God insures those who pay? Formal insurance and religious offerings in Ghana.*

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Abstract

This paper presents experimental evidence exploring how insurance might be a motive for religious donations by members of a Pentecostal church in Ghana. We randomize enrollment into a commercially available funeral insurance policy and let church members allocate money between themselves and a set of religious goods in a series of dictator games with significant stakes. Members enrolled in insurance give significantly less money to their own churches. At the same time, enrollment in insurance reduces giving towards other spiritual goods. We set up a model exploring different channels of religious based insurance. The implications of the model and the results of the dictator games suggest that adherents perceive the church as a source of insurance and that this insurance is derived from beliefs in an interventionist God. Survey results suggest that community-based material insurance is also important and we hypothesize that these two insurance channels exist in parallel.

Keywords: economics of religion, informal insurance, charitable giving

JEL codes: D14, G22, O12, O17, Z12

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1 Introduction

Religious institutions fulfil important economic functions across the world. Certain market failures can be overcome by communal religious practice, including screening out free riders through costly signalling or providing ex-post insurance to members of religious groups (Berman [2000], Chen [2010], Iannaccone [1992]). These efficiency-enhancing aspects of religion might be particularly important in settings with weak formal institutions where problems of incomplete information are particularly prevalent. In this paper we focus on such a setting. We examine the interplay between formal market-based insurance and non-formal church-based insurance in Accra, Ghana.

We conduct a lab-in-the field experiment in Accra to test whether insurance is one motive behind religious participation. We do this by randomly assigning free enrollment into a formal, commercially available funeral insurance policy and measuring how this affects willingness to contribute money in a dictator game to the church and two other charitable recipients. The additional recipients - a secular charity and a prayer event - provide a means of differentiating between a club good interpretation of church involvement, where participants care primarily about signalling their behaviour to other church members to benefit from community based insurance, and an interpretation of church participation that encompasses broader spiritual motives, including a form of spiritual insurance directly with God. If people believe that divine powers can influence real outcomes, they may try to act upon this belief by behaving in ways they believe will please God. Such beliefs are important in our religious setting, where people have faith in divine powers that actively intervene in their daily lives as opposed to affecting only a possible afterlife.

We find that enrollment in the formal insurance policy causes church members to give less money to the church in a dictator game. Interestingly, we find that formal insurance also causes church members to give less to the other recipients who are not directly linked to the church, but are associated with church teachings on "good behaviour". We also find

that church members simply primed with death risk (they receive information on the death insurance, but not the insurance itself) increase their giving to the church and other charitable recipients.

We set up a model to illustrate the conditions under which we can interpret these results as evidence for insurance. In the model, a church member derives utility from secular and religious consumption. We first show that if religious consumption does not have an insurance motivation, a reduction in perceived losses (through our enrolment treatment) should increase the amount allocated to religious consumption, via an income effect. However, if religious consumption does have an insurance motivation, and if the insurance is perceived as sufficiently effective, the substitution effect of a reduction in perceived losses will outweigh the income effect and lead to a reduction in the amount allocated to religious consumption.

The insurance motive can work either through a reduction in perceived losses from negative shocks because of transfers from other church members, or through a reduction in perceived probabilities of adverse shocks because of belief in divine response to religious giving. Our experiment finds strong evidence for the latter mechanism. Our findings link with some recent studies showing that beliefs in divine intervention in the daily lives of individuals are sometimes an important determinant of real and costly social decisions. For instance, Gershman [2016] and Nunn and de la Sierra [2017] document cases where beliefs in supernatural forces modify individuals' behavior in important ways. In our case, people believe that behaving in ways they believe will please God can significantly reduce their risk of adverse shocks. However, our survey results suggest that churches also provide financial assistance to their members in some cases. We hypothesize that a community-based material insurance exists in parallel.

Finally, we show that exogenous factors that increase religious giving, thereby reducing the marginal insurance utility from religious consumption, can reduce the probability that the substitution effect outweighs the income effect. Consistently with this, we show

that subjects who give substantially more than the average, or who participate in the game during intensive "revival week" events in which churchgoers donate much more than in an average week, demonstrate treatment effects that are of the opposite sign to the average for the sample.

Although our model is an instance of standard micro-economic analysis as applied to the problem of the allocation of resources between secular and religious consumption, our empirical study is methodologically innovative in two main ways. First, we have sought to distinguish carefully between different channels through which religious insurance might work - notably, through influencing the behavior of other members of the religious community as opposed to influencing the probabilities of adverse events themselves that are believed by subjects to be determined only by God. Secondly, we have provided an experimental intervention that directly affects the demand for religious insurance by providing an institutional substitute.

Our findings add to the literature on the economic functions of religious organisations by providing experimental evidence that a religious institution can be used as a substitute for a formal financial service in an environment where obstacles to the functioning of the formal market are high. Furthermore, the experimental findings add nuance to the literature on religious institutions as coordinating platforms by demonstrating that adherents might care as much about spiritual insurance (affecting outcomes through signalling to an interventionist God) as they do about material insurance (accessing transfers of goods and services from other church members).

In the following section, we give an overview of the literature on religion and insurance. In section 3, we present our experimental design. In section 4, we use a simple model to derive our experimental hypotheses to identify an insurance effect and to distinguish between community-based insurance and spiritual insurance. In section 5, we discuss our experimental results and conclude in section 6.

2 Religion and insurance

The macro-economic literature, in the wake of Weber [1905], has long recognized the potential importance of culture, and especially religion, for economic growth. However, most empirical studies in this literature suffer from endogeneity problems, and it is generally hard to rule out the possibility that confounding factors explain both the religiosity of a population and the growth of its economy. For instance McCleary and Barro [2006] find in their instrumental variable model that higher GDP per capita causes a reduction in average religiosity, while many studies find the opposite result in OLS regressions (i.e., that higher religiosity leads to lower GDP per capita). Even when it is possible to do so, such large-scale studies have difficulty pinpointing the mechanisms involved. Experimental methods may therefore be helpful both in establishing causality and in identifying the likely mechanisms involved. Our paper precisely aims at understanding a particular economic function of religious organizations: their role as informal insurers.

2.1 Risk and religion

There is a broad literature that makes the link between religious participation and risk-coping strategies. In examining religious organisations as insurers, our work closely follows that of Chen [2010], who finds that religious intensity increased with the need for ex-post insurance in Indonesia, and Ager and Ciccone [2016], who find a relationship between higher rainfall risk and religious participation. Religious participation has also been shown to provide partial insurance against fluctuations in consumption and well being (Dehejia et al. [2007]). Other evidence from cross-country surveys, and historical evidence from the Great Depression demonstrate a degree of substitution between access to social welfare and religious participation (Gruber and Hungerman [2007], Scheve and Stasavage [2006]). We add experimental evidence to this literature, causally demonstrating that access to secular insurance can reduce religious involvement.

2.2 Microinsurance

Urban Ghana is a particularly interesting setting in which to study interactions between religious participation and insurance. Relatively low rates of insurance mean that enrollment in a formal policy is likely to be a meaningful and significant treatment for many of our participants. At the same time, high levels of religious participation allow us to examine any effects of insurance in a setting where religious behaviour is both a salient and commonplace feature of daily life.

In our sample of 576 church members we find that only 30% of all those interviewed participate in the National Health Insurance Scheme, Ghana's public health insurance program. 17% indicate that they hold any other types of insurance. These low rates are consistent with other developing countries where people use a variety of costly strategies to cope with the range of health and financial risks that are not met by formal insurance. In recent years, microinsurance policies have been proposed and tested as poverty alleviation tools with varying degrees of success (Cole et al. [2013], Giesbert et al. [2011], Giesbert and Steiner [2015], Karlan et al. [2014]). Consistently across studies, take-up has been lower than expected and this has been attributed to a variety of factors including liquidity constraints (Cole et al. [2013]), limited attention (Zwane et al. [2011]), trust in the insurance mechanism (Karlan et al. [2014]), and the existence of informal insurance substitutes (Mobarak and Rosenzweig [2013]).

Religious institutions are an important instance of informal networks, especially in Sub-Saharan Africa, yet they have received little attention in the literature. Our experiment explicitly tests how access to a formal insurance scheme impacts the willingness of our subjects to contribute with their offering to church funding and other charities. It contributes to the microinsurance literature by studying in a controlled environment how religious participation might affect demand for formal insurance. Our results strongly suggest that formal

and spiritual insurance are substitutes for each other, though we would not wish to claim that insurance is the only or even the main motivation for religious adherence and participation.

2.3 Pentecostalism

The importance of religious institutions in Africa is well represented by the startling increase in the popularity and influence of Pentecostal churches across much of the continent. Pentecostalism and related Charismatic movements represent one of the fastest-growing segments of global Christianity. Approximately a quarter of the world's two billion Christians are members of these churches (Pew Research Center [2006]). A large share of them are found in Sub-Saharan Africa, where 28.3% of the population belongs to a Pentecostal or Charismatic movement according to the 2010 census (Pew Research Center [2011]).

Participants in our experiment were recruited from different branches of the Assemblies of God church, one of the oldest Pentecostal denominations in Ghana (and also across much of sub-Saharan Africa). The church has approximately six thousand congregations and two million adherents in Ghana.[1] The doctrines of the church are broadly similar to those expressed in other Pentecostal churches in Ghana, and indeed Assemblies of God was one of the founding churches of the Ghanaian Pentecostal and Charismatic Council (GPCC), an umbrella association of Christian church denominations that are united by a set of Pentecostal doctrines.

Pentecostalism and Charismatic movements emphasize the work of the Holy Spirit and claim that spiritual gifts, such as prophecy, divine healing and speaking in tongues are expected to be present in the lives of believers (Pew Research Center [2006]). Although in theory Pentecostal and Charismatic movements differ on some aspects, these aspects are marginal for our study, and we will use the term Pentecostal broadly. This makes sense

[1] World Christian Database. http://www.worldchristiandatabase.org/wcd/about/religions.asp

especially in Ghana, where the popular speech hardly draws a distinct line between Pentecostalism and Charismatism (Okyerefo [2011]).

For adherents of Pentecostal movements, the church is an essential part of their life. They go to church regularly, more than other Christians (Pew Research Center [2006]). They also perform their religious practices more frequently. For example, compared to the general population, Pentecostals pray and read the Bible more often, and more frequently watch or listen to religious programs on television and radio. They are also more likely to share their beliefs with others to spread their faith (Pew Research Center [2006]).

Members also enjoy non-spiritual benefits from their church. An essential function of Pentecostal churches in Ghana, in particular in urban areas, is to offer a place for social gathering. For instance, 41% of study participants declare that they have found their spouse (or are most likely to find their future spouse if not already married) in church. Some church members even report that they favour church members as business partners (48% of church members in our study). More fundamentally, people seem to be attracted to such churches because they feel part of a broader community which looks after them, be it through other church members, church leaders, or God. For example when faced with any personal or family problems, 69% of our participants would call their pastor and 25% would ask another church member for help.

Table 1 presents some descriptive statistics of the six church branches where we recruited participants for our study. We approached these churches using a snowball sampling strategy. The church branches are heterogeneous in terms of age, size, members' characteristics, and geographical locations in the city. They represent the great diversity of Pentecostal churches that can be found in Accra. The teachings and organizational structures of these churches are mirrored across much of sub-Saharan Africa where Assemblies of God claims sixteen million adherents and together, Pentecostal churches account for almost 40% of all African Christians. In the next section, we discuss the particular set of Pentecostal teach-

ings that are captured by the model of insurance we propose.

While many of these teachings are fairly standard across African Pentecostal churches, we do not believe that the lab-in-the field set up of our experiment attracted a fully representative sample of church-goers. Indeed Table 3 shows that our subject pool differs from the Ghanaian national averages in ways we might expect given that experiments were conducted during the working week. We attracted participants who were less likely to be employed, earned less on average, and were younger than the Ghanaian average. These characteristics could interact with perceptions of insurance. In our results however, we present our treatment effects with controls showing that the insurance effects are robust to variations along these dimensions within our recruited sample.

2.4 Pentecostalism and insurance

Perceived links between insurance and the church could be particularly strong in Pentecostal churches in urban Africa. Some reasons for this are general to religious communities across the world. For example, the costs of religious participation can be seen as screening mechanisms to ensure that members are reliable and to prevent free-riding (Iannaccone [1992]). Additionally, the community structure of the group with repeated interactions reduces monitoring costs (Berman [2000]). Furthermore, the heterogeneity of church members means that shocks are likely to be relatively independent and risk preferences are likely to be heterogeneous, implying that churches might be well placed to provide insurance within their networks (compared, say, to workplaces). Particularly important in the African context is the fact that previous work has shown the effectiveness of insurance interventions to depend crucially on trust in the insurance provider (Cole et al. [2013], Karlan et al. [2014]). Survey evidence from the Afrobarometer and the World Values Survey shows that across Africa, religious leaders are considered amongst the most trustworthy members of civil society. They are expected to take responsibility for their members' welfare in the absence of government-led social interventions and these expectations are enhanced by urbanization

(McCauley [2013]).

This setting where ideas about religion and insurance are closely linked is ideal for a controlled experiment for one additional reason. The teachings of Pentecostal churches make participation costs explicit. Church members are expected to make large and frequent financial contributions to the church and other spiritual goals as part of their religious participation (Gifford [2004]). Thus we can examine financial contributions to the church and religious goods as an outcome variable that is directly linked to church membership and involvement.

These financial contributions are layered and the different ways of transferring money might have different motivations. *Tithing*, the practice of giving away a tenth of all income, usually takes the form of a non-anonymous monthly payment to the church for which church members receive a receipt. This type of giving is akin to a membership fee to the church community. On the other hand, *pledges to the church* are occasional non-anonymous donations involving large amounts of money, often for a specific purpose such as purchasing a bus or founding a new church branch. Finally, there are *spontaneous offerings*, made on a more regular basis, which are generally anonymous and the amounts given unobserved. This includes among others *seed offerings* - the practice of giving money in anticipation of a future material benefit, or *thanksgivings* in gratitude for already materialized benefits (Maxwell [1998], Gifford [2004]). The type of giving we observe in our experiment falls into this category of spontaneous giving.

Giving to the church might interact with the use of the church as an insurer in a number of ways. Firstly, individuals might give to the church in expectation that the church as an institution would reward this sign of commitment by disbursing funds in times of need. Secondly, individuals might use their public giving to send signals that they are good community members to other church members, and expect that other church members then contribute to help them in times of need. These two types of community-based insurance

could be considered "material" insurance. Finally, in addition to its role as a social network, the church is also a setting for encounters with the divine. This role is important in settings such as Ghana, where there are strong beliefs in a divine power who influences daily lives (World Values Survey, Gifford [2004]). In this case, the church might have value as an insurer because it facilitates access to a divine power who is believed to intervene to prevent negative shocks, and giving to religious goals is seen as fulfilling a Christian duty that will be rewarded by this God. We call this type of insurance "spiritual" insurance. We try to incorporate a test for this into the design of the experiment by allowing participants to give both directly to the church, but also to other causes that are separate from the church, but could still be seen as fulfilling the spiritual duty of giving.

3 Experiment

We ran an experiment in Accra, Ghana that randomly enrolled church members in a funeral insurance policy offered by a leading micro-insurer active in the Ghanaian market. The outcomes we measured were allocations out of an endowment towards a participant's church and two other non-church recipients.

3.1 Enrolment treatment: Funeral insurance policy

Funerals are large and costly events in many sub-Saharan African societies (Berg [2016], Case et al. [2013]). Surviving family members are often expected to honor the dead through lavish commemorations. The rising toll of funeral costs has received attention from academics and political leaders, and more recently private financial service providers have begun to offer savings and insurance products designed specifically to meet these costs.

In Ghana, guests and other members of the bereaved's community typically make contributions that help to cover the funeral costs. It is important to note that community support

is not only financial - churches also organise provision of food and moral and logistical support, so any formal insurance product will only be addressing a single aspect of the church contributions. The degree of formalisation of this type of support varies across the churches in our sample. In interviews with church leaders, most confirmed that observed commitment from members was a prerequisite for church involvement in their funerals. Definitions of commitment always included attendance of church events and financial commitment to the church in terms of tithes and offerings.

The funeral policy we offered to participants covered the life of the participant and a member of his or her immediate family. If either of these parties were to pass away within a year, the policy would pay GHS 1000 ($265) to the surviving family members. This policy cost GHS 12.5 ($3USD) per family per year. Individuals in this treatment were enrolled on the spot after completing a demographic survey. In our main sample, among the individuals randomized in the insurance group, only three participants (approx. 2%) did not receive insurance.[2]

In order to verify the extent to which the treatment was meaningful for insured participants, we conducted a follow-up survey in March 2017.[3] Of the 576 participants in our experiment, we were able to obtain phone numbers for 407 (71%), and of these we were able to obtain responses with usable data from 182, representing 32% of our total experimental sample. Of these 63 had been enrolled in the insurance treatment, and 53 of these (84%) correctly recalled this fact (of the remainder, 5 recalled incorrectly that they were not enrolled, while 5 could not remember). Given that around two years had elapsed since the experiment, and that the enrolment was for a period of one year, we consider that a correct recollection rate of 84% is broadly encouraging. None of the insured individuals had experienced a bereavement that would have entitled them to an insurance payment, so we were not able to verify how effectively the mechanism had functioned.

[2]These individuals could not be enrolled in the insurance policy because they were already enrolled in a similar funeral insurance scheme or because they refused to sign up.

[3]Full details of this follow-up survey are available from the authors on request.

3.2 Priming treatment: Providing insurance information

It became clear during pre-tests that discussions of death and planning around death would be very sensitive topics. Reluctance to contemplate large unpleasant risks has been raised in the literature, particularly in other developing country settings where people are severely limited in the steps they can take to address these risks (Case et al. [2013]). Furthermore, findings in psychological research show that awareness of mortality can modify Christians religiosity and beliefs in a supernatural entity (see for instance Jong et al. [2012], Norenzayan and Hansen [2006]). Willing participants in the insurance treatment were directly enrolled in the policy at the start of the experiment, so the treatment necessitated a lengthly discussion about planning for death.

As the experiment was designed to isolate the effect of being *enrolled* in insurance, we offered the same information about the insurance policy to the control group, so that the same issues of death would be salient in both settings. To isolate the potential effect of risk priming, we had a second treatment where people were not informed about the content of the insurance policy. Comparisons between this group who did not discuss death and the control group who received insurance information allow us to verify that there was indeed a priming effect.

Our follow-up survey revealed a higher treatment recall error in this priming treatment group than in the insurance treatment group. Of the individuals contacted who were able to provide usable data, 57 had received the priming treatment and of these only 18 (32%) correctly recalled that they had not been provided with insurance, only with the information about insurance. Nevertheless, at around two years after the event it is unsurprising that a greater proportion of those who were not insured should be in error than of those who were insured.

This and other experimental details are documented in the pre-experiment registration submitted to the AEA registry.[4]

3.3 Recruitment

We recruited 576 study participants from different church branches within one particular denomination. Participants for the main study were recruited from six church branches through announcements made on Sunday mornings during regular church services, and to avoid confounds with normal Sunday offering, all sessions took place during the subsequent work week. A subset of participants were inadvertently recruited during "revival weeks" when their churches were engaged in active fundraising services during the work week. We found interesting results for this subset, which are discussed after presenting the main experimental results.

It was very important to the credibility of our study that the study take place off church premises and that participants be assured of anonymity so as to avoid any contamination of the results by perceived pressure from the church authorities. This involved a substantial effort to transport the recruited individuals to a study location at some distance from the church, as well as the setting up of a proper lab-in the-field with physical division between subjects so as to make the assurance of anonymity credible.

We were also interested in seeing how our hypothesised mechanisms operate within a secular organisation, so we recruited an additional 242 market sellers. Traders in this market are organized into an association that could provide financial assistance such as credit or insurance to dues-paying members. During the first round of data collection, we realized that the insurance treatment did not operate in this sample as it did within the group of church members. Indeed, the funeral insurance was coordinated by the head of the market association and informal discussions with study participants cautioned us that trust in the insurance coordinator might be low. Furthermore, questionnaire answers informed us that

[4] AEA RCT Registry ID: AEARCTR-0000558

the market association is not a commonly-used risk sharing structure, and is by no means similar to the church community in that respect. We therefore stopped collecting data on market members after the first round of the study and the sample for this group is too small to be able to detect treatment effects. Results from this smaller additional sample are available from the authors on request.

3.4 Experimental Setup and Design

Interested participants were assigned to sessions of 8 - 12 people. With the exception of recruitment, all interactions with participants took place off the church premises in a neutral location set up with laptops and room dividers where participants could answer survey questions and privately complete their decisions in the dictator games. All participants were compensated for transport to the neutral locations.

A session consisted of an extended survey and a set of dictator game decisions. These decisions are described further below. Each participant was interviewed by an enumerator who spoke the participant's local language.

Participants played 10 modified dictator games. Each game asked participants to allocate GHS 11 (a little less than average daily income) between two recipients. The set of recipients consisted of the participant's church, a secular charity, a national prayer organisation, and the possibility of keeping the money. There were also two ways in which individuals would give to the church: the first being an anonymous donation, the second being a named donation. The pairs of recipients are listed in Table 2.

The Street Children's Fund is a charity that takes care of the education needs of homeless and vulnerable children. The charity operates in a district of the city that is geographically and culturally distinct from the ones where we recruited participants. Giving to this charity could largely be understood as an altruistic action. The thanksgiving offering is part of

an annual inter-faith prayer event. Leaders and members of various faiths join together in prayer for Ghana. Giving towards this event was meant to be interpreted as giving towards a largely spiritual interest. Pre-tests and focus groups during piloting confirmed that study participants would see these two recipients in this manner.

Participants were paid a flat show-up fee of GHS 20. After all decisions had been made in the dictator games, one game was selected at random, and further payments were made according to the decision taken for that game. This meant that participants had the opportunity to earn up to GHS 31. Average overall earnings from the experiment were GHS 22.50.

4 Model

We develop a simple model to formalize the types of behaviour we expect our experiment to capture, and use results from the model to motivate the experimental hypotheses.

First we establish how church members who derive utility from secular as well as spiritual consumption would behave after provision of insurance if there is no insurance offered by the church. We then consider two insurance channels. Community-based insurance is modelled as a payment given to a church member in the case of a loss where the size of the payment depends on how much the church member gives to his own church. Spiritual insurance is modelled as a belief that the subjective probability of a loss is reduced by giving to the church and other goods used for religious signalling, such as the spiritual and secular charities. Under the insurance treatment, the provision of insurance reduces the size of a potential loss. We capture the priming effect of insurance information as leading to a perceived increase in the size of a potential loss. The extensions to the baseline model of no insurance show how in the presence of an insurance motive in the church, the main insurance treatment can lead to a decrease in giving, and the provision of only insurance information can lead to an increase in giving.

4.1 Setup

We assume that a church member has an income of Y and chooses to give an amount g to the church. The church member enjoys utility $u(Y-g)$ from consuming $Y-g \geq 0$ secular goods, and utility $\theta f(g)$ from contributing $g \geq 0$ to church goods. The parameter θ reflects the relative weight the individual puts on church activities compared to secular consumption. This weight might differ from one individual to the next (i.e., individual heterogeneity). More importantly for our empirical analysis it might also differ in time (i.e., in revival weeks individuals go to church everyday and are focused on spiritual activities). Thus a church member who gives g to the church enjoys a total utility of $u(Y-g)+\theta f(g)$. Both utility functions are increasing and concave in their arguments. In each period, church members face a probability π of an income loss of size D.

Under the assumption that insurance is offered through the church, giving also has the impact of reducing the size of the loss, thus the total loss would be $D-l(g)$. Under the assumption that church members believe in spiritual insurance, the probability of a loss is decomposed into a basic probability of loss $\tilde{\pi}$, and a reduction in the probability of loss that can be mitigated by giving money to spiritual goods. Therefore, the total subjective probability of loss is $\pi = \tilde{\pi} - p(g)$.

The following subsections set-up the maximization problems and show how optimal giving varies with the perceived size of loss. All proofs are in the appendix.

4.2 Optimal giving to the church in the absence of any insurance

In this section we assume that church members choose a particular level of giving g to maximize their total expected utility. There is no insurance offered through the church.

$$\max_{g} \quad (1-\pi)u(Y-g) + \pi u(Y-g-D) + \theta f(g) \tag{1}$$

Solving for the first order conditions and taking optimal giving g^* as a function of D allows us to show that giving is decreasing with the size of the loss D:

$$\frac{\partial g^*}{\partial D} < 0 \tag{2}$$

This classical result of consumption smoothing comes from the standard concavity assumptions of the utilities derived from secular and religious consumption. When faced with an increase in the potential loss D, church members shift spending from religious consumption to secular consumption to ensure a higher level of secular consumption in case of loss. We call this result the "income effect".

Therefore, this subsection predicts that if there is no insurance mechanism in the church (neither community-based, nor spiritual), the information treatment, by increasing the perceived loss D, would lead individuals to decrease church giving g^*. Compared to the information treatment, the enrolment treatment decreases D, and thus would increase giving to the church.

4.3 Community insurance: optimal giving when giving reduces the size of a loss

In this section we assume that the church community provides material insurance such that church giving reduces the size of the loss, $L = D - l(g)$. In this case, church giving can be seen as payment of the premium of an informal insurance that covers part of the possible loss. As it is offered by the church community, only giving to the church - and not giving to other religious goods - provides access to this type of insurance. The utility maximization problem is as follows:

$$\max_{g} \quad (1-\pi)u(Y-g) + \pi u(Y-g-D+l(g)) + \theta f(g) \tag{3}$$

We solve for the first order conditions and express optimal giving g^* as a function of the loss D. We find that:

$$\frac{\partial g^*}{\partial D} > 0 \Leftrightarrow l'(g^*) > 1 \tag{4}$$

When there is an insurance motive behind church donations, an increase in the potential loss D triggers two opposite effects: the substitution effect, whereby church members try to mitigate the increase in loss by buying more informal insurance; and the income effect' described in the section 4.2 where church members reduce giving to the church to have more money available for secular consumption smoothing.

Condition (4) shows that as long as community-based insurance is effective enough in decreasing the loss, which is the case for low enough g^*, the consumption-smoothing effect from the baseline model (income effect) is outweighed by the increased demand for church insurance (substitution effect). Therefore, the overall effect of an increase in D is an increase in the optimal giving.

This subsection therefore predicts that if there exists an effective community insurance that reduces the size of a loss in case of a shock, the information about insurance should increase church giving (compared to no treatment) while the enrolment treatment would decrease church giving (compared to the information treatment). There should be no impact of either treatments on giving to other recipients.

4.4 Spiritual insurance: optimal giving when giving reduces the subjective probability of a loss

In this section we assume that there is a spiritual insurance motive such that giving reduces the subjective probability of the loss $\pi = \tilde{\pi} - p(g)$. It is important to stress that giving

can be to the church or to any other charitable/spiritual organizations that can be used for religious signalling. The mechanism here works through God: being a good Christian reduces the subjective probability of a negative shock. Utility can now be written as:

$$\max_{g} \quad (1 - \tilde{\pi} + p(g))u(Y - g) + (\tilde{\pi} - p(g))u(Y - g - D) + \theta f(g) \tag{5}$$

We can show that:

$$\frac{\partial g^*}{\partial D} > 0 \Leftrightarrow p'(g^*)u'(Y - g* - D) > (\tilde{\pi} - p(g^*))u''(Y - g^* - D) \tag{6}$$

This condition is harder to interpret intuitively in the non-parametrized form, so we defer the discussion to the appendix where we investigate it using a CARA utility function. In short, we find that the optimal giving g^* is increasing in the size of loss D when the spiritual insurance is effective enough. Indeed, when this is the case, individuals prefer to invest in decreasing the subjective probability of loss by increasing their religious giving (substitution effect) rather than smoothing consumption (income effect).

Therefore, this subsection predicts that providing participants with insurance information would increase giving to any charitable or spiritual organization (compared to no treatment) while enrolling them in the insurance treatment would decrease giving to any charitable or spiritual organization (compared to the information treatment).

4.5 Experimental hypotheses

This subsection derives experimental hypotheses from the model's predictions and explains how the experiment can help us distinguish between these different hypotheses.

H0 There is no insurance provided through the church (section 4.2).

H0a Compared to no treatment, insurance information decreases giving to the church

(or has no effect).

H0b Compared to information treatment, insurance enrollment increases giving to the church (or has no effect).

H1 *Community* insurance is provided through the church (section 4.3).

H1a Compared to no treatment, insurance information increases giving to the church.

H1b Compared to information treatment, insurance enrollment decreases giving to the church.

H1c There should be no effect on giving to outcomes that do not affect the size of the loss. Thus, there should be no effect on giving to the thanksgiving offering or the street children's fund.

H2 *Spiritual* insurance is provided through the church (section 4.4).

H2a Compared to no treatment, insurance information increases giving to the church.

H2b Compared to information treatment, insurance enrollment decreases giving to the church.

H2c Giving to other recipients that might affect the subjective probability of loss should be affected. Thus, there should be similar effects to giving to the thanksgiving offering or the street children's fund as the effects on giving to the church.

Thanks to our experimental design, we can test for an insurance mechanism in giving (test for H0a against H1a/H2a and H0b against H1b/H2b) and then test the two insurance channels of spiritual and community-based insurance against each other (H1c against H2c).

5 Experimental Results

5.1 Descriptive statistics

Our main results include 454 church members recruited during regular service weeks from six different church branches. Table 3 summarises the basic demographics of these partic-

ipants. The final column in this table also includes nationally representative demographic information. Consistent with the recruitment process taking place in churches that are not gender-balanced, we find that our study population had more women than men. Only a fifth of our participants had completed at least a high school education, and 45% held any sort of insurance prior to participating in the study (including the National Health Insurance). On average, our participants earned approximately GHS 350 per month or roughly GHS 12 per day, equivalent to $92 dollars per month, or a little more than $3 per day. The groups were balanced across treatments for all key variables, as shown in Table 4. An F-test rejects the hypothesis that these main demographic variables jointly explain assignment to any of the treatments. Compared to the national population, our participants had lower incomes, were less likely to be employed, and attended church more frequently.

The demographic variables discussed above come from the survey conducted prior to the dictator game decisions. The survey also covered questions on the relationship between participants and the church. We find that the church is important to members as a financial institution, but this aspect of the relationship is not the only motivation. The most popular reason given for going to church is that, "the teaching of God corresponds to what I believe in" (53% of participants). Yet 24% of participants have also received financial support from the church within the last two years, and whereas only 16% of participants would go to a a bank or any other type of financial institution for help, 25% of them would go to their church for financial assistance. Thus, self-reported survey measures demonstrate that there is a financial role for the church. We turn next to the experimental results which test whether and how insurance might be part of this role.

5.2 Summary of the allocation decisions

Participants played a series of dictator games and in each dictator game they were paired with one of three recipients - an anonymous donation to the participant's own church, the street children's fund, or the thanksgiving offering. In each game, participants decided how

much to keep for themselves out of an endowment of GHS 11, equivalent to their daily income, and how much to give to the recipient.

The histograms in Figure 1 plot the distributions of giving to the three different recipients. On average, participants chose to keep 5.77 GHS or 52% of their endowment, and give 5.22 GHS or 48% of the endowment. There was some concern that participants would avoid making a decision by focusing on the median allocation. We find that 40% of participants selected an allocation of either 5 GHS or 6 GHS. Across recipients, roughly 7% of participants gave nothing, and 10% of participants gave everything away. These spikes at the extreme values highlight that allocations to the recipients may have been censored. To account for this, we report all experimental results using a Tobit regression.

We also find that giving towards the three recipients is significantly correlated, with the correlation coefficients between the pairs of choices ranging from 0.52 to 0.59. If the experimental design induced any order effects, these high degrees of correlation could be problematic for interpretations across recipients. However, the order of dictator decisions was randomised across participants, mitigating the concern that any order effects could interact with treatment effects.

5.3 Treatment effects

5.3.1 The effect of only insurance information

The first treatment effect tests the hypothesis that a more salient threat of death and a discussion of the associated risk coping strategies affects giving. Table 5 presents the basic results of the insurance information treatment on giving relative to the no information setting. In the sessions with no additional information, participants gave an average of GHS 5.05, or 45% of the endowment to the church. Participants who received insurance information increased giving by GHS 0.78 or 7% of the endowment. This increase in giving

is consistent with the hypothesis that the focused discussion of risk puts participants in a fearful state, which makes them more likely to give money to the church. There was also an increase in giving of similar magnitude to the street children's fund (an increase of GHS 1.00) and the thanksgiving offering (an increase of GHS 0.75).

5.3.2 The effect of being enrolled in an insurance policy

Table 6 presents the results of the effect of actually being enrolled in an insurance policy. These results are obtained by comparing people who received insurance with people receiving only insurance information. Column 1 demonstrates that enrolment in the formal insurance policy reduces giving to the church by GHS 0.92. Again, we find similar effects regarding giving to the street children's fund and giving to the thanksgiving offering.

These effects are robust when we control for a large set of church and demographic characteristics as demonstrated in the Appendix, Tables 9 and 10. In these tables, the effect of priming on death and the insurance effect are combined by taking the total experimental population and using insurance information as the reference treatment. The coefficient on no insurance reflects the priming effect while the coefficient on insurance reflects the insurance effect. Table 9 includes measures for individual religiosity while Table 10 includes dummy variables for each church branch. These controls should pick up variation in church structure on important characteristics such as the level of formal church support during members' funerals and any variation in church teaching on giving. Neither the individual level characteristics nor the church characteristics explain the treatment effects on giving.

5.4 Discussion

5.4.1 How does insurance work in the minds of church members?

These experimental results point to an interesting relationship between the types of insurance church members might believe they receive from the church, and their willingness to engage in costly behaviours to signal membership of the church. Firstly, treatment effects are present across the three recipients. As discussed in earlier sections, neither the street children's fund nor the national thanksgiving offering are linked to the participant's church. If the type of insurance the participant associates with his church membership is purely community based, there should not be a treatment effect on giving to these external recipients. As decisions were made privately and off the church premises in the middle of the working week, it is very unlikely that giving to these charities was used as a means of signalling good behaviour to other church members or church leadership. Thus, the fact that we find effects of giving to these non-church recipients in addition to giving to the church indicates that part of the insurance channel works through beliefs that encourage giving as an act of worship to a divine god.

To investigate this spiritual insurance mechanism, we look at the treatment effects in other dictator games played by participants (as described in Table 2). First, we investigate the possibility to give to the church where the participant's name would be attached to his donation rather than an anonymous giving. Table 11 in the Appendix shows that the priming and enrolment treatments have the same effect on church giving when donations are not anonymous as when they are.

The fact that our subjects do not try to signal their generosity through the use of nominal donation motivates the interpretation that charitable behaviour is used as a spiritual psychological mechanism to cope with risk.

We also show in the Appendix that both the priming treatment and the insurance treat-

ment do not modify participants' decisions to allocate money to their own church against charitable recipients (Table 12, columns 1 and 2) nor the money allocation between the two NGOs (Table 12, column 3). It seems that the three different beneficiaries are equally important in the participants' mind for coping with risk.

The GHS 11 endowment used in the dictator games is a little bit more than the median weekly offering to the church. Comparing giving in the insurance information treatment with the no insurance treatment, it is interesting to see that a relatively brief discussion about death could raise giving by 6.5%, and provides an indication of the importance of the church in this context where there is a lot of uncertainty, but few institutions to deal with it.

One final result of interest is that in our follow-up survey, 15% of those in the insurance treatment and 29% of those in the insurance priming treatment reported having purchased insurance themselves since the experiment. Furthermore, 89% of the former and fully 95% of the latter reported that they would be interested in purchasing funeral insurance in the future. While far from conclusive, these findings suggest that exposure to information about formal sector insurance can significantly affect subjects' attitudes to purchasing insurance, in ways that imply the churches may under some circumstances be a facilitating mechanism rather than an obstacle to the growth of the formal sector.

5.4.2 Heterogeneous treatment effects: church members during fund-raising events

Up to this point, we have discussed results for church members recruited during normal service weeks. After recruitment, we learnt that two churches had hosted revival weeks during the course of our experiments. Revival weeks are special periods of church activity where members are encouraged to attend church daily. The services consist of prayer, teaching, singing, and exhortation to give money to the church.

Asamoah-Gyadu [2015] describes revival meetings as an essential feature of contemporary Pentecostal liturgy. In his view, Pentecostal teaching is focused on "scriptures applied in ways that encourage members to invest in financial markets, seize oppotunities in education, business, politics and entertainment and wherever able, increase their spheres of influence in the world". Access to these material benefits is accomplished through religious activities including "massive revival meetings, summits and conferences, all day prayer services and all-night prophetic vigils and mass evangelistic crusades".

In total, 119 church members participated in the experiment while they were in the middle of a revival week. In terms of demographics, we don't find them to be different from members recruited during regular service weeks (see Table 7). However, we find important differences in treatment effects. After receiving insurance information, revival week members *decreased* giving to the church and after being enrolled in insurance, they *increased* giving to the church (see Table 8). For comparison the analyses of other donations are in the Appendix.

Referring back to the model, these results are consistent with interpreting the revival week as an upwards shift of θ, the relative weight in our subjects' utility function of church activities compared to secular ones. During revival weeks the importance of the church in our subjects spiritual life is magnified, which in term of the model means that there is an upward shift of θ. As equation (36) in the Appendix demonstrates, when equilibrium giving is higher than a given threshold, even in the presence of spiritual insurance, church members respond to an exogenous shock decreasing the size of a loss by a decrease in optimal giving. Intuitively, there is a point at which members have already given so much money to the church, that when faced with the prospect of a negative income shock, they prefer to keep money to smooth secular consumption (i.e., when g^* is large, the income effect dominates the substitution effect).

This explanation of the revival week effect is consistent with the types of activities and

benefits members are supposed to derive from revival weeks. Additionally, we find suggestive evidence that people who self report to be habitually high givers respond to treatment in the same manner as people who completed the experiment during a revival week (see Tables 15 and 16 in the Appendix). In other words, their reaction to our treatments is the reverse of the reaction of people who are not in revival week, confirming that for high givers the income effect dominates the substitution effect.

6 Conclusion

We conducted a lab-in-the-field experiment with church members from an established Pentecostal church in Accra, Ghana. We find evidence for religious and charitable giving being part of a church member's risk-coping strategy. This spiritual insurance channel does not contradict the possibility that other church community-based mechanisms exist in parallel. Indeed, survey responses from church members and leaders emphasize the important roles the church plays as a financial contributor.

The homogeneous treatment effects obtained within the church population depend on three important factors. First, Pentecostal churches stress the involvement of God in terms of blessings in everyday life and teach about God rewarding religious and charitable giving. This particular religious discourse makes members of these churches more prone to see charitable behaviour as a means to decrease the risk of bad events happening and to increase the occurrence of good events. Second, trust in the insurance is fundamental, especially in a context where formal institutions are generally weak. In our case, the church was used as a coordinator for the insurance scheme and participants seemed to trust the insurance because it was coordinated by the church. Finally, our results obviously depend on the absence (or limited presence) of better institutions to deal with risk.

We believe that our results would hold in other Pentecostal churches and settings where

the development of formal insurance is low. Since the focus on beliefs in religious rituals that influence immediate events are common among a variety of religions and faiths, it would be interesting to reproduce the experiment in a different religious setting.

The experiment stressed the importance of religion for economic decisions made by individuals in a setting with weak formal institutions. While individuals might go to religious institutions in those settings because they offer risk-mitigating strategies, we show that formal, private insurance can at least partially substitute spiritual based insurance mechanisms. Since the church was used as a coordinator for the insurance scheme, we are inclined to see religious institutions in this context as opportunities to spread formal insurance rather than as an obstacle, a conclusion underlined by the results of our follow-up study reported above.

7 Tables and figures

Table 1: Summary statistics of church branches

	(1) mean
Age	26.17
Number of church members (approx.)	1035.67
Church members have an education level higher than average	0.33
Church members have income higher than average	0.17
Average number attending Sunday service	610.00
Average amount received on a Sunday	1150.00
The church owns its building	0.83
The church owns other properties	0.17
Number of paid staff	6.67
The church has a welfare fund	1.00
Observations	6

Table 2: Pairs of dictator game recipients.

A	Self	Church (anonymous)
B	Self	Street children
C	Self	Thanksgiving
D	Self	Church (non-anonymous)
E	Church (anonymous)	Street children
F	Church (anonymous)	Thanksgiving
G	Church (anonymous)	Church (non-anonymous)
H	Street children	Thanksgiving
I	Street children	Church (non-anonymous)
J	Thanksgiving	Church (non-anonymous)

Table 3: Summary statistics of study participants and comparison with general population

	(1) Study participants mean	(2) General population mean
female	0.61	0.52
married	0.39	0.39
higher education	0.26	0.15
employed	0.56	0.76
income	359.39	445.50

Note: Figures for general population are from Ghana Living Standard Survey Round 6.

Table 4: Treatment balance

	(1) Insurance mean	(2) Insurance information mean	(3) No insurance mean
female	0.54	0.63	0.67
age	36.66	35.43	36.04
married	0.40	0.39	0.38
higher education	0.26	0.23	0.27
employed	0.55	0.53	0.60
monthly income	375.44	358.04	345.13
going to church daily	0.07	0.06	0.07
frequent prayer	0.81	0.85	0.80
any insurance	0.39	0.41	0.38
Observations	165	120	169
F stat		.52	.8
p-value		.86	.62

Table 5: Giving after receiving insurance information compared to giving with no insurance nor insurance information

	(1) Giving to church	(2) Giving to thanks.	(3) Giving to street.
model			
Insurance information	0.778*	0.746*	1.004**
	(0.450)	(0.448)	(0.457)
Constant	5.045***	4.937***	5.220***
	(0.256)	(0.204)	(0.266)
Observations	289	289	289

Note: Tobit regression censored at 0 and 11. Dependent variables measure donations intended for the own church branch, the street children's fund (secular NGO) and the Inter-denominational Thanksgiving (religious NGO) with the alternative option to keep the money. Standard errors (between parenthesis) are clustered at session level. Significance levels: *p<0.1; **p<0.05; ***p<0.01.

Figure 1: Distribution of giving among normal church population.

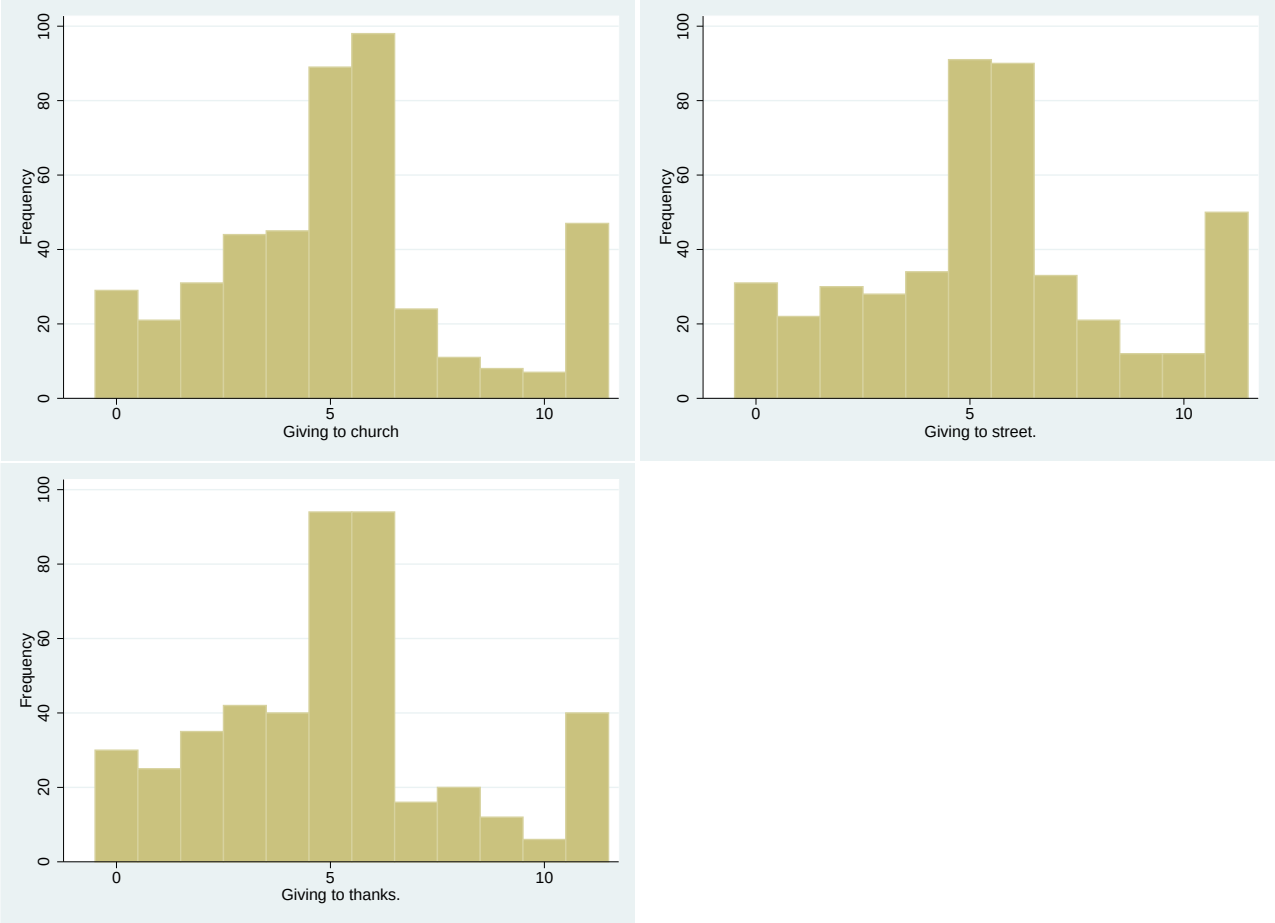

Table 6: Giving after enrolment in insurance compared to giving with insurance information only

	(1) Giving to church	(2) Giving to thanks.	(3) Giving to street.
model			
Insurance	-0.915*	-0.930*	-0.926**
	(0.471)	(0.502)	(0.434)
Constant	5.846***	5.703***	6.227***
	(0.385)	(0.408)	(0.377)
Observations	285	285	285

Note: Tobit regression censored at 0 and 11. Dependent variables measure donations intended for the own church branch, the street children's fund (secular NGO) and the Inter-denominational Thanksgiving (religious NGO) with the alternative option to keep the money. Standard errors (between parenthesis) are clustered at session level. Significance levels: *p<0.1; **p<0.05; ***p<0.01.

Table 7: Comparison of regular and revival week participants

	(1) Non revival participants mean	(2) Revival participants mean
female	0.61	0.60
age	36.10	34.63
married	0.39	0.30
higher education	0.26	0.35
employed	0.56	0.55
monthly income	359.39	358.17
going to church daily	0.07	0.11
frequent prayer	0.81	0.95
any insurance	0.39	0.49
Observations	454	122
F stat		1.61
p-value		.11

Note: Tobit regression censored at 0 and 11. Dependent variables measure donations intended for the own church branch, the street children's fund (secular NGO) and the Inter-denominational Thanksgiving (religious NGO) with the alternative option to keep the money. Standard errors (between parenthesis) are clustered at session level. Significance levels: *p<0.1; **p<0.05; ***p<0.01.

Table 8: Treatment effects on church giving for total sample (column 1) and revival week only (colmun 2)

	(1) Giving to church	(2) Giving to church
model		
Insurance	-0.911*	2.249***
	(0.475)	(0.661)
No insurance	-0.878*	2.033**
	(0.460)	(0.956)
Revival week	-2.247***	
	(0.619)	
Revival week X Insurance	3.065***	
	(0.824)	
Revival week X No insurance	2.866***	
	(1.062)	
female	0.0816	0.602
	(0.346)	(0.689)
age	0.0170	0.0624**
	(0.0148)	(0.0281)
log(income)	0.00164	-0.496
	(0.172)	(0.358)
higher education	0.490	1.032
	(0.408)	(0.761)
employed	0.424	1.044
	(0.326)	(0.733)
Ewe	0.137	-0.125
	(0.399)	(0.745)
Ga	-0.334	1.190
	(0.418)	(1.026)
other ethnicity	0.887**	1.451*
	(0.451)	(0.840)
Constant	4.726***	2.468
	(0.956)	(1.877)
Observations	521	117

Note: Tobit regression censored at 0 and 11. Dependent variables measure donations intended for the own church branch, the street children's fund (secular NGO) and the Inter-denominational Thanksgiving (religious NGO) with the alternative option to keep the money. Standard errors (between parenthesis) are clustered at session level. Significance levels: *p<0.1; **p<0.05; ***p<0.01.

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8 Appendix

8.1 Additional Tables

Table 9: Giving with controls for church involvement

	(1) Giving to church	(2) Giving to thanks.	(3) Giving to street.
model			
Insurance	-0.904*	-1.059**	-1.068**
	(0.485)	(0.536)	(0.450)
No insurance	-0.848*	-0.920*	-1.182**
	(0.459)	(0.477)	(0.480)
female	0.0106	-0.420	-0.725
	(0.404)	(0.361)	(0.492)
age	0.00629	-0.0100	0.00312
	(0.0160)	(0.0146)	(0.0159)
higher education	0.259	-0.121	-0.552
	(0.471)	(0.421)	(0.418)
log(income)	0.158	-0.120	0.296
	(0.206)	(0.243)	(0.210)
employed	0.221	0.588	0.0740
	(0.367)	(0.425)	(0.413)
Ewe	0.137	-0.208	0.378
	(0.456)	(0.470)	(0.462)
Ga	-0.673	0.00685	0.0929
	(0.410)	(0.420)	(0.544)
other ethnicity	0.707	0.797*	0.402
	(0.530)	(0.446)	(0.476)
frequent prayer	-0.146	0.620	-0.691
	(0.507)	(0.567)	(0.599)
going to church daily	0.206	-0.179	-0.226
	(0.480)	(0.584)	(0.589)
Constant	4.678***	6.149***	5.733***
	(1.185)	(1.287)	(1.317)
Observations	404	404	404

Note: Tobit regression censored at 0 and 11. Dependent variables measure donations intended for the own church branch, the street children's fund (secular NGO) and the Inter-denominational Thanksgiving (religious NGO) with the alternative option to keep the money. Standard errors (between parenthesis) are clustered at session level. Significance levels: *p<0.1; **p<0.05; ***p<0.01.

Table 10: Giving with controls for the church

	(1) Giving to church	(2) Giving to thanks.	(3) Giving to street.
model			
Insurance	-0.762*	-0.977**	-0.968**
	(0.430)	(0.489)	(0.445)
No insurance	-0.703	-0.875*	-0.998**
	(0.451)	(0.456)	(0.467)
female	0.00841	-0.368	-0.790
	(0.402)	(0.348)	(0.486)
age	0.00264	-0.0130	-0.00105
	(0.0161)	(0.0141)	(0.0152)
higher education	0.272	-0.151	-0.478
	(0.462)	(0.421)	(0.429)
log(income)	0.110	-0.125	0.219
	(0.200)	(0.224)	(0.196)
employed	0.146	0.524	0.0288
	(0.360)	(0.418)	(0.418)
Ewe	0.238	-0.107	0.451
	(0.498)	(0.517)	(0.505)
Ga	-0.599	0.170	0.198
	(0.384)	(0.404)	(0.517)
other ethnicity	0.604	0.703	0.381
	(0.529)	(0.470)	(0.482)
AoG Abundant Life	-0.870*	-0.888	-1.146*
	(0.500)	(0.667)	(0.601)
AoG Redemption	-1.086**	-1.687***	-1.337**
	(0.549)	(0.605)	(0.638)
AoG Faith Chapel	0.115	-0.245	-0.198
	(0.526)	(0.633)	(0.650)
AoG Sanctuary	0.605	0.349	-0.157
	(0.478)	(0.580)	(0.515)
AoG Shammah	-0.0715	-0.388	-0.560
	(0.600)	(0.611)	(0.614)
Dchurchother	0.817*	0.424	0.00458
	(0.468)	(0.843)	(0.538)
Constant	4.928***	7.070***	6.043***
	(1.148)	(1.267)	(1.295)
Observations	404	404	404

Note: Tobit regression censored at 0 and 11. Dependent variables measure donations intended for the own church branch, the street children's fund (secular NGO) and the Inter-denominational Thanksgiving (religious NGO) with the alternative option to keep the money. Standard errors (between parenthesis) are clustered at session level. Significance levels: *p<0.1; **p<0.05; ***p<0.01.

Table 11: Non-anonymous church giving

	(1)
	Giving to Church named (vs keep)
model	
Insurance	-1.013**
	(0.473)
No insurance	-0.548
	(0.493)
Constant	5.607***
	(0.413)
Observations	454

Note: Tobit regression censored at 0 and 11. Dependent variables measure donations intended for the own church branch, the street children's fund (secular NGO) and the Inter-denominational Thanksgiving (religious NGO) with the alternative option to keep the money. Standard errors (between parenthesis) are clustered at session level. Significance levels: *p<0.1; **p<0.05; ***p<0.01.

Table 12: Treatment effects for other dictator games

	(1)	(2)	(3)
	Thanks (vs church)	Street (vs church)	Thanks (vs street)
model			
Insurance	-0.082	0.006	-0.255
	(0.330)	(0.271)	(0.266)
No insurance	0.093	0.169	-0.127
	(0.335)	(0.258)	(0.254)
Constant	4.901***	5.702***	4.841***
	(0.249)	(0.205)	(0.185)
Observations	454	454	454

Note: Tobit regression censored at 0 and 11. Dependent variables measure donations intended for the own church branch, the street children's fund (secular NGO) and the Inter-denominational Thanksgiving (religious NGO) with the alternative option to keep the money. Standard errors (between parenthesis) are clustered at session level. Significance levels: *p<0.1; **p<0.05; ***p<0.01.

Table 13: Treatment effects for giving to thanksgiving for total sample (column 1) and revival week only (colmun 2)

	(1) Giving to thanks.	(2) Giving to thanks.
model		
Insurance	-1.036*	1.819***
	(0.529)	(0.326)
No insurance	-0.976**	1.869*
	(0.471)	(1.018)
Revival week	-2.716***	
	(0.497)	
Revival week X Insurance	2.964***	
	(0.677)	
Revival week X No insurance	3.004***	
	(1.092)	
female	-0.0411	1.055
	(0.305)	(0.728)
age	-0.00473	0.00977
	(0.0125)	(0.0209)
log(income)	-0.0714	-0.0555
	(0.196)	(0.332)
higher education	-0.0339	0.110
	(0.340)	(0.563)
employed	0.764**	1.312**
	(0.338)	(0.586)
Ewe	0.0800	0.749
	(0.406)	(0.703)
Ga	0.198	0.703
	(0.448)	(1.086)
other ethnicity	0.895**	1.111
	(0.381)	(0.756)
Constant	5.768***	1.240
	(1.079)	(1.529)
Observations	521	117

Note: Tobit regression censored at 0 and 11. Dependent variables measure donations intended for the own church branch, the street children's fund (secular NGO) and the Inter-denominational Thanksgiving (religious NGO) with the alternative option to keep the money. Standard errors (between parenthesis) are clustered at session level. Significance levels: *p<0.1; **p<0.05; ***p<0.01.

Table 14: Treatment effects for giving to Street Children Fund for total sample (column 1) and revival week only (colmun 2)

	(1) Giving to street.	(2) Giving to street.
model		
Insurance	-1.004**	1.779***
	(0.433)	(0.456)
No insurance	-1.134**	1.405*
	(0.465)	(0.716)
Revival week	-2.464***	
	(0.465)	
Revival week X Insurance	2.741***	
	(0.574)	
Revival week X No insurance	2.557***	
	(0.838)	
female	-0.459	0.406
	(0.382)	(0.669)
age	0.00279	0.0156
	(0.0135)	(0.0245)
log(income)	0.247	0.234
	(0.171)	(0.307)
higher education	-0.156	0.777
	(0.375)	(0.662)
employed	0.203	0.669
	(0.346)	(0.581)
Ewe	0.615	0.998
	(0.397)	(0.745)
Ga	0.236	0.673
	(0.480)	(0.910)
other ethnicity	0.473	0.593
	(0.385)	(0.592)
Constant	4.890***	0.755
	(1.073)	(1.771)
Observations	521	117

Note: Tobit regression censored at 0 and 11. Dependent variables measure donations intended for the own church branch, the street children's fund (secular NGO) and the Inter-denominational Thanksgiving (religious NGO) with the alternative option to keep the money. Standard errors (between parenthesis) are clustered at session level. Significance levels: *p<0.1; **p<0.05; ***p<0.01.

Table 15: Comparing revival church members and church members giving relatively high amounts to the church

	(1) Giving to church	(2) Giving to thanks.	(3) Giving to street.
model			
Insurance	-0.952*	-1.233**	-1.220**
	(0.544)	(0.591)	(0.490)
No insurance	-1.196**	-1.393***	-1.331***
	(0.525)	(0.479)	(0.477)
High givers	-0.976*	-1.697***	-1.675***
	(0.570)	(0.560)	(0.554)
High givers X Insurance	0.634	1.267	1.285
	(0.858)	(0.818)	(0.820)
High givers X No insurance	1.388*	2.425***	0.981
	(0.784)	(0.813)	(0.818)
Revival week	-1.925***	-2.505***	-2.411***
	(0.626)	(0.494)	(0.454)
Revival week X Insurance	2.840***	3.004***	2.919***
	(0.954)	(0.743)	(0.536)
Revival week X No insurance	2.296**	2.465**	2.225***
	(1.024)	(0.971)	(0.722)
Constant	6.124***	6.149***	6.698***
	(0.463)	(0.437)	(0.391)
Observations	514	514	514

Note: Tobit regression censored at 0 and 11. Dependent variables measure donations intended for the own church branch, the street children's fund (secular NGO) and the Inter-denominational Thanksgiving (religious NGO) with the alternative option to keep the money. Standard errors (between parenthesis) are clustered at session level. Significance levels: *p<0.1; **p<0.05; ***p<0.01.

Table 16: Comparing revival church members and church members giving relatively high amounts to the church, controlling for church involvment

	(1) Giving to church	(2) Giving to thanks.	(3) Giving to street.
model			
Insurance	-0.955*	-1.197**	-1.229**
	(0.540)	(0.599)	(0.487)
No insurance	-1.198**	-1.354***	-1.333***
	(0.521)	(0.499)	(0.477)
High givers	-0.750	-1.635**	-1.307**
	(0.644)	(0.656)	(0.633)
High givers X Insurance	0.609	1.173	1.290
	(0.872)	(0.802)	(0.825)
High givers X No insurance	1.358*	2.373***	0.991
	(0.788)	(0.812)	(0.815)
Revival week	-1.893***	-2.436***	-2.376***
	(0.620)	(0.491)	(0.443)
Revival week X Insurance	2.800***	2.833***	2.872***
	(0.939)	(0.727)	(0.526)
Revival week X No insurance	2.293**	2.424**	2.191***
	(1.013)	(0.989)	(0.744)
employed	0.273	0.478	0.0471
	(0.313)	(0.307)	(0.318)
log(income)	0.113	-0.177	0.200
	(0.197)	(0.248)	(0.208)
going to church daily	-0.128	-0.925*	-0.764
	(0.569)	(0.553)	(0.602)
church_sevweekly	-0.0586	-0.785**	-0.697
	(0.414)	(0.357)	(0.423)
frequent prayer	0.0404	0.787	-0.278
	(0.559)	(0.548)	(0.564)
Constant	5.307***	6.699***	6.293***
	(1.307)	(1.366)	(1.298)
Observations	514	514	514

Note: Tobit regression censored at 0 and 11. Dependent variables measure donations intended for the own church branch, the street children's fund (secular NGO) and the Inter-denominational Thanksgiving (religious NGO) with the alternative option to keep the money. Standard errors (between parenthesis) are clustered at session level. Significance levels: *p<0.1; **p<0.05; ***p<0.01.

8.2 Model Appendix

8.2.1 Setup

We assume that a church member has an income of Y and chooses to give an amount g to the church. The church member enjoys utility $u(.)$ from consuming secular goods, and utility $\theta f(.)$ from consuming church goods. Thus a church member who gives g to the church enjoys a total utility of $u(Y-g)+\theta f(g)$. Both utility functions are concave, thrice differentiable, and increasing in their arguments. In each period church members face a probability π of an income loss of size D.

Under the assumption that insurance is offered through the church community, church giving also has the impact of reducing the size of the loss, thus the total loss would be $D-l(g)$. The function $l(g)$ is assumed to be increasing and concave. Under the assumption that church members believe in spiritual insurance, this probability is decomposed into a basic probability of loss $\tilde{\pi}$, and a portion of the loss that can be mitigated by giving money to spiritual goods. Therefore, the total subjective probability of giving is $\pi=\tilde{\pi}-p(g)$.

8.2.2 Optimal giving to the church in the absence of any insurance

In this section we assume that church members choose a particular level of giving to maximise their total expected utility. There is no insurance offered through the church.

$$\max_{g} \quad (1-\pi)u(Y-g)+\pi u(Y-g-D)+\theta f(g) \tag{7}$$

This leads to the following first order condition:

$$(\pi-1)u'(Y-g)-\pi u'(Y-g-D)+\theta f'(g)=0 \tag{8}$$

Rewriting the FOC in terms of $g^*(D,\theta)$,

$$(\pi - 1)u'(Y - g^*(D,\theta)) - \pi u'(Y - g^*(D,\theta) - D) + \theta f'(g^*(D,\theta)) = 0 \quad (9)$$

This equation implicitly defines the optimal giving g^*, which is a function of the expected loss D and θ.

We want to know the impact of experimentally manipulating D on the level of giving of individuals, in other terms the sign of $\dfrac{\partial g^*(D,\theta)}{\partial D}$.

Let $g_D^{*'}(D,\theta) = \dfrac{\partial g^*(D,\theta)}{\partial D}$. Taking the derivative of the FOC with respect to D leads to the following equality:

$$g_D^{*'}(D,\theta) * [\pi[u''(Y-g^*-D) - u''(Y-g^*)] + u''(Y-g^*) + \theta f''(g^*)] = -\pi u''(Y-g^*-D) \quad (10)$$

The right-hand side of the expression is *positive*. Each individual term of the expression multiplied by $g_D^{*'}$ is *negative*. Therefore $g_D^{*'}$ must also be *negative*.

Let us call $g_\theta^{*'} = \dfrac{\partial g^*(D,\theta)}{\partial \theta}$. We can also show that $g_\theta^{*'}$ is positive: a positive shock on the utility from consuming church goods increases church donations. Taking the derivative of the FOC with respect to θ leads to the following equality:

$$g_\theta^{*'}(D,\theta) * [(1-\pi)u''(Y-g^*) + \pi u''(Y-g^*-D) + \theta f''(g^*)] = -f'(g^*) \quad (11)$$

The right-hand side of the expression is *negative*. Each individual term of the expression multiplied by $g_\theta^{*'}$ is *negative*. Therefore $g_\theta^{*'}$ is *positive*.

8.2.3 Community insurance: optimal giving when giving reduces the size of a loss

In this section we assume that giving to church reduces the size of the loss. $L = D - l(g)$ This assumption illustrates the channel of community insurance.

$$\max_{g} \quad (1-\pi)u(Y-g) + \pi u(Y-g-D+l(g)) + \theta f(g) \tag{12}$$

This leads to the following first order condition:

$$(\pi-1)u'(Y-g) + \pi(-1+l'(g))u'(Y-g-D+l(g)) + \theta f'(g) = 0 \tag{13}$$

Rewriting the FOC in terms of $g^*(D,\theta)$:

$$(\pi-1)u'(Y-g^*(D,\theta))) + \pi(-1+l'(g^*(D,\theta)))u'(Y-g^*(D,\theta)-D+l(g^*(D,\theta))) + \theta f'(g^*(D,\theta))) = 0 \tag{14}$$

Taking the derivative of the FOC with respect to D leads to the following equality:

$$g_D^{*'} * [(1-\pi)u''(Y-g^*) + \pi(l'(g^*)-1)^2 u''(Y-g^*-D+l(g^*)) + \pi l''(g^*)u'(Y-g-D+l(g^*)) + \theta f''(g^*)] = \pi(l'(g^*)-1)u''(Y-g^*-D+l(g)) \tag{15}$$

On the right-hand side $u''(Y-g^*-D+l(g))$ is always *negative* while the expression multiplied by $g_D^{*'}$ of the left-hand side is also always *negative*. Therefore the sign of $g_D^{*'}$ depends on $(l'(g^*)-1)$.

This provides a relationship between the efficiency of community based insurance and the optimal response of giving.

$$g_D^{*'} > 0 \text{ when } l'(g^*) > 1, \text{ or } g^* < l'^{-1}(1) \tag{16}$$

and

$$g_D^{*'} \leq 0 \text{ when } l'(g^*) \leq 1, \text{ or } g^* \geq l'^{-1}(1) \tag{17}$$

These conditions tell us that for low levels of optimal giving, experimentally increasing the perceived loss D will decrease optimal giving.

We show below that the variation in optimal giving g^* can be the result of a variation in θ. More particularly, we demonstrate that $g_\theta^{*'} > 0$. Taking the derivative of the FOC with respect to θ gives:

$$\begin{aligned} g_\theta^{*'} * [(1-\pi)u''(Y-g^*) + \pi l''(g^*)u'(Y-g^*-D+l(g^*)) \\ + \pi(-1+l'(g^*))^2 u''(Y-g^*-D+l(g^*)) + \theta f''(g^*)] = -f'(g^*) \end{aligned} \tag{18}$$

The right-hand side of the expression is *negative*. Each individual term of the expression multiplied by $g_\theta^{*'}$ is *negative*. Therefore $g_\theta^{*'}$ is *positive*.

Therefore our model predicts that there exist a threshold level for θ that will trigger a switch in the sign of $g_D^{*'}$.

Numerical illustration Graphs 2 and 3 illustrate a numerical example, in which we simulate the case of $g_D^{'*}(D,\theta)$ changing sign around the threshold $\tilde{\theta}$.

This example uses a CARA utility function ($u(c) = 1 - exp(-ac)$), and assumes that $l(g) = s\ log(1+g)$. The parameters D, s are chosen such that $D - l(g) \geq 0$. Figure 2 shows that the optimal giving $g^*(D,\theta)$ is increasing in θ while Figure 3 indicates that $g^*(D,\theta)$ is an increasing function of D until the threshold $\tilde{\theta} = 0.345$.

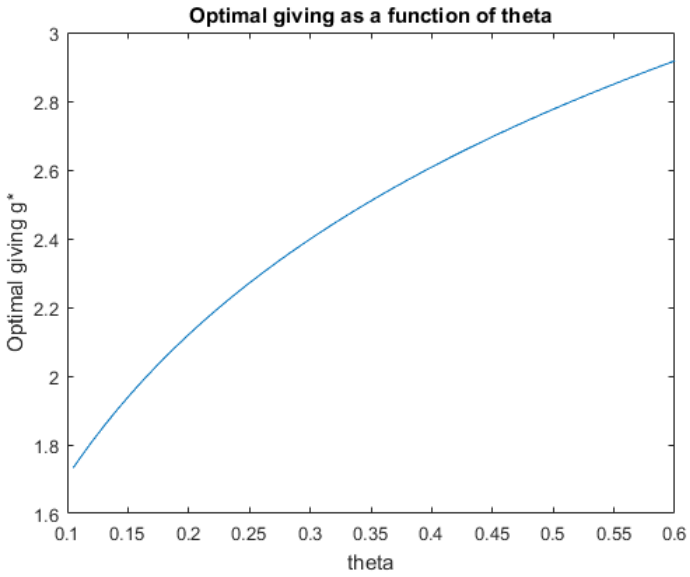

Figure 2: Community insurance - Numerical example: $Y = 10$, $D = 8$, $\pi = 0.4$, $u(.)$ CARA with $a = 0.1$, $f(.)$ CARA with $a = 1$, and $l(.)$ a logarithmic function with $s = 3.5$

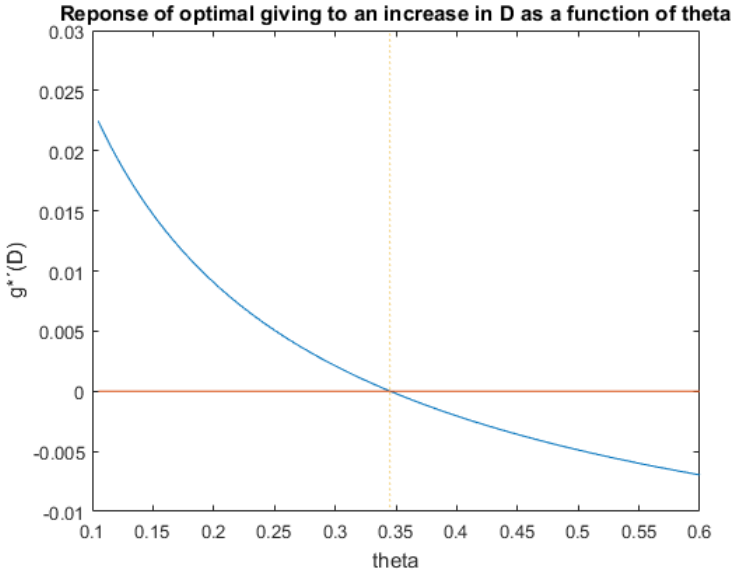

Figure 3: Community insurance - $g^{*'}(D)$ as a function of θ - numerical example marking the threshold $\tilde{\theta}$ where the sign of $g^{*'}(D)$ changes from positive to negative

8.2.4 Spiritual insurance: optimal giving when giving reduces the subjective probability of a loss

In this section we assume that giving reduces the size of the loss. $\pi = \tilde{\pi} - p(g)$ This assumption illustrates the channel of spiritual insurance.

$$\max_{g} \quad (1 - \tilde{\pi} + p(g))u(Y - g) + (\tilde{\pi} - p(g))u(Y - g - D) + \theta f(g) \tag{19}$$

This leads to the following first order condition:

$$p'(g)u(Y-g)-(1-\tilde{\pi}+p(g))u'(Y-g)-p'(g)u(Y-g-D)-(\tilde{\pi}-p(g))u'(Y-g-D)+\theta f'(g) = 0 \tag{20}$$

Rewriting the FOC in terms of $g^*(D, \theta)$,

$$\begin{aligned} &p'(g^*(D,\theta))u(Y - g^*(D,\theta)) - (1 - \tilde{\pi} + p(g^*(D,\theta)))u'(Y - g^*(D,\theta))- \\ &p'(g^*(D,\theta))u(Y-g^*(D,\theta)-D)-(\tilde{\pi}-p(g^*(D,\theta)))u'(Y-g^*(D,\theta)-D)+\theta f'(g^*(D,\theta)) = 0 \end{aligned} \tag{21}$$

Taking the derivative of the FOC with respect to D leads to the following equality:

$$\begin{aligned} g_D^{*'} * [p''(g^*)[u(Y - g^*) - u(Y - g^* - D)] + 2p'(g^*)[u'(Y - g^* - D) - u'(Y - g*)] \\ + (\tilde{\pi} - p(g^*))[u''(Y - g^* - D) - u''(Y - g^*)] + u''(Y - g^*) + f''(g)] \\ = -[p'(g^*)u'(Y - g* - D) + (\tilde{\pi} - p(g))u''(Y - g^* - D)] \end{aligned} \tag{22}$$

Therefore, we have the following conditions:

$$g_D^{*'} > 0 \text{ when } -[p'(g^*)u'(Y - g* - D) + (\tilde{\pi} - p(g))u''(Y - g^* - D)] < 0 \tag{23}$$

$$g_D^{*'} < 0 \text{ when } -[p'(g^*)u'(Y - g* - D) + (\tilde{\pi} - p(g))u''(Y - g^* - D)] > 0 \tag{24}$$

Numerical illustration We simplify these conditions using a CARA utility function: $u(c) = 1 - e^{-ac}$, $u'(c) = ae^{-ac}$, $u''(c) = -a^2e^{-ac}$ and the risk aversion $R(c) = -\dfrac{u''(c)}{u'(c)} = a$

$$-p'(g) - (\pi - p(g))\frac{u''(Y - g - D)}{u'(Y - g - D)} = -p'(g) + (\tilde{\pi} - p(g))a \tag{25}$$

Therefore:

$$g_D^{*'} > 0 \text{ when } -p'(g^*) + (\tilde{\pi} - p(g^*))a < 0 \tag{26}$$

$$g_D^{*'} < 0 \text{ when } -p'(g^*) + (\tilde{\pi} - p(g^*))a > 0 \tag{27}$$

which can be rewritten as:

$$g_D^{*'} > 0 \text{ when } \frac{1}{a}p'(g^*) > (\tilde{\pi} - p(g^*)) \tag{28}$$

$$g_D^{*'} < 0 \text{ when } \frac{1}{a}p'(g^*) < (\tilde{\pi} - p(g^*)) \tag{29}$$

Therefore, we find that $g_D^{*'}$ is positive when the effectiveness of the spiritual insurance divided by the coefficient of absolute risk aversion at g^* is greater than the level of risk at g^*.

We can now also derive the conditions under which $g_D^{*'}$ is increasing until a certain level, and then decreasing. For this, we use the following reformulation of conditions (30) and (31):

$$g_D^{*'} > 0 \text{ when } p'(g^*) + ap(g^*) > a\tilde{\pi} \tag{30}$$

$$g_D^{*'} < 0 \text{ when } p'(g^*) + ap(g^*) < a\tilde{\pi} \tag{31}$$

Let us define $\Gamma(g) = p'(g) + ap(g)$. For $g_D^{*'}$ to be first positive and then negative we need $\Gamma(g)$ to be decreasing:

$$g_D^{*'} > 0 \text{ when } g^* < \Gamma^{-1}(a\pi) \tag{32}$$

$$g_D^{*'} < 0 \text{ when } g^* > \Gamma^{-1}(a\pi) \tag{33}$$

In order for Γ' to be decreasing, we need the following condition to be true:

$$\Gamma'(g) \leq 0 \Leftrightarrow p''(g) + ap'(g) \leq 0 \tag{34}$$

In the following, we will use a parametrization of $p(g)$ that is concave, and an a such that condition (34) hold in order to illustrate that with an increase in the level of giving, due to a higher θ for example, the sign of $g_D^{*'}$ can reverse.

We know that g^* is a function of θ, and we will now show a numerical example that illustrates the possibility of $g_D^{*'}|_{g^*(\theta)}$ to be positive until $g^*(\tilde{\theta})$ and negative afterwards. We will use the a simple logarithmic function $p(g) = klog(g+1)$ where $\tilde{\pi}$ and k are such that $0 < \tilde{\pi} - p(g) < 1$. If we insert this into equation (30), we get:

$$-\frac{k}{g^*(\theta)+1} + (\tilde{\pi} - klog(g^*(\theta)+1))a < 0 \tag{35}$$

Together with (31), we know that at a specific $\tilde{\theta}$, this equation is equal to zero:

$$-\frac{k}{g^*(\tilde{\theta})+1} + (\tilde{\pi} - klog(g^*(\tilde{\theta})+1))a = 0 \tag{36}$$

The following graphs illustrate a numerical example, in which we simulate the case of $g^*(\theta)$ being around the threshold in (36).

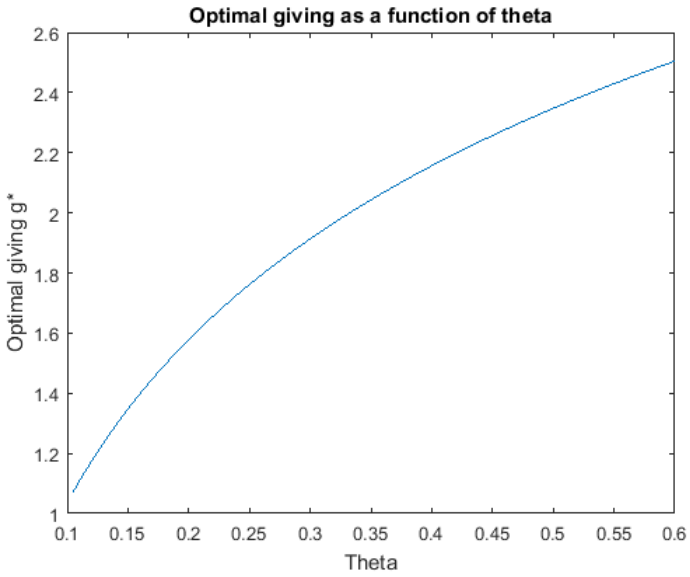

Figure 4: Numerical example: $Y = 10$, $D = 8$, $\pi = 0.4$, $u(.)$ CARA with $a = 0.1$, $f(.)$ CARA with $a = 1$, and $p(.)$ a logarithmic function with $k = 0.09$

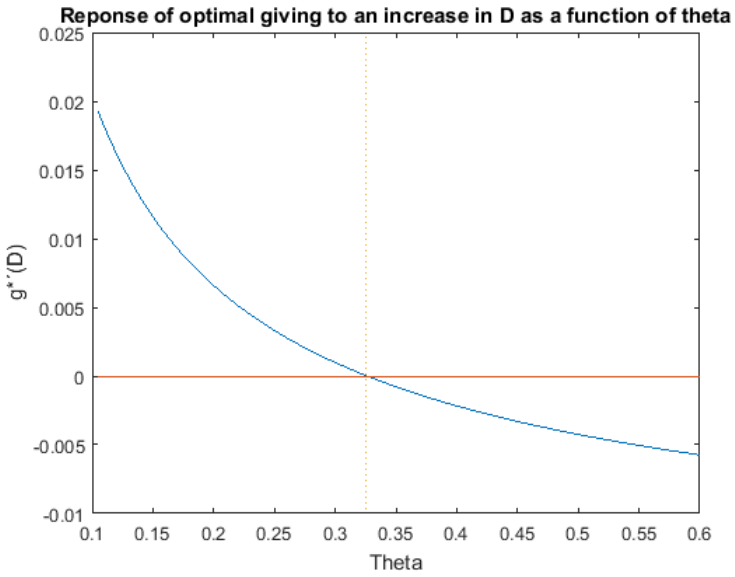

Figure 5: $g^{*'}(D)$ as a function of θ - numerical example marking the threshold $\tilde{\theta}$ where the sign of $g^{*'}(D)$ changes from positive to negative