Hedging by Giving: Spiritual Insurance and Religious Donations

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Abstract

We examine donation behaviors from the perspective of religious beliefs. Using a transaction-level dataset from an Asian economy, we find that individuals with higher income uncertainty are more likely to donate, especially for religious donations, and after negative income uncertainty and health shocks. This pattern is inconsistent with existing explanations of donation, but can be explained by a "spiritual insurance" channel, which posits that giving reduces the probability of the bad state. Indeed, we observe that those who donate to non-local religious organizations reduce their insurance purchases. We additionally analyze a field experiment on 30 million potential donors conducted by a large online donation platform, and find that spiritual insurance narratives significantly increase the likelihood to donate. We contribute by combining archival data and field experiment for the first time to show that the "spiritual insurance" channel can be influential for donation behaviors and the insurance market.

Keywords: donation, income uncertainty, spiritual insurance, wishful thinking, religion

JEL Classification: D14, G22, H44, O17, Z12

Whoever is kind to the poor lends to the LORD, and will be repaid in full.

—(New International Version, Proverbs 19:17)

1. Introduction

Charitable giving is an important social and economic phenomenon that has contributed to the reduction of poverty and diseases worldwide. According to the recent statistics, the industry has accounted for 2.3% of U.S. GDP (Giving USA, 2021). Among the different donation channels, religious donations are significant. For example, in 2020, religious charities received 28% of all U.S. donations and 40% in Canada, representing the largest share in both countries (Giving USA, 2021; Lasby and Barr, 2018). According to census data for a high-income Asian economy studied in this paper, more than 50% of the donors have donated to religious organizations.

What motivates people to make charitable donations? Researchers have shown that donations can be motivated by both self-interest such as tax reduction (Meer, 2014) and social preferences such as altruism (Becker, 1974), warm-glow (Andreoni, 1989, 1990), social pressure (DellaVigna, List, and Malmendier, 2012; DellaVigna et al., 2013; Andreoni, Rao, and Trachtman, 2017) and reciprocity (Falk and Fischbacher, 2006; Falk, 2007). However, the literature largely ignores religion-specific motivations. Are religious donations motivated differently and do they demonstrate a unique pattern?

Throughout history, humans often turned to religion when facing uncertainty. For example, before sailing, ancient Greek and ancient Chinese sailors would worship Poseidon and Mazu, respectively. Many religious texts also call on the faithful to do good things, including donations, to change the outcome of the present life. As an example, Proverbs 19:17 states that "Whoever is kind to the poor lends to the LORD, and will be repaid in full." The concept of karma, i.e., "what goes around comes around", also runs through Buddhism. These examples illustrate the mentality we call "spiritual insurance", in the sense that people donate in exchange for blessings from their gods and hedge income uncertainty spiritually, believing that good deeds will be rewarded by the super nature. For instance, Kent (2002) suggests that spiritual insurance for healing and protection explains the growth of the Wesleyan church in 18^{th} century England.

This paper investigates whether spiritual insurance exists by combining an archival data approach and a field experiment approach. Using within-person variations from observational data in a developed economy in Asia, we study the relationship between donations and income uncertainty for the first time. We find a surprising positive predictive effect of income uncertainty and health shocks on donations especially religious ones, and a pattern of substitutability between religious donations and insurance purchases, a set of patterns uniquely consistent with spiritual insurance, thus providing the first archival data evidence for spiritual insurance. Moreover, we analyze a field experiment conducted by a large online donation platform on approximately 30 million potential donors that examines the effect of spiritual insurance narratives on donations for the first time, and find a significant result.

We first outline a stylized model of donation behaviors to motivate our empirical exercise.

In this model, if donations do not have a spiritual insurance interpretation, income uncertainty reduces the level of donations through an income effect. However, a strong enough mentality of spiritual insurance predicts a positive effect of income uncertainty on the level of donations. Effectively, people under such a mentality tend to donate more when they face higher income uncertainty or adverse shocks in life, because this is the moment they are in urgent need of blessings. Traditional motives, whether self-interest or social preferences, often predict the opposite, because donation is generally treated as normal goods in these models. In all models, however, donation is increasing in the level of income, suggesting that the relationship of donation with income uncertainty, not income level, provides a distinguishing test of spiritual insurance. The model also predicts that donations and insurance are substitutes.

We test the model predictions using a unique transaction-level dataset on donations and income for customers of a leading commercial bank in a high-income economy in East Asia. The economy in our data has a GNI per capita between 20,000 and 30,000 USD, above twice the threshold for the World Bank's high-income economy designation. Our dataset covers July 2013 to June 2015 and includes more than 70,000 individuals who receive their paychecks through direct deposit at this bank and spend regularly on the bank's credit card. In our dataset, we observe donations to non-local organizations made by account holders via bank cards.

Indeed, in this dataset we find that a higher level of unanticipated income shocks, a common proxy variable for background risk (Guiso and Paiella, 2008), predicts higher donations. We compute income uncertainty by evaluating the volatility of realized payroll income in the immediate past, after eliminating predictable income components (Meghir and Pistaferri, 2004; Jurado, Ludvigson, and Ng, 2015). Income uncertainty variations in our dataset may arise from, for instance, unpredicted changes in bonuses, wage adjustments, and commissions. Our main empirical specification leverages within-individual variations by employing a predictive regression with time and individual fixed effects, controlling for income and wealth levels. Using this specification, we estimate the predictive effect of income uncertainty (derived from all monthly income realizations over the preceding four quarters) on the subsequent quarter's donation behavior. We find that a one standard deviation increase in income uncertainty leads to a 0.37 times increase in donations relative to the unconditional sample mean, a result that is statistically significant at the 1% level. To mitigate measurement errors and concentrate on income uncertainty external to the employee, we employ the firm-level average of income uncertainty as an instrument for individual-level income uncertainty. The instrumental variable approach corroborates the positive predictive effect of income uncertainty on donations.

We provide further tests for the spiritual insurance motive. First, we divide donations into religious and secular according to their destinations, and separately analyze the effect of income uncertainty on them. In the census for this economy, we observe that a large share of the stated motivations for religious donations is "seeking blessings" (58% of the people making religious donations state this motivation, compared to 22% of the people making secular donations), a type of motivation that is consistent with spiritual insurance. The religious foundations receiving donations in our dataset are primarily evangelical, also consistent with a stronger "seeking

blessings" interpretation. Indeed, consistent with a more prevalently-stated spiritual insurance motivation for religious donations than for secular donations, we find that the predictive effect of income uncertainty on donations is 52% stronger for religious donations than for secular donations. Separating income uncertainty into positive and negative ends using a semi-variance approach, we find that the pattern of donations increasing in income uncertainty is especially true for negative income uncertainty predicting religious donations, with a consistently significant effect across the baseline and instrumental variable specifications.

Second, we also find that when people experience medical shocks, people tend to increase religious donations *only*, and not secular donations. We examine health shocks as a common negative shock comparable in importance to income uncertainty, to see the effect of this relatively exogenous shock on donations. Without a spiritual insurance motive, a health shock should reduce donations if donations are a normal good, but spiritual insurance would predict the opposite. Defining a health shock as incurring medical expenses above the median in the preceding quarter, we observe donations in the following quarter increase by 1.46 times the sample mean. This increase in donations post-health shock is primarily attributed to religious contributions, as the coefficient for secular donations is not statistically significant.

Third, donations and insurance purchases display a pattern of substitutability as predicted by the model, consistent with the (non-traditional) insurance function of the donation that the spiritual insurance explanation hinges on. We observe that those who donate reduce their insurance purchases. Specifically, focusing on within-person variations, we observe that compared to the sample mean, those who have made religious donations in a quarter purchase 81% less insurance in the same period. Also, donation mutes the relationship between income uncertainty and the purchase of market-based insurance. We observe that income uncertainty positively predicts the insurance purchase amount for the whole sample using the same predictive specification as before, but this link disappears among those who have made religious donations in the quarter. These patterns are statistically significant for religious donations but not secular donations. These results suggest that substitutability exists in our sample between religious donations and market-based insurance and that such substitutability is economically significant.

All these findings are novel patterns in the donation literature, and suggest that donations serve as a form of spiritual insurance in our data. We conduct careful additional tests to show that alternative explanations do not explain our findings fully. First, we consider increased altruism as an alternative explanation, where individuals facing income uncertainty or health shocks might develop heightened sympathy, leading to more donations.[1] If altruism were the driving force, we would expect a similar pattern in both religious and secular donations. Yet, our data shows distinct differences between these two types. Additionally, increased altruism alone does not satisfactorily explain the substitutability between religious donations and insurance purchases noted in our findings.

Second, there has also been some evidence showing that donations serve as a form of informal mutual insurance within the religious group (Dehejia, DeLeire, and Luttmer, 2007; Chen,

[1] The literature on increased altruism suggests that natural disasters and wars can tighten social norms and enhance prosocial behavior, especially towards in-groups (Gelfand et al., 2011; Bauer et al., 2016; Posch, 2021).

2010; Ager and Ciccone, 2018). One advantage of our setting is that the institutions receiving the donations observed in our data are all non-local organizations, which almost directly excludes the possibility of mutual insurance within the local community. Nevertheless, we explicitly examine whether donations materially increase the degree of consumption insurance by decreasing the passthrough of income growth to consumption growth, and we find that they do not, as expected. In addition to increased altruism and mutual insurance, we also analyze and rule out the potential that income seasonality, or tax considerations may drive our results.

While our primary tests show that spiritual insurance offers a perspective to interpret donation behaviors in the observational data, we further directly examine the effect of spiritual insurance narratives by analyzing a field experiment conducted by one of the world's largest crowdfunding charity platforms. This experiment, running from July 28 to August 15, 2022 and involving 30 millions of potential donors, randomly assigned them to a treatment group, who encountered a "do good deeds and receive blessings" message beneath the donation button on charity petition pages. This subtle intervention aimed to enhance the salience of the spiritual insurance narrative. The results of the field experiment align with the spiritual insurance motive. The presence of the message led to a modest, yet significant, increase in donations. This finding is noteworthy, given the minimal nature of the intervention. Intriguingly, regional variations in responsiveness to the spiritual narrative were observed, correlating with the prevalence of superstitious beliefs in different areas. These results not only confirm our initial findings from transactional data but also demonstrate the tangible impact of spiritual narratives on donation behaviors, suggesting a robust spiritual insurance mechanism at play.

Our study is related to several lines of research. The first is the rich literature on the motives of donations. Both self-interest and social preferences can drive donation behavior (for a comprehensive review, see Andreoni and Payne (2013)). The literature has provided evidence that donations are affected by tax considerations. For example, using tax reforms in France, Fack and Landais (2010) find that donations are sensitive to changes in tax costs, and more generous donors react more than smaller donors. Using data from the United States, Duquette (2016) finds that donations to different charity subsectors respond to tax costs heterogeneously.[2] Alternatively, Becker (1974) and Bergstrom, Blume, and Varian (1986) propose the purely altruistic model where donations are treated as public goods. As a form of altruism, Fehr and Schmidt (1999) and Bolton and Ockenfels (2000) propose models of inequality aversion. Many experimental studies show that people want to reduce inequality in consumption or income distribution by making donations (e.g. Charness and Rabin, 2002; Falk and Fischbacher, 2006; Cox, Friedman, and Gjerstad, 2007; Blanco, Engelmann, and Normann, 2011). Andreoni (1989, 1990) and Crumpler and Grossman (2008) propose a form of impure altruism—"warm-glow", i.e., people donate to make themselves happy or enjoy a positive self-image. Experimental studies such as Ottoni-Wilhelm, Vesterlund, and Xie (2017) show that pure and impure altruism co-exist in donation behavior. Reciprocity is also an important driver. Using a large-scale field experiment, Falk (2007) shows that those who receive a gift donate 17% more frequently than those who do

[2] Works in this direction also include e.g., Feldstein and Taylor (1976), Auten, Sieg, and Clotfelter (2002), Meer (2014), Almunia et al. (2020), Hungerman and Ottoni-Wilhelm (2021), Cage and Guillot (2021), and Ring and Thoresen (2022).

not. Social image and social pressure are also shown to affect giving behavior (Glazer and Konrad, 1996; Bénabou and Tirole, 2006; Andreoni and Bernheim, 2009; DellaVigna, List, and Malmendier, 2012). Our paper contributes to this important literature by providing evidence for a new motive, spiritual insurance. While this literature generally predicts that donation should be negatively associated with income uncertainty, our new motive predicts the opposite pattern that has been documented with the data.

A larger literature considers the effects of economic uncertainty on general consumption and finds that high uncertainty lowers general consumption (Zeldes, 1989; Kimball, 1990; Eberly, 1994; Carroll, 1997). However, apart from Name-Correa and Yildirim (2013) who characterize the optimal fundraising strategy of fundraisers when there is uncertainty about the donors' income, there are only a few experimental studies examining the relationship between income uncertainty and donations. Kellner, Reinstein, and Riener (2019) solicit charitable donations from small lottery winnings in a lab setting. They find that ex-ante commitments to "give if you win" when the uncertainty of the lottery is not resolved exceed donations after a win. Chen and Zhong (2021) find that income uncertainty drives individuals to share more and lie less in dictator and dice game experiments and conjectures that people behave morally for better outcomes under uncertain decisions. We contribute to this emerging literature on income uncertainty and donations by offering the first empirical study based on donations in observational data as well as in experimental data.

The third related literature is on spiritual insurance.[3] The economic studies of religion have found evidence that religiosity is related to low social security provision (Scheve and Stasavage, 2006; Gruber and Hungerman, 2007) and high agricultural risk (Ager and Ciccone, 2018), and that religiosity increases when disasters such as earthquakes, pandemics or wars occur (Bentzen, 2019, 2021; Henrich et al., 2019), although it is hard to isolate the spiritual insurance motive of religion. Auriol et al. (2020) show evidence for the spiritual insurance motive using a field experiment in Ghana. They find that an intervention of free insurance coverage against funeral cost risks reduces subjects' donations to local and national religious institutions in a dictator game, and conclude that the motivations for these donations include both spiritual insurance and mutual insurance. Our study differs from Auriol et al. (2020) in that we uniquely use within-person variations to provide evidence for spiritual insurance. Our study also focuses on people's recent experience of income uncertainty and medical expenditure shocks, and these people in our observational data are in a high-income economy. The results we obtain suggest that spiritual insurance exists inside and outside of experiments and is present in multiple risk domains.

The rest of the paper is organized as follows. In Section 2, we present a model and derive testable implications on the relationship of donation with income uncertainty, with or without a spiritual insurance motive. Section 3 introduces the dataset on donation, insurance purchases, and income based on banking transactions, and the construction of the income uncertainty

[3]The phenomenon of spiritual insurance is related to a more general behavior called wishful thinking, motivated belief, or anticipatory utility surveyed in Bénabou and Tirole (2016). The theoretical models include and are not limited to Bénabou and Tirole (2002), Bénabou (2013), Brunnermeier and Parker (2005), Caplin and Leahy (2001, 2019), and Zimmermann (2020). Related laboratory (.e.g. Dana, Weber, and Kuang, 2007; Di Tella et al., 2015; Engelmann et al., 2019; Exley and Kessler, 2019; Engelmann et al., forthcoming) and field studies (.e.g. Bridet and Schwardmann, forthcoming) also confirm the existence of motivated beliefs.

measure. In Section 4 we describe the empirical specification and report the estimates on the predictive relationship of income uncertainty on donations, and present further tests of the spiritual insurance motive. Section 5 details our field experiment on spiritual insurance narratives. Section 6 concludes.

2. Model

To formalize the empirical hypothesis, we first provide a simple model about the relationship between income level/uncertainty and donations. Our model builds on the model of Auriol et al. (2020) that studies how the risk of a negative expense shock, such as funeral costs, influences donations. Following their model, the kind of donations to non-local recipients that we study may have two motives. There is a non-insurance motive, in which donation generates direct utility, and also a spiritual insurance motive, in which donation reduces the perceived probability of the bad state. We consider background risk in income, which is two-sided, instead of the one-sided expense risk in their model.

The agent is endowed with uncertain income $\tilde{I}$. The income realization differs across the three states: $\bar{I}-D$ (bad state) and $\bar{I}+D$ (good state), each with probability p, as well as $\bar{I}$ (neutral state) with probability $1-2p$. Before knowing the realization of $\tilde{I}$, the agent decides to give g as a donation, which generates direct utility. The agent's utility function is $E(u(\tilde{I}-g))+\theta v(g)$. The utility function has standard properties: Both $u(\cdot)$ and $v(\cdot)$ are assumed to be increasing and strictly concave, and $u(\cdot)$ exhibits prudence, i.e. $u'''(\cdot)>0$, following the literature on consumption and insurance choices under risks (e.g. Kimball, 1990; Eeckhoudt and Schlesinger, 2013). Below, we consider the model relationship of optimal donation choice with income and income uncertainty, first in the model without a spiritual insurance motive, then in the model with such a motive. We compare predictions of the two models to clarify the testable implication of the spiritual insurance motive on donation behavior.[4]

If we do not consider the spiritual insurance motive, it is straightforward to see that the following lemma holds.

Lemma 1 *In the model without the spiritual insurance motive, optimal donation size g^* increases in expected income $\bar{I}$ and decreases in background risk D.*

Incorporating a spiritual insurance motive into our model significantly alters some predictions of Lemma 1, which we elaborate upon below. This motive is modeled as a form of motivated belief—namely, wishful thinking. The phenomenon of wishful thinking has received increasing attention from the literature. Recent studies show that this phenomenon leads to a higher expected utility for non-neoclassical agents and can also explain a range of behavioral biases (e.g. Bénabou and Tirole, 2016; Caplin and Leahy, 2019). Here we assume that the agent's

[4] Details of the proof are provided in Online Appendix A.1 and A.2. In Online Appendix A.3, we also provide an extended model that considers an insurable expense risk, on top of the background risk in income that is present in the baseline model. We use the extended model to derive results that motivate our analysis on the substitutability of spiritual insurance and market-based insurance, a further test on the spiritual insurance channel. All baseline model predictions are preserved in the extended model.

perceived probabilities of bad state and good states become $\bar{p} - \pi(g)$ and $\bar{p} + \pi(g)$, respectively, with an increasing and strictly concave function $\pi(g)$.[5] That means the agent believes that donating changes the income uncertainty she faces as a reward from the supernature for her good deeds.

With a spiritual insurance motive, the agent's optimization problem now becomes:

$$\max_g (1-2\bar{p})u(\bar{I}-g) + (\bar{p}-\pi(g))u(\bar{I}-g-D) + (\bar{p}+\pi(g))u(\bar{I}-g+D) + \theta v(g) \tag{1}$$

Solving the first-order conditions of the agent's optimization problem with a spiritual insurance motive and performing comparative static analysis, we obtain the following relationship between optimal donation and expected income:

$$\frac{\partial g^*}{\partial \bar{I}} > 0 \tag{2}$$

In other words, the effect of the income level $\bar{I}$ on donation is still positive when there is a spiritual insurance motive, same as when the spiritual insurance motive is not present.

However, the relationship between optimal donation and the size of income uncertainty could now be different, under certain conditions. Via another comparative static analysis of the first-order conditions with a spiritual insurance motive, we obtain that the relationship between optimal donation and the size of income uncertainty could be positive, i.e.:

$$\frac{\partial g^*}{\partial D} > 0 \tag{3}$$

if the following condition is satisfied:

$$\begin{aligned} &\pi'(g^*)\left[u'\left(\bar{I}-g^*+D\right)+u'\left(\bar{I}-g^*-D\right)\right] \\ &> \left(\bar{p}-\pi(g^*)\right)\left(-u''\left(\bar{I}-g^*-D\right)\right)+\left(\bar{p}+\pi(g^*)\right)u''\left(\bar{I}-g^*+D\right) \end{aligned} \tag{4}$$

The condition (4) required for $\frac{\partial g^*}{\partial D} > 0$ has clear economic interpretations. On the left-hand side, $\pi'(g^*)[u'(\bar{I}-g^*+D)+u'(\bar{I}-g^*-D)]$ represents the marginal benefit from the spiritual insurance channel for donating, when the size of background risk D increases by one, as the low-state marginal utility decreases and the high-state marginal utility increases. This term reflects that donation g alters the subjective state probabilities $\pi(g)$, which is the defining feature of the spiritual insurance motive. On the right-hand side, $(\bar{p}-\pi(g^*))(-u''(\bar{I}-g^*-D))+(\bar{p}+\pi(g^*))u''(\bar{I}-g^*+D)$ is the additional increase in the expected marginal utility of consumption when the size of background risk D rises by one, that the expected cost of foregone consumption is now higher.

[5] It is noteworthy to highlight the findings of Shafir and Tversky (1992), who observed that individuals do not necessarily believe they can influence the outcome of uncertainty when faced with uncertainty. Instead, they act in a manner as if they hold such beliefs. This behavioral pattern aligns with the probability weighting model proposed by Abdellaoui et al. (2011). Notably, though formulated differently, the probability transformations in Abdellaoui et al. (2011) result in identical behavioral implications as the subjective probabilities in our model. Therefore, our formulation could also be interpreted as reflecting subjective biases in probability assessments rather than a literal belief in manipulating probabilities.

This term represents the income effect of higher income uncertainty on donations, which tends to reduce the latter, and also exists in the model without spiritual insurance.

Comparing the two sides of condition (4), we see that if the spiritual insurance channel is strong enough to overcome the traditional income effect, then the model with the spiritual insurance motive will predict that when income uncertainty increases, optimal donations will rise, in direct contrast to the model without spiritual insurance. We summarize the above findings as Proposition 1 (full proof given in Online Appendix A.2).

Proposition 1 *In the model with a spiritual insurance motive, the optimal donation size g^* increases in expected income $\bar{I}$. If the spiritual insurance channel is strong enough, i.e., (4) holds, then the optimal donation size g^* rises in background risk D.*

Proposition 1 suggests that when donation significantly lowers the agent's perceived probability of the low state (as a reward from the supernature), i.e., $\pi'(\cdot)$ is significantly large, then the spiritual insurance channel is strong enough and holds, which will lead to a positive relationship between income uncertainty and donation. Condition (4) is easy to hold. In Online Appendix A.2 and Figure A1 we conduct a simulation exercise and find that (4) holds in 94.7% of a wide range of parameter combinations that we consider reasonable. Based on the findings of Lemma 1 and Proposition 1, we have the following remarks:

Remark 1 *Regardless of whether the donation is motivated by spiritual insurance, optimal donation increases with expected income, so it is not possible to infer the existence of a spiritual insurance motive from the relationship between income levels and donations.*

Remark 2 *When the spiritual insurance motive is sufficiently strong, the optimal donation is positively related to income uncertainty, exactly opposite to the prediction in the model absent the spiritual insurance motive.*

Hence, estimating the relationship of donations with income uncertainty provides a test that potentially distinguishes the spiritual insurance motive: A null or negative relationship between donations and income uncertainty would suggest that the spiritual insurance motive is nonexistent or weak. However, suppose donation is found to be positively related to income uncertainty, such evidence would support a strong spiritual insurance motive in donations.

The spiritual insurance explanation hinges on the (non-traditional) insurance function of the donation. In our data, we also observe insurance purchases in addition to donations. Therefore, we provide an extended model that introduces expense risks (in addition to income risks) and insurance purchases. We detail the setup and proofs of the extended model in (Online Appendix A.3).

The extended model motivates more tests of the spiritual insurance channel based on how donation and the purchase of market-based insurance interact with each other. The primary prediction when we compare the extended model with spiritual insurance to the extended model without spiritual insurance is summarized in Proposition 2 (Online Appendix A.3): If the spiritual insurance channel is strong enough—per a condition that resembles condition (4)—then

increasing donations, by diminishing the perceived risk of a low-income state, can decrease the purchase of insurance; vice versa, buying market-based insurance can reduce donations. Alternatively, if the spiritual insurance channel is weak or absent, the relationship between donations and the purchase of insurance is reversed.

Guided by the above discussion of the baseline and the extended model, we proceed to empirically examine the relationship of donations with income uncertainty, and the relationship between donations and insurance purchases.

3. Data

3.1 The Data

To study the relationship between income uncertainty, donations, and insurance purchases, we use a dataset on the income and spending of all employees at firms that use the same commercial bank (henceforth the "Bank") for direct deposits. The Bank is the largest commercial bank in a high-income economy in East Asia.

Our data consist of detailed transaction records and monthly balances for all types of accounts, including checking, savings, credit cards, stocks, mutual funds, insurance, mortgage, and consumer loans. The data also provide demographic information for each individual, including gender, marital status, age, education, occupation, number of dependents, and zip code.

We observe donations that these clients make as part of their credit card transactions. We view our transactional data on credit card donations and payroll income as providing a unique laboratory to study donation in the presence of income uncertainty naturally occurred on a large scale. Credit card is one of the two main ways people in our sample economy transact and donate (together with cash) because banks and large charitable organizations make it particularly easy to donate via credit cards. Recording donations via cash is infeasible, thus our findings may represent a more conservative estimate of the relationship between income uncertainty and donations.

Our database categorizes each donation into one of two types: religious donations and secular donations. This categorization is based on whether the recipient is a religious organization, as is the case for 57.7% of the donations. This economy, although anonymized for confidentiality reasons, is populated by religious groups that, in a shared way, suggest good deeds have a blessing effect in their official statements. The local Catholic church and the largest local Protestant church (evangelical, as are most local churches, with a minority presence of Pentecostals) emphasize "ask, and it will be given to you" (Matthew 7:7) and "from the fullness of his grace we have all received one blessing after another" (John 1:16) in their official statements, respectively. A great majority (92.8%) of the sample religious donations go to two large evangelical charities. The largest Buddhist group emphasizes in their official statement "believe in the Buddhas to receive protection and blessings and be removed from helplessness and fear". Three Buddhist foundations account for the remainder of the religious donations. Similar beliefs are also present in the local folk religions where people worship protective deities. The sample secular dona-

tions go to five foundations that do not display a religious affiliation. Notably, these charities, whether religious or secular, are large, broad-based entities focusing on philanthropic causes such as child poverty alleviation, humanitarian aid, and support for the disabled. These beneficiaries differ markedly from the profile of our dataset's constituents. Moreover, the recorded donations in our dataset do not include contributions to local religious organizations, typically made in cash, making it unlikely that the motive for our sample donations was mutual insurance at the community level.

The data from the Bank span two years, from July 2013 through June 2015. We perform the following sample cleaning procedure. First, to ensure accurate calculation of income uncertainty and credit card spending, we focus on full-time workers between the ages of 18 and 55 at firms using the Bank for direct deposits consecutively during our 24-month sample period, and who spend through the Bank's credit card.[6] Second, to exclude outliers with excessive income fluctuations, we remove all data for individuals whose monthly income in any month exceeded 1000% or fell below 10% of their income in the previous month. Following these criteria, our final sample consists of 74,023 individuals for whom we have records on payroll income, credit card spending, and insurance purchases.

3.2 Summary Statistics

In our empirical analysis examining the relationship between religious donations, insurance purchases, and income uncertainty, we aggregate transaction-level data to an individual-quarter level. This aggregation to the individual-quarter level helps address the low frequency of donations and insurance purchases in the sample. The aggregated dataset consists of 592,184 individual-quarter observations. Table 1 presents the summary statistics. The average and median monthly payroll incomes in the sample are 4,067 USD and 2,200 USD, respectively. This median income exceeds the official employed median income of 1,200 USD in this economy, indicating that our sample represents a group of higher-income employees with access to financial services. The distribution of payroll income is right-skewed, leading us to use the logarithm of payroll income and the corresponding uncertainty measures in our analysis. We define financial asset value as the client's end-of-month checking and savings account balances with the bank plus the value of mutual fund shares held through the bank. The average financial asset value is 13,600 USD. Regarding demographics, the average age of the clients is 36.5 years, with only 32% being married. The majority, over 60%, are white-collar workers, executives, or managers, and more than half hold at least a bachelor's degree. Overall, these statistics indicate that we have a large sample of relatively young and educated workers.

[Table 1 here]

The share of clients who donated during the sample period is 6.27%. Additionally, 2.09% of all sample individuals donated in more than one quarter. Observations with a non-zero donation amount constitute 1.46% of the sample at the individual-quarter level. Among those who

[6] To ensure workers are full-time, we include only individuals that earn at least the minimum wage (635 USD per month) each month. The age limit is set to 55, the minimum legal retirement age for the economy.

made donations in a given quarter, the average donation amount was 97.10 USD. This equates to approximately 0.80% of their average quarterly income, which we interpret as a non-negligible proportion that these clients spend on donations.[7]

Donations to religious organizations seem important in our sample. Of all observations with a non-zero donation amount at the individual quarter level, 61% made donations that went to religious organizations, with the conditional average amount of these religious donations being 94.39 USD. Conversely, 42% of these observations involved donations that went to secular organizations, with the conditional average amount of these secular donations being 94.40 USD. Additionally, within the same quarter, some clients in our sample contributed to both religious and secular organizations.

For the bank clients in our raw data, we observe the type and amount of each insurance product purchased. The products purchased are primarily critical illness insurance and life insurance, which make up approximately 90% of the observed insurance purchases. We exclude savings and investment insurance products, which account for the remaining 10% of the observed insurance purchases, as their primary purpose is not risk hedging. Nearly half of the bank clients in our sample (45.3%) purchased insurance during the period. Observations with insurance purchases constitute 13.4% of the total sample at the individual-quarter level. For those who purchased insurance in a given quarter, the average amount spent on market-based insurance products was 905.07 USD.

3.3 Measuring Individual-Level Income Uncertainty

In our study, the primary independent variable is income uncertainty. We specifically examine how this uncertainty, formed through individual experiences in the recent past, *predicts* donation behavior. To quantify income uncertainty at the individual level and to mitigate simultaneity bias in our predictive regression analysis, we use the volatility of realized income over a recent period as a proxy. This approach involves calculating income uncertainty for each individual-quarter observation as the standard deviation of log realized monthly payroll income from the previous four quarters, with the income measure residualized in a standard procedure described below.

Following the literature (Meghir and Pistaferri, 2004; Blundell, Pistaferri, and Preston, 2008; Jurado, Ludvigson, and Ng, 2015), fluctuations in income consist of two components: a predictable part and an unpredicted shock; for our measurement of income uncertainty, the predictable component should be excluded through a residualization procedure. This residualization process involves regressing log payroll income against observable characteristics and then removing the predictable component. To appropriately account for these components in our analysis, we adopt the following statistical model of income:

$$y_{im} = \alpha + \mathbf{Z}'_{im}\beta + \mu_m + \varepsilon_{im} \tag{5}$$

[7] For context, the United States contributes about 2.3% of its total GDP to charity (Giving USA, 2021).

In Equation (5), y_{im} refers to the logarithm of monthly payroll income of individual i in month m; $\mathbf{X}_{im}$ denotes the demographic characteristics, including the city of residence, age, age squared, and dummy variables for marital status, education level, occupation, and the number of dependents; μ_m denotes the time fixed effect. In our analysis, we focus on the residuals, $\hat{\varepsilon}_{im}$, from this model, as they represent the unpredicted component of income.

The income uncertainty measure for each individual-quarter observation, income uncertainty$_{i,t-1}$, is calculated as the standard deviation of all monthly payroll income residuals, $\hat{\varepsilon}_{im}$, within the recent period M_{t-1}. This is expressed as follows:

$$\text{income uncertainty}_{i,t-1} = sd_{m \in M_{t-1}} \left(\hat{\varepsilon}_{im} \right) \tag{6}$$

The recent period M_{t-1}, used for computing income uncertainty, comprises all months from the previous four quarters. This duration strikes a balance: it is long enough to capture sufficient variation for calculating income uncertainty, yet short enough to allow for an effective estimation of dynamic effects on donations. The magnitude of income uncertainty compare reasonably to the literature.[8] Our results remain robust across alternative durations of M_{t-1}, including shorter periods of three or two quarters.

Our approach to calculating income uncertainty, using data from the recent past, aligns with studies investigating the impact of firm-level uncertainty on individual consumption (Alfaro and Park, 2020; Di Maggio et al., 2022). These studies measure uncertainty through realized stock market volatility. Similarly, our method, which employs the standard deviation of unpredicted income realizations in the immediate past as a proxy for expected income uncertainty, is in line with the findings of Meghir and Pistaferri (2004). They demonstrated that volatility in unpredicted income realizations from the recent past significantly and positively predicts future income uncertainty. Indeed, as detailed later in Section 4.4, our dataset reflects this same pattern.

4. Empirical Results

We empirically examine the relationship between income uncertainty and donations and describe the results in this section. These results provide distinguishing information regarding the spiritual insurance channel. To shed more light on this channel, we further provide results on religious donations versus secular donations, the donation change after the downside-risk, as well as results on the substitutability of spiritual insurance with market-based insurance.

[8] Ganong et al. (2020) calculate that the standard deviation of transitory month-to-month labor income fluctuations is 0.36 in the Survey of Income and Program Participation and 0.30 in their transactional dataset from Chase Bank. We compute that the sample mean of income uncertainty$_{i,t-1}$ is 0.44, averaging across employees and time. This level of income uncertainty is slightly larger than those in Ganong et al. (2020) but on a similar order of magnitude. The source of this uncertainty in the unpredicted component of payroll income can include, for instance, unpredicted changes in bonuses, wage adjustments, and commissions. The sample standard deviation of income uncertainty$_{i,t-1}$ is 0.16, meaning that across persons and within-person across time, individuals may experience different level of income uncertainty. Notably, to pinpoint variations external to the employee in the empirical analysis, we use firm-level average income uncertainty at each point in time as an instrument for its individual-level counterpart, while simultaneously controlling for a set of fixed effects that include individual fixed effects to ensure we use within-person variations.

4.1 The Relationship between Uncertainty and Donations

In this subsection, we analyze the impact of individual-level income uncertainty on donation behavior. Our analysis is based on a predictive specification that utilizes within-person variations. The econometric model is specified as follows:

$$\text{donation}_{i,t+1} = \beta_1 \text{income uncertainty}_{i,t} + \boldsymbol{X}'_{i,t}\gamma + \mu_t + \lambda_i + \varepsilon_{i,t} \tag{7}$$

In Equation (7), the dependent variable, $\text{donation}_{i,t+1}$, represents the total donations made by individual i in quarter $t+1$. The key independent variable, $\text{income uncertainty}_{i,t}$, reflects the income uncertainty experienced by individual i recently before quarter $t+1$. The vector $\boldsymbol{X}_{i,t}$ encompasses the other independent variables and control variables such as the log level of payroll income, log financial wealth, age, age squared, educational attainment, occupational type, marital status, and the number of dependents. μ_t denotes the quarterly time fixed effect, while λ_i represents the individual fixed effect.[9] To account for potential within-individual correlation of regression residuals, we cluster standard errors at the individual level.

Our econometric specification is designed to address the issues inherent in cross-sectionally relating donations with income uncertainty, which can hinder causal interpretation. This econometric specification, centered on within-person variations, mitigates these issues in two key ways. First, by controlling for individual fixed effects, we eliminate the influence of time-invariant personal characteristics. Second, our reliance on backward-looking measures of income uncertainty to predict future donations helps to preclude the possibility of simultaneity bias or reverse causality. Consequently, our empirical strategy, leveraging within-person variations, enables us to estimate and interpret the predictive influence of income uncertainty on donation behavior at the individual level.

Columns (1)-(3) of Table 2 present the estimates of Equation (7). column (1) includes the baseline individual and quarter fixed effects; column (2) adds the other independent variables control variables; columns (3) further adds city-times-quarter fixed effects that controls for any city-specific trends in charitable giving. The income uncertainty coefficient estimate barely changes. For brevity, control coefficients are included in the online appendix (Appendix Table A.1). We observe that a one standard deviation increase in income uncertainty from the past four quarters leads to an average increase of 0.52 USD in donations in the subsequent quarter, a result that is statistically significant at the 1% level.[10] While the absolute dollar amount may seem modest, it represents a substantial increase of 37% relative to the sample's mean quarterly donations, indicating an economically significant effect.

[Table 2 here]

[9] Note: Age is fully absorbed as a linear combination of individual and time fixed effects in this specification. However, there is variation over time in educational attainment, occupation types, marital status, and the number of dependents, so these variables are not fully absorbed.

[10] To ensure our results are not influenced by the specifics of our model specification, we conducted a series of robustness checks. The consistency of our findings is confirmed by using alternative durations for M_{t-1}, calculating income uncertainty with unpredicted monthly income fluctuations $\hat{\varepsilon}_{im}$ over shorter periods of three or two quarters (see Panels A and B of Appendix Table A.2). Moreover, results remain consistent when aggregating donation transactions to the individual-month level, as detailed in Panel C of Appendix Table A.2. While these alternative specifications lead to different numbers of observations, the point estimates remain consistent across the various sets of results.

The residual payroll income fluctuations that we use to measure income uncertainty arise because of reasons that include unpredicted changes in bonuses, wage adjustments, and commissions. Our estimation took advantage of the fact that the volatility of these fluctuations are observed to change within-individual over time in the dataset. The resulting estimates essentially capture the contrasts in donation behaviors predicted by periods of high versus low experienced income uncertainty for the same individual.

However, the interpretation of estimates from Equation (7) might be subject to two potential complications. Firstly, the income uncertainty variable could be prone to measurement errors. Secondly, it may encompass both external income risk factors and labor supply choices of the employee. To address these issues, we use firm-level average income uncertainty at any point in time as an instrument for individual-level income uncertainty. We focus on individuals continuously employed at firms with 10 or more employees to ensure that the instrument is meaningful. Notably, as before, the inclusion of individual fixed effects make sure that we do not simply pick up cross-sectional variations, for instance the possibility that religious people may work in firms that are fundamentally different in risk levels. Consequently, our instrument targets variations in income uncertainty attributable to firm-level changes external to the employee, a feature that supports the plausibility of the exclusion restriction.

The instrumental variable estimates, shown in columns (4)-(6) of Table 2, reinforce the positive predictive effect of income uncertainty on donations. The first-stage regression coefficient, which links individual-level income uncertainty to firm-level average income uncertainty, is 0.56. For brevity, this coefficient is not included in Table 2. The instrument's relevance is substantiated by the first-stage F statistics, which exceed 400, far surpassing conventional benchmarks. According to the IV estimate, a one standard deviation increase in income uncertainty over the previous four quarters predicts an average donation increase in the following quarter by 2.02 USD, a finding that is statistically significant at the 1% level.

The consistently observed positive effect of income uncertainty on donations aligns with the prediction of Proposition 1, under the assumption of a strong spiritual insurance motive. This finding contrasts with the predictions outlined in Lemma 1, where a weak or absent spiritual insurance motive is considered. While our model is intentionally simple, our model only assumes the demand for donation to follow that for a normal good absent spiritual insurance. Under this assumption, a risk-averse and prudent individual would reduce donations with increasing income uncertainty, as suggested by Kimball (1990), if the spiritual insurance motive is weak or absent.

Through the lens of our model, a strong spiritual insurance channel gives rise to a positive relationship between income uncertainty and donations. Theoretically, such a positive relationship could also arise in the absence of a spiritual insurance motive if our model assumptions are not true. For instance, it could be because individuals are not prudent, so that higher income uncertainty increases spending in general and in donations. However, this idea contradicts empirical findings by Carroll and Samwick (1998) and Bayer et al. (2019), among others. Or second, individuals view donations as inferior goods, so that higher income uncertainty could

also increase donations through a reversed income effect. Yet, this hypothesis is at odds with the findings of Auten, Sieg, and Clotfelter (2002) and the comprehensive review by Andreoni and Payne (2013), which discusses various channels of donations—self-interest (e.g. tax-incentive) and social preferences (e.g. altruism, warm-glow, social image, peer pressure)—and the canonical model settings of the literature on the behavioral channels just mentioned.

As we discussed in Remark 1, we do not expect the coefficient on log income level to shed light on whether a spiritual insurance motive exists. Nevertheless, our findings reveal a positive, albeit weak, relationship between income level and donations. As shown in Table 2, the coefficient on log income level is insignificantly positive, at 0.02 (and 0.11 in the IV regression), with standard errors of 0.06 (and 0.07 in the IV regression).[11] The positive sign of the coefficient on log income level is consistent with the model's prediction. The size of the coefficient on log income level is an order of magnitude smaller than the size of the coefficient on income uncertainty.

We summarize our first main empirical finding regarding the predictive relationship between income uncertainty and donations as follows:

Finding 1 *Higher income uncertainty positively predicts more donations, consistent with the prediction of the model with a strong spiritual insurance channel.*

4.2 Donation and Spiritual Insurance

While Finding 1 supports the influence of spiritual insurance on donation behavior, several questions remain. First, given spiritual insurance often represents a belief in "divine intervention", do donations to religious organizations exhibit stronger results compared to secular charities? Second, in light of the tendency of believers to seek blessings against adversity, is there a more pronounced effect of negative uncertainty? Third, if donation has a spiritual insurance function, do we observe people substitute between insurance purchases and donations? The dataset allows us to carry out more tests that provide informational content on these questions and on distinguishing predictions of the model with a spiritual insurance channel.

4.2.1 Religious and Secular Donation

Donating for Blessings: Religious and Secular Destinations

To explore whether religion plays a role in the result consistent with spiritual insurance that we estimated, we categorize the donations into religious and secular donations based on whether the recipient is a religious organization. We draw upon census data from our sample economy to contextualize the reasons behind religious donations. The census asks individuals whether they have made a religious donation and whether they have made a secular donation, with the donations categorized by the type of the recipient organization identically to our method on the

[11] One potential explanation for the modest coefficient size on log income level is that our income uncertainty measure, derived from historical data, might not perfectly capture income risk. This does not invalidate the interpretation of our estimated predictive effect because measurement error in income uncertainty tends to bias against finding a significant effect on donations. If this measurement error exists and is negatively correlated with income levels—as suggested by Guvenen, Ozkan, and Song (2014)—then a weak relationship between income levels and donations is expected under a strong spiritual insurance motive.

transactional dataset. The census then inquires each donor what is the primary reason for her religious (secular) donation out of five candidate reasons: supporting the organization's mission, giving back to the society, building up charitable deeds and seek blessings, being influenced by family, friends or colleagues, and being persuaded by fundraisers. As Figure 1 from this census data reveals, the most frequently stated reason for religious donations is to "build up charitable deeds and seek blessings" (56%), followed by "giving back to the society" (25%).

[Figure 1 here]

This observation on the most stated reason for religious donations serves possibly as the most direct anecdotal evidence of donors believing that giving to religious organizations may result in divine blessings. The prevalence of this belief in seeking blessings through religious donations resonates with a "pragmatic" approach to religion often observed, for instance in many Asian countries, where religious practices are closely tied to life's needs and circumstances (Phan, 2003). It's worth noting that elements of this practical approach are also found in segments of evangelicalism, a detail pertinent to our study due to the evangelical context of most churches and charities within our sample. Welch (2020) provides insights into the presence of pragmatism in some strands of American evangelicalism, highlighting that in these instances, practical considerations often shape religious behaviors and beliefs.

For secular donations, the pattern is reversed. The donors have a smaller proportion citing "build up charitable deeds and seek blessings" (22%, ranking second), following "giving back to the society" (58%). Interestingly, we note that "seeking blessings" is still a non-negligible reason for secular donations. One possible explanation is that secular donations could still represent good deeds believed to be rewarded supernaturally, a point also discussed in Auriol et al. (2020). Therefore, spiritual insurance is overall important as a purpose for donations. Nevertheless, religious donations have stated motives more tightly linked to the divines, and we may expect stronger spiritual insurance behavior,

Given these differing motivations, we hypothesize that the spiritual insurance effect is likely to be more evident in religious donations, though it may also manifest in secular donations. To test this hypothesis, we re-estimate Equation (7) separately for each donation type. The findings, as shown in columns (1)-(2) of Table 3, follow the same specification as column (3) of Table 2 but differentiate between religious and secular donations as separate dependent variables.

[Table 3 here]

The results indicate that income uncertainty positively affects both types of donations, with a more substantial impact on religious donations. Specifically, a one standard deviation increase in income uncertainty leads to a 0.32 USD increase in religious donations, compared to a 0.21 USD increase in secular donations. This difference in coefficients is statistically significant (p-value of 2.6%).[12] The magnitude of the effect on religious donations is 54% greater than that on secular donations, suggesting a meaningful economic distinction.

[12] We report that this statistically significant difference between religious and secular donations is robust to addressing multiple hypothesis testing following Romano and Wolf (2005). We detail the robustness exercise in Online Appendix A.5.

This pattern is also observed in the IV estimates (columns (5) and (6) of Table 3), where the impact on religious donations is 89% larger, though with a less pronounced statistical difference between the two types. The stronger effect in religious donations corroborates the high proportion of donations made with the motivation of "seeking blessings," as indicated in Figure 1.

Downside Income Shock as a Negative Shock

American philosopher William James, one of the most influential architects of modern psychology, put forward a utilitarian view that religion improves well-being by providing relief from "evils" in the world (James, 1902). The existing research in religious studies and psychology on the buffering role of religion has also primarily focused on the negative events in life (see, e.g. Maton, 1989 that studies child loss; Pargament et al., 2004 for diseases; Clark and Lelkes, 2005, and Rainville, 2018 for unemployment, as well as studies reviewed in Pargament, 2011, which follow this theme). Does the predictive relationship we find mainly exist for risk on the negative side?

To better understand this potential distinction, we decompose the income uncertainty measure into positive and negative income uncertainty. We employ the semi-deviation method, a widely used approach for measuring downside risk (Barndorff-Nielsen, Kinnebrock, and Shephard, 2010; Segal, Shaliastovich, and Yaron, 2015).[13] We then estimate the predictive effects of positive and negative income uncertainty on religious and secular donations.

The estimation results are shown in columns (3) and (4) of Table 3. We find that negative income uncertainty significantly predicts increases in both religious and secular donations, but positive income uncertainty also positively predicts these donation types. The observation that positive income uncertainty also significantly affects donations suggests that individuals may seek blessings for favorable outcomes in situations of positive uncertainty as well, an aspect that has been less emphasized in existing research. Negative income uncertainty exhibits larger point estimates compared to positive income uncertainty. Specifically, a one standard deviation increase in negative (positive) income uncertainty leads to an increase of 0.19 (0.13) USD in religious donations and 0.14 (0.07) USD in secular donations in the following quarter.

In columns (7) and (8) of Table 3, we present IV estimates that employ firm-level average positive and negative income uncertainty as instruments for their individual-level counterparts. These estimates further validate the observed pattern, showing larger point estimates for negative income uncertainty, although with reduced statistical significance for both positive and negative income uncertainty. It is noteworthy that in these IV estimates, the only predictive effect statistically significant at the 10% level is the effect of negative income uncertainty on religious

[13] Specifically, positive and negative income uncertainties are determined based on whether an individual's demeaned residual income in a given month is above or below zero. This is calculated as follows:

$$\text{positive uncertainty}_{i,\{t-1,\ldots,t-T\}} = \sqrt{\frac{1}{T}\sum_{s=t-T}^{t-1} \mathbb{I}\{\Delta\hat{\varepsilon}_{is} \geq 0\}\, \Delta\hat{\varepsilon}_{is}{}^2},$$

$$\text{negative uncertainty}_{i,\{t-1,\ldots,t-T\}} = \sqrt{\frac{1}{T}\sum_{s=t-T}^{t-1} \mathbb{I}\{\Delta\hat{\varepsilon}_{is} < 0\}\, \Delta\hat{\varepsilon}_{is}{}^2},$$

where $\Delta\hat{\varepsilon}_{is}$ represents the demeaned residual income for individual i in month s relative to the period average ($\Delta\hat{\varepsilon}_{is} \equiv \hat{\varepsilon}_{is} - \frac{\sum_{\tau=t-T}^{t-1}\hat{\varepsilon}_{i\tau}}{T}$) and $\mathbb{I}\{\Delta\hat{\varepsilon}_{it} \geq 0\}$ is an indicator function taking the value of 1 if $\Delta\hat{\varepsilon}_{it} \geq 0$, and 0 otherwise.

donations.

Health Shock as a Negative Shock

Besides income uncertainty, an important form of concrete adverse shock closely related to religious donation is disease. For instance, Yang (1967) stated that in an investigation in China that "96.6 percent of the 500 prayer slips in the temples were related to the healing of disease", and in another interview "[the priest] told the writer that some 80 percent of the worshipers who visited the temple prayed for the return of health." Also, in a meta-analysis on religion and health in the Lancet, Sloan, Bagiella, and Powell (1999) mentions that in a poll of 1000 US adults, "79% of the respondents believed that spiritual faith can help people recover from disease." Following the spirit, we investigate whether spiritual insurance also manifests in response to health shocks. Disease is a negative shock to a household's financial situation because it implies not only medical expenditures, but also a possible decline in future income due to health outcomes.

Absent a spiritual insurance motive, health shock should reduce donation if donation is a normal good, regardless of whether the motive is self-interest or social preferences; but spiritual insurance would predict the opposite, because households under health shock are in urgent need of blessings and healing. Thus, we investigate how health shock as a prominent negative shock affects people's donation behavior. We also view health shock as relatively exogenous, so its relationship with donation serves as an additional and cleaner test of the spiritual insurance motive.

We define a health shock as incurring medical expenditures in the past quarter that are above the positive median of the sample.[14] The regression model is specified as follows:

$$\text{donation}_{i,t+1} = \beta_1 \text{health shock}_{i,t} + \boldsymbol{X}'_{i,t}\gamma + \mu_t + \lambda_i + \varepsilon_{i,t} \tag{8}$$

In this model, $\text{health shock}_{i,t}$ is operationalized either as a dummy variable indicating the occurrence of at least one health shock in the past quarter or, for robustness, as the standardized amount of above-median medical expenditures during that period. The other variables in the equation are defined consistently with Equation (7).

[Table 4 here]

Table 4 shows the health shock results. Columns (1) and (4) show the estimation results on total donations. We find that health shock under both measures positively predicts total donations over the next quarter. Specifically, the coefficient in column (1) suggests that experiencing at least one health shock in the past quarter leads to an increase of 2.08 USD in donations in the subsequent quarter, which is equivalent to 146% of the sample mean. Similarly, results in column (4) indicate that a standard deviation increase in health shock spending in the past quarter predicts a 0.44 USD increase in donations, amounting to 31% of the sample mean.

The remaining columns of Table 4 detail the predictive effects of health shocks on religious and secular donations separately. Here, we note more distinguished differences between these

[14] We exclude transactions related to cosmetic surgery to ensure that these expenditures indeed represent negative shocks. For robustness, we also vary the window of health shock to the past two quarters or adjust the window of future donations to one month. Our findings remain consistent across these different specifications.

two donation types. According to the results in columns (2) and (3), the occurrence of at least one health shock in the past quarter leads to a substantial increase in religious donations – specifically, 1.98 USD in the following quarter, amounting to 236% of the average quarterly religious donations. In contrast, the influence of health shocks on secular donations is both statistically and economically minimal, with a mere 0.11 USD increase (p-value of 0.377).

Hence, the increase in donations following the occurrence of health shocks comes primarily from religious donations, with no apparent contribution from secular donations. These results tend to support the existence of a spiritual insurance channel, and suggest that the spiritual insurance motive related to health shocks is also stronger in religious donations.

Putting together the positive relationships between income uncertainty/health shock and donations, they substantiate the idea that donations, especially religious donations, can be motivated by spiritual insurance. This motivation poses a novel pattern of donations regarding when and under what economic circumstances people tend to donate. We summarize our second set of main findings as follows:

Finding 2 *The predictive effect of income uncertainty on donations is stronger for religious donations. Health shock, another prominent negative shock, also predicts more religious donations.*

4.2.2 The Substitutability between Religiosity and Insurance

The extended model's prediction in Section 2 further motivates our study to examine the relationship between donations and insurance. If a spiritual insurance motive indeed underlies donations and is strong enough, Proposition 2 says we should observe a pattern of substitutability between spiritual insurance and market-based insurance, within the same period.

To test this prediction, we ask whether individuals reduce insurance purchases in periods when they make donations. Further, we examine whether this relationship is more pronounced for religious donations. To assess this potential substitutability, our empirical specification is designed as follows:

$$\begin{aligned}\text{insurance}_{i,t+1} =& a_1 \cdot \mathbb{I}\{\text{donation}_{i,t+1} > 0\} + a_2 \cdot \text{income uncertainty}_{i,t} \\ &+ \boldsymbol{X}'_{i,t}\gamma + \mu_t + \lambda_i + \varepsilon_{i,t}\end{aligned} \tag{9}$$

where $\text{insurance}_{i,t+1}$ is the amount of insurance individual i purchased in quarter $t+1$, and $\mathbb{I}(\text{donation}_{i,t+1} > 0)$ is a indicator variable that takes the value of 1 when individual i is observed to donate least once in the same quarter. The indicator variable approach helps reduce noise and means that we focus on the extensive margin of donations. To reflect that income uncertainty influences both insurance purchases (Guiso and Jappelli, 1998) and donations, we include the ex-ante predictor variable $\text{income uncertainty}_{i,t}$ as a control variable. Other variables are defined as before, meaning that we still focus on within-person variations.

Notably, because we control for individual fixed effects, the coefficient of interest, a_1, measures the within-person difference in insurance purchases between observations in which the individual donates and those in which she does not donate. The inclusion of individual fixed

effects helps control for unobserved, time-invariant individual characteristics that might influence both donation and insurance behaviors. We interpret this difference, as captured by a_1, to determine whether donations and insurance purchases are complementary or substitutable within the same quarter $t+1$.

We estimate Equation (9) three times, for donations to any charity, for donations to religious charities, and for donations to secular charities, respectively, to assess the degrees of insurance substitutability for different types of donations. These estimation results of Equation (9) are presented in columns (1) to (3) of Table 5. As a pre-test, the ex-ante predictor variable income uncertainty recently experienced—as a control variable here—consistently positively predicts insurance purchases, sharing a similar pattern to donations. This positive effect of income uncertainty on insurance purchases aligns with expectations from risk-averse behavior with positive prudence and corroborates findings in the background risk literature, such as Guiso and Jappelli (1998)).

Turning to the insurance substitutability test of the spiritual insurance motive, column (1) of Table 5 shows a negative estimate of a_1, indicating a subtitutable relationship on average between charitable donations and insurance purchases. Specifically, we observe that when an individual donates at least once in a given quarter, her average insurance purchases decrease by 80.4 USD. This reduction, amounting to approximately two-thirds of the unconditional sample mean, is statistically significant at the 1% confidence level. This negative estimate of a_1 aligns with the prediction of Proposition 2 under a strong spiritual insurance motive.

Interestingly, and similar to our health shock findings, a significant substitutable relationship is observed only with religious donations. The estimate of a_1 in column (2) indicates a 98.67 USD reduction in insurance purchases when individual i is observed to donate to a religious charity, approximately four fifths of the average insurance purchase. On the other hand, as shown in column (3), the reduction in insurance purchases exhibited when individual i is observed to make a secular donation has a smaller coefficient value compared to that for religious donations, and is statistically insignificant.

[Table 5 here]

We are also interested in how donation potentially interferes with the nexus between income uncertainty and insurance purchases. We, therefore, propose the following specification:

$$\begin{aligned}\text{insurance}_{i,t+1} =& a_1 \mathbb{I}\{\text{donation}_{i,t+1} > 0\} + a_2 \cdot \cdot \text{income uncertainty}_{i,t} \\ &+ a_3 \cdot \mathbb{I}\{\text{donation}_{i,t+1} > 0\} \cdot \text{income uncertainty}_{i,t} \\ &+ \boldsymbol{X}'_{i,t}\gamma + \mu_t + \lambda_i + \varepsilon_{i,t}\end{aligned} \tag{10}$$

The coefficient of interest is a_3, on the interaction term of the donation indicator in quarter $t+1$ and income uncertainty experienced just before the quarter. It reflects whether and by how much the sensitivity of insurance purchases to income uncertainty is changed when individual i is observed to donate at least once, compared to when individual i is not observed to donate. All other variables are defined as before.

The estimation results of Equation (10) are presented in columns (4) to (6) of Table 5, for different donation destinations. These results reflect that donations, especially religious donations, is observed with changes in the insurance-uncertainty sensitivity. The results presented in column (4) indicates that when individuals are observed to donate at least once, insurance purchases in the same quarter are no longer predicted by income uncertainty. The point estimates suggest that while a one standard deviation increase in income uncertainty experienced recently predicts a statistically significant 88.09 USD increase in insurance purchases when an individual is not observed to donate, the same increase in income uncertainty predicts a statistically and economically insignificant reduction of 9.59 USD in insurance purchases when the individual donates.

The results presented in columns (5) and (6) of Table 5 further indicate that a significant change in the sensitivity of insurance purchases to income uncertainty is only observed when individual i is observed to make a religious donations. The corresponding change in this sensitivity of insurance purchases to income uncertainty when the individual makes a secular donation has a smaller coefficient value compared to that for religious donations, and is statistically insignificant.

One other possibility that could account for the patterns in Table 5 is the presence of financial constraints. Does the substitutability pattern still exist for individuals who are unlikely to be financially-constrained? We note that the different effects between religious donation and secular donation can already exclude such an alternative. But we nonetheless carry out more analysis by keeping only observations of individuals who are unlikely to be financially-constrained. We define the inclusion criterion conservatively as individuals whose monthly income consistently exceeds their total expenditures, including consumption and the higher of their actual maximum monthly expenditure or the sample positive average monthly expenditures on insurance and donations. This conservative criterion ensures that our analysis includes only those who have sufficient financial flexibility. Examining only these individuals unlikely to be financially-constrained, we find very similar results (see Online Appendix Table A.6). This consistency across different financial contexts strengthens our conclusion that the observed relationship between donations, particularly religious donations, and insurance purchases is not merely a byproduct of financial constraints.

Further, to ensure that the substitutability result is not due to statistical chance or false positives, we conduct a placebo test, replacing the indicator variable representing donation with a indicator variable representing high consumption spending, with several specifications differing in the threshold of defining the high consumption spending indicators. Reassuringly, we find no negative relationships between these placebo high-spending indicators and insurance purchases (see Online Appendix Table A.7).

Overall, the observed substitutability between donations and insurance purchases, notably more pronounced with religious donations, provides additional evidence consistent with the spiritual insurance channel. We summarize these findings as follows:

Finding 3 *Conditional on donating, especially conditional on donating to religious charities, peo-*

ple (a) buy less insurance, and (b) their insurance spending is no longer related to income uncertainty, even for individuals unlikely to be financially-constrained.

4.3 Examining Alternative Explanations

We have discussed early on that Finding 1, the positive predictive effect of income uncertainty on donations, is hard to explain with existing donation theories. Now that we have reported more of our empirical findings (Findings 2 and 3), we further examine whether they distinguish spiritual insurance and alternative explanations.

Mutual Insurance

One alternative explanation of the positive relationship between income uncertainty and donation is that religious donations serve as a form of informal insurance. By donating, individuals strengthen their ties within a community (e.g., a church) that reciprocally provides support during adverse future shocks. Indeed, this mutual insurance phenomenon is also supported by empirical evidence in the existing literature. For example, Dehejia, DeLeire, and Luttmer (2007) find that households who donate to a religious organization are better able to insure their consumption. In our data, the mutual insurance channel is naturally excluded, since the donations we observe are directed to broad-based charities, aiding unfamiliar people in various disadvantaged groups across and outside the economy, individuals who do not directly overlap with the donors' social groups. Thus, there is unlikely an effect on mutual help in the community.

We nonetheless try to address the potential of mutual insurance as much as possible by replicating the specification of Dehejia, DeLeire, and Luttmer (2007) with our data. We find that the religious donations observed in our dataset, i.e., credit card donations to large non-local religious organizations, do not seem to improve the degree of consumption insurance (the pass-through of income growth to consumption growth), aligning with the setting. Results are reported in Online Appendix Table A.8. The patterns we find indicate that neither religious nor secular donations to broad-based charities reduce the passthrough of income changes to consumption, thus they suggest donations as spiritual insurance in our context do not work through informal consumption insurance within the community.

Increased Altruism

Another alternative explanation is increased altruism: individuals' own experience of income uncertainty and adverse health shock increase the level of sympathy and hence altruism toward those who are in need. While there's no direct evidence linking these experiences to heightened altruism, the literature on social norms have suggested that disasters can lead to tighter norms in the sense of stronger similarity of normative opinions and less tolerance for non-conformism (Gelfand et al., 2011; Posch, 2021). Additionally, research indicate war experience may enhance prosocial behavior towards the in-group (local community) but not the out-group (distant peers) (Bauer et al., 2016), and individuals tend to behave more honestly in experiments under uncertain situations than deterministic situations (Chen and Zhong, 2021).

While our Finding 1 alone may appear compatible with the concept of increased altruism, if

this were the driving factor, we would expect similar effects in both religious and secular donations, but the distinct difference between the two after health shocks suggests an inconsistency. Instead, our Finding 2 resonates with Henrich et al. (2019), which found that war experience increase membership specifically in religious groups, as opposed to non-religious groups such as peace clubs or neighborhood associations. This suggest that spiritual insurance may be related to the pattern of increased altruism that simpler tests might find.

Further, this explanation also cannot predict the substitutability between religious donation and insurance purchase (our Finding 3). We illustrate this inability by discussing the prediction of the initial model without spiritual insurance but with an increased altruism motive (Appendix A.4). Indeed, when this motive is strong enough, optimal donations increases with the size of income uncertainty. However, this motive does not generate the substitutability between insurance purchase and donations. Intuitively, ex-ante donating more in anticipation of uncertainty reduces available economic resources ex-post, potentially increasing the need for insurance. This dynamic makes insurance purchase and donation complements, rather than substitutes, in the model solely influenced by the increased altruism motive.

Income Seasonality

Income uncertainty in our sample can arise from fluctuations in commissions, performance-based compensation, wage raises and wage cuts, as well as bonuses. To ensure our results are not driven by the seasonality of these income fluctuations, we have controlled for month of the year fixed effects in all our regressions.

Furthermore, we recognize that bonuses, customarily paid in a few months, constitute a particular seasonal component of income. While we view as plausible that individuals may do good deeds to sway blessings in a favorable bonus outcome, we also conducted an additional robustness check to ensure that our results are not purely driven by the seasonality of bonuses, detailed in Online Appendix Table A.9. Here, we stringently exclude payroll observations from traditional bonus months (January, February, July) in our computation of income uncertainty. The consistency of our findings, even after this exclusion, underscores their robustness, confirming that our results are not artifacts of income seasonality.

Tax Considerations

Online Appendix Table A.10 shows the predictive effect of income uncertainty on donations controlling for tax considerations, to address the potential that income uncertainty may be correlated with the price of giving. The donations in our dataset are eligible for tax exemption, making the price of giving effectively one minus the marginal tax rate. We do not directly observe the marginal tax rate of the individuals. To address this, we implemented two methods for imputing marginal tax rates:

1. Extrapolating based on monthly payroll income, multiplied by an annualization factor of twelve, to estimate annual income.

2. Utilizing ex-post annual income for observations with a complete calendar year in our dataset (i.e. all observations in 2014). For other observations (i.e. observations in 2013

and 2015)s, we extrapolated annual income by applying the whole sample seasonality adjustment factors on the available income data.

Our results remain consistent across both imputation methods for the price of giving. And, including these marginal tax rates as an additional control variable does not change our study's outcomes. This reinforces the robustness of our findings on the link between income uncertainty and donation behavior.

4.4 Discussion: Does Donation Reduce Future Income Uncertainty?

One interesting question to be answered post-hoc is whether donations, particularly religious ones, have a significant impact on future income uncertainty. This is possible if donations under spiritual insurance provides psychological comfort, thereby creating a 'self-fulfilling prophecy' effect. Anticipating a better future, individuals may experience less stress in dealing with uncertainty, potentially leading to improved work performance and lower income uncertainty. This possibility involves no supernatural force but can nonetheless achieve a similar result. To more directly explore this question, we test whether donations in the first year of our two-year sample predicts income uncertainty in the second year. The regression specification is follows:

$$\begin{aligned}\text{income uncertainty}_{i,year=2} = \rho_0 + \rho_1 \mathbb{I}\{\text{donation}_{i,year=1} > 0\} \\ + \rho_2 \text{income uncertainty}_{i,year=1} + \boldsymbol{X}_i'\gamma + \varepsilon_i\end{aligned} \tag{11}$$

where $\text{income uncertainty}_{i,year=2}$ denotes the income uncertainty measure for individual i in the second half of our 24-month sample ("second year"). The main regressor, $\mathbb{I}\{\text{donation}_{i,year=1} > 0\}$, is a dummy variable indicating whether individual i donated in the first half of the 24-month sample ("first year"). The coefficient of interest is ρ_1. We control for $\text{income uncertainty}_{i,year=1}$, i.e., the income uncertainty measure in the first year. The other control variables included in $\boldsymbol{X}_i$ are the same as in Equation (7), but are measured for the first year. ε_i is the error term. We estimate Equation (11) separately for donation to any charity, to religious charities, and to secular charities. We also consider an alternative main regressor using the donation amount in the first year. These estimation results are shown in Table 6.

[Table 6 here]

The results in Table 6 suggest that donation activities in the first year, whether in existence or amount, do not significantly predict income uncertainty in the second year. This holds true for both religious and secular donations.[15] On the other hand, income uncertainty experienced in the first year does significantly and positively forecast income uncertainty in the second year. This is consistent with Meghir and Pistaferri (2004), and provides confidence on our approach using an income uncertainty measure based on realized volatility.

[15] Given our observation that income uncertainty predicts donations, as delineated in Finding 1, yet donations do not forecast income uncertainty, we can infer a lack of reverse causality in this relationship in a "Granger" sense. This directional clarity adds further robustness to our findings, confirming that the effect of income uncertainty on donations is not reciprocally influenced by the impact of donations on income uncertainty.

Collectively, we do not find evidence that donation have a material effect on future income uncertainty, suggesting that the anticipated blessing associated with spiritual insurance are wishful in a material sense. Considering the observed reduction in insurance purchases following donations, especially under high income uncertainty, such spiritual insurance behaviors could inadvertently heighten risk exposure.

However, what we find does not rule out, and may even align with belief-based utility models (e.g., Caplin and Leahy, 2001; Brunnermeier and Parker, 2005; Eliaz and Spiegler, 2006; Kőszegi, 2010; Oster, Shoulson, and Dorsey, 2013; Ignacio, Emanuel, and Sevgi, 2023); and the models surveyed in Bénabou, 2015). They may align in the sense that donations, especially religious donations, may enhance psychological utility despite no significant effect on material well-being.

5. The Field Experiment on Spiritual Narratives

In an effort to directly probe the potency of spiritual narratives in guiding donation behaviors, and to build upon the findings from our primary tests suggesting spiritual insurance as a lens for interpreting donation behaviors, we analyze a unique field experiment done by one of the largest charitable crowdfunding platforms in Asia and globally (Platform X hereafter). Platform X, known for aiding low-income patients with serious illnesses, had supported over millions of patients by the end of 2023, with a user base of hundreds of millions and donations totaling more than billions of USD. These figures represent a significant portion (10%) of total charitable giving within its country.

Patients in need can initiate campaigns on Platform X by submitting verifiable medical and financial details. Upon approval, these campaigns become accessible to Platform X's user base. Each campaign features detailed information about the patient, their condition, and their financial needs, allowing potential donors to make informed decisions.

5.1 Experimental Design

The design of the experiment focused on assessing the influence of spiritual narratives on donation decisions. Platform X subtly altered the donation interface for users randomly assigned to the treatment group by adding a phrase under the "Donation" button: "do good deeds and receive blessings" in six local language characters (See Figure 2 for a translated illustration of the donation interface and the experiment treatment). This simple addition was designed to increase the salience of the spiritual insurance narrative. The control group experienced the standard donation interface without this message.

[Figure 2 here]

Running from July 28 to August 15, 2022, the experiment's randomization was at the user level, ensuring consistent treatment for individuals who encountered multiple campaigns. Out of over 30 million users involved in the entire experiment, we obtained summary results from

a random subsample of approximately 4.2 million users for detailed analysis.[16] This subsample comprised nearly equal numbers of participants in both the treatment and control groups.

5.2 Data Description and Balance Tests

The analysis includes two data sets: donor behavior and fundraiser characteristics. Donor data included donation behavior, age, location, the way they learned of each campaign, historical donation activities, anonymous donation history, and social distance within the donation network. Fundraiser data covered disease type, campaign details, target amount, patient age, patient gender, and insurance coverage. In combination, we observe the 4.2 million experiment subjects in our sample to visit the numerous campaigns on the platform approximately 7.5 million times.

Random assignment ensured comparability between groups, as confirmed by balance tests. The balance tests were carried out on 20 covariate dimensions including the age of the experiment subjects, the historical and recent donations behaviors of the experiment subjects, and the details of the campaigns visited by the experiment subjects (see Appendix Table A.12). Our sample revealed that most campaign patients were covered by basic health insurance but still faced significant financial burdens, particularly with cancer diagnoses. The average campaign target was approximately 42,000 USD. Patients on average wrote more than 848 characters in the campaign description and uploaded more than 7 photos to appeal others to donate. Donors, on average, had interacted with over 35 campaigns and donated in 4 campaigns prior to the experiment, with a total average donation of 18 USD. Donor activity, both historical and recent, suggested vitality within the platform community. The majority of participants received campaign links through timeline posts on social media (84%), and resided in a different city than that of the patient (68%).

5.3 Experiment Results and Discussions

Average Treatment Effects

Our primary interest in the field experiment was to assess the likelihood of donations being influenced by the spiritual insurance narrative, succinctly captured in the six-word phrase "do good deeds and receive blessings" placed below the donation button. The results, detailed in Figure 3, indicate a modest but significant increase in the likelihood of donating due to this treatment. In the control condition, the donation likelihood stood at 5.752%, while in the treated condition, it rose to 5.806%. This proportional increase in donation likelihood of 0.93% from the baseline, though relatively small, is noteworthy, especially when compared to similar experiments in the field. These effects are about a quarter of those found in Chan et al. (2023), whose experiment involved a more central modification of the donation screen, showing the donation information of the potential donor's friends and finding a deterring effect on donations. The treatment's impact is particularly significant considering that the only change on the donation

[16] We designed the data analysis plan and submitted it to Platform X, which conducted analysis within the platform. Data remains within Platform X's premises and is not extracted. We only obtained the results of the analysis as requested.

page was a small addition at the bottom, occupying merely 1/20th of the screen. Interestingly, we found no significant change in the donation amounts (the intensive margin), indicating that those nudged by the message did not alter their donation patterns in terms of amount.

[Figure 3 here]

Heterogeneous Treatment Effects: Regional Variations in Spiritual Narratives

Cultural variations (Guiso, Sapienza, and Zingales, 2006; Alesina and Giuliano, 2015) might influence the impact of our spiritual narrative treatment. In regions with greater exposure to narratives of fate determined by supernatural forces, larger treatment effects may be observed. To explore this, we utilized the Baidu search index—akin to Google trends (Shiller, 2017)—from Baidu, the largest search engine in the country where the experiment was conducted. This index measures the frequency of keyword searches in a given geographical area, adjusted for the base of all searches. We selected the prefectural city level, comparable to the Metropolitan Statistical Area (MSA), as our regional unit.

To gauge pre-exposure to spiritual narratives or superstitious beliefs, we concentrated on eight specific keywords that traditionally signify belief in fate being influenced by supernatural forces and have substantial web search volume.[17] We collected city-level standardized search activities for each keyword in 2022 and then conducted principal component analysis, keeping the first principal component. We then winsorize this first principal component at the 1% and 99% level and use its z-score. This component captures the dominant search behavior patterns related to spiritual narratives across the selected keywords.

If this first component of the spirituality-related Baidu search indices indeed captures spiritual narratives, and if spiritual insurance is a factor driving donations on Platform X *de-facto*, then we expect the component to significantly correlate with city-level donations. Column (1) of Table 7 reports the coefficient estimate of a univariate regression of average donations (calculated as city total donations on Platform X during the experiment period per million residents) across 290 prefectural cities on this first principal component. Column (2) adds control variables such as per-capita income, public expenditures, and coverage of public programs, similarly z-scored. Indeed, estimates of the coefficient on the component in both univariate and multi-variate regressions shows that this city-level measures of pre-exposure to spiritual narratives significantly and positively correlate with per-capita donations on Platform X.

[Table 7 here]

Then, we estimate the relationship between the first principal component of the spirituality-related Baidu search indices that measures pre-exposure to spiritual narratives, and treatment effects on donation likelihood in the field experiment. This is done by regressing the latter on the former at the city-level, with both winsorized at the 1% and 99% level and z-scored. Column (3) reports the univariate coefficient, and column (4) adds the same set of city-level controls.

[17] These keywords were "God of Wealth" (cái shén), "Feng Shui" (fēng shuǐ), "auspicious day of the zodiac" (huáng dào jí rì), "warding off evil spirits" (pì xié), "praying for good luck" (qí fú), "burning incense" (shāo xiāng), "karma" (yīn guǒ), and "I Ching/Book of Changes" (zhōu yì).

This analysis yielded a univariate (multivariate) coefficient of approximately 0.124 (0.174) for the spirituality-related index, achieving statistical significance at the 5% level (p-value=0.034 without controls and p-value=0.011 with controls). This finding suggests a significant positive correlation between a city's superstitious beliefs and its residents' responsiveness to our experimental treatment. Specifically, a one standard deviation increment in the principal component—reflecting increased superstition levels within a city—corresponds to a 0.124 (0.174) standard deviation elevation in the treatment effect. Figure 4 visually illustrates this relationship, suggesting that regions with stronger spiritual or superstitious beliefs may exhibit more pronounced reactions to the spiritual narrative introduced in the field experiment.

[Figure 4 here]

Collectively, the experimental insights from Platform X not only corroborate our initial findings from the archival data but also provide a tangible demonstration of how spiritual narratives influence donation behaviors. The alignment of results from both the archival data and the field experiment further strengthens the likelihood that the spiritual insurance channel is a significant driver of donation behaviors.

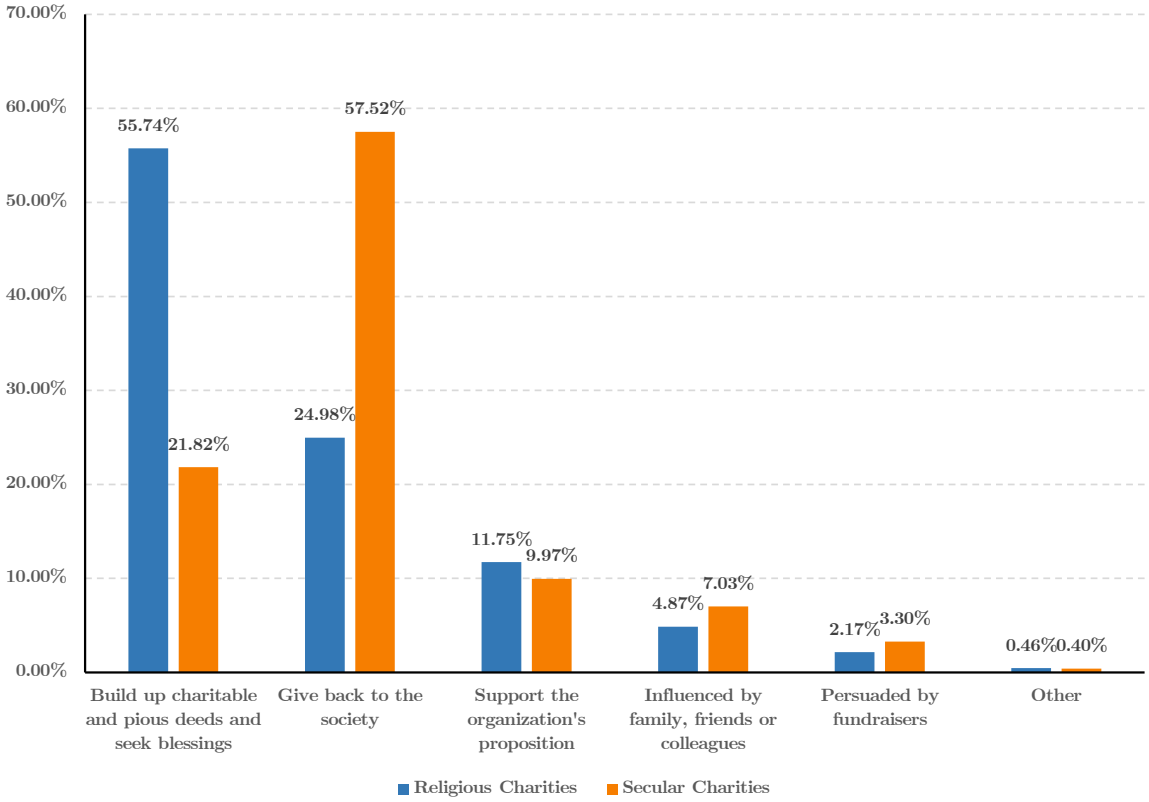
6. Conclusions

Using data from a leading commercial bank in a developed economy in Asia, we find that rising income uncertainty leads to rising donations, which is inconsistent with the known motivation for donations. This effect is stronger for religious donations, and health shock, another prominent negative shock, also predicts more religious donations. Furthermore, our findings suggest that the spiritual insurance role of donations is negatively related to the demand for market-based insurance among the individuals in the high-income economy that we analyze. A field experiment on spiritual narratives that adds a spiritual insurance phrase to the donation interface increases the likelihood of donation. These findings point to the explanation that religious donations serve as spiritual insurance to cope with income uncertainty and other adverse shocks in life. The belief underlying spiritual insurance proves to be a form of wishful thinking, because our data analysis suggests that donations do not reduce future income or consumption uncertainty.

Our results also speak to some puzzling patterns relating religious donations and the financial market. List (2011) finds that charitable giving is "sticky downwards" in the sense that it is much more sensitive to increases than decreases in the S&P500. List and Peysakhovich (2011) also show that although charitable donations are generally positively related to the S&P500 index, donations to religious organizations are nearly unaffected. One possible reason underlying these macro patterns is the spiritual insurance effect we observe in this paper. Taken as a whole, as transactional data on financial decisions and decisions in areas previously only loosely related to finance is becoming more and more accessible to researchers, our empirical results encourage more future research to use these newly-available data to investigate non-traditional factors in influencing financial decisions related to risk. We believe this route may open many new avenues

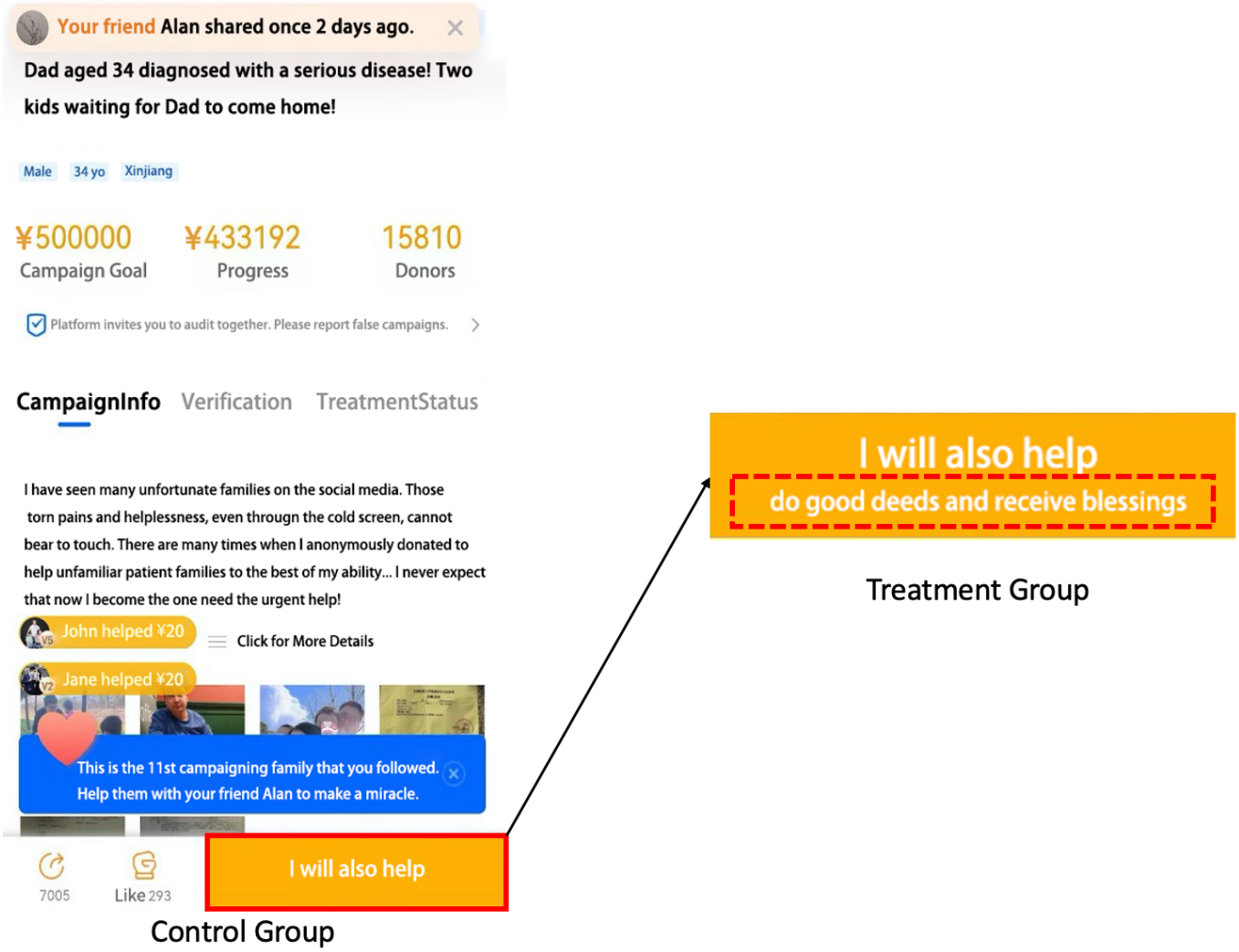
in understanding the drivers of financial decisions as well as decisions in other related spheres of economics.

Figure 1: Survey-stated Primary Reason for Donating to Nonprofit Organizations



Source: Census of the sample economy. This distribution of primary reasons is calculated out of a sample of a total of 2,630 donors who gave to religious organizations and a total of 2,488 donors who gave to secular organizations.

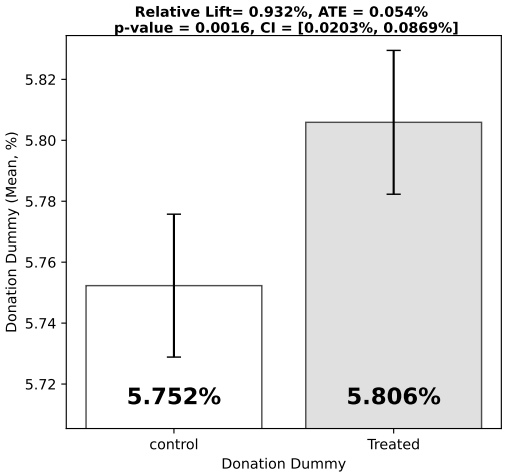
Figure 2: The Field Experiment on Spiritual Narratives:
Translated Illustration of Platform X and Experimental Design



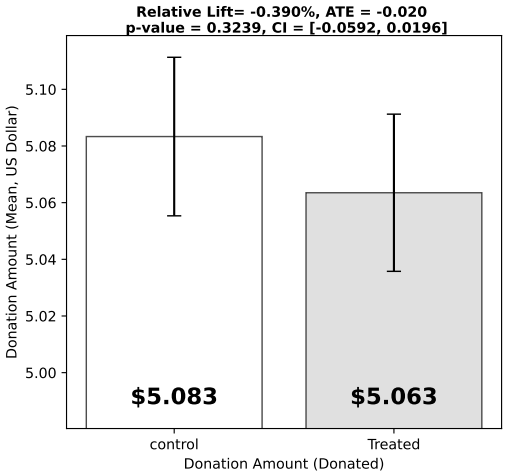
Note: This figure illustrates the platform design and the experiment treatment, both translated to English. Patients in need can initiate campaigns on Platform X by submitting verifiable medical and financial details. Upon verification and approval, these campaigns become accessible to X's potential donor base. Each campaign features detailed information about the patient, their condition, and their financial needs, allowing potential donors to make informed decisions. The design of the field experiment was focused on assessing the influence of spiritual narratives on donation decisions. The donation interface was subtly altered for potential donors randomly assigned to the treatment group by adding a phrase under the "Donation" button: "do good deeds and receive blessings" in six words. This simple addition was designed to increase the salience of the spiritual insurance narrative. The control group experienced the standard donation interface without this message. The experiment ran from July 28 to August 15, 2022, and the randomization was at the user level.

Figure 3: The Field Experiment: Average Treatment Effect

(a) Effect on Donation Likelihood

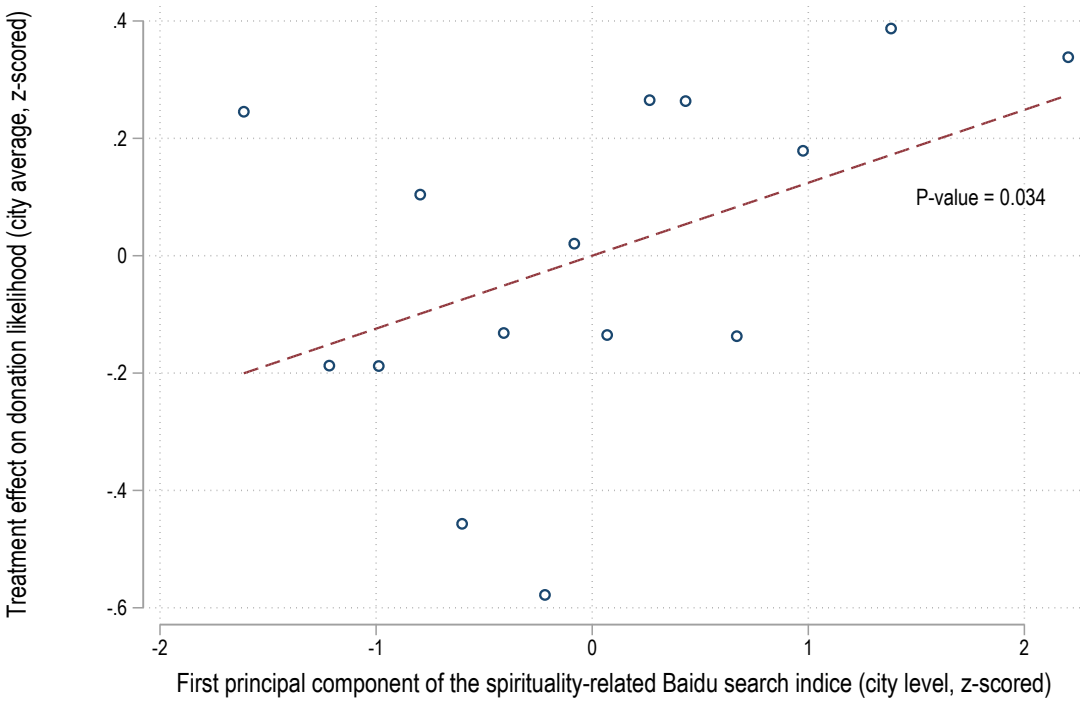


(b) Effect on Donation Amount (Donated)



Note: This figure illustrates the estimated average treatment effects in the field experiment on Platform X. For the treatment group of potential donors, a phrase ("do good deeds and get blessings") was added below the donation button in the campaign page on this online donation platform, while the page stays unchanged for the control group. The left and right panels show the average treatment effects on donation ratio and donation amount respectively. The right panel, "Donate Amount (Donated)", denotes the amount the user gave to the campaign if the user donated. Comparisons between the treated and control are described on the top of each panel, with relative change ratios, average treatment effects, and p-values and 95% confidence intervals for the average treatment effects. The error bars are 95% confidence intervals around the sample group averages.

Figure 4: The Field Experiment: The Relationship between Heterogeneous Treatment Effects and Regional Variations in Spirituality-related Search Activities



Note: The figure illustrates how the treatment effects in the field experiment is positively related at the city-level with web search activity of keywords that traditionally signify a belief in fate being influenced by supernatural forces and are associated with spiritual narratives. Both the dependent variable and the independent variable are z-scored. The dots are produced through a binscatter procedure. The linear fit line corresponds to the regression result in Table 7.

Table 1: Summary Statistics

Number of individuals							74,023
Number of quarters							8
Number of observations							592,184
Non-zero fraction of donation							1.46%
Non-zero fraction of religious donation							0.89%
Non-zero fraction of secure donation							0.61%
Non-zero fraction of insurance							13.44%
Non-zero fraction of health expenditure							6.54%
	Mean	Std. dev.	Min	25th pct.	Median	75th pct.	Max
Income	$4,067	$30,867	$635	$1,478	$2,200	$3,867	$11,349,309
Financial wealth	$13,600	$35,667	$0	$894	$3,500	$12,667	$3,540,548
Total donation	$97.10	$95.85	$0.03	$50.00	$80.00	$100.00	$3,033.33
Religious donation	$94.39	$102.60	$3.33	$50.00	$70.00	$100.00	$3,033.33
Secular donation	$94.40	$72.54	$0.03	$50.00	$83.33	$100.00	$1,200.00
Insurance	$905.07	$6,143.89	$1.97	$266.67	$433.33	$657.57	$963,227.20
Health expenditure	$72.56	$207.33	$0.07	$18.00	$33.33	$66.67	$18,400.00
Age	36.53	6.99	18	31	36	41	55
Gender	Female						
	0.46						
Marriage status	Married						
	0.32						
Education	Masters and above		Undergraduate			Vocational school	
	0.14		0.38			0.20	
	High school and below						
	0.29						
Job position	Public sector officers		Agricultural workers			Blue-collar workers	
	0.02		0.00			0.31	
	White-collar workers		Service-sector workers			Executives	
	0.52		0.04			0.08	
	Owner-managers		Others				
	0.01		0.02				
Dependents	No dependent		One dependent			Two dependents	
	0.87		0.05			0.07	
	Three or more						
	0.01						

Notes: This table presents the summary statistics for the sample at the individual-quarter level. Income is the average monthly payroll receipt during the quarter. Financial wealth is measured as the sum of the value of saving, bond, fund, stock net of debt, and loan. Donation includes donation to secular and religious charities. Insurance is spending on life insurance and health insurance. Health expenditure is defined as spending on medical care. The means, standard deviations, and quantiles of donation, health expenditure, and insurance are conditional on the corresponding variable is non-zero. All currency units are converted to USD at the exchange rate.

Table 2: Predicting Donations using Income Uncertainty

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable	All donations$_{t+1}$					
Specification	OLS	OLS	OLS	IV	IV	IV
Income uncertainty$_t$	0.53***	0.52***	0.52***	1.99***	2.06***	2.02***
	(0.06)	(0.06)	(0.06)	(0.73)	(0.76)	(0.78)
Income$_t$		0.01	0.02		0.11	0.11
		(0.06)	(0.06)		(0.07)	(0.07)
Observations	296,092	296,092	296,092	273,616	273,616	273,616
First-stage F-stat.				423.9	415.6	400.3
R^2-Adjusted	0.402	0.402	0.402			
Dep. var. mean	1.42	1.42	1.42	1.42	1.42	1.42
Control variables	NO	YES	YES	NO	YES	YES
Individual FE	YES	YES	YES	YES	YES	YES
Quarter FE	YES	YES	YES	YES	YES	YES
City $\times$ quarter FE	NO	NO	YES	NO	NO	YES

Notes: This table reports estimates of regressions predicting donation behavior using individual-level income uncertainty. The dependent variable is the amount of donations in the current quarter. The main independent variable of interest, income uncertainty, is the standard deviation of all observations of log monthly payroll income in the previous four quarters, after residualizing from the income measure the part that can be accounted for by demographic background variables and time fixed effects. Control variables include the current quarter's income (in logarithms), financial wealth (in logarithms), and demographic variables that include age (omitted due to multi-collinearity), age squared, educational attainment, occupational type, marital status, and the number of dependents. All currency units are converted to USD at the exchange rate. Columns (1)-(3) report the OLS estimates and columns (4)-(6) report the instrumental variable estimates, where individual-level income uncertainty is instrumented by the firm-level average of income uncertainty. Standard errors are clustered at the individual level and are reported beneath the estimated coefficient within parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively. Standardized coefficients are reported for continuous dependent variables. The full set of coefficients are reported in Online Appendix Table A.1.

Table 3: Predicting Donations using Income Uncertainty:

Religious Donations and Secular Donations; Positive versus Negative Uncertainty

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Religious	Secular	Religious	Secular	Religious	Secular	Religious	Secular
Dep. variable	donation$_{t+1}$	donation$_{t+1}$	donation$_{t+1}$	donation$_{t+1}$	donation$_{t+1}$	donation$_{t+1}$	donation$_{t+1}$	donation$_{t+1}$
Specification	OLS	OLS	OLS	OLS	IV	IV	IV	IV
Income	0.32***	0.21***			1.32**	0.70*		
uncertainty$_t$	(0.04)	(0.04)			(0.67)	(0.40)		
Positive			0.13***	0.07***			0.35	0.22
uncertainty$_t$			(0.02)	(0.03)			(0.31)	(0.20)
Negative			0.19***	0.14***			1.19*	0.34
uncertainty$_t$			(0.05)	(0.04)			(0.72)	(0.46)
Income$_t$	0.03	-0.05	0.03	-0.05	0.11**	-0.00	0.12*	-0.02
	(0.05)	(0.04)	(0.05)	(0.04)	(0.06)	(0.04)	(0.06)	(0.04)
Observations	296,092	296,092	296,092	296,092	273,616	273,616	273,616	273,616
First-stage F-stat.					400.3	400.3	170.5	170.5
R^2-Adjusted	0.368	0.444	0.368	0.444				
Dep. var. mean	0.84	0.58	0.84	0.58	0.84	0.58	0.84	0.58
Control variables	YES	YES	YES	YES	YES	YES	YES	YES
Individual FE	YES	YES	YES	YES	YES	YES	YES	YES
City $\times$ quarter FE	YES	YES	YES	YES	YES	YES	YES	YES

Notes: This table reports the estimates of regressions predicting religious and secular donation behavior using individual-level income uncertainty on the positive-side and the negative-side. The dependent variable in odd (even) columns is the amount of religious (secular) donation in the current quarter. For Columns (1)-(2) and (5)-(6), the main independent variable of interest, income uncertainty, is the standard deviation of all observations of log monthly payroll income in the previous four quarters, after residualizing from the income measure the part that can be accounted for by demographic background variables and time fixed effects. For Columns (3)-(4) and (7)-(8), the main independent variables of interest are square roots of the positive and negative income semi-variances (positive uncertainty and negative uncertainty). Control variables and fixed effects are the same as in Table 2. All currency units are converted to USD at the exchange rate. Columns (1)-(4) report the OLS estimates and columns (5)-(8) report the instrumental variable estimates, where individual-level (positive, negative) income uncertainty is instrumented by the firm-level average of (positive, negative) income uncertainty. Standard errors are clustered at the individual level and are reported beneath the estimated coefficient within parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively. Standardized coefficients are reported for continuous dependent variables. The full set of coefficients are reported in Online Appendix Table A.3.

Table 4: Predicting Donations using Health Shocks

	(1)	(2)	(3)	(4)	(5)	(6)
	All	Religious	Secular	All	Religious	Secular
Dependent variable	donations$_{t+1}$	donation$_{t+1}$	donation$_{t+1}$	donations$_{t+1}$	donation$_{t+1}$	donation$_{t+1}$
Occurrence of health shock$_t$	2.08***	1.98***	0.11			
(past quarter)	(0.23)	(0.20)	(0.12)			
Standardized amount of health shock$_t$				0.44***	0.42***	0.02
(past quarter)				(0.13)	(0.12)	(0.02)
Income$_t$	-0.05	0.01	-0.06	-0.05	0.01	-0.06
	(0.06)	(0.05)	(0.04)	(0.06)	(0.05)	(0.04)
Observations	296,092	296,092	296,092	296,092	296,092	296,092
R^2-Adjusted	0.402	0.369	0.443	0.402	0.369	0.443
Dep. var. mean	1.42	0.84	0.58	1.42	0.84	0.58
Control variables	YES	YES	YES	YES	YES	YES
Individual FE	YES	YES	YES	YES	YES	YES
City $\times$ quarter FE	YES	YES	YES	YES	YES	YES

Notes: This table reports the estimates of regressions predicting donation behavior using individual-level health shocks. The dependent variables are the amount of all (religious, secular) donation in the current quarter in respective columns. The main dependent variable of interest, health shock, is defined as the dummy of incurring medical expenditures in the past quarter that are above the median of the sample in Columns (1)-(3), and as the amount spent on medical expenditures in the past quarter that are above the median of the sample in Columns (4)-(6). Control variables and fixed effects are the same as in Table 2. All currency units are converted to USD at the exchange rate. Standard errors are clustered at the individual level and are reported beneath the estimated coefficient within parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively. Standardized coefficients are reported for continuous dependent variables. The full set of coefficients are reported in Online Appendix Table A.4.

Table 5: The Substitutability between Spirituality and Insurance

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable	Insurance Expenditures$_{t+1}$					
Donation dummy$_{t+1}$	-80.40***			7.06		
	(25.76)			(37.03)		
Religious donation dummy$_{t+1}$		-98.67***			14.82	
		(32.58)			(48.70)	
Secular donation dummy$_{t+1}$			-54.08			0.14
			(37.90)			(52.96)
Income uncertainty$_t$ ×				-97.68**		
Donation dummy$_{t+1}$				(42.77)		
Income uncertainty$_t$ ×					-125.25**	
Religious donation dummy$_{t+1}$					(58.79)	
Income uncertainty$_t$ ×						-60.19
Secular donation dummy$_{t+1}$						(52.98)
Income uncertainty$_t$	86.58***	86.47***	86.14***	88.09***	87.66***	86.52***
	(19.64)	(19.63)	(19.62)	(19.83)	(19.75)	(19.69)
Income$_t$	64.91***	64.97***	64.86***	64.68***	64.78***	64.80***
	(24.50)	(24.50)	(24.50)	(24.52)	(24.51)	(24.51)
Observations	296,092	296,092	296,092	296,092	296,092	296,092
R^2-Adjusted	0.215	0.215	0.215	0.215	0.215	0.215
Dep. var. mean	242.01	242.01	242.01	242.01	242.01	242.01
Control variables	YES	YES	YES	YES	YES	YES
Individual fixed effect	YES	YES	YES	YES	YES	YES
City × quarter fixed effect	YES	YES	YES	YES	YES	YES

Notes: This table reports estimates of regressions examining the substitutability between donations and insurance purchases. The dependent variable is the amount of insurance purchased in the current quarter. The main independent variables of interest include income uncertainty in the immediate past, donation occurrence in the current quarter (donation dummy), and interaction of income uncertainty and donation occurrence. Income uncertainty is the standard deviation of all observations of log monthly payroll income in the previous four quarters, after residualizing from the income measure the part that can be accounted for by demographic background variables and time fixed effects. The donation occurrence dummies equals one when at least one (religious, secular) donation is made in the current quarter. Control variables and fixed effects are the same as in Table 2. All currency units are converted to USD at the exchange rate. Standard errors are clustered at the individual level and are reported beneath the estimated coefficient within parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively. Standardized coefficients are reported for continuous dependent variables. The full set of coefficients are reported in Online Appendix Table A.5.

Table 6: "Self-fulfilling hypothesis"? Whether donations materially reduce future uncertainty

	(1)	(2)	(3)
Dependent variable	Income uncertainty$_{year=2}$		
Panel A: Donation dummy and future income uncertainty			
Donation dummy$_{year=1}$	0.04		
	(0.03)		
Religious donation dummy$_{year=1}$		0.04	
		(0.04)	
Secular donation dummy$_{year=1}$			0.06
			(0.04)
Income uncertainty$_{year=1}$	0.39***	0.39***	0.39***
	(0.00)	(0.00)	(0.00)
Income$_{year=1}$	0.33***	0.33***	0.33***
	(0.01)	(0.01)	(0.01)
Observations	74,023	74,023	74,023
R^2-Adjusted	0.351	0.351	0.351
Control variables	YES	YES	YES
Panel B: Donation amount and future income uncertainty			
Donation amount$_{year=1}$	0.00		
	(0.05)		
Religious donation amount$_{year=1}$		-0.01	
		(0.09)	
Secular donation amount$_{year=1}$			0.01
			(0.10)
Income uncertainty$_{year=1}$	0.39***	0.39***	0.39***
	(0.00)	(0.00)	(0.00)
Income$_{year=1}$	0.33***	0.33***	0.33***
	(0.01)	(0.01)	(0.01)
Observations	74,023	74,023	74,023
R^2-Adjusted	0.351	0.351	0.351
Control variables	YES	YES	YES

Notes: This table reports estimates of regressions examining the relation of future income uncertainty on current donation behavior. The dependent variable is individual income uncertainty measured as the standard deviation of monthly residualized income in the second year of the two-year sample. The main independent variables of interest are income uncertainty in the first year and the occurrence and amounts of (all-type, religious, secular) donation in the first year, in respective columns. Control variables include income in the first year (in logarithms), financial wealth in the first year (in logarithms), and demographic variables that include age, age squared, educational attainment, occupational type, marital status, and the number of dependents. All currency units are converted to USD at the exchange rate, the unit of donation is 1000 USD. Standard errors are clustered at the individual level and are reported beneath the estimated coefficient within parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively. The full set of coefficients are reported in Online Appendix Table A.11.

Table 7: The Field Experiment: The Relationship between Heterogeneous Treatment Effects and Regional Variations in Spirituality-related Search Activities

Dependent variables	(1) Per-capita donations (city-level)	(2) Per-capita donations (city-level)	(3) Treatment effect (city average)	(4) Treatment effect (city average)
First principal component of the	3363.303***	2488.144***	0.124**	0.174**
spirituality-related Baidu search indices	(573.835)	(822.926)	(0.058)	(0.068)
Per capita gross regional product		-1563.145		-0.094
		(1062.327)		(0.128)
Per capita retail sales		2524.516**		0.033
		(1027.773)		(0.108)
Per capita public expenditure		226.497		-0.070
		(1125.434)		(0.154)
Per capita public expenditure		-1219.129		0.112
(science and technology)		(812.559)		(0.095)
Per capita public expenditure		2024.067**		0.044
(education)		(941.841)		(0.170)
Coverage of urban employee basic		-678.432		0.029
pension		(709.608)		(0.112)
Coverage of urban employee public		-889.344		-0.074
health insurance		(863.603)		(0.152)
Coverage of urban employee		3006.966**		-0.037
unemployment insurance		(1233.060)		(0.138)
Constant	9698.963***	9698.963***	0.000	0.000
	(411.554)	(372.528)	(0.058)	(0.059)
Observations	290	290	290	290
R-squared	0.188	0.353	0.015	0.027

Note: This table reports the relationship between heterogeneous treatment effects in the field experiment and regional variations in spirituality-related search activities. For the treatment group of potential donors, a phrase (”do good deeds and get blessings”) was added below the donation button in the campaign page on this online donation platform, while the page stays unchanged for the control group. The prefectural-city level average treatment effects and the right-hand-side variables in all columns are z-scored. The prefectural-city level total donations on Platform X is normalized by population. Heteroskedasticity-consistent standard errors are reported beneath the estimated coefficient within parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively.

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Hedging by Giving: Spiritual Insurance and Religious Donations

Online Appendix

A. Proofs of Lemmas and Propositions

We provide proofs of the Lemmas and Propositions in the paper in this appendix section.

A.1 Optimal Donations without Spiritual Insurance Motive

In the model without a spiritual insurance channel, the objective function is:

$$\max_g (1-2p)u(\bar{I}-g)+pu(\bar{I}-g-D)+pu(\bar{I}-g+D)+\theta v(g) \tag{A.1}$$

The first order condition (FOC) is as follow:

$$-(1-2p)u'(\bar{I}-g)-pu'(\bar{I}-g-D)-pu'(\bar{I}-g+D)+\theta v'(g)=0 \tag{A.2}$$

The second order condition (SOC) is satisfied:

$$(1-2p)u''(\bar{I}-g)+pu''(\bar{I}-g-D)+pu''(\bar{I}-g+D)+\theta v''(g)<0 \tag{A.3}$$

To consider the comparative statics of optimal donations g^* with respect to expected income $\bar{I}$, rewrite g^* as $g^*(\bar{I},D)$, and denote $g^*_{\bar{I}}(\bar{I},D)=\frac{dg^*(\bar{I},D)}{d\bar{I}}$. Taking the derivative of the FOC with respect to $\bar{I}$ gives rise to the following relationship:

$$g^*_{\bar{I}}(\bar{I},D)=\frac{(1-2p)u''(\bar{I}-g)+pu''(\bar{I}-g-D)+pu''(\bar{I}-g+D)}{(1-2p)u''(\bar{I}-g)+pu''(\bar{I}-g-D)+pu''(\bar{I}-g+D)+\theta v''(g)}>0 \tag{A.4}$$

Both the numerator and the denominator are negative because the utility function u is concave. Therefore, the income effect on donations in the model without a spiritual insurance motive is positive.

Then consider the comparative statics of optimal donations g^* with respect to the size of the background risk D. Denote $g^*_D(\bar{I},D)=\frac{dg^*(\bar{I},D)}{dD}$, the derivative of the FOC with respect to D. We have the following relationship:

$$g^*_D(\bar{I},D)=\frac{pu''(\bar{I}-g+D)-pu''(\bar{I}-g-D)}{(1-2p)u''(\bar{I}-g)+pu''(\bar{I}-g-D)+pu''(\bar{I}-g+D)+\theta v''(g)}<0 \tag{A.5}$$

The denominator in (A.5) is inherited from the previous equation and is negative. The numerator in (A.5) is positive because $u''' > 0$. Therefore, the effect of the size of income uncertainty on donations in the model without a spiritual insurance motive is negative.

This ends the proof for Lemma 1, that is, in the model without a spiritual insurance motive, if expected income $\bar{I}$ rises, the optimal donation size g^* rises, and if the size of income uncertainty D rises, the optimal donation size g^* falls. In the model without a spiritual insurance motive, donation is a normal good, and shares the findings on uncertainty and consumption of normal goods in Kimball (1990).

A.2 Optimal Donations with Spiritual Insurance Motive

We next assume a spiritual insurance motive exists and derive testable implications. The objective function of the individual's optimal donation problem with a spiritual insurance motive is:

$$\max_g (1-2\bar{p})u(\bar{I}-g) + (\bar{p}-\pi(g))u(\bar{I}-g-D) + (\bar{p}+\pi(g))u(\bar{I}-g+D) + \theta v(g) \tag{A.6}$$

The FOC of the optimal donation problem is now as follows:

$$\begin{gathered}\pi'(g)[u(\bar{I}-g+D) - u(\bar{I}-g-D)] + \theta v'(g) = \\ (1-2\bar{p})u'(\bar{I}-g) + (\bar{p}-\pi(g))u'(\bar{I}-g-D) + (\bar{p}+\pi(g))u'(\bar{I}-g+D)\end{gathered} \tag{A.7}$$

On the left-hand side of (A.7), the term $\pi'(g)[u(\bar{I}-g+D) - u(\bar{I}-g-D)]$ specifically represents the (subjective) marginal benefit from spiritual insurance, and, as before, the next term $\theta v'(g)$ is the marginal benefit of donating not from spiritual insurance. The right-hand side of (A.7) is the expected marginal cost of donating g. The optimal decision balances the marginal benefits and the marginal costs of donation.

Consider an increase in the size of income uncertainty D in the above model with a spiritual insurance motive. First, the marginal benefit of donating from spiritual insurance increases because the scaling factor $u(\bar{I}-g+D) - u(\bar{I}-g-D)$ is higher. Second, the marginal cost of donating also increases through a canonical income effect, as in the model without spiritual insurance. Third, the spiritual insurance channel dampens this canonical income effect of D by shifting subjective belief from the bad state, where the income effect of D is malevolent, to the good state, where the income effect of D is benevolent. Combined, in the model with spiritual insurance, if the spiritual insurance motive is sufficiently strong——strong enough to counterbalance the opposing income effect——then the optimal donation g^* will increase in the size of income uncertainty D.

We formally establish the above statement in the proof below.

Proof of Proposition 1.

To initiate the proof, first examine the condition under which the second-order condition (SOC) of the optimal donation problem in the model with a spiritual insurance motive holds. Taking

the second derivative of the objective function, the SOC amounts to the following condition:

$$\begin{aligned}
&\pi''(g)(u(\bar{I}-g+D)-u(\bar{I}-g-D))+\theta v''(g)+(1-2\bar{p})u''(\bar{I}-g)+\\
&(\bar{p}-\pi(g))u''(\bar{I}-g-D)+(\bar{p}+\pi(g))u''(\bar{I}-g+D)-\\
&2\pi'(g)\left(u'(\bar{I}-g+D)-u'(\bar{I}-g-D)\right)<0
\end{aligned} \tag{A.8}$$

In Equation (A.8), all terms are negative except the final one. In an extreme scenario where this final term is dominant, the optimal donation amount would lead to what we term 'complete spiritual insurance'—effectively reducing the subjective probability of experiencing the low state to zero. This represents a corner solution in our model. However, when the subjective probability return function $\pi(\cdot)$ and/or utility function $u(\cdot)$ exhibit sufficient curvature, a different outcome emerges. This curvature ensures the satisfaction of the second-order condition, implying diminishing returns from the spiritual insurance benefits of donations. Under this more typical scenario, which we focus on henceforth, the subjective probability of the low-income state remains above zero post-donation, and the optimal donation problem adopts an interior solution.

Then, to analyze the comparative statics of optimal donation g^* with respect to expected income $\bar{I}$ and background risk D in the model with a spiritual insurance motive, we rewrite g^* as $g^*(\bar{I},D)$, and take derivative of the FOC with respect to $\bar{I}$ and D:

$$\begin{aligned}
&g_I^*(\bar{I},D)\left[\pi''(g)(u(\bar{I}-g+D)-u(\bar{I}-g-D))+\theta v''(g)+\right.\\
&(1-2\bar{p})u''(\bar{I}-g)+(\bar{p}-\pi(g))u''(\bar{I}-g-D)+\\
&\left.(\bar{p}+\pi(g))u''(\bar{I}-g+D)-2\pi'(g)\left(u'(\bar{I}-g+D)-u'(\bar{I}-g-D)\right)\right]\\
&=(1-2\bar{p})u''(\bar{I}-g)+(\bar{p}-\pi(g))u''(\bar{I}-g-D)+\\
&(\bar{p}+\pi(g))u''(\bar{I}-g+D)-\pi'(g)\left(u'(\bar{I}-g+D)-u'(\bar{I}-g-D)\right)
\end{aligned} \tag{A.9}$$

$$\begin{aligned}
&g_D^*(\bar{I},D)\left[\pi''(g)(u(\bar{I}-g+D)-u(\bar{I}-g-D))+\theta v''(g)+\right.\\
&(1-2\bar{p})u''(\bar{I}-g)+(\bar{p}-\pi(g))u''(\bar{I}-g-D)+\\
&\left.(\bar{p}+\pi(g))u''(\bar{I}-g+D)-2\pi'(g)\left(u'(\bar{I}-g+D)-u'(\bar{I}-g-D)\right)\right]\\
&=-\pi'(g)\left(u'(\bar{I}-g+D)+u'(\bar{I}-g-D)\right)+\\
&(\bar{p}+\pi(g))u''(\bar{I}-g+D)-(\bar{p}-\pi(g))u''(\bar{I}-g-D)
\end{aligned} \tag{A.10}$$

Notice that the terms in the brackets on the left side of both equations are exactly the terms in the SOC. Thus, the mathematical conditions for $g_I^*(\bar{I},D)>0$ and $g_D^*(\bar{I},D)>0$ are the conditions

below:

$$g_I^*(\bar{I},D)>0 \text{ if } (1-2\bar{p})u''(\bar{I}-g)+(\bar{p}-\pi(g))u''(\bar{I}-g-D)+ \\ (\bar{p}+\pi(g))u''(\bar{I}-g+D)-\pi'(g)\left(u'(\bar{I}-g+D)-u'(\bar{I}-g-D)\right)<0 \tag{A.11}$$

$$g_D^*(\bar{I},D)>0 \text{ if } \pi'(g)\left(u'(\bar{I}-g+D)+u'(\bar{I}-g-D)\right) \\ >(\bar{p}-\pi(g^*))\left(-u''\left(\bar{I}-g^*-D\right)\right)+(\bar{p}+\pi(g^*))u''\left(\bar{I}-g^*+D\right) \tag{A.12}$$

The condition (A.11) for $g_I^*(\bar{I},D)>0$ is similar to the technical requirement for the second-order condition (A.8), that is, that the spiritual insurance channel should not be so extreme that the corner case of complete spiritual insurance occurs and the conventional income effect does not exist.

More central is the condition (A.12) for $g_D^*(\bar{I},D)>0$, which has clear economic interpretations. On the left-hand side, $\pi'(g)(u'(\bar{I}-g+D)+u'(\bar{I}-g-D))$ is the additional benefit of donations through the spiritual insurance channel, when D increases by one, as the low-state marginal utility is now higher and the high-state marginal utility is now lower. On the right-hand side, $(\bar{p}-\pi(g^*))(-u''(\bar{I}-g^*-D))+(\bar{p}+\pi(g^*))u''(\bar{I}-g^*+D)$ is the additional increase in the expected marginal utility of foregone consumption with the increase in D, which is the income effect of higher income uncertainty that tends to reduce donations, and also exists in the model without spiritual insurance. If the left-hand side is greater than the right-hand side, that is, if the spiritual insurance channel is strong enough, the model with spiritual insurance predicts that

$$\frac{\partial g^*}{\partial D}>0,$$

that is, when the size of income uncertainty D increases, optimal donation g^* rises. This conclusion contrasts with the model where the spiritual insurance motive is not a consideration.

This ends the proof of Proposition 1.

The condition (A.12) that makes the spiritual insurance motive dominate is not difficult to reach. We use a numerical example to illustrate this. We choose the same functional forms as in Auriol et al. (2020). We use a constant absolute risk aversion (CARA) utility function, i.e., $u(c)=1-\exp\{-ac\}$. The magnitude to which the perceived probability of the bad state $\bar{p}-\pi(g)$ is reduced as an individual donates is specified as $\pi(g)=k\cdot\ln(g+1)$. The parameter k governs the relative ease with which the perceived probability is changed. We choose $\bar{I}=10$ following Auriol et al. (2020). We choose $D=4.27$ and $\bar{p}=0.39$ to match the average income uncertainty of $\log$ monthly income of 0.427 in the dataset. The value of g is chosen to match the ratio of the conditional average monthly donation size to average income ($\$46/\$4067$), which gives $g=0.11$. We then examine whether condition (4) in the paper, that is, condition (A.12) here, holds under different values of the coefficient of absolute risk aversion a and the parameter k.

We vary the utility exponent (a) from 0 to 1.0, corresponding to a relative risk aversion (RRA) range of 0 to 10 at a mean income of $\bar{I}=10$. Similarly, we adjust the subjective probability return coefficient k within a range that aligns the ratio of perceived probability reduction relative to the

objective probability ($\pi(g)/\bar{p}$), when the donation size (g) equals the sample average, to a span of 0 to 1.0.

Figure A.1: Numerical Example of Parameter Ranges that Satisfy Condition (4)

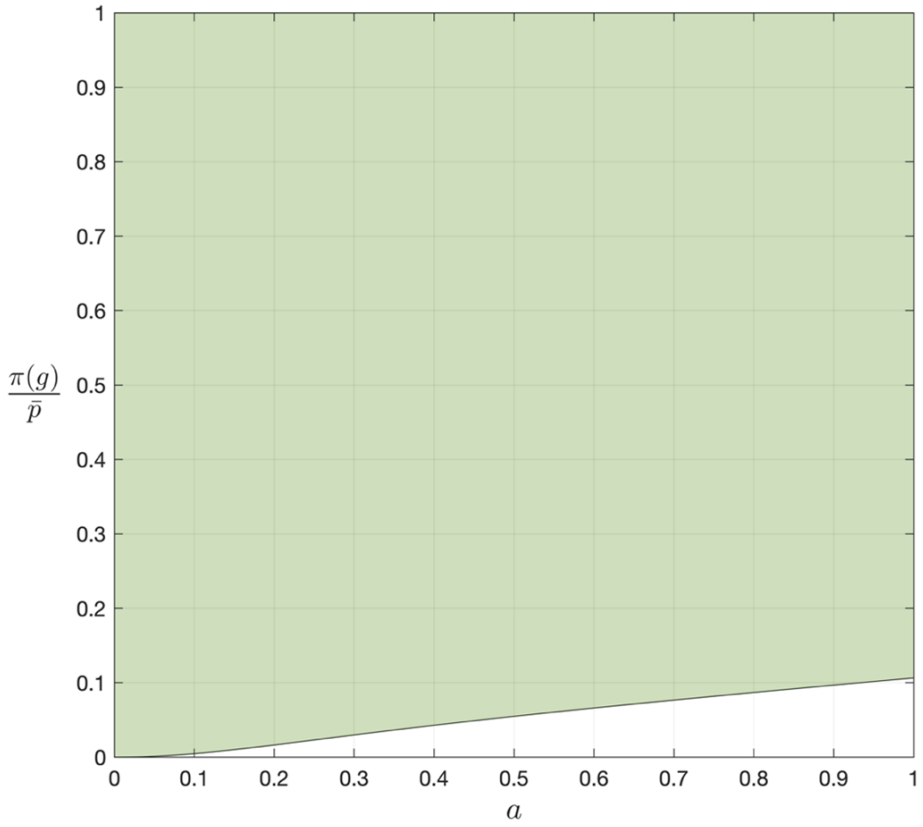

Figure A1 presents our findings, showing the parameter combinations of a and k where condition (4) in the paper, that is, condition (A.12) holds true. Overall, we observe that condition (4) is met in 94.7% of the parameter pairs examined. Notably, a higher subjective probability return coefficient (k), or a greater perceived probability reduction ($\pi(g)/\bar{p}$), increases the likelihood of satisfying the condition. This aligns with expectations, considering that $\pi(g)/\bar{p}$ indicates the efficacy of the spiritual insurance channel. Conversely, an increase in a reduces the probability of meeting the condition, likely due to the amplified income effect from greater income uncertainty at higher levels of risk aversion. Nevertheless, even at the highest risk aversion in our range (RRA of 10), condition (A.12) is predominantly satisfied, holding true 89% of the time.

A.3 Optimal Donations with Two-Dimensional Risks

In this appendix section, we expand our model to include two distinct dimensions of risk: income risk ($\tilde{I}$) and insurable expense risk ($\tilde{E}$). As in our initial model, income risk remains uninsurable and its perceived probability distribution is modified by the spiritual insurance channel.

In contrast, the expense risk, which occurs with probability q, introduces a new element as it can be hedged through market-based insurance.

Agents in our model are provided with the option to purchase a portion (α) of this market-based insurance at a cost of $\alpha(1+\lambda)qE$. This insurance compensates for a fraction (α) of the losses incurred from the expense risk. The coefficient λ, representing the premium loading factor—a concept well-established in the insurance literature (e.g. Eeckhoudt and Schlesinger, 2013)—is inherently non-negative. It essentially denotes the additional cost over the expected loss that the insurance company charges for providing the coverage.

By extending the model in this manner, our objective is to explore the relationship between donations and the purchase of market-based insurance as agents navigate two types of risks—uninsurable income risk and insurable expense risk—within the same economic framework. To analyse this model relationship, we proceed to detail the agent's objective function as follows:

$$\begin{aligned}
\max_{g,\alpha} \quad & q[(1-2\bar{p})u(\bar{I}-g-(1-\alpha)E-\alpha(1+\lambda)qE) \\
& +(\bar{p}-\pi(g))u(\bar{I}-g-D-(1-\alpha)E-\alpha(1+\lambda)qE) \\
& +(\bar{p}+\pi(g))u(\bar{I}-g+D-(1-\alpha)E-\alpha(1+\lambda)qE)] \\
& +(1-q)[(1-2\bar{p})u(\bar{I}-g-\alpha(1+\lambda)qE) \\
& +(\bar{p}-\pi(g))u(\bar{I}-g-D-\alpha(1+\lambda)qE) \\
& +(\bar{p}+\pi(g))u(\bar{I}-g+D-\alpha(1+\lambda)qE)] \\
& +\theta v(g) \\
\equiv\ & \mathbb{E}_{\tilde{I}}\mathbb{E}_{\tilde{E}}u(\tilde{I}-g-(1-\alpha)\tilde{E}-\alpha(1+\lambda)qE)+\theta v(g)
\end{aligned} \tag{A.13}$$

where donation g and the purchase of market-based insurance α are the agent's two choice variables.

We obtain the following the first-order conditions for g and α, where $y_0(\alpha)$ short-hands for $\bar{I}-\alpha(1+\lambda)qE$, and $y_1(\alpha)$ short-hands for $\bar{I}-(1-\alpha)E-\alpha(1+\lambda)qE$:

$$\begin{aligned}
[g]: \quad & \pi'(g)\left\{q\left[u\left(y_1(\alpha)-g+D\right)-u\left(y_1(\alpha)-g-D\right)\right]+\right. \\
& \left.(1-q)\left[u\left(y_0(\alpha)-g+D\right)-u\left(y_0(\alpha)-g-D\right)\right]\right\}+\theta v'(g)= \\
& q\left[(\bar{p}+\pi(g))u'\left(y_1(\alpha)-g+D\right)+(\bar{p}-\pi(g))u'\left(y_1(\alpha)-g-D\right)\right. \\
& \left.+(1-2\bar{p})u'\left(y_1(\alpha)-g\right)\right]+(1-q)\left[(1-2\bar{p})u'\left(y_0(\alpha)-g\right)+\right. \\
& \left.(\bar{p}+\pi(g))u'\left(y_0(\alpha)-g+D\right)+(\bar{p}-\pi(g))u'\left(y_0(\alpha)-g-D\right)\right]
\end{aligned} \tag{A.14}$$

$$
\begin{aligned}
[\alpha]: \quad & q\left(1-(1+\lambda)q\right)E\cdot\left[(1-2\bar{p})u'\left(y_1(\alpha)-g\right)\right. \\
& \left.(\bar{p}+\pi(g))u'\left(y_1(\alpha)-g+D\right)+(\bar{p}-\pi(g))u'\left(y_1(\alpha)-g-D\right)\right] \\
& =(1-q)(1+\lambda)qE\cdot\left[(1-2\bar{p})u'\left(y_0(\alpha)-g\right)\right. \\
& \left.(\bar{p}+\pi(g))u'\left(y_0(\alpha)-g+D\right)+(\bar{p}-\pi(g))u'\left(y_0(\alpha)-g-D\right)\right]
\end{aligned}
\tag{A.15}
$$

The FOC for g equates the spiritual insurance and non-spiritual insurance benefits of donation versus the expected utility of the forgone consumption. The FOC for α balances the marginal utilities of the claim and the non-claim states considering the premium of and compensations from the purchased insurance. Significantly, the first-order conditions for donation and the purchase of market-based insurance are interconnected via the spiritual insurance channel: donation reduces the perceived probability of the low-income state where the insurance compensation is especially beneficial, and the insurance purchase, in turn, affects the value of modifying the probability distribution of the income risk.

The second-order condition for the insurance variable α follows trivially. For the donation variable (g), the second-order condition is confirmed by substituting the term u in condition (A.8) with $\mathrm{E}_{\tilde{E}}u(\cdot)$.

Then, we conduct a comparative static analysis. This leads to the main result from the extended model with two-dimensional risks, summarized in the following proposition:

Proposition 2 *If the spiritual insurance motive for donations is strong enough, i.e.,*

$$
\begin{aligned}
& q\cdot\left[1-(1+\lambda)q\right]\cdot\left\{\pi'(g)\left[u'\left(y_1(\alpha)-g-D\right)-u'\left(y_1(\alpha)-g+D\right)\right]\right. \\
& -\left[(\bar{p}+\pi(g))(-u''\left(y_1(\alpha)-g+D\right))+(\bar{p}-\pi(g))(-u''\left(y_1(\alpha)-g-D\right))\right. \\
& \left.\left.+(1-2\bar{p})(-u''\left(y_1(\alpha)-g\right))\right]\right\} \\
& -(1-q)\cdot\left[(1+\lambda)q\right]\cdot\left\{\pi'(g)\left[u'\left(y_0(\alpha)-g-D\right)-u'\left(y_0(\alpha)-g+D\right)\right]\right. \\
& -\left[(\bar{p}+\pi(g))(-u''\left(y_0(\alpha)-g+D\right))+(\bar{p}-\pi(g))(-u''\left(y_0(\alpha)-g-D\right))\right. \\
& \left.\left.+(1-2\bar{p})(-u''\left(y_0(\alpha)-g\right))\right]\right\}>0
\end{aligned}
\tag{A.16}
$$

then donation g and insurance purchase α are negatively related, that is

$$
\frac{\partial g^*}{\partial \alpha}<0, \frac{\partial \alpha^*}{\partial g}<0
$$

Proof of Proposition 2.

Consider rewriting g^* as $g^*(\alpha)$. Upon differentiating (A.14) with respect to α, we obtain the fol-

lowing arithmetically tedious but straightforward relationship:

$$
\begin{aligned}
& g_\alpha^* \{(1-2\bar{p})\left[qu''\left(y_1(\alpha)-g\right)+(1-q)u''\left(y_0(\alpha)-g\right)\right] \\
& +(\bar{p}+\pi(g))\left[qu''\left(y_1(\alpha)-g+D\right)+(1-q)u''\left(y_0(\alpha)-g+D\right)\right] \\
& +(\bar{p}-\pi(g))\left[qu''\left(y_1(\alpha)-g-D\right)+(1-q)u''\left(y_0(\alpha)-g-D\right)\right] \\
& -2\pi'(g)\left[qu'\left(y_1(\alpha)-g+D\right)+(1-q)u'\left(y_0(\alpha)-g+D\right)\right. \\
& \left.-qu'\left(y_1(\alpha)-g-D\right)-(1-q)u'\left(y_0(\alpha)-g-D\right)\right]+ \\
& \pi''(g)\left[qu\left(y_1(\alpha)-g+D\right)+(1-q)u\left(y_0(\alpha)-g+D\right)\right. \\
& \left.-qu\left(y_1(\alpha)-g-D\right)-(1-q)u\left(y_0(\alpha)-g-D\right)\right]+\theta v''(g)\} \\
& =q\cdot[1-(1+\lambda)q]\cdot E\cdot\{\pi'(g)\left[u'\left(y_1(\alpha)-g-D\right)-u'\left(y_1(\alpha)-g+D\right)\right] \\
& -(\bar{p}+\pi(g))(-u''\left(y_1(\alpha)-g+D\right))-(\bar{p}-\pi(g))(-u''\left(y_1(\alpha)-g-D\right)) \\
& -(1-2\bar{p})(-u''\left(y_1(\alpha)-g\right))\} \\
& -(1-q)\cdot[(1+\lambda)q]\cdot E\cdot\{\pi'(g)\left[u'\left(y_0(\alpha)-g-D\right)-u'\left(y_0(\alpha)-g+D\right)\right] \\
& -(\bar{p}+\pi(g))(-u''\left(y_0(\alpha)-g+D\right))-(\bar{p}-\pi(g))(-u''\left(y_0(\alpha)-g-D\right)) \\
& -(1-2\bar{p})(-u''\left(y_0(\alpha)-g\right))\}
\end{aligned}
\tag{A.17}
$$

The expressions within the curly brackets on the left-hand side precisely match those in the second-order condition for g, thereby being less than zero. To establish $\frac{\partial g^*}{\partial \alpha} < 0$, it is sufficient for the right-hand side of this equation to be greater than zero, a condition that given $qE > 0$ is equivalent to condition (A.16).

In a similar vein, let us denote $\alpha_g^* = \frac{\partial \alpha^*}{\partial g}$ and differentiate (A.14) with respect to g:

$$
\begin{aligned}
&\alpha_g^* \left\{ [1-(1+\lambda)q]^2 qE \cdot [(1-2\bar{p})u''(y_1(\alpha)-g) \right. \\
&+(\bar{p}+\pi(g))u''(y_1(\alpha)-g+D)+(\bar{p}-\pi(g))u''(y_1(\alpha)-g-D)] \\
&-[(1+\lambda)q]^2(1-q)E \cdot [(1-2\bar{p})u''(y_0(\alpha)-g) \\
&\left. +(\bar{p}+\pi(g))u''(y_0(\alpha)-g+D)+(\bar{p}-\pi(g))u''(y_0(\alpha)-g-D)] \right\} \\
&= q \cdot [1-(1+\lambda)q] \cdot E \cdot \{\pi'(g)[u'(y_1(\alpha)-g-D)-u'(y_1(\alpha)-g+D)] \\
&-(\bar{p}+\pi(g))(-u''(y_1(\alpha)-g+D))-(\bar{p}-\pi(g))(-u''(y_1(\alpha)-g-D)) \\
&-(1-2\bar{p})(-u''(y_1(\alpha)-g))\} \\
&-(1-q) \cdot [(1+\lambda)q] \cdot E \cdot \{\pi'(g)[u'(y_0(\alpha)-g-D)-u'(y_0(\alpha)-g+D)] \\
&-(\bar{p}+\pi(g))(-u''(y_0(\alpha)-g+D))-(\bar{p}-\pi(g))(-u''(y_0(\alpha)-g-D)) \\
&-(1-2\bar{p})(-u''(y_0(\alpha)-g))\}
\end{aligned}
\tag{A.18}
$$

Similarly, the expressions within the brackets on the left-hand side correspond to those in the SOC for α, collectively summing to less than zero. Notably, the right-hand side of this equation mirrors that of the preceding one. As a result, condition (A.16) is sufficient to ensure $\frac{\partial \alpha^*}{\partial g} < 0$. This concludes the proof of Proposition 2.

The remaining aspect of Proposition 2 is to explain how condition (A.16), which establishes substitutability between donation and market-based insurance, requires a sufficiently strong spiritual insurance channel.

Donating g affects the cost-benefit analysis of insurance purchase α in the model through four specific ways. First, through the spiritual insurance channel, donating g reduces the probability of the low-income state, and reduces the expected marginal utility benefit to buying insurance (row 1 of condition (A.16)) that occurs in the claim states. Second, spending g reduces money at hand in all states—akin to the income effect in condition (4)—and increases the benefit of insurance (row 2 and 3 of the condition) that occurs in the claim states. Third, reducing the probability of the low-income state also reduces the expected marginal utility cost of paying the insurance premium (row 4 of the condition) in the non-claim states. Fourth and last, spending g reduces money at hand in all states, and through increases the marginal utility cost of paying the insurance premium (row 5 and 6 of the condition) in the non-claim states.

Condition (A.16) thus first requires a strong enough spiritual insurance channel that dominates the canonical income effect in the claim states, so that the net effects of row 1–3 are positive. This requirement closely resembles condition (4). Then, it requires that the net effect of the spiritual insurance channel is higher in the claim states than in the non-claim states, which is natural given that the optimal insurance coverage is partial in the model and $u'' < 0$. In this case, the net effects in rows 1–3 dominates the net effects in rows 4–6, leading to condition (A.16)

being satisfied, and donations and insurance coverage are substitutes. Alternatively, if the spiritual insurance channel is weak or absent, the relationship between donations and the purchase of insurance is reversed.

A.4 Optimal Donations with Increased Altruism Motive

In this appendix section, we discuss the prediction of an increased altruism motive—characterized by a tendency towards more altruistic acts in adverse or uncertain situations—on donation behavior and on the interplay between donations and insurance purchases.

We proceed with this discussion by including in the plain vanilla initial model without a spiritual insurance motive a warm-glow weight $\theta(D)$ that increases with the size of income uncertainty D. This variable warm-glow weight reflects an increased altruism motive. The agent's objective function is now:

$$\max_{g}(1-2p)u(\bar{I}-g)+pu(\bar{I}-g-D)+pu(\bar{I}-g+D)+\theta(D)v(g) \tag{A.19}$$

We assume that $\theta'(D)>0$ and $\theta''(D)\leq 0$.

It is straight forward to show that $g_I^*(\bar{I},D)>0$ in this model, so that optimal donations increase with expected income $\bar{I}$. The relationship between optimal donations and the size of income uncertainty D is as follows:

$$g_D^*(\bar{I},D)=\frac{pu''(\bar{I}-g+D)-pu''(\bar{I}-g-D)-\theta'(D)v'(g)}{(1-2p)u''(\bar{I}-g)+pu''(\bar{I}-g-D)+pu''(\bar{I}-g+D)+\theta(D)v''(g)} \tag{A.20}$$

With a strong enough increased altruism motive, optimal donations g^* increase with the size of income uncertainty D. The denominator is negative because u is concave. In the numerator, if $\theta'(D)$ is large enough, then the increased altruism motive dominates the income effect, represented by the first two terms in the numerator (which combine to be positive because of positive prudence, $u'''>0$), and results in a negative numerator.

Hence, the empirical finding that higher income uncertainty is observed with more donations is consistent with both the model with a spiritual insurance motive and the model with an increased altruism motive.

However, if we consider the two-dimensional risks situation, things are different. $\frac{\partial g^*}{\partial \alpha}$ and $\frac{\partial \alpha}{\partial g^*}$ in the model with just the increase altruism motive but augmented with two-dimensional risks

are determined as follows:

$$
\begin{aligned}
&g_\alpha^* \{(1-2\bar{p})\left[qu''\left(y_1(\alpha)-g\right)+(1-q)u''\left(y_0(\alpha)-g\right)\right] \\
&+\bar{p}\left[qu''\left(y_1(\alpha)-g+D\right)+(1-q)u''\left(y_0(\alpha)-g+D\right)\right] \\
&+\bar{p}\left[qu''\left(y_1(\alpha)-g-D\right)+(1-q)u''\left(y_0(\alpha)-g-D\right)\right]+\theta(D)v''(g)\} \\
&=q\cdot[1-(1+\lambda)q]\cdot E\cdot\{\bar{p}u''\left(y_1(\alpha)-g+D\right)+\bar{p}u''\left(y_1(\alpha)-g-D\right) \\
&+(1-2\bar{p})u''\left(y_1(\alpha)-g\right)\}-(1-q)\cdot[(1+\lambda)q]\cdot E\cdot\{\bar{p}u''\left(y_0(\alpha)-g+D\right) \\
&+\bar{p}u''\left(y_0(\alpha)-g-D\right)+(1-2\bar{p})u''\left(y_0(\alpha)-g\right)\}
\end{aligned}
\tag{A.21}
$$

$$
\begin{aligned}
&\alpha_g^*\left\{[1-(1+\lambda)q]^2qE\cdot[(1-2\bar{p})u''\left(y_1(\alpha)-g\right)+\bar{p}u''\left(y_1(\alpha)-g+D\right)\right. \\
&\left.+\bar{p}u''\left(y_1(\alpha)-g-D\right)]-[(1+\lambda)q]^2(1-q)E\cdot[(1-2\bar{p})u''\left(y_0(\alpha)-g\right)\right. \\
&\left.+\bar{p}u''\left(y_0(\alpha)-g+D\right)+\bar{p}u''\left(y_0(\alpha)-g-D\right)]\right\} \\
&=q\cdot[1-(1+\lambda)q]\cdot E\cdot\{\bar{p}u''\left(y_1(\alpha)-g+D\right)+\bar{p}u''\left(y_1(\alpha)-g-D\right) \\
&+(1-2\bar{p})u''\left(y_1(\alpha)-g\right)\}-(1-q)\cdot[(1+\lambda)q]\cdot E\cdot\{\bar{p}u''\left(y_0(\alpha)-g+D\right) \\
&+\bar{p}u''\left(y_0(\alpha)-g-D\right)+(1-2\bar{p})u''\left(y_0(\alpha)-g\right)\}
\end{aligned}
\tag{A.22}
$$

The terms within the curly brackets on the left-hand sides of the above equations are negative, aligning with the respective SOCs. The right-hand side, shared by both equations, tends to be negative because $u''' > 0$ and $y_1(\alpha) < y_0(\alpha)$. Consequently, $\frac{\partial g^*}{\partial \alpha}$ and $\frac{\partial \alpha}{\partial g^*}$ tend to be positive. Intuitively, insurance coverage, in this context, does not directly influence $\theta(D)$, thus not diminishing the altruistic donation motive. Instead, it facilitates better consumption smoothing, allowing agents to donate more ex-ante. Conversely, ex-ante donating more reduces the economic resource at hand in expense states and increases the demand for insurance. This dynamic makes insurance purchase and donation complements, rather than substitutes, in the model solely influenced by the increased altruism motive.

A.5 Multiple Hypothesis Testing

We have compared religious donations and secular donations with respect to the predictive effect of income uncertainty and health shocks, as well as their substitutability with insurance, motivated by the observation that donors to religious organizations more frequently state a "seeking blessings" motive. The final robustness issue we discuss is the risks of false positives dues to the multiple testing on different effects for religious versus secular donations. We deal with this issue using the Romano-Wolf multiple hypothesis correction procedure (Romano and Wolf, 2005) to control for the familywise error rate (FWER). We report the Romano-Wolf adjusted p-values for our outcomes in Table A.13.

[Table A.13 here]

The Romano-Wolf adjusted p-values lead to the same statistical significance of the religious versus secular donation comparisons as those in the baseline estimations. Specifically, whether we use the Romano-Wolf adjusted or the baseline p-values, we reject that the predictive effect of income uncertainty is the same at the 5% significance level, and reject that the predictive effect of health shock is the same at the 1% significance level. The p-value for the same degree of insurance substitutability is 0.21 under Romano-Wolf adjustment and 0.19 under the baseline. Collectively, we reject the null hypothesis that coefficients on religious and secular donations is the same in all analysis, even when we adjust for multiple hypothesis testing, strengthening our above conclusions.

References for Online Appendix

Auriol, Emmanuelle, Julie Lassebie, Amma Panin, Eva Raiber, and Paul Seabright. 2020. "God Insures Those Who Pay? Formal Insurance and Religious Offerings in Ghana." *The Quarterly Journal of Economics* 135 (4):1799–1848.

Kimball, Miles S. 1990. "Precautionary Saving and the Marginal Propensity to Consume."

B. Omitted Tables

Table A.1: Predicting Donations using Income Uncertainty
(Full Set of Control Coefficients)

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable	All donations$_{t+1}$					
Specification	OLS	OLS	OLS	IV	IV	IV
Income uncertainty$_t$	0.53***	0.52***	0.52***	1.99***	2.06***	2.02***
	(0.06)	(0.06)	(0.06)	(0.73)	(0.76)	(0.78)
Income$_t$		0.01	0.02		0.11	0.11
		(0.06)	(0.06)		(0.07)	(0.07)
Financial wealth$_t$		0.04*	0.04*		0.02	0.02
		(0.02)	(0.02)		(0.02)	(0.02)
Age squared		-0.01**	-0.01**		-0.01*	-0.01*
		(0.00)	(0.00)		(0.00)	(0.00)
Married		0.17	0.16		0.28	0.26
		(0.29)	(0.29)		(0.30)	(0.30)
Education (baseline: Graduate school and above)						
Undergraduate		-0.71	-0.71		-0.50	-0.49
		(0.56)	(0.56)		(0.57)	(0.57)
Vocational school		-0.30	-0.29		0.04	0.04
		(0.65)	(0.65)		(0.65)	(0.65)
High school and below		-0.84	-0.83		-0.40	-0.40
		(0.62)	(0.63)		(0.60)	(0.60)
Occupation (baseline: Public sector officers)						
Agricultural workers		0.34	0.62		0.73	1.09
		(0.89)	(0.91)		(1.11)	(1.15)
Blue-collar workers		0.12	0.14		-0.16	-0.15
		(0.74)	(0.74)		(0.91)	(0.91)
White-collar workers		-0.08	-0.06		-0.37	-0.36
		(0.75)	(0.75)		(0.92)	(0.92)
Service-sector workers		0.40	0.40		0.09	0.09
		(0.89)	(0.89)		(1.04)	(1.04)
Owner-managers		0.35	0.35		0.03	0.02
		(1.07)	(1.07)		(1.23)	(1.23)
Executives		0.04	0.04		-0.46	-0.45
		(1.05)	(1.05)		(1.19)	(1.19)
Others		0.79	0.80		0.44	0.48
		(0.85)	(0.85)		(1.04)	(1.04)
Dependents (baseline: No dependent)						
One dependent		-0.52	-0.51		-0.69	-0.68
		(1.05)	(1.05)		(1.16)	(1.16)
Two dependents		-0.67	-0.66		-1.32	-1.29
		(0.79)	(0.79)		(0.85)	(0.85)
More than two dependents		-1.49	-1.50		-0.33	-0.37
		(1.13)	(1.13)		(0.42)	(0.41)
Constant	1.56***	12.31***	12.62***			
	(0.00)	(4.67)	(4.70)			
Observations	296,092	296,092	296,092	273,616	273,616	273,616
First-stage F-stat.				423.9	415.6	400.3
R^2-Adjusted	0.402	0.402	0.402			
Dep. var. mean	1.42	1.42	1.42	1.42	1.42	1.42
Control variables	NO	YES	YES	NO	YES	YES
Individual FE	YES	YES	YES	YES	YES	YES
Quarter FE	YES	YES	YES	YES	YES	YES
City × quarter FE	NO	NO	YES	NO	NO	YES

Notes: This table reports the full set of coefficients of regressions predicting donation behavior using individual-level income uncertainty. The dependent variable is the amount of donations in the current quarter. The main independent variable of interest, income uncertainty, is the standard deviation of all observations of log monthly payroll income in the previous four quarters, after residualizing from the income measure the part that can be accounted for by demographic background variables and time fixed effects. Control variables include the current quarter's income (in logarithms), financial wealth (in logarithms), and demographic variables that include age (omitted due to multi-collinearity), age squared, educational attainment, occupational type, marital status, and the number of dependents. All currency units are converted to USD at the exchange rate. Columns (1)-(3) report the OLS estimates and columns (4)-(6) report the instrumental variable estimates, where individual-level income uncertainty is instrumented by the firm-level average of income uncertainty. Standard errors are clustered at the individual level and are reported beneath the estimated coefficient within parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively. Standardized coefficients are reported for continuous dependent variables.

Table A.2: Predicting Donations using Income Uncertainty
(Alternative model specifications)

Dependent variable	(1) All donations$_{t+1}$	(2) All donations$_{t+1}$	(3) All donations$_{t+1}$
Panel A: Income uncertainty computed using realized monthly payroll income in three recent quarters (instead of four)			
Income uncertainty$_t$	0.39***	0.39***	0.39***
	(0.05)	(0.05)	(0.05)
Income$_t$		0.04	0.04
		(0.04)	(0.04)
Observations	370,115	370,115	370,115
R^2-Adjusted	0.212	0.212	0.212
Dep. var. mean	1.42	1.42	1.42
Control variables	NO	YES	YES
Individual FE	YES	YES	YES
Quarter FE	YES	YES	YES
City × quarter FE	NO	NO	YES
Panel B: Income uncertainty computed using realized monthly payroll income in two recent quarters (instead of four)			
Income uncertainty$_t$	0.21***	0.20***	0.20***
	(0.04)	(0.04)	(0.04)
Income$_t$		0.02	0.01
		(0.04)	(0.04)
Observations	444,138	444,138	444,138
R^2-Adjusted	0.212	0.212	0.212
Dep. var. mean	1.42	1.42	1.42
Control variables	NO	YES	YES
Individual fixed effect	YES	YES	YES
City × month fixed effect	NO	NO	YES
Panel C: Predicting donations in the next month (instead of donations in the next quarter)			
Income uncertainty$_t$	0.20***	0.20***	0.20***
	(0.02)	(0.02)	(0.02)
Income$_t$		0.01	0.02
		(0.02)	(0.02)
Observations	888,276	888,276	888,276
R^2-Adjusted	0.181	0.181	0.181
Dep. var. mean	0.47	0.47	0.47
Control variables	NO	YES	YES
Individual fixed effect	YES	YES	YES
City × month fixed effect	NO	NO	YES

Notes: This table reports estimates of regressions predicting donation behavior using alternative model specifications. Panels A and B report the specifications where income uncertainty is computed using realized monthly payroll income in a shorter 3-quarter or 2-quarter recent period (instead of the baseline four quarters) as the independent variable, respectively. Panel C reports the specification where we alternatively predict donations in the next month (instead of the baseline donations in the next quarter) using the income uncertainty independent variable as computed in the baseline. Control variables include the income for the same period as donation (in logarithms), financial wealth (in logarithms), and demographic variables that include age, age squared, educational attainment, occupational type, marital status, and the number of dependents. All currency units are converted to USD at the exchange rate. Standard errors are clustered at the individual level and are reported beneath the estimated coefficient within parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively. Standardized coefficients are reported for continuous dependent variables.

Table A.3: Predicting Donations using Income Uncertainty
Religious Donations and Secular Donations; Positive versus Negative Uncertainty
(Full set of control coefficients)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dep. variable	Religious donation$_{t+1}$	Secular donation$_{t+1}$	Religious donation$_{t+1}$	Secular donation$_{t+1}$	Religious donation$_{t+1}$	Secular donation$_{t+1}$	Religious donation$_{t+1}$	Secular donation$_{t+1}$
Specification	OLS	OLS	OLS	OLS	IV	IV	IV	IV
Income uncertainty$_t$	0.32***	0.21***			1.32**	0.70*		
	(0.04)	(0.04)			(0.67)	(0.40)		
Positive uncertainty$_t$			0.13***	0.07***			0.35	0.22
			(0.02)	(0.03)			(0.31)	(0.20)
Negative uncertainty$_t$			0.19***	0.14***			1.19*	0.34
			(0.05)	(0.04)			(0.72)	(0.46)
Income$_t$	0.03	-0.05	0.03	-0.05	0.11**	-0.00	0.12*	-0.02
	(0.05)	(0.04)	(0.05)	(0.04)	(0.06)	(0.04)	(0.06)	(0.04)
Financial wealth$_t$	0.02	0.01	0.02	0.01	0.02	0.01	0.02	0.01
	(0.02)	(0.01)	(0.02)	(0.01)	(0.02)	(0.01)	(0.02)	(0.01)
Age squared	-0.00	-0.01***	-0.00	-0.01***	-0.00	-0.00**	-0.00	-0.00**
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Married	0.26	-0.10	0.26	-0.10	0.25	0.01	0.23	0.01
	(0.20)	(0.21)	(0.20)	(0.21)	(0.22)	(0.21)	(0.22)	(0.21)
Education (baseline: Graduate school and above)								
Undergraduate	-0.14	-0.57	-0.14	-0.56	-0.15	-0.34	-0.14	-0.35
	(0.38)	(0.41)	(0.38)	(0.41)	(0.42)	(0.39)	(0.43)	(0.39)
Vocational school	0.37	-0.66	0.37	-0.66	0.40	-0.37	0.43	-0.39
	(0.42)	(0.48)	(0.42)	(0.48)	(0.46)	(0.45)	(0.47)	(0.45)
High school and below	-0.14	-0.69	-0.14	-0.69	-0.06	-0.34	-0.04	-0.36
	(0.36)	(0.51)	(0.36)	(0.51)	(0.40)	(0.45)	(0.41)	(0.45)
Occupation (baseline: Public sector officers)								
Agricultural workers	0.80	-0.17	0.78	-0.18	1.06	0.03	1.09	-0.01
	(0.63)	(0.59)	(0.63)	(0.59)	(0.82)	(0.68)	(0.78)	(0.66)
Blue-collar workers	0.59	-0.45	0.59	-0.45	0.49	-0.64	0.54	-0.63
	(0.53)	(0.51)	(0.53)	(0.51)	(0.65)	(0.61)	(0.65)	(0.61)
White-collar workers	0.46	-0.52	0.46	-0.52	0.37	-0.73	0.40	-0.71
	(0.53)	(0.51)	(0.53)	(0.52)	(0.65)	(0.61)	(0.65)	(0.62)
Service-sector workers	1.13	-0.73	1.12	-0.73	1.03	-0.94	1.06	-0.93
	(0.72)	(0.51)	(0.72)	(0.51)	(0.83)	(0.60)	(0.83)	(0.60)
Owner-managers	0.93	-0.58	0.93	-0.58	0.82	-0.80	0.75	-0.79
	(0.61)	(0.86)	(0.61)	(0.86)	(0.72)	(0.97)	(0.73)	(0.97)
Executives	1.09*	-1.04	1.08*	-1.04	0.86	-1.31	0.85	-1.29
	(0.63)	(0.75)	(0.63)	(0.75)	(0.71)	(0.84)	(0.72)	(0.84)
Others	1.05*	-0.25	1.05*	-0.25	0.93	-0.45	0.93	-0.43
	(0.57)	(0.57)	(0.57)	(0.57)	(0.70)	(0.68)	(0.71)	(0.68)
Dependents (baseline: No dependent)								
One dependent	-1.06	0.55	-1.06	0.55	-1.23	0.55	-1.18	0.56
	(0.95)	(0.45)	(0.95)	(0.45)	(1.05)	(0.50)	(1.05)	(0.50)
Two dependents	-0.62	-0.03	-0.62	-0.03	-0.85	-0.44*	-0.86	-0.41*
	(0.73)	(0.30)	(0.73)	(0.30)	(0.81)	(0.24)	(0.80)	(0.24)
More than two dependents	-0.32	-1.18	-0.31	-1.18	-0.31	-0.06	-0.29	-0.06
	(0.24)	(1.10)	(0.24)	(1.10)	(0.31)	(0.15)	(0.31)	(0.13)
Constant	2.49	10.13***	2.52	10.14***				
	(3.90)	(2.56)	(3.90)	(2.55)				
Observations	296,092	296,092	296,092	296,092	273,616	273,616	273,616	273,616
First-stage F-stat.					400.3	400.3	170.5	170.5
R^2-Adjusted	0.368	0.444	0.368	0.444				
Dep. var. mean	0.84	0.58	0.84	0.58	0.84	0.58	0.84	0.58
Control variables	YES	YES	YES	YES	YES	YES	YES	YES
Individual FE	YES	YES	YES	YES	YES	YES	YES	YES
City × quarter FE	YES	YES	YES	YES	YES	YES	YES	YES

Notes: This table reports the full set of coefficients of regressions predicting religious and secular donation behavior using individual-level income uncertainty on the positive-side and the negative-side. The dependent variable in odd (even) columns is the amount of religious (secular) donation in the current quarter. For Columns (1)-(2) and (5)-(6), the main independent variable of interest, income uncertainty, is the standard deviation of all observations of log monthly payroll income in the previous four quarters, after residualizing from the income measure the part that can be accounted for by demographic background variables and time fixed effects. For Columns (3)-(4) and (7)-(8), the main independent variables of interest are square roots of the positive and negative income semi-variances (positive uncertainty and negative uncertainty). Control variables and fixed effects are the same as in Table A.1. All currency units are converted to USD at the exchange rate. Columns (1)-(4) report the OLS estimates and columns (5)-(8) report the instrumental variable estimates, where individual-level (positive, negative) income uncertainty is instrumented by the firm-level average of (positive, negative) income uncertainty. Standard errors are clustered at the individual level and are reported beneath the estimated coefficient within parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively. Standardized coefficients are reported for continuous dependent variables.

Table A.4: Moving Window Results of Health Shock on Donation (Full Set of Control Coefficients)

Dependent variable	(1) Total donations$_{t+1}$	(2) Religious donation$_{t+1}$	(3) Secular donation$_{t+1}$	(4) Total donations$_{t+1}$	(5) Religious donation$_{t+1}$	(6) Secular donation$_{t+1}$
Occurrence of health shock$_t$	2.08***	1.98***	0.11			
(past quarter)	(0.23)	(0.20)	(0.12)			
Standardized amount of health shock$_t$				0.44***	0.42***	0.02
(past quarter)				(0.13)	(0.12)	(0.02)
Income$_t$	-0.05	0.01	-0.06	-0.05	0.01	-0.06
	(0.06)	(0.05)	(0.04)	(0.06)	(0.05)	(0.04)
Financial wealth$_t$	0.04**	0.03	0.02	0.04**	0.03	0.02
	(0.02)	(0.02)	(0.01)	(0.02)	(0.02)	(0.01)
Age squared	-0.01**	-0.00	-0.01***	-0.01**	-0.00	-0.01***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Married	0.16	0.25	-0.10	0.17	0.27	-0.10
	(0.29)	(0.20)	(0.21)	(0.29)	(0.20)	(0.21)
Education (baseline: Graduate school and above)						
Undergraduate	-0.74	-0.16	-0.58	-0.73	-0.15	-0.58
	(0.56)	(0.38)	(0.41)	(0.56)	(0.38)	(0.41)
Vocational school	-0.33	0.36	-0.69	-0.35	0.34	-0.69
	(0.64)	(0.41)	(0.48)	(0.65)	(0.42)	(0.48)
High school and below	-0.85	-0.14	-0.71	-0.87	-0.16	-0.71
	(0.62)	(0.35)	(0.51)	(0.62)	(0.36)	(0.51)
Occupation (baseline: Public sector officers)						
Agricultural workers	-0.04	0.23	-0.27	0.51	0.74	-0.24
	(0.91)	(0.66)	(0.59)	(0.91)	(0.62)	(0.59)
Blue-collar workers	0.24	0.66	-0.42	0.24	0.66	-0.42
	(0.74)	(0.53)	(0.51)	(0.74)	(0.53)	(0.51)
White-collar workers	0.09	0.58	-0.49	0.06	0.55	-0.49
	(0.75)	(0.53)	(0.51)	(0.75)	(0.53)	(0.51)
Service-sector workers	0.55	1.25*	-0.70	0.45	1.16	-0.71
	(0.89)	(0.72)	(0.51)	(0.89)	(0.72)	(0.51)
Owner-managers	0.45	1.00	-0.55	0.43	0.99	-0.56
	(1.07)	(0.61)	(0.86)	(1.07)	(0.61)	(0.86)
Executives	0.17	1.17*	-1.00	0.16	1.16*	-1.00
	(1.05)	(0.63)	(0.75)	(1.05)	(0.63)	(0.75)
Others	1.00	1.20**	-0.19	0.95	1.15**	-0.20
	(0.85)	(0.57)	(0.57)	(0.85)	(0.57)	(0.57)
Dependents (baseline: No dependent)						
One dependent	-0.42	-0.99	0.57	-0.48	-1.04	0.56
	(1.05)	(0.95)	(0.45)	(1.05)	(0.95)	(0.45)
Two dependents	-0.60	-0.59	-0.01	-0.59	-0.59	-0.01
	(0.79)	(0.73)	(0.30)	(0.79)	(0.73)	(0.30)
More than two dependents	-1.49	-0.30	-1.18	-1.49	-0.31	-1.18
	(1.12)	(0.23)	(1.10)	(1.13)	(0.24)	(1.10)
Constant	13.32***	3.44	9.87***	13.64***	3.75	9.89***
	(4.66)	(3.87)	(2.51)	(4.66)	(3.86)	(2.51)
Observations	296,092	296,092	296,092	296,092	296,092	296,092
R^2-Adjusted	0.402	0.369	0.443	0.402	0.369	0.443
Dep. var. mean	1.42	0.84	0.58	1.42	0.84	0.58
Control variables	YES	YES	YES	YES	YES	YES
Individual FE	YES	YES	YES	YES	YES	YES
City $\times$ quarter FE	YES	YES	YES	YES	YES	YES

Notes: This table reports the full set of coefficients of regressions predicting donation behavior using individual-level health shocks. The dependent variables are the amount of all (religious, secular) donation in the current quarter in respective columns. The main dependent variable of interest, health shock, is defined as the dummy of incurring medical expenditures in the past quarter that are above the median of the sample in Columns (1)-(3), and as the amount spent on medical expenditures in the past quarter that are above the median of the sample in Columns (4)-(6). Control variables and fixed effects are the same as in Table A.1. All currency units are converted to USD at the exchange rate. Standard errors are clustered at the individual level and are reported beneath the estimated coefficient within parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively. Standardized coefficients are reported for continuous dependent variables.

Table A.5: Substitutability between Donations and Insurance Purchases
(Full set of control coefficients)

Dependent variable	(1)	(2)	(3)	(4)	(5)	(6)
	Insurance Expenditures$_{t+1}$					
Donation dummy$_{t+1}$	-80.40***			7.06		
	(25.76)			(37.03)		
Religious donation dummy$_{t+1}$		-98.67***			14.82	
		(32.58)			(48.70)	
Secular donation dummy$_{t+1}$			-54.08			0.14
			(37.90)			(52.96)
Income uncertainty$_t$ ×				-97.68**		
Donation dummy$_{t+1}$				(42.77)		
Income uncertainty$_t$ ×					-125.25**	
Religious donation dummy$_{t+1}$					(58.79)	
Income uncertainty$_t$ ×						-60.19
Secular donation dummy$_{t+1}$						(52.98)
Income uncertainty$_t$	86.58***	86.47***	86.14***	88.09***	87.66***	86.52***
	(19.64)	(19.63)	(19.62)	(19.83)	(19.75)	(19.69)
Income$_t$	64.91***	64.97***	64.86***	64.68***	64.78***	64.80***
	(24.50)	(24.50)	(24.50)	(24.52)	(24.51)	(24.51)
Financial wealth$_t$	-1.66	-1.67	-1.66	-1.70	-1.71	-1.67
	(7.35)	(7.35)	(7.36)	(7.35)	(7.35)	(7.35)
Age squared	1.24	1.24	1.24	1.24	1.24	1.24
	(1.10)	(1.10)	(1.10)	(1.10)	(1.10)	(1.10)
Married	-115.16	-114.92	-115.30	-115.34	-115.42	-115.18
	(119.99)	(119.99)	(120.01)	(120.00)	(120.00)	(120.00)
Education(baseline: Graduate school and above)						
Undergraduate	24.95	25.20	25.25	24.77	24.92	25.29
	(1,740.89)	(1,740.87)	(1,740.89)	(1,740.91)	(1,740.90)	(1,740.89)
Vocational school	-330.90	-330.12	-330.91	-331.07	-330.20	-331.05
	(1,717.99)	(1,717.95)	(1,718.02)	(1,718.00)	(1,717.96)	(1,718.05)
High school and below	-755.36	-754.90	-755.04	-755.76	-755.37	-755.08
	(1,889.16)	(1,889.13)	(1,889.17)	(1,889.19)	(1,889.15)	(1,889.17)
Occupation (baseline: Public sector officers)						
Agricultural workers	229.06	229.34	228.55	230.21	230.54	228.74
	(344.95)	(344.96)	(344.94)	(344.75)	(344.75)	(344.94)
Blue-collar workers	-204.26	-203.85	-204.57	-203.81	-203.29	-204.55
	(252.91)	(252.91)	(252.97)	(252.88)	(252.86)	(252.98)
White-collar workers	-133.49	-133.02	-133.72	-132.81	-132.35	-133.68
	(247.96)	(247.95)	(248.03)	(247.92)	(247.90)	(248.03)
Service-sector workers	-947.82	-946.79	-948.30	-946.58	-945.20	-948.32
	(902.60)	(902.58)	(902.68)	(902.57)	(902.57)	(902.68)
Owner-managers	-189.80	-189.33	-190.53	-188.94	-187.80	-190.86
	(314.85)	(314.86)	(314.92)	(314.80)	(314.80)	(314.93)
Executives	-65.13	-64.55	-66.27	-64.15	-63.38	-66.49
	(276.77)	(276.78)	(276.86)	(276.72)	(276.71)	(276.89)
Others	534.64	535.28	533.97	534.90	535.78	534.04
	(585.98)	(585.98)	(585.96)	(585.97)	(585.96)	(585.97)
Dependents (baseline: No dependent)						
One dependent	-350.33	-350.81	-349.30	-349.40	-348.74	-349.72
	(341.83)	(341.84)	(341.83)	(341.85)	(341.87)	(341.84)
Two dependents	79.88	80.08	80.41	82.56	83.18	80.57
	(86.29)	(86.31)	(86.28)	(86.27)	(86.28)	(86.29)
More than two dependents	345.81	346.64	346.63	346.79	347.52	346.79
	(366.38)	(366.36)	(366.38)	(366.35)	(366.34)	(366.37)
Constant	-1,533.96	-1,541.14	-1,536.82	-1,534.38	-1,538.81	-1,537.91
	(1,590.03)	(1,589.71)	(1,590.15)	(1,590.01)	(1,589.79)	(1,590.07)
Observations	296,092	296,092	296,092	296,092	296,092	296,092
R^2-Adjusted	0.215	0.215	0.215	0.215	0.215	0.215
Dep. var. mean	242.01	242.01	242.01	242.01	242.01	242.01
Control variables	YES	YES	YES	YES	YES	YES
Individual fixed effect	YES	YES	YES	YES	YES	YES
City × quarter fixed effect	YES	YES	YES	YES	YES	YES

Notes: This table reports the full sets of coefficients of regressions examining the substitutability between donations and insurance purchases. The dependent variable is the amount of insurance purchased in the current quarter. The main independent variables of interest include income uncertainty in the immediate past, donation occurrence in the current quarter (donation dummy), and interaction of income uncertainty and donation occurrence. Income uncertainty is the standard deviation of all observations of log monthly payroll income in the previous four quarters, after residualizing from the income measure the part that can be accounted for by demographic background variables and time fixed effects. The donation occurrence dummies equal one when at least one (religious, secular) donation is made in the current quarter. Control variables and fixed effects are the same as in Table A.1. All currency units are converted to USD at the exchange rate. Standard errors are clustered at the individual level and are reported beneath the estimated coefficient within parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively. Standardized coefficients are reported for continuous dependent variables.

Table A.6: Substitutability between Donations and Insurance Purchases
(Restricting to individuals unlikely to be financially-constrained)

Dependent variable	(1)	(2)	(3)	(4)	(5)	(6)
	Insurance Expenditures$_{t+1}$					
Donation dummy$_{t+1}$	-64.44**			39.77		
	(26.81)			(38.21)		
Religious donation dummy$_{t+1}$		-80.86**			58.71	
		(33.71)			(49.32)	
Secular donation dummy$_{t+1}$			-41.62			12.47
			(40.36)			(57.03)
Income uncertainty$_t$ ×				-116.78***		
Donation dummy$_{t+1}$				(44.07)		
Income uncertainty$_t$ ×					-153.38**	
Religious donation dummy$_{t+1}$					(60.51)	
Income uncertainty$_t$ ×						-60.94
Secular donation dummy$_{t+1}$						(56.51)
Income uncertainty$_t$	101.27***	101.19***	100.92***	103.11***	102.70***	101.30***
	(8.33)	(8.33)	(8.32)	(8.40)	(8.39)	(8.33)
Income$_t$	43.37***	43.43***	43.31***	43.07***	43.16***	43.25***
	(9.48)	(9.48)	(9.48)	(9.47)	(9.48)	(9.48)
Observations	271,624	271,624	271,624	271,624	271,624	271,624
R^2-Adjusted	0.130	0.130	0.130	0.130	0.130	0.130
Dep. var. mean	121.63	121.63	121.63	121.63	121.63	121.63
Control variables	YES	YES	YES	YES	YES	YES
Individual fixed effect	YES	YES	YES	YES	YES	YES
City × quarter fixed effect	YES	YES	YES	YES	YES	YES

Notes: This table reports results examining the substitutability between donations and insurance purchases for the sample unlikely to be cash-constrained. We consider the individual as unlikely to be constrained if she has income to spare in every month, after the observed expenditure on consumption and the maximum of (1) the observed expenditure and (2) the sample conditional average expenditure on donations and on insurance purchase. Specifically, we subtract from an individual's income in each month the sum of (1) the observed consumption in the month, (2) the maximum monthly amount spent on insurance over the sample period for the individual or the sample conditional average insurance purchase amount (whichever is greater) and (3) the maximum monthly amount spent on donations over the sample period for the individual or the sample conditional average donation amount (whichever is greater). The dependent variable is the amount of insurance purchased in the current quarter. All other model setup is the same as in Table 5.

Table A.7: Substitutability between Donations and Insurance Purchases (Placebo test)

Dependent variables	(1)	(2)	(3)	(4)	(5)
	Insurance Expenditures$_{t+1}$				
High-spending dummy$_{t+1}$	-7.67	-30.39	-9.76	-5.73	-39.12
	(9.74)	(26.19)	(36.36)	(23.58)	(103.99)
Income uncertainty$_t$ $\times$	6.56	14.89	-6.98	13.41	-26.82
High-spending dummy$_{t+1}$	(17.24)	(15.54)	(29.86)	(31.11)	(87.11)
Income uncertainty$_t$	82.35***	81.54***	86.90***	85.10***	86.33***
	(13.70)	(19.33)	(17.21)	(20.09)	(19.68)
Income$_t$	64.94***	64.92***	64.82***	64.94***	64.83***
	(24.45)	(24.50)	(24.37)	(24.53)	(24.50)
Observations	296,092	296,092	296,092	296,092	296,092
R^2-Adjusted	0.215	0.215	0.215	0.215	0.215
High spending over __ percentile	50th	75th	90th	95th	99th
Dep. var. mean	242.01	242.01	242.01	242.01	242.01
Control variables	YES	YES	YES	YES	YES
Individual fixed effect	YES	YES	YES	YES	YES
City $\times$ quarter fixed effect	YES	YES	YES	YES	YES

Notes: The table reports the estimates of robustness check regression, in which donation in Table 5 are replaced by high-spending consumption. The dependent variable is the total amount of insurance purchases for the current quarter. Income uncertainty is the standard deviation of all observations of log monthly payroll income in the previous four quarters, after residualizing from the income measure the part that can be accounted for by demographic background variables and time fixed effects. High-spending dummy variables in Columns (1) to (5) represent whether the individual experience consumption over the 50th, 75th, 90th, 95th, and 99th percentile in the same quarter as insurance purchases, respectively. All other model setup is the same as in Table 5.

Table A.8: Mutual Insurance: Does Donations Improve the Degree of Consumption Insurance?

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variables	Consumption (Year 2 - Year 1)					
Donation type	If donated in Year 1			Donation Amount in Year 1		
	Any donation	*Religious donation*	*Secular donation*	*Any donation*	*Religious donation*	*Secular donation*
Income (Year 2 - Year 1) × Donation	0.01	0.02	0.01	0.00	0.00	0.00
	(0.01)	(0.02)	(0.02)	(0.00)	(0.00)	(0.00)
Income (Year 2 - Year 1)	0.03***	0.03***	0.03***	0.03***	0.03***	0.03***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Donation	348.21*	193.83	453.62*	0.45	0.41	0.67
	(189.55)	(245.92)	(267.58)	(0.41)	(0.43)	(0.86)
Control variables	YES	YES	YES	YES	YES	YES
Observations	74,023	74,023	74,023	74,023	74,023	74,023
R^2-Adjusted	0.01	0.01	0.01	0.01	0.01	0.01

Notes: This table reports how donation behavior affects the consumption pass-through of income fluctuations, and is a replication of Dehejia, DeLeire, and Luttmer (2007). The dependent variable is the difference between the consumption in the second year and the consumption in the first year. The independent variables include the difference between the income in the second year and the income in the first year, donation behaviors of the first year and control variables. Donation behaviors in Columns (1) to (3) are dummy variables indicating whether at least a donation, religious donation, or secular donation occurs in the first year, respectively. Donation behaviors in Columns (4) to (6) are the amounts of donation, religious donation, and secular donation made in the first year. Control variables include demographic background variables and financial wealth (in logarithms) in the first year. Demographic variables are age, the square of age, educational attainment, occupational type, marital status, and the number of dependents at the current month. All currency units are converted to USD at the exchange rate. Standard errors are clustered at the individual level and are reported beneath the estimated coefficient within parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively.

Table A.9: Predicting Donations using Income Uncertainty
(Further excluding conventional bonus-dispersing months when computing income uncertainty)

	(1)	(2)	(3)	(4)	(5)	(6)
Dep. variable	All donations$_{t+1}$					
Specification	OLS	OLS	OLS	IV	IV	IV
Income uncertainty$_t$	0.42***	0.42***	0.40***	2.49***	2.61***	2.58***
	(0.05)	(0.05)	(0.05)	(0.91)	(0.97)	(1.00)
Income$_t$		-0.03	-0.05		0.15*	0.15*
		(0.06)	(0.06)		(0.08)	(0.08)
Observations	296,092	296,092	296,092	273,616	273,616	273,616
First-stage F-stat.				274.9	262.1	249.3
R^2-Adjusted	0.402	0.402	0.402			
Dep. var. mean	1.42	1.42	1.42	1.42	1.42	1.42
Control variables	NO	YES	YES	NO	YES	YES
Individual FE	YES	YES	YES	YES	YES	YES
Quarter FE	YES	YES	YES	YES	YES	YES
City $\times$ quarter FE	NO	NO	YES	NO	NO	YES

Notes: Here, we conduct an additional robustness check where we stringently exclude payroll observations from traditional bonus months (January, February, July) in our computation of income uncertainty, to recognize that bonuses, customarily paid in these few months, constitute a particular seasonal component of income. While we view as plausible that individuals may do good deeds to sway blessings in a favorable bonus outcome, this additional robustness check is to ensure that our results are not purely driven by the seasonality of bonuses. The dependent variable is total donation during the current quarter. The independent variable income uncertainty is the standard deviation of residual log monthly payroll income in the past four quarters after removing these months where bonuses are traditionally dispersed (January, February, July). All other model setup is the same as in Table 2.

Table A.10: Predicting Donations using Income Uncertainty
(Controlling for tax considerations)

	(1)	(2)	(3)	(4)	(5)	(6)
Dep. variable	All donations$_{t+1}$					
Specification	OLS	OLS	OLS	IV	IV	IV
Panel A: Marginal tax rates calculated by extrapolating monthly income						
Income uncertainty$_t$	0.53***	0.52***	0.53***	2.01***	2.07***	2.03***
	(0.06)	(0.06)	(0.06)	(0.73)	(0.76)	(0.78)
Income$_t$		0.01	0.02		0.12*	0.13*
		(0.04)	(0.04)		(0.07)	(0.07)
Price of giving	0.13	0.28	0.43	-0.59	0.30	0.46
	(0.48)	(0.57)	(0.57)	(0.63)	(0.60)	(0.60)
Observations	296,092	296,092	296,092	273,616	273,616	273,616
First-stage F-stat.				423.2	415.6	400.2
R^2-Adjusted	0.402	0.402	0.402			
Dep. var. mean	1.42	1.42	1.42	1.42	1.42	1.42
Control variables	NO	YES	YES	NO	YES	YES
Individual FE	YES	YES	YES	YES	YES	YES
Quarter FE	YES	YES	YES	YES	YES	YES
City × quarter FE	NO	NO	YES	NO	NO	YES
Panel B: Marginal tax rates calculated by using ex-post annual income						
Income uncertainty$_t$	0.53***	0.52***	0.52***	2.00***	2.07***	2.03**
	(0.06)	(0.06)	(0.06)	(0.73)	(0.77)	(0.79)
Income$_t$		-0.02	-0.02		0.11	0.11
		(0.04)	(0.04)		(0.08)	(0.08)
Price of giving	-1.51	-1.73	-1.83	-1.02	0.16	0.01
	(1.15)	(1.24)	(1.25)	(1.17)	(1.43)	(1.45)
Observations	296,092	296,092	296,092	273,616	273,616	273,616
First-stage F-stat.				422.5	410.6	395.4
R^2-Adjusted	0.402	0.402	0.402			
Dep. var. mean	1.42	1.42	1.42	1.42	1.42	1.42
Control variables	NO	YES	YES	NO	YES	YES
Individual FE	YES	YES	YES	YES	YES	YES
Quarter FE	YES	YES	YES	YES	YES	YES
City × quarter FE	NO	NO	YES	NO	NO	YES

Notes: This table reports the predictive effect of income uncertainty on donations controlling for tax considerations, to address the potential that income uncertainty may be correlated with the price of giving. The donations in our dataset are eligible for tax exemption, making the price of giving effectively one minus the marginal tax rate. Panel A reports the imputed marginal tax rates based on extrapolating based on monthly payroll income, multiplied by twelve, to estimate annual income, and Panel B reports the imputed marginal tax rates based on utilizing ex-post annual income for those with a complete calendar year in our dataset. For others, we extrapolated annual income using all available monthly income data, applying aggregate seasonality adjustment factors. All other model setup is the same as in Table 2.

Table A.11: "Self-fulfilling hypothesis"? Whether donations materially reduce future uncertainty (Full set of control coefficients)

Dependent variable	(1)	(2)	(3)
	Income uncertainty$_{year=2}$		
Panel A: Donation dummy and future income uncertainty			
Donation dummy$_{year=1}$	0.04		
	(0.03)		
Religious donation dummy$_{year=1}$		0.04	
		(0.04)	
Secular donation dummy$_{year=1}$			0.06
			(0.04)
Income uncertainty$_{year=1}$	0.39***	0.39***	0.39***
	(0.00)	(0.00)	(0.00)
Income$_{year=1}$	0.33***	0.33***	0.33***
	(0.01)	(0.01)	(0.01)
Financial wealth$_{year=1}$	0.01***	0.01***	0.01***
	(0.00)	(0.00)	(0.00)
Age$_{year=1}$	0.00	0.00	0.00
	(0.00)	(0.00)	(0.00)
Age$_{year=1}$ squared	-0.00***	-0.00***	-0.00***
	(0.00)	(0.00)	(0.00)
Female	0.10***	0.10***	0.10***
	(0.01)	(0.01)	(0.01)
Married$_{year=1}$	-0.00	-0.00	-0.00
	(0.01)	(0.01)	(0.01)
Education$_{year=1}$ (baseline: Graduate school and above)			
Undergraduate	-0.21***	-0.21***	-0.21***
	(0.01)	(0.01)	(0.01)
Vocational school	-0.22***	-0.22***	-0.22***
	(0.01)	(0.01)	(0.01)
High school and below	-0.26***	-0.26***	-0.26***
	(0.01)	(0.01)	(0.01)
Occupation$_{year=1}$ (baseline: Public sector officers)			
Agricultural workers	-0.24***	-0.24***	-0.24***
	(0.08)	(0.08)	(0.08)
Blue-collar workers	0.05**	0.05**	0.05**
	(0.02)	(0.02)	(0.02)
White-collar workers	0.16***	0.16***	0.16***
	(0.02)	(0.02)	(0.02)
Service-sector workers	0.03	0.03	0.03
	(0.03)	(0.03)	(0.03)
Owner-managers	0.05	0.05	0.05
	(0.04)	(0.04)	(0.04)
Executives	0.09***	0.09***	0.09***
	(0.02)	(0.02)	(0.02)
Others	-0.02	-0.02	-0.02
	(0.03)	(0.03)	(0.03)
Dependents$_{year=1}$ (baseline: No dependent)			
One dependent	0.03*	0.03*	0.03*
	(0.01)	(0.01)	(0.01)
Two dependents	-0.00	-0.00	-0.00
	(0.01)	(0.01)	(0.01)
More than two dependents	0.02	0.02	0.02
	(0.03)	(0.03)	(0.03)
Constant	-455.33***	-456.04***	-455.95***
	(14.13)	(14.12)	(14.12)
Observations	74,023	74,023	74,023
R^2-Adjusted	0.351	0.351	0.351
Control variables	YES	YES	YES
Panel B: Donation amount and future income uncertainty			
Donation amount$_{year=1}$	0.00		
	(0.05)		
Religious donation amount$_{year=1}$		-0.01	
		(0.09)	
Secular donation amount$_{year=1}$			0.01
			(0.10)
Income uncertainty$_{year=1}$	0.39***	0.39***	0.39***
	(0.00)	(0.00)	(0.00)
Income$_{year=1}$	0.33***	0.33***	0.33***

	(0.01)	(0.01)	(0.01)
Financial wealth$_{year=1}$	0.01***	0.01***	0.01***
	(0.00)	(0.00)	(0.00)
Age$_{year=1}$	0.00	0.00	0.00
	(0.00)	(0.00)	(0.00)
Age$_{year=1}$ squared	-0.00***	-0.00***	-0.00***
	(0.00)	(0.00)	(0.00)
Female	0.10***	0.10***	0.10***
	(0.01)	(0.01)	(0.01)
Married$_{year=1}$	-0.00	-0.00	-0.00
	(0.01)	(0.01)	(0.01)
Education$_{year=1}$ (baseline: Graduate school and above)			
Undergraduate	-0.21***	-0.21***	-0.21***
	(0.01)	(0.01)	(0.01)
Vocational school	-0.22***	-0.22***	-0.22***
	(0.01)	(0.01)	(0.01)
High school and below	-0.26***	-0.26***	-0.26***
	(0.01)	(0.01)	(0.01)
Occupation$_{year=1}$ (baseline: Public sector officers)			
Agricultural workers	-0.24***	-0.24***	-0.24***
	(0.08)	(0.08)	(0.08)
Blue-collar workers	0.05**	0.05**	0.05**
	(0.02)	(0.02)	(0.02)
White-collar workers	0.16***	0.16***	0.16***
	(0.02)	(0.02)	(0.02)
Service-sector workers	0.03	0.03	0.03
	(0.03)	(0.03)	(0.03)
Owner-managers	0.05	0.05	0.05
	(0.04)	(0.04)	(0.04)
Executives	0.09***	0.09***	0.09***
	(0.02)	(0.02)	(0.02)
Others	-0.02	-0.02	-0.02
	(0.03)	(0.03)	(0.03)
Dependents$_{year=1}$ (baseline: No dependent)			
One dependent	0.03*	0.03*	0.03*
	(0.01)	(0.01)	(0.01)
Two dependents	-0.00	-0.00	-0.00
	(0.01)	(0.01)	(0.01)
More than two dependents	0.02	0.02	0.02
	(0.03)	(0.03)	(0.03)
Constant	-456.61***	-456.70***	-456.62***
	(14.13)	(14.12)	(14.13)
Observations	74,023	74,023	74,023
R^2-Adjusted	0.351	0.351	0.351
Control variables	YES	YES	YES

Notes: This table reports the full set of coefficients of regressions examining the relation of future income uncertainty on current donation behavior. The dependent variable is individual income uncertainty measured as the standard deviation of monthly residualized income in the second year of the two-year sample. The main independent variables of interest are income uncertainty in the first year and the occurrence and amounts of (all-type, religious, secular) donation in the first year, in respective columns. Control variables include income in the first year (in logarithms), financial wealth in the first year (in logarithms), and demographic variables that include age, age squared, educational attainment, occupational type, marital status, and the number of dependents. All currency units are converted to USD at the exchange rate, the unit of donation is 1000 USD. Standard errors are clustered at the individual level and are reported beneath the estimated coefficient within parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively.

Table A.12: The Field Experiment: Balance Tests

Covariate	Mean		T-Statistic/Chi-Squared	*p*-Value
	Control	Treated		
Age	38.168	38.179	-1.323	0.186
Hist. visit case	35.848	35.850	-0.054	0.957
Hist. donate case	4.489	4.504	-1.466	0.143
Hist. donate amt.	18.159	18.208	-1.159	0.246
Last month visited(=1)	37.6%	37.6%	0.121	0.121
Last month visited case	0.667	0.666	0.931	0.352
Last month donated count	0.078	0.078	-1.641	0.101
Last month donated amt.	0.311	0.313	-0.702	0.483
Anonymous donation count	0.109	0.107	0.971	0.332
Anonymous donation amt.	0.198	0.200	-0.767	0.443
Campaign target amt.	42141.2	42175.3	-1.659	0.097
Campaign target amt. (log)	10.649	10.650	-1.357	0.175
Campaign word count	848.495	848.051	1.424	0.154
Campaign picture count	7.389	7.386	0.963	0.336
Patient age	39.619	39.591	1.466	0.143
Patient gender(=Male)	61.2%	61.2%	0.145	0.145
Insurance coverage(=Yes)	90.1%	90.1%	0.470	0.638
Cancer(=Yes)	25.4%	25.5%	0.216	0.829
Same city(=Yes)	31.9%	31.8%	0.832	0.405
Channel(=Timeline posts)	84.0%	84.0%	0.555	0.579

Notes: This table presents the balance test results for the field experiment on Platform X examining the effect of spiritual narratives on the likelihood to donate. Sample balance was tested between observations from the treatment group and control group potential donors. We report group means, t-statistics for continuous variables or Chi-squared statistics for binary variables, and the corresponding p-values. All currency units are converted to USD at the exchange rate.

Table A.13: Religious and Secular Donations: Adjusting for Multiple Hypothesis Testing

Religious v.s. secular hypotheses	Coeff. difference	One-sided p-values for rejecting the null hypothesis (H0)	
		Unadjusted	Romano-Wolf adjusted
Predictive effect of income uncertainty on religious versus secular donations (Table 3)	0.11	0.0259**	0.0490**
Predictive effect of health shocks on religious versus secular donations (Table 4)	1.87	0.0000***	0.0020***
Insurance substitutability of religious versus secular donations (Table 5)	-44.59	0.1861	0.2128

Note: This table reports the unadjusted p-values for the difference between the coefficients on religious and secular contributions in Tables 3, 4, and 5 and the p-values after adjusting for multiple hypothesis testing using the Romano-Wolf method. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively.