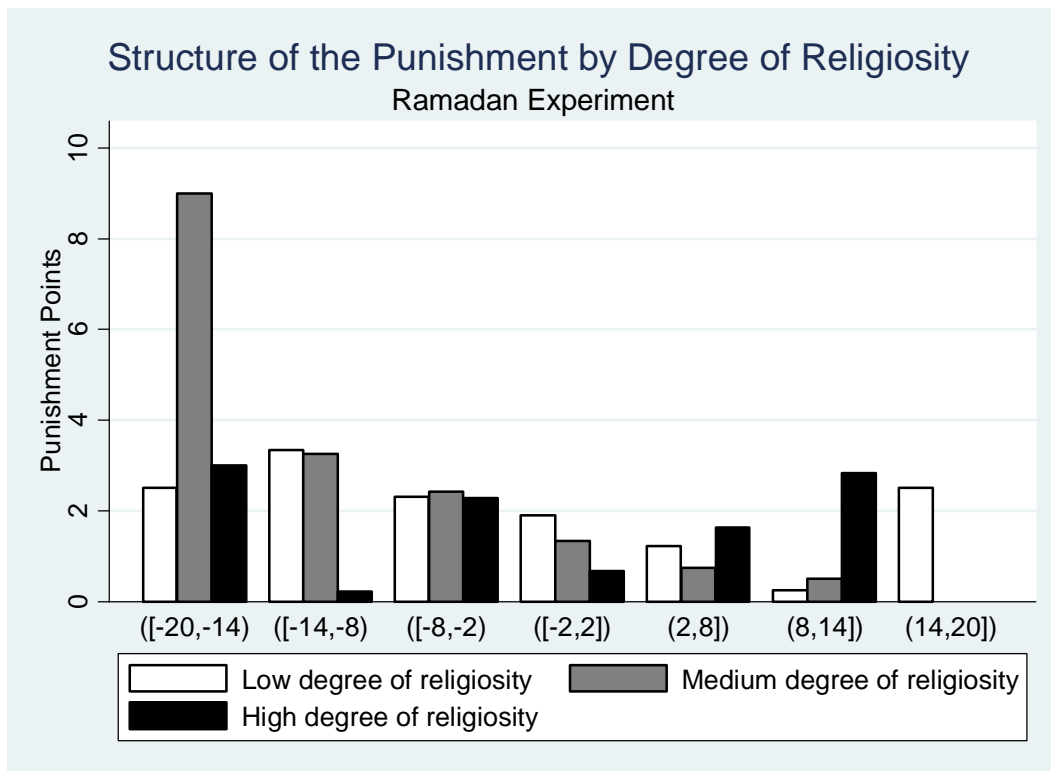


Figure 2. The structure of punishment by the degree of religiosity during non-Ramadan.

