# Hedging by Giving:
# Spiritual Insurance and Religious Donations


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**Abstract:** This paper analyzes donation behaviors from the perspective of religious beliefs. Using a transaction-level dataset on income and donation dynamics from a high-income economy in Asia, this paper shows that higher income uncertainty predicts more donations, especially for religious donations, and after negative income uncertainty and health shock. This pattern is inconsistent with existing explanations of donation, and we pinpoint evidence that our results are explained by a "spiritual insurance" channel. Indeed, we find that those who donate to non-local religious organizations reduce their insurance purchases, and donation moreover mutes the relationship between income uncertainty and the purchase of market-based insurance. Our results suggest that the "spiritual insurance" channel of religion can be influential for donation and the insurance market even outside of underdeveloped economies.

**Keywords:** donation, income uncertainty, spiritual insurance, wishful thinking, religion
**JEL codes:** 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 most recent statistics, the industry has accounted for 2.3% of U.S. GDP (Giving USA, 2021). Among different donation channels, religious donations are significant: For example, 28% of donations in the U.S. went to religion in 2020 (Giving USA, 2021), accounting for the largest share of donations. Religious donations account for 40% of all donations in Canada (Lasby and Barr, 2018), also the largest in the country. According to census data in a high-income Asian economy studied in this paper, over 50% of the donators have donated to religious organizations.

What motivate 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 et al., 2012; DellaVigna et al., 2013; Andreoni et al., 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. For 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 18th century England. Using a field experiment, Auriol et al. (2020) also provide evidence for the existence of spiritual insurance among Pentecostals in Ghana, but the existence of such a channel in the developed economies has not been shown.

This paper investigates whether spiritual insurance exists by studying the relationship between donations and income uncertainty for the first time using observational data in a developed economy in Asia. 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 being 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 donation and insurance are mutually exclusive.

We test this prediction using a unique transaction-level dataset on donations and income for customers of a leading commercial bank in a high-income economy in Asia. The economy in our data has a GNI per capita between $20,000 and $30,000, 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 that 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, aggregating the dataset to a monthly frequency, we find that a higher level of unanticipated income shocks, a common proxy variable for background risk (Guiso and Paiella 2008), predicts higher donations.

Further analysis suggests that our surprising finding of donations being increasing in income uncertainty is mainly due to uncertainty of negative income movements and is more

pronounced for religious donations than for secular donations. We also find that when people experience medical shocks, people tend to increase religious donations *only*, and not secular donations. These are novel patterns in the donation literature. Interestingly, donations and insurance purchases display a pattern of substitutability, as predicted by the model: Those who donate reduce their insurance purchases, and donation moreover mutes the relationship between income uncertainty and the purchase of market-based insurance. All these findings suggest that donations serve as a form of spiritual insurance in our data.

More specifically, we calculate income uncertainty by using the volatility of realized monthly income in the immediate past. We remove the predictable part of income from the observed payroll income realizations (Meghir and Pistaferri 2004; Jurado, Ludvigson, and Ng 2015). We examine the effect of income uncertainty on donations using within-individual variations and a predictive regression: controlling for income levels, financial wealth, demographic variables, time and individual fixed effects, we estimate the predictive effect of income uncertainty calculated using income realizations from the past twelve months on the amount of donation over the next three months. We document in our dataset that when income uncertainty rises by one standard deviation, donations rise by 0.77 times the unconditional sample mean, a result that is statistically significant at the 1% level. Indeed, we also find that the predictive effect of income levels on donations is positive but economically small, and we interpret it as consistent with the possibility that when income drops, uncertainty may be high, so with spiritual insurance, the observed relationship of donations with income levels may also be influenced.

We provide further tests for the spiritual insurance motive. We first divide donations into religious and secular according to their destinations. In the census, we find that the stated motivations for religious and secular donations both have "spiritual insurance" elements, but a larger share of donators report spiritual insurance motivations for religious donations (58%, versus 22% for secular donations). Indeed, in our transactional data, we find that the predictive effect of income uncertainty on donations is 43% stronger for religious donations than for secular donations, consistent with the more prevalent survey-stated spiritual insurance motivation in religious donations.

Also, in the examples we provided just before on the ancient Greek and Chinese sailors and the Wesleyan church, believers primarily ask for insurance against negative shocks. Therefore, we further decompose income uncertainty into positive and negative income uncertainty following a semi-variance approach from the finance literature (Barndorff-Nielsen, Kinnebrock, and Shephard 2008; Segal, Shaliastovich, and Yaron 2015). Using the same predictive specification, we find that the coefficient on negative income uncertainty is statistically significantly higher than the coefficient on positive income uncertainty: When negative (positive) income uncertainty increases by one standard deviation, religious donations increase by \$0.47 (\$0.27), a difference of \$0.20. We interpret this result as suggesting our finding of spiritual insurance is stronger after observing negative income changes. We also examine health shocks, a common negative shock of similar importance to income uncertainty, to see the effect of this relatively exogenous shock on donations. Absent a spiritual insurance motive, health shock should reduce donation if donation is a normal good, but spiritual insurance would predict the opposite. Defining health shock as incurring above-median medical expenditures in the past three months, we find donations in the next three months rise by 140% times the sample mean. This post-health-shock rise in donations is mostly from religious donations, as the coefficient for secular donations is not statistically significant.

The spiritual insurance explanation hinges on the (non-traditional) insurance function of the donation. Our model, extended in a natural way, predicts that donation and market-based insurance are substitutes, and that observed donations would be associated with less purchase of market-based insurance on average. We estimate a set of regression models to test whether substitutability exists between religious donations and market-based insurance. Specifically, focusing on within-person variations, we observe that compared to the sample mean, those who have made religious donations in a three-month period purchase 63% less insurance in the same period. Also, 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 three-month period. These results suggest that substitutability exists in our sample between religious donations and market-based insurance and that such substitutability is economically significant.

We conduct careful additional tests to rule out alternative explanations. First, one alternative explanation is increased altruism, where people increase their level of sympathy and thus donations after experiencing hardship. Our study rules out this explanation because this motive would be present for both religious and secular donations, however we find clear differences between the two after the health shock. In addition to this, this motive does not lead to religious donations and insurance purchases being substitutes for each other.

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

Lastly, we also examine whether donations and especially religious donations materially reduce income uncertainty in the future. This is possible if donations under spiritual insurance provide psychological comfort and so people are able to deal with uncertainty more properly, which act as a form of "self-fulfilling prophecy". However, we find that income uncertainty in the future do not materially decrease following donations, suggesting that the spiritual insurance role of donations is indeed a way of wishful thinking.

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 donations are affected by tax considerations. For example, using data from an online donation platform, Meer (2014) finds that an increased price of giving results in a lower likelihood of a project being funded. Duquette (2016) reveals overall donations are sensitive to changes in tax costs, but different subsectors respond heterogeneously. 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 not. Social image and social pressure are also shown to affect the 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) finds 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 by offering the first empirical study based on donations in observational data.

The third related literature is about spiritual insurance.[2] Auriol et al. (2020) show evidence for the spiritual insurance motive using a field experiment in Ghana. They find that

[2] 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

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 use within-person variations in donation behavior in observational data. Our study also focuses on people's recent experience of income uncertainty and medical expenditure shocks, and these people are in a high-income economy. The results we obtain suggest that spiritual insurance exists 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 data. 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 examines whether spiritual insurance materially reduces income uncertainty. 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

and Tirole (2002), and Bénabou (2013), Brunnermeier and Parker (2005), Caplin and Leahy (2001; 2019), and Zimmermann (2020). Related laboratory studies also confirm the existence motivated beliefs (e.g., Dana, Weber, and Kuang 2007; Di Tella et al. 2015; Engelmann et al. 2019; Exley and Kessler 2019).

as $\bar{I}$ (neutral state) with probability $1-2p$. Before knowing the realization of $\tilde{I}$, the agent decides to put out $g$ as donation, which generates direct utility. The agent's utility function is $E\left(u\left(\tilde{I}-g\right)\right)+\theta v(g)$. 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.[3]

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 $D$.

Some of Lemma 1's predictions changes when the model does contain a spiritual insurance motive and we discuss the specifics below. When the spiritual insurance motive is present, the agent demonstrates a form of motivated belief—wishful thinking. That means the agent believes that donating changes the income uncertainty she faces as a reward from the supernature for her good deeds. 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 irrational 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 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 $\pi(g)$.

[3] 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 motivates 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.

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

$$\max_{g}(1-2\bar{p})u\left(\bar{I}-g\right)+\left(\bar{p}-\pi(g)\right)u\left(\bar{I}-g-D\right)+\left(\bar{p}+\pi(g)\right)u\left(\bar{I}-g+D\right)+\theta v(g) \quad (1)$$

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:

$$\frac{\partial g^{*}}{\partial \bar{I}}>0. \quad (2)$$

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.:

$$\frac{\partial g^{*}}{\partial D}>0, \quad (3)$$

if the following condition is satisfied:

$$\begin{aligned}&\pi'\left(g^{*}\right)\left[u'\left(\bar{I}-g^{*}+D\right)+u'\left(\bar{I}-g^{*}-D\right)\right]\\&>\left(\bar{p}-\pi\left(g^{*}\right)\right)u''\left(\bar{I}-g^{*}-D\right)(-1)+\left(\bar{p}+\pi\left(g^{*}\right)\right)u''\left(\bar{I}-g^{*}+D\right)\end{aligned} \quad (4)$$

The condition (4) required for $\frac{\partial g^{*}}{\partial D}>0$ has clear economic interpretations. On the left-hand side, $\pi'\left(g^{*}\right)\left[u'\left(\bar{I}-g^{*}+D\right)+u'\left(\bar{I}-g^{*}-D\right)\right]$ represents the marginal benefit from the spiritual insurance channel for donating, when the size of background risk $D$ increases by one. 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, $\left(\bar{p}-\pi\left(g^{*}\right)\right)u''\left(\bar{I}-g^{*}-D\right)(-1)+\left(\bar{p}+\pi\left(g^{*}\right)\right)u''\left(\bar{I}-g^{*}+D\right)$ is the expected additional increase in the marginal utility of consumption when the size of background risk $D$ increases by one. This term represents the income effect of higher income uncertainty on donations, which is negative and also exists in the model without spiritual insurance.

Comparing the two sides of the 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, the optimal donation size will rise, in direct contrast to the model without spiritual insurance. We summarize the above findings as Proposition 1 (full proof given in the appendix.)

**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 (4) 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 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 (depending on a condition similar to (4)), by reducing the perceived probability of the low-income state, donating more reduces the purchase of insurance; vice versa, the purchase of market-based insurance reduces donations. Further, if the spiritual insurance channel is weak or inexistent, the relationship 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

We use a proprietary dataset from a leading commercial bank (the "Bank") in a high-income Asian economy. The 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 consumer, including gender, marital status, age, education, occupation, dependents, and zip code. The raw data include approximately 1.6 million clients for two years from July 2013 through June 2015. We focus on clients who receive their salaries through the Bank (around 10% of the raw data), for whom we observe all incoming payroll transactions in their checking accounts.

We also observe donations that these clients make as part of their credit card transactions. We view our transactional data on credit card donations as providing a unique laboratory to study donation in the presence of income uncertainty naturally occurred on a large scale. The specified destination of each donation is recorded in the database, and we can divide it into two

categories: religious donations (mostly to Christian charities) and secular donations, by whether the recipient is a religious organization.

We note that all of the recorded donations in our dataset go to large, national charitable foundations (religious or secular), not to local religious organizations, making it unlikely that the motive for the donations was mutual insurance at the community level. 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 relationship between income uncertainty and donations.

We perform the following sample cleaning procedure: First, to ensure the accurate calculation of income uncertainty, we focus on a sample of full-time workers between the ages of 18 and 55 that receive payroll via the Bank consecutively during our 24-month sample period.[4] Next, to exclude outliers from individuals with excessive income fluctuations, we rule out individuals whose monthly income exceeds 1000% (or falls below 10%) of the previous month. These restrictions yield a sample of 74,023 individuals and 1,776,552 individual-month observations across 24 months.

### 3.2. Summary Statistics

Table 1 reports the summary statistics. The average monthly payroll income in the sample is $4,067 (USD). The median monthly payroll income is $2,200, which is higher than the official median income for the employed in this economy. Our sample payroll income distribution is right-skewed. Hence, we use the logarithm of payroll income and uncertainty measures based on the logarithm of payroll income in our subsequent empirical analysis. We define financial asset value as the client's end-of-month checking and savings account balances with the bank plus mutual fund share values held through the bank. The average financial asset value is $13,600. The average age of these bank clients is 36.5, and only 32% are married. More than 60% are white-collar workers, executives, or managers. More than half have a

[4] 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.

bachelor's degree or above. Overall, these statistics indicate that we have a large sample of relatively young and educated workers.

The share of clients who donated during the sample period is 6.27%, and 2.20% of all sample individuals donated in more than one month. Observations with a non-zero donation account for 1.03% of the sample at the individual-month level. Conditional on making donations in a month, the average donation amount is $46.08, which accounts for about 0.75% of the average monthly income for the same observations, which we interpret as a non-negligible amount that these clients spend on donations.

Donations to religious organizations seem important in our sample. Of all observations with a non-zero donation at the individual-month level, 62% made donations that went to religious organizations. The conditional average monthly amount of these religious donations is $44.01. At the same time, 41% of these observations made donations that went to secular organizations. The conditional average monthly amount of these secular donations is $45.73. At the individual-month level, some bank clients in our sample made donations to both religious and secular organizations.

The insurance penetration rate is significant in our sample. The share of bank clients that purchased any insurance during the period is close to a half (45.3%). Observations with insurance purchases represent 11.0% of the total sample at the individual-month level. For the bank clients in our raw data, we observe the type and amount of each insurance product purchased. The purchased products are primarily critical illness insurance and life insurance, which make up approximately 90% of the observed insurance purchases. We exclude saving insurance and investment insurance (together accounting for the remainder 10% of the observed insurance purchases), the main purpose of which is not hedging risks. Conditional on purchasing insurance in a given month, the average amount of market-based insurance purchased is $368.67.

[Table 1 here]

### 3.3. Measuring Individual-Level Income Uncertainty

The primary independent variable in our study is income uncertainty and we focus on how income uncertainty at the individual level formed with experience in the immediate past *predicts* donation behavior. To quantify income uncertainty at the individual level and to avoid simultaneity bias in estimating the predictive regression analysis, we proxy for individual-level income uncertainty using the volatility of realized monthly income over an immediate past period. We take the period to be twelve months in the empirical analysis. All results are robust when we use a shorter period of nine months or six months. To the extent that our income uncertainty variable contains measurement error, we expect an attenuation bias toward zero for the coefficient estimate on this variable in our predictive regression analysis, which biases against finding support for the spiritual insurance channel.

Fluctuations in income consist of two parts: a part that can be predicted and the other part that is an unpredicted shock. The former should not be included in the measurement of income uncertainty. Our income uncertainty measure thus excludes predictable fluctuations in income in the construction process. We calculate our measure for income uncertainty in the following steps. We first estimate the following model to remove the predictable part of income fluctuations following the literature (Meghir and Pistaferri 2004; Jurado, Ludvigson, and Ng 2015):

$$\log(income)_{it} = \alpha + \boldsymbol{X}_{it}'\beta + \mu_t + \varepsilon_{it} \tag{5}$$

where $\log(income)_{it}$ denotes the logarithm of payroll income of individual $i$ in month $t$, $X_{it}$ denotes the demographic characteristics of the individual $i$ in month $t$, including the city of residence, age, the square of age, and a set of dummy variables for marital status, level of education, occupation and the number of dependents, and $\mu_t$ denotes the time fixed effect of month t. After removing the predictable part of income fluctuations, we obtain $\varepsilon_{it}$, the residual term of log income, or residual income.

After obtaining residual income, we compute our measure for income uncertainty, which is based on individual experience on income realizations in the immediate past, as the standard

deviation of residual income over the last $T$ months. That is to say, the income uncertainty measure $incomeuncertainty_{i,t-1}$ is computed as follows

$$incomeuncertainty_{i,t-1} = sd_{s\in\{t-1,\ldots,t-T\}}\left(\hat{\varepsilon}_{is}\right) \tag{6}$$

where $\hat{\varepsilon}_{is}$ is residual income for individual $i$ in month $s = t\text{-}1, \ldots, t\text{-}T$. Calculating income uncertainty using recent past data is similar to studies on how uncertainty from the firm affects individual consumption (Alfaro and Park 2020; Di Maggio et al. 2022), which measure uncertainty using realized stock market volatility. Our measure that uses income volatility in the immediate past to proxy for expected income uncertainty is also consistent with Meghir and Pistaferri (2004), who show that income volatility in the immediate past significantly and positively predicts income uncertainty in the next period.

# 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.

## 4.1. The Relationship between Uncertainty and Donations

We analyze the effect of individual-level income uncertainty on donation behavior based on a dynamic moving-window specification. The econometric specification is as follows:

$$donation_{i,t} = \beta_1 incomeuncertainty_{i,t-1} + \boldsymbol{X}_{it}'\gamma + \mu_t + \lambda_i + \varepsilon_{it} \tag{7}$$

where $donation_{it}$ on the left-hand side denotes the sum of individual $i$'s donations in the immediate-after period, taken to be the current month and the next two months in this benchmark specification. On the right-hand side, $income\ uncertainty_{i,t-1}$ denotes the income uncertainty experienced by individual $i$, calculated as the standard deviation of her residual income over the immediate-past period, taken to be the previous twelve months in the baseline.

$\boldsymbol{X}_{it}$ denotes the other independent variables and control variables, including the values of the log level of income in the current month $t$, log financial wealth, age, the square of age, educational attainment, occupational type, marital status, and the number of dependents of individual $i$ at month $t$. $\mu_t$ represents time fixed effect and $\lambda_i$ is individual fixed effect.

Our econometric specification is designed to address the problem that cross-sectionally relating donations to income uncertainty in a pooled regression is subject to issues that exclude a causal interpretation. Our approach using within-person variations addresses these issues, first because by controlling for individual fixed effects, we remove the influence of any time-invariant characteristic at the individual level. Second, because we use only backward-looking measures of income uncertainty to forecast donations in the future, we exclude the possibility that our results might be driven by a simultaneity bias or by reverse causality. Our empirical approach based on within-person variations then allows us to estimate and understand how income uncertainty predictively influences donation dynamically within a given individual.

Our benchmark specification amounts to investigating how the income uncertainty of the past twelve months affects donations within the next three months with the aforementioned controls and fixed effects. We choose a 12-month period as the immediate-past period for computing income uncertainty because this length is long enough to have sufficient variation to calculate income uncertainty, but also not too long so that we have enough months left to estimate the dynamic effects on donation. Due to the low frequency of donations in the sample, we use the sum of donations in the immediate 3-month period (the current month and the next two months) as the dependent variable, to ensure sufficient variation and yet retain a long enough sample period.

We make sure that details of the model specification do not drive the results of our econometric analysis through a battery of robustness checks. Results are robust if we use donation amounts in the immediate 1-month, 2-month, or 6-month period as the dependent variable, or if we compute income uncertainty using a shorter 6-month or 9-month period as the independent variable, as shown by results in Panels A to E of Online Appendix Table A1. These alternative modeling choices give rise to different numbers of observations, but the point estimates hardly change. Results are furthermore robust to are robust to controlling for log

income in the previous month or average of the previous twelve months instead of log income in the current month, and are robust to alternative ways of computing income uncertainty in the immediate past period as the standard deviation of (1) the non-residualized log income or (2) the income growth rate, instead of the standard deviation of residualized log income, as shown by results in Online Appendix Table A2 and A3.

We estimate Equation (7) as a panel fixed-effect predictive model to arrive at the predictive effect of income uncertainty on donations. As our dynamic moving-window approach indicates, Equation (7) allows overlap between observations, e.g., donations in month *t* are used simultaneously to calculate the immediate-after period donations at time points *t-2*, *t-1*, and *t*, and similarly each income observation is used more than one time in computing income uncertainty in the immediate past period. These overlap between observations may create within-person autocorrelations. Thus, we cluster standard errors at the individual level to address these within-person autocorrelations. For robustness, we also choose a sample with no data overlap across observations to estimate Equation (7) and report the results in Online Appendix Table A3, and the results are unchanged.

Table 2 shows the estimates of Equation (7). For brevity, we leave the control coefficients in the online appendix (Online Appendix Table A4). We report that when income uncertainty rises by one standard deviation in the past 12 months, donations in the next three months on average increase by $1.22, and this effect is significant at the 1% level. Although the sample-wide dollar amount may give the impression of being small, percentage-wise the increase amounts to 86% of the sample mean of three-month donations, a non-trivial effect.

[Table 2 here]

The positive effect of income uncertainty on donations is consistent with the prediction of Proposition 1 under the condition that the spiritual insurance motive is strong enough, and is inconsistent with the predictions of the model when the spiritual insurance motive is weak or absent as predicted by Lemma 1. While our model is intentionally simple, our model only restricts the demand for donation follows that for a normal good absent spiritual insurance. Given that, a risk-averse and prudent individual would spend less on donations as income uncertainty increases (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, a positive relationship between income uncertainty and donations could also arise in the absence of a spiritual insurance motive if our model assumptions are not true. For example, it could be because individuals are not prudent, so that higher income uncertainty increases spending in general and in donations. But it is contrary to what a large number of studies, such as Carroll and Samwick (1998) and Bayer et al. (2019), have empirically found. Or second, individuals view donations as inferior goods, so that higher income uncertainty could also increase donations through a reversed income effect. But this hypothesis contradicts Auten, Sieg, and Clotfelter (2002), collective results surveyed by Andreoni and Payne (2013) that review the self-interest (e.g. tax-incentive) and social preferences (e.g. altruism, warm-glow, social image, peer pressure) channels of donations, and model settings of the literature on behavioral channels just mentioned.

As discussed in Remark 1, we do not expect the coefficient on log income level to shed light on whether a spiritual insurance motive exists. We find a positive but weak relationship between income level and donations. As shown in Table 2, we find an insignificant positive coefficient of donations on the log income level, with the coefficient value being 0.13, with a standard error of 0.27.[5] The positive sign of the coefficient 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.

[5] One possible reason why the size of the coefficient on log income level is modest is that our income uncertainty variable based on historical data admittedly does not measure income risk perfectly. This does not invalidate the interpretation of our estimated predictive relationship because measurement error in income uncertainty biases against us from finding a significant effect of income uncertainty on donations. If such measurement error in income uncertainty exists, and if unmeasured income uncertainty is negatively related to income levels e.g. as in Guvenen, Ozkan, and Song (2014), then under a strong spiritual insurance motive a weak relationship between income levels and donations is as expected.

### 4.2. Donation and Spiritual Insurance

While Finding 1 provides supportive empirical evidence of spiritual insurance influencing donation behavior, there are still several questions unanswered. First, spiritual insurance often represents a belief in "divine intervention", thus do we observe stronger results in donations to religious organizations versus secular charities? Second, to the extent that believers often seek blessings against adverse events, do we observe a larger 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

**Income Uncertainty in the Positive and Negative Side**

To explore whether religion plays a role in the result consistent with spiritual insurance that we estimated, we split the donations into religious and secular donations. According to the census of the economy in our data, 39% of the population donates for blessings, a reason second only to the 41% who donate for giving back to the society. For religious donations, the most important purpose is praying for blessing (56%), followed by giving back to the society (25%); while the order is reversed for secular donations, with the most important purpose being giving back to the society (58%), followed by praying for blessing (22%). The statistics indicate that people make religious and secular donations primarily for different purposes, but spiritual insurance is overall important as a purpose for donation. One possible explanation is that while religious donations are more tightly linked to divines, thus we may expect stronger spiritual insurance behavior, secular donations may also serve as good deeds that in the belief of some givers would be rewarded by the super nature, a point that is also raised by Auriol et al. (2020).

[Figure 1 here]

Thus, following the pattern that religious and secular donations displaying different motivations in the census, we expect to find that our finding regarding spiritual insurance is more pronounced in religious donations, although we may find manifestation of spiritual insurance in both religious and secular donations. To examine our conjecture, we split the donations into religious and secular donations as two separate dependent variables, and re-estimate Equation (5) separately for these two dependent variables. Table 3 shows the estimation results. Columns (1) and (3) of Table 3 have the same specification as Column (1) of Table 2, except that the dependent variables are replaced with religious and secular donations, respectively; Columns (2) and (4) of Table 3 correspond to Column (2) of Table 2.

[Table 3 here]

Comparing Columns (1) and (3) of Table 3, the estimates suggest significant positive relationships between income uncertainty and both forms of donations. The finding of statistically significant results in both forms of donations is similar to Auriol et al. (2020). When income uncertainty rises by one standard deviation, religious donations increase by \$0.74 over the next three months, a 52% increase relative to the sample average; whereas secular donations increase by \$0.48, a 34% increase from the sample mean. While the difference in the regression coefficients of religious versus secular donations on income uncertainty is not statistically significant with a p-value of 17.5%, thus suggesting both types of donations exhibit patterns consistent with a spiritual insurance motive, the coefficient of regressing religious donations on income uncertainty is 54% larger than that for secular donations, which suggests a non-negligible economic difference. Overall, results in Columns (1) and (3) of Table 3 suggest that the effect of income uncertainty is present in both types of donations, but more pronounced in religious donations, consistent with our expectation.

### Downside Income Shock as a Negative Shock

In the examples of sailors worshiping Poseidon and Mazu before sailing and Wesleyans in 18$^{th}$ century England praying for healing and protection, believers primarily ask for insurance against negative shocks. 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.[6] The estimation results are shown in Columns (2) and (4) of Table 3. The fact that the coefficient on positive income uncertainty is also significant means that the spiritual insurance channel may also exist in wishing for a favorable outcome when facing uncertainty on the positive side. However, for both religious and secular donation, the predictive coefficient of negative income uncertainty is larger than that of positive income uncertainty. The presence of the pattern in both forms of donations is consistent with Auriol et al. (2020). To be more specific on the difference between the negative and the positive side, when negative (positive) income uncertainty increases by one standard deviation, religious donations increase by \$0.47 (\$0.27), a difference of \$0.20, and secular donations increase by \$0.32 (\$0.17), a difference of \$0.15, over the next three months. We observe that for religious donations, the difference between the coefficients of negative and positive income uncertainty is also slightly larger.

These results suggest our finding of spiritual insurance is stronger after observing negative income changes. Consistent with the census statistics that 56% (22%) of people making religious (secular) donations report praying for blessings as a reason for the donation, the pattern is present in both types of donations, but more pronounced in religious 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

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[6] We adopt the semi-deviation method, which is a common method for measuring downside risk (for example, see Barndorff-Nielsen, Kinnebrock, and Shephard 2008; Segal, Shaliastovich, and Yaron 2015), to decompose the income uncertainty into two components that separately capture positive and negative movements, respectively. Specifically, we define the positive and negative income uncertainty as follows:

$$positive\ uncertainty_{i,\{t-1,\ldots,t-T\}} = \sqrt{(1/T)\sum_{s=t-T}^{t-1} \mathrm{I}\left(\Delta\hat{\varepsilon}_{is} \geq 0\right)\Delta\hat{\varepsilon}_{is}^{\,2}},$$

$$negative\ uncertainty_{i,\{t-1,\ldots,t-T\}} = \sqrt{(1/T)\sum_{s=t-T}^{t-1} \mathrm{I}\left(\Delta\hat{\varepsilon}_{is} < 0\right)\Delta\hat{\varepsilon}_{is}^{\,2}},$$

where $\Delta\hat{\varepsilon}_{is}$ stands for demeaned residual income for individual $i$ in month $s$ relative to period average $(\hat{\varepsilon}_{is} - \sum_{\tau=t-T}^{t-1}\hat{\varepsilon}_{i\tau}/T)$ and $\mathrm{I}(\Delta\hat{\varepsilon}_{it} \geq 0)$ takes the value of 1 when $\Delta\hat{\varepsilon}_{it} \geq 0$ and 0 otherwise.

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." Following the spirit, we investigate whether spiritual insurance also exists in the case of 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 spiral insurance motive.

We define health shock as incurring medical expenditures in the past three months that are above the median of the sample.[7] The regression specification is as follows:

$$donation_{it} = \beta_1 health\ shock_{it} + \boldsymbol{X}_{it}'\gamma + \mu_t + \lambda_i + \varepsilon_{it} \quad (8)$$

where $health\ shock_{it}$ could be either a dummy variable indicating that at least one health shock has occurred in the past three months or the amount of above-median medical expenditures in the past three months, depending on the specifications. Other variables are defined in the same way as in Equation (5).

[Table 4 here]

Table 4 shows the health shock results. Columns (1) and (4) show the estimation results of the overall donations. We find that health shock under both measures positively predicts donations over the next three months. More specifically, the coefficient in Column (1) indicates that when at least one health shock occurs within the past three months, donations will increase by $1.97 in the next three months, which is 140% of the sample mean. The results in Column (4), on the other hand, indicate that for every $100 increase in health shock spending in the past three months, donations in the next three months increase by $0.82, which is 58% of the sample mean. These results tend to support the existence of a spiritual insurance channel.

[7] We exclude transactions related to cosmetic surgery to ensure the heath shock is indeed a negative shock. For robustness, we also adjust the window of health shock to the past six months or the window of future donations to one month, and the results are robust.

We continue to decompose total donations into religious and secular donations, and re-estimate Equation (6). The results are presented in Columns (2), (3), (5), and (6) in Table 4. Here we note more distinguished differences between religious and secular donations. The estimation results in Column (2) and (3) suggest that when at least one health shock occurs within the past three months, religious donations will increase by $1.82 in the next three months, which is 130% of the sample average three-month donations, whereas the effect of health shocks on secular donations ($0.14 with a p-value of 20.4%) is statistically and economically insignificant. 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 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 substantiate the idea that donations, especially religious donations, can be motived 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, and for income uncertainty on the negative side. Health shock, another prominent negative shock, also predicts more religious donations.

### 4.2.2. The Substitutability between Religiosity and Insurance

The extended model prediction in Section 2 further motivates our study to examine the relationship between donations and insurance. If a spiritual insurance channel indeed underlies donations and is strong enough, Proposition 2 of the extended model says we should observe a pattern of substitutability between spiritual insurance and market-based insurance in the data. Based on this prediction, we ask: Will people reduce insurance purchases during the same period when they make donations, and if such a pattern exists, is it stronger for religious donations, and does the pattern hold for individuals who are unlikely to be cash-constrained?

Our specification is as follows, which estimates the within-period substitutability of insurance and donations:

$$insurance_{it} = \beta_1 donation_{it} + \beta_2 income\ uncertainty_{i,t-1} + \boldsymbol{X}_{it}'\gamma + \mu_t + \lambda_i + \varepsilon_{it} \qquad (9)$$

where $insurance_{it}$ is the amount of insurance purchased for the current and next two months, and $donation_{it}$ is a dummy variable that takes the value of 1 when there is at least one donation for the current and next two months. The coefficient of interest is $\beta_1$, which measures how much insurance purchases differ for individuals who donate (to secular charities, to religious charities, or to any charity) and those who do not donate. Other variables are defined as before.

The estimation results of Equation (8) are presented in Columns (1) to (3) of Table 6, where the key independent variable (if donate) in Columns (1), (2), and (3) correspond to donation to any charity, donation to religious charities, and donation to secular charities, respectively. First, it can be inferred from the coefficients in Column (1) that the amount of insurance purchased in the next three months increases significantly when income uncertainty rises in the past, regardless of whether individuals make any donation. This result is natural because risk-averse individuals tend to purchase more insurance when uncertainty rises and is also consistent with the background risk literature (for example, see Guiso and Jappelli 1998). More closely related to examining the spiritual insurance channel, Column (1) shows that when controlling for the effect of income uncertainty, those who make at least one donation purchase $66 less insurance on average (more than half of the unconditional sample mean) during the same period than those who do not make any donation, an effect that is significant at 5% confidence level.

Interestingly, similar to our health shock findings, such a significant substitutability pattern exists only with religious donation but not secular donation: The estimates in Column (2) suggest that the reduction in insurance purchases when religious donation is observed is $77, a reduction that is approximately two-thirds of the sample average insurance purchases. On the other hand, Column (3) demonstrates that there is no statistically significant reduction in insurance purchases when secular donation is observed.

[Table 5 here]

We are also interested in how donation behavior and insurance purchase behavior interact when people are faced with fluctuations in income uncertainty. We, therefore, propose the following specification that estimates whether and by how much donation changes the relationship between insurance purchases and income uncertainty:

$$\begin{aligned} insurance_{it} &= \beta_1 donation_{it} + \beta_2 income\ uncertainty_{i,t-1} + \\ &\beta_3 donation_{it} \times income\ uncertainty_{i,t-1} + \boldsymbol{X}_{it}'\gamma + \mu_t + \lambda_i + \varepsilon_{it} \end{aligned} \tag{10}$$

The coefficient of interest is $\beta_3$, on the interaction term of donation and income uncertainty. It measures how much the sensitivity of insurance purchases to income uncertainty changes from people who do not donate to people who make donations.

The estimation results of Equation (9) are presented in Columns (4) to (6) of Table 6. The results show that insurance purchases are significantly sensitive to income uncertainty only for people who do not donate. For people who do make donations, insurance purchases are no longer sensitive to income uncertainty. When holding other variables constant, a one standard deviation increase in past income uncertainty predicts a \$184.9 increase in three-month insurance purchases for those who do not make any donations in the same period, while the corresponding amount for those who make at least one donation is only \$10.3. That is to say, the occurrence of donations is associated with a reduction of \$174.6, or 94.4%, of insurance purchases for one standard deviation increase in the income uncertainty.

The results of Columns (5) and (6) further show that this alternation of the background risk – insurance purchase nexus in the presence of donations is contributed only by religious donations. In the setting mentioned above, donation to religious charities is associated with a significant reduction in the sensitivity of insurance purchases to background risk, such that the conditional sensitivity of insurance purchases to background risk when religious donation is observed is insignificantly negative. On the other hand, no economic significant nor statistical significant change in this sensitivity is found when secular donation is observed.

One alternative to spiritual insurance that may explain the pattern in Table 5 is the presence of cash constraints. Does the substitutability pattern still exist for individuals who are unlikely to be cash-constrained? We note that 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 cash-constrained, defined conservatively as individuals who have 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.[8] Examining only these individuals unlikely to be cash-constrained, we find very similar results (Online Appendix Table A11).

Further, to avoid the substitutability result being driven by statistical chance/false positive, we conduct a placebo test, replacing the dummy representing donation with a dummy representing high spending in various other consumption spending categories (such as traveling, restaurant dining, etc.) Reassuringly, we find no negative relationships between these placebo high-spending dummies and insurance purchases (Online Appendix Table A10).

Overall, the significant substitutability between donation and insurance purchase, especially the finding that such substitutability exists with the religious donations but not secular donations, provides additional evidence consistent with the spiritual insurance channel. We summarize these findings as follows:

**Finding 3:** donating is associated with a reduction in insurance purchases in the same period and a muting of the relationship between background risk and insurance purchases, even for individuals unlikely to be cash-constrained.

### 4.3. Alternative Explanations

We have discussed in Section 4.1 that the positive predictive relationship of income uncertainty on donations is hard to explain with existing donation theories. Now that we have reported more of our empirical findings, we further examine whether these findings distinguish spiritual insurance and alternative explanations.

[8] 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). We consider the individual as unlikely to be constrained if she has income to spare in every month.

One alternative explanation of the positive relationship between income uncertainty and donation is the 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 this is possible, this effect should exist with both religious and secular donations, but the clear difference between the two after the health shock is not consistent with this explanation. Further, this explanation also cannot predict the substitutability between religious donation and insurance purchase.

Another alternative explanation is that religious donations are a form of informal insurance, with people donating for the support of their peers in the community (e.g., church). Indeed, there is also a lot of empirical evidence in the literature that discovers this phenomenon. 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 institutions receiving donations are national charities, and donations go directly to unfamiliar people in need throughout the economy, thus there is unlikely an effect on mutual help in the community.

We nonetheless try to alleviate mutual insurance concerns 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) in our data. Results are reported in Online Appendix Table A11. The patterns we find suggest that neither religious nor secular donations reduce the passthrough of income changes to consumption, thus they suggest donations as spiritual insurance do not work through informal consumption insurance within the community.

The combination of the above results provides collective evidence for our hypothesis that the positive relationship between income uncertainty and charitable giving can be explained by a form of spiritual insurance: people make donations to religion in the hope that they will be reciprocated with luck that improves their conditions, or with more peace of mind. Beliefs of such blessing are wishful in a material sense because our data show no improvement in their conditions after making donations. However, despite the beliefs being wishful, people

materially reduce the purchase of formal insurance after making donations, especially when facing high income uncertainty, which further increases their risk exposure.

# 5. Discussions

### Does Donation Reduce Future Income Uncertainty?

One interesting question to be answered lastly is whether donations, particularly religious ones, have a significant impact on future income uncertainty. This is possible if donations under spiritual insurance provides psychologic comfort and operate as a "self-fulfilling prophecy": individuals anticipate a better future and find work or coping with uncertainty to be less stressful after making such donations. As a result, they may perform better with work and, as a result, experience less income uncertainty. This possibility involves no supernatural force but can nonetheless achieve similar result. To more directly examine it, we test whether donation in the first year predicts income uncertainty in the second year. The regression specification is follows:

$$income\ uncertainty_{i,t+1} = \alpha + \beta_1 donation_{i,t} + \beta_2 income\ uncertainty_{i,t} + \boldsymbol{X}_i'\gamma + \varepsilon_i \quad (11)$$

where $income\ uncertainty_{i,t+1}$ denote the income uncertainty (computed using monthly income observations) of individual $i$ in second year of our two-year dataset. $donation_{it}$ is a measure of donation behavior of individual $i$ in the first year (we consider both an donation dummy and the donation amount). We control for $income\ uncertainty_{i,t}$, i.e., income uncertainty in the first year. The variables included in $\boldsymbol{X}_i$ are the same as in Equation (5), except that all control variables are measured for the first year. $\varepsilon_i$ is the error term. The estimation results are shown in Table 6.

**[Table 6 here]**

Table 6 suggests that while income uncertainty experienced in the first year has a significant positive correlation with income uncertainty experienced in the second year, whether the individual donated in the first year (or the donation amount) has no significant

predictive power for the income uncertainty in the second year. This is true for both religious and secular donations. Thus, we do not find evidence that donation have a material effect on future income uncertainty. However, what we find does not rule out, and may even be consistent with the models of belief-based utility (Caplin and Leahy 2001; Brunnermeier and Parker 2005; Eliaz and Spiegler 2006; Kőszegi 2010; Oster, Shoulson, and Dorsey 2013; and the models surveyed in Bénabou 2015), that donations, especially religious donations, increases the psychological utility despite no significant effect on material wellbeing.

### External Validity

Our study on income uncertainty and donations adds external validity to Auriol et al. (2020)'s field experiment findings on spiritual insurance in Ghana and provides support for spiritual insurance in a high-income economy and in observational data. To what extent do the finding of this study extend to other high-income economies? Characteristics of our empirical setting and data, i.e., the non-local nature of the donation destination and the high-frequency feature of the dataset from the Bank, uniquely allow this study to test spiritual insurance, but a dataset satisfying these features has only been put forward in this study for the Asian economy we study. The increasing availability of transactional-level data on individual behavior could offer a satisfactory answer to the question in other economies.

Traditional survey data might provide some information but not pin down spiritual insurance. We report in Online Appendix A13 that using a survey dataset for another high-income economy (HRS for the U.S.), we find a result similar in spirit to our study and to Auriol et al. (2020): The amount of life insurance purchased is negatively related to the churchgoing frequency, controlling for individual and time fixed effects. We note that because the church is local in the HRS data, mutual insurance may still exist. Thus, this supplementary result does not pin down spiritual insurance, and more detailed data is still required to extend our findings to the U.S.

## 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. And this effect is mainly due to negative income uncertainty, and is particularly strong religious donations. Our result also suggests that the spiritual insurance role of donations is negatively related to the demand for insurance in the sample of individuals in the high-income economy that we analyze. 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 findings offer a novel perspective for understanding donation behavior, especially those from the religious group, at the micro-level. However, our results also speak to some puzzling macro patterns. List (2011) finds that charitable giving is "sticky downwards" in the sense that it is much more sensitive to increases than decreases in macroeconomic indicators, such as GDP and 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, which dilutes the positive relationship between income and donation predicted under traditional motivations of donations, especially during economic or market downturns that typically involve rising income uncertainty.

Taken as a whole, as transactional data is becoming more and more accessible to researchers, we view our empirical results to encourage more future research to use these newly-available data on donation behavior and on spiritual insurance, which may open new avenues in understanding the drivers of charitable giving and how religion influence individual behavior in economies of all stages.

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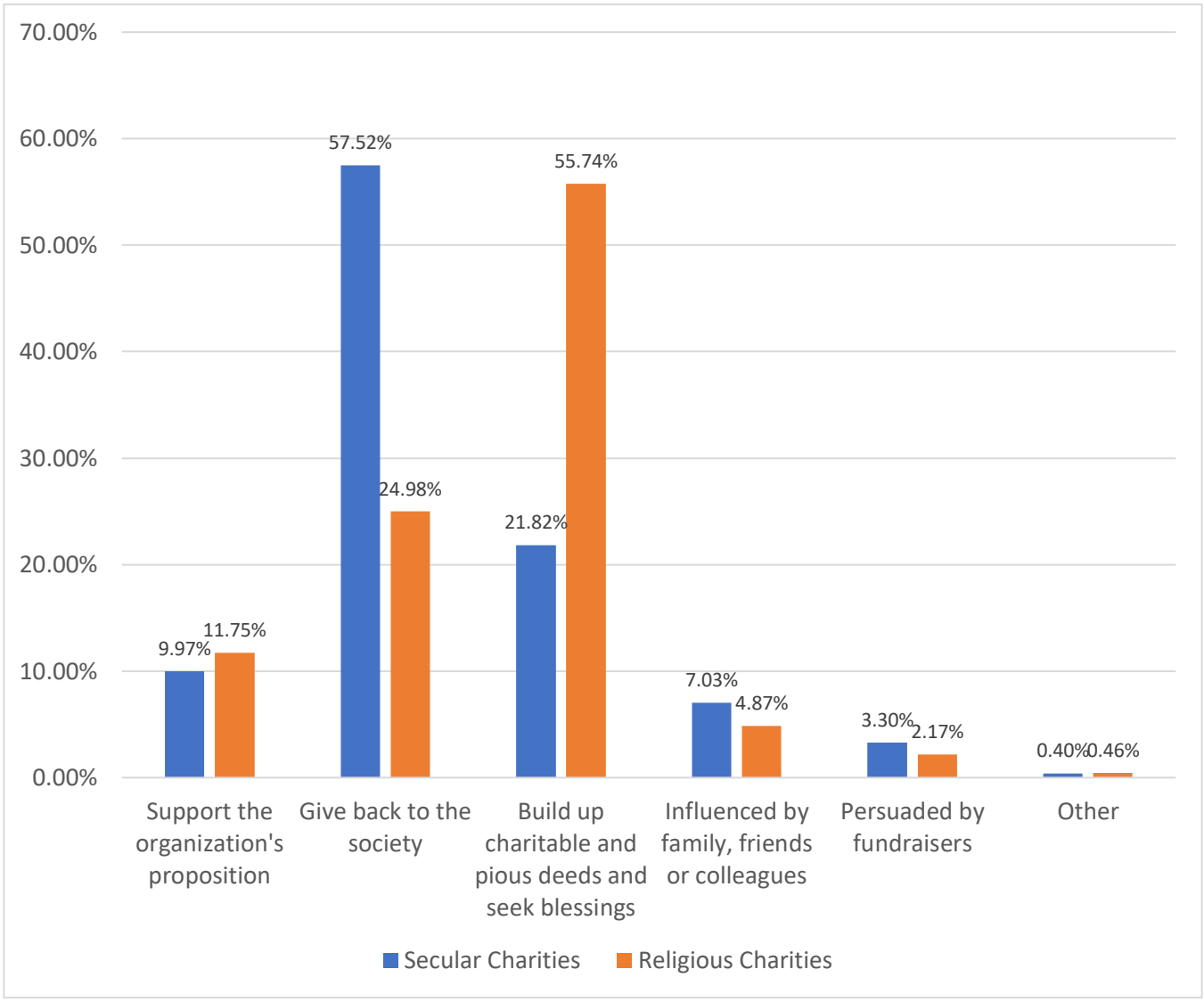
## Figures and Tables

Figure 1 The Primary Reason for Donating to Nonprofit Organizations




Source: Census of the sample economy.

# Table 1: Summary Statistics

Notes: This table presents the summary statistics for the sample at the individual-month level. Financial wealth is measured as the sum of the value of saving, bond, fund, stock net of debt, and loan. Donation include 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.

| | |
|---|---|
| Number of individuals | 74,023 |
| Number of months | 24 |
| Number of observations | 1,776,552 |
| Non-zero fraction of donation | 1.03% |
| Non-zero fraction of religious donation | 0.64% |
| Non-zero fraction of secular donation | 0.42% |
| Non-zero fraction of insurance | 11.00% |
| Non-zero fraction of health expenditure | 2.75% |

| | Mean | Standard | Min | 25th | Median | 75th | 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 | $46.08 | $54.35 | $0.03 | $23.33 | $33.33 | $56.67 | $2,000.00 |
| Religious donation | $44.01 | $55.71 | $3.33 | $23.33 | $33.33 | $50.00 | $2,000.00 |
| Secular donation | $45.73 | $47.04 | $0.03 | $16.67 | $33.33 | $56.67 | $1,200.00 |
| Insurance | $368.67 | $3,433.33 | $0.03 | $74.27 | $166.67 | $266.67 | $672,173.60 |
| Health expenditure | $37.98 | $157.19 | $0.07 | $14.67 | $20.00 | $33.33 | $15,333.33 |
| Age | 36.53 | 6.99 | 18 | 31 | 36 | 41 | 55 |
| Gender | Female | | | | | | |
| | 0.46 | | | | | | |
| Marital status | Married | | | | | | |
| | 0.32 | | | | | | |
| Education | Graduate school and above | | | Undergraduate | | Vocational school | |
| | 0.14 | | | 0.38 | | 0.20 | |
| | High school and below | | | | | | |
| | 0.28 | | | | | | |
| Job position | Military personnel, civil | | | Agricultural workers | | Blue-collar workers | |
| | 0.02 | | | 0.00 | | 0.31 | |
| | White-collar workers | | | Service-sector workers | | Owner-managers | |
| | 0.52 | | | 0.04 | | 0.01 | |
| | Executives | | | Others | | | |
| | 0.08 | | | 0.02 | | | |
| Dependents | No dependent | | | One dependent | | Two dependents | |
| | 0.87 | | | 0.05 | | 0.07 | |
| | More than two dependents | | | | | | |
| | 0.01 | | | | | | |

## Table 2: Moving Window Results of Income Uncertainty on Donation

Notes: This table reports the effect of individual-level income uncertainty on donation behavior based on a moving window model. The dependent variable is total donation for the current month and next two months. The independent variables include income uncertainty, income and control variables. Income uncertainty is the standard deviation of past 12 months' income after removing the portion that can be explained by demographic background variables, financial wealth (in logarithms), and time-fixed effects. Income is the current month's income (in logarithms). Control variables include demographic background variables, and financial wealth (in logarithms). Demographic variables are 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. Individual fixed effect and time fixed effect are controlled. 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 A4.

| Dependent variables | Total donation | Total donation | Total donation |
|---|---|---|---|
| | (1) | (2) | (3) |
| Income uncertainty | 2.74*** | 2.84*** | 2.85*** |
| | (0.27) | (0.28) | (0.28) |
| Income | 0.05* | 0.06** | 0.05 |
| | (0.03) | (0.03) | (0.03) |
| Control variables | | √ | √ |
| Time fixed effect | | | √ |
| Individual fixed effect | √ | √ | √ |
| Number of IDs | 74,023 | 74,023 | 74,023 |
| Observations | 740,230 | 740,230 | 740,230 |
| R2-Adjusted | 0.514 | 0.514 | 0.514 |

## Table 3: Moving Window Results of Income Uncertainty on Religious and Secular Donation

Notes: This table reports the effect of individual-level income uncertainty on donation behavior based on a moving window model. In Columns (1) and (2), the dependent variables are the religious donation for the current month and next two months. In Columns (3) and (4), the dependent variables are the secular donation for the current month and next two months. The independent variables include income uncertainty, income and control variables. Income uncertainty in Columns (1) and (3) is the standard deviation of past 12 months' income after removing the portion that can be explained by demographic background variables, financial wealth (in logarithms), and time-fixed effects. Positive (negative) income uncertainty in Columns (2) and (4) is the positive (negative) semi-deviation of past 12 months' income after removing the portion that can be explained by demographic background variables, financial wealth (in logarithms), and time-fixed effects. Income is the current month's income (in logarithms). Control variables include demographic background variables, and financial wealth (in logarithms). Demographic variables are 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. Individual fixed effect and time fixed effect are controlled. 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 A5.

| Dependent variables | Religious donation | Religious donation | Secular donation | Secular donation |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| Income uncertainty | 1.73*** | | 1.12*** | |
| | (0.21) | | (0.19) | |
| Positive uncertainty | | 0.63*** | | 0.39*** |
| | | (0.12) | | (0.12) |
| Negative uncertainty | | 1.09*** | | 0.75*** |
| | | (0.27) | | (0.23) |
| Income | 0.06** | 0.06** | -0.01 | -0.01 |
| | (0.02) | (0.02) | (0.02) | (0.02) |
| Control variables | √ | √ | √ | √ |
| Individual fixed effect | √ | √ | √ | √ |
| Time fixed effect | √ | √ | √ | √ |
| Number of IDs | 74,023 | 74,023 | 74,023 | 74,023 |
| Observations | 740,230 | 740,230 | 740,230 | 740,230 |
| R2-Adjusted | 0.489 | 0.489 | 0.548 | 0.548 |

# Table 4: Moving Window Results of Health Shock on Donation

Notes: This table reports how health shock affects people's donation behavior based on a moving-window model. The dependent variables in Columns (1) to (3) are total donation, religious donation, and secular donation for the current month and next two months, respectively, as so do for Columns (4) to (6). The independent variables include health shock, income and control variables. The definition of health shock in Columns (1) to (3) is incurring medical expenditures that are above the median of the sample in the past three months, and the definition of health shock in Columns (4) to (6) is the amount spending on medical expenditures that are above the median of the sample in the past three months. Income is the current month's income (in logarithms). Control variables include demographic background variables, and financial wealth (in logarithms). Demographic variables are 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, and the unit of the amount of health shock in Columns (4) to (6) is 1,000 USD. Individual fixed effect and time fixed effect are controlled. 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 A6.

| Dependent variables | Total donation | Religious donation | Secular donation | Total donation | Religious donation | Secular donation |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Occurrence of health shock (past 3 months) | 1.97*** | 1.82*** | 0.14 | | | |
| | (0.19) | (0.16) | (0.11) | | | |
| Amount of health shock (past 3 months) | | | | 8.22*** | 7.80*** | 0.43 |
| | | | | (2.34) | (2.20) | (0.35) |
| Income | 0.01 | 0.04 | -0.02 | 0.01 | 0.04 | -0.02 |
| | (0.03) | (0.02) | (0.02) | (0.03) | (0.02) | (0.02) |
| Control variables | √ | √ | √ | √ | √ | √ |
| Individual fixed effect | √ | √ | √ | √ | √ | √ |
| Time fixed effect | √ | √ | √ | √ | √ | √ |
| Number of IDs | 74,023 | 74,023 | 74,023 | 74,023 | 74,023 | 74,023 |
| Observations | 740,230 | 740,230 | 740,230 | 740,230 | 740,230 | 740,230 |
| R2-Adjusted | 0.515 | 0.490 | 0.548 | 0.515 | 0.489 | 0.548 |

# Table 5: Substitutability between Donations and Insurance Purchases

Notes: This table reports results examining the substitutability between donations and insurance purchases. The dependent variable is the amount of insurance purchased in the immediate after period, defined as the current month and next two months. The independent variables include income uncertainty, donation occurrence, interaction of income uncertainty and donation occurrence, income, and control variables. Income uncertainty is the standard deviation of the log realized payroll income in the past 12 months after removing the portion that can be explained by demographic background variables, financial wealth (in logarithms), and time-fixed effects. The donation occurrence is dummy variables that is denoted as one when there is at least one total donation, religious donation, and secular donation for the current month and next two months, respectively. Income is the current month's income (in logarithms). Control variables include demographic background variables, and financial wealth (in logarithms). Demographic variables are 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. Individual fixed effect and time fixed effect are controlled. 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 A7.

| Dependent variables | Insurance Purchase | | | | | |
|---|---|---|---|---|---|---|
| Donation type | *Total donation* | *Religious donation* | *Secular donation* | *Total donation* | *Religious donation* | *Secular donation* |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Income uncertainty | 437.27*** | 436.65*** | 435.47*** | 443.30*** | 442.68*** | 435.84*** |
| | (79.25) | (79.25) | (79.22) | (79.87) | (79.67) | (79.40) |
| Donation | -67.15*** | -77.83*** | -53.19 | 157.39 | 278.41** | -17.03 |
| | (20.07) | (22.43) | (35.33) | (103.10) | (127.92) | (159.06) |
| Income Uncertainty × | | | | -387.28** | -612.87*** | -62.24 |
| Donation | | | | (186.89) | (234.26) | (283.15) |
| Income | 45.44*** | 45.46*** | 45.38*** | 45.32*** | 45.32*** | 45.37*** |
| | (11.22) | (11.22) | (11.22) | (11.23) | (11.23) | (11.22) |
| Control variables | √ | √ | √ | √ | √ | √ |
| Individual fixed effect | √ | √ | √ | √ | √ | √ |
| Time fixed effect | √ | √ | √ | √ | √ | √ |
| Number of IDs | 74,023 | 74,023 | 74,023 | 74,023 | 74,023 | 74,023 |
| Observations | 740,230 | 740,230 | 740,230 | 740,230 | 740,230 | 740,230 |
| R2-Adjusted | 0.374 | 0.374 | 0.374 | 0.374 | 0.374 | 0.374 |

# Table 6: The Relation of Donation Behavior with Future Income Uncertainty

Notes: This table reports the relation of donation behavior with future income uncertainty. The dependent variable is individual income uncertainty of the second year. The independent variables include donation behaviors of the first year, income uncertainty of the first year, income of the first year (in logarithms), and control variables. Donation behavior 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 behavior in Columns (4) to (6) are the amounts of donation, religious donation, and secular donation made in the first year, respectively. Income uncertainty is the standard deviation of the according year's 12 months' income after removing the portion that can be explained by demographic background variables, financial wealth (in logarithms), and time-fixed effects. 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, the unit of donation is 1000 USD, and income uncertainty multiplies by 100 to make the number readable. 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 A8.

| Dependent variables | Income uncertainty (Year 2) | | | | | |
|---|---|---|---|---|---|---|
| Donation type | If donated in Year 1 | | | Donation Amount in Year 1 | | |
| | *Any donation* | *Religious donation* | *Secular donation* | *Any donation* | *Religious donation* | *Secular donation* |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Donation | 0.67 | 0.67 | 0.98 | 0.12 | -0.08 | 0.20 |
| | (0.44) | (0.63) | (0.64) | (0.86) | (1.56) | (1.77) |
| Income uncertainty (Year 1) | 0.37*** | 0.37*** | 0.37*** | 0.37*** | 0.37*** | 0.37*** |
| | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) |
| Income | 5.69*** | 5.70*** | 5.69*** | 5.70*** | 5.70*** | 5.70*** |
| | (0.15) | (0.15) | (0.15) | (0.15) | (0.15) | (0.15) |
| Control variables | √ | √ | √ | √ | √ | √ |
| Observations | 74,023 | 74,023 | 74,023 | 74,023 | 74,023 | 74,023 |
| R2-Adjusted | 0.351 | 0.351 | 0.351 | 0.351 | 0.351 | 0.351 |

# Hedging by Giving:
# Spiritual Insurance and Religious Donation

## Online Appendix

**Online Appendix**

## A. Proofs of Lemmas and Propositions

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

### A.1. Optimal Donations without Spiritual Insurance Motive

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

$$\max_{g}(1-2p)u\left(\bar{I}-g\right)+pu\left(\bar{I}-g-D\right)+pu\left(\bar{I}-g+D\right)+\theta v(g) \tag{12}$$

The first order condition (FOC) is as follow:

$$-(1-2p)u'\left(\bar{I}-g\right)-pu'\left(\bar{I}-g-D\right)-pu'\left(\bar{I}-g+D\right)+\theta v'(g)=0 \tag{13}$$

The second order condition (SOC) is satisfied:

$$(1-2p)u''\left(\bar{I}-g\right)+pu''\left(\bar{I}-g-D\right)+pu''\left(\bar{I}-g+D\right)+\theta v''(g)<0 \tag{14}$$

When considering the comparative static analysis of the optimal donations $g^*$ with respect to the expected income $\bar{I}$ and the size of background risk $D$, rewriting $g^*$ as $g^*\left(\bar{I},D\right)$, and denoting $g^*_{\bar{I}}\left(\bar{I},D\right)=\dfrac{dg^*\left(\bar{I},D\right)}{d\bar{I}}$. The derivative of the FOC with respect to $\bar{I}$ leads to the following relationship:

$$g^*_{\bar{I}}\left(\bar{I},D\right)=\frac{(1-2p)u''\left(\bar{I}-g\right)+pu''\left(\bar{I}-g-D\right)+pu''\left(\bar{I}-g+D\right)}{(1-2p)u''\left(\bar{I}-g\right)+pu''\left(\bar{I}-g-D\right)+pu''\left(\bar{I}-g+D\right)+\theta v''(g)}>0 \tag{15}$$

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

Then denote $g_D^*\left(\bar{I},D\right)=\dfrac{dg^*\left(\bar{I},D\right)}{dD}$, the derivative of the FOC with respect to $D$ leads to the following relationship:

$$g_D^*\left(\bar{I},D\right)=\frac{pu''\left(\bar{I}-g+D\right)-pu''\left(\bar{I}-g-D\right)}{(1-2p)u''\left(\bar{I}-g\right)+pu''\left(\bar{I}-g-D\right)+pu''\left(\bar{I}-g+D\right)+\theta v''(g)}<0 \quad (16)$$

The numerator is positive because $u'''>0$. This ends the proof for Lemma 1, i.e., in the model without a spiritual insurance motive, if expected income $\bar{I}$ rises, the optimal donation size $g^*$ rises, and if background risk $D$ 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

In this subsection, we assume the existence of a spiritual insurance motive and derive testable implications. The objective function of the individual's optimal donation problem is:

$$\max_g (1-2\bar{p})u\left(\bar{I}-g\right)+\left(\bar{p}-\pi(g)\right)u\left(\bar{I}-g-D\right)+\left(\bar{p}+\pi(g)\right)u\left(\bar{I}-g+D\right)+\theta v(g) \quad (17)$$

The FOC is as follow:

$$\begin{aligned}&\pi'(g)\left[u\left(\bar{I}-g+D\right)-u\left(\bar{I}-g-D\right)\right]+\theta v'(g)=\\&(1-2\bar{p})u'\left(\bar{I}-g\right)+\left(\bar{p}-\pi(g)\right)u'\left(\bar{I}-g-D\right)+\left(\bar{p}+\pi(g)\right)u'\left(\bar{I}-g+D\right)\end{aligned} \quad (18)$$

The term $\pi'(g)\left[u\left(\bar{I}-g+D\right)-u\left(\bar{I}-g-D\right)\right]$ represents the (subjective) marginal benefit from the spiritual insurance channel for donating, whereas the next term $\theta v'(g)$ represents the marginal benefit of donating not from spiritual insurance. The right-hand side terms represent the expected marginal cost of donating $g$. The optimal decision balances the marginal benefits and the marginal costs and donating.

Note that when $D$ increases, both the marginal benefit and the marginal cost of donating increase. First, the marginal benefit from spiritual insurance increases through a higher $u\left(\bar{I}-g+D\right)-u\left(\bar{I}-g-D\right)$. Second, the marginal cost of donating increases through an income effect. Because a higher $D$ increases expected marginal utility, a canonical income effect exists that tends to reduce donations, as in the model without spiritual insurance. Somewhat differently than in that variant of the model, the spiritual insurance channel also dampens this canonical income effect of $D$ by shifting subjective belief from the bad state, where the income effect of $D$ is malevolent, toward the good state, where the income effect of $D$ is benevolent. By this logic, the optimal donation amount is increasing in $D$ under the model with spiritual insurance if the spiritual insurance channel is sufficiently strong such that it overcomes the income effect.

Taking the second derivative of the objective function, we examine the condition under which the second-order condition of the optimal donating problem holds:

$$\begin{aligned}&\pi''(g)\left(u\left(\bar{I}-g+D\right)-u\left(\bar{I}-g-D\right)\right)+\theta v''(g)+\left(1-2\bar{p}\right)u''\left(\bar{I}-g\right)+\\&\left(\bar{p}-\pi(g)\right)u''\left(\bar{I}-g-D\right)+\left(\bar{p}+\pi(g)\right)u''\left(\bar{I}-g+D\right)-\\&2\pi'(g)\left(u'\left(\bar{I}-g+D\right)-u'\left(\bar{I}-g-D\right)\right)<0\end{aligned} \tag{19}$$

All terms are negative except the final term. If the final term dominates, which we would be an extreme case, the optimal donation amount would be a corner solution that makes the after-donating subjective probability of the low state equals zero, i.e., complete spiritual insurance would occur. On the other hand, if there is sufficient curvature in the $\pi(\cdot)$ and $u(\cdot)$ functions, the second order condition holds. In this case, which we assume hereafter, there is decreasing returns to the spiritual insurance benefits of donations and the optimal donating

problem adopts an interior solution. The after-donating subjective probability of the low state is non-zero in this case.

In order to discover the relationship between optimal donations $g^*$ and expected income $\bar{I}$ and background risk $D$, similar to the previous section, we rewrite $g^*$ as $g^*(\bar{I},D)$, and take derivative of the FOC with respect to $\bar{I}$ and $D$:

$$\begin{aligned}&g_I^*(\bar{I},D)[\pi''(g)\left(u\left(\bar{I}-g+D\right)-u\left(\bar{I}-g-D\right)\right)+\theta v''(g)+(1-2\bar{p})u''\left(\bar{I}-g\right)+\\&\left(\bar{p}-\pi(g)\right)u''\left(\bar{I}-g-D\right)+\left(\bar{p}+\pi(g)\right)u''\left(\bar{I}-g+D\right)-\\&2\pi'(g)\left(u'\left(\bar{I}-g+D\right)-u'\left(\bar{I}-g-D\right)\right)]=\\&(1-2\bar{p})u''\left(\bar{I}-g\right)+\left(\bar{p}-\pi(g)\right)u''\left(\bar{I}-g-D\right)+\\&\left(\bar{p}+\pi(g)\right)u''\left(\bar{I}-g+D\right)-\pi'(g)\left(u'\left(\bar{I}-g+D\right)-u'\left(\bar{I}-g-D\right)\right)\end{aligned} \tag{20}$$

$$\begin{aligned}&g_D^*\left(\bar{I},D\right)[\pi''(g)\left(u\left(\bar{I}-g+D\right)-u\left(\bar{I}-g-D\right)\right)+\theta v''(g)+\\&(1-2\bar{p})u''\left(\bar{I}-g\right)+\left(\bar{p}-\pi(g)\right)u''\left(\bar{I}-g-D\right)+\left(\bar{p}+\pi(g)\right)u''\left(\bar{I}-g+D\right)-\\&2\pi'(g)\left(u'\left(\bar{I}-g+D\right)-u'\left(\bar{I}-g-D\right)\right)]=\\&-\pi'(g)\left(u'\left(\bar{I}-g+D\right)+u'\left(\bar{I}-g-D\right)\right)+\\&\left(\bar{p}+\pi(g)\right)u''\left(\bar{I}-g+D\right)-\left(\bar{p}-\pi(g)\right)u''\left(\bar{I}-g-D\right)\end{aligned} \tag{21}$$

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

$$\begin{aligned}&g_{\bar{I}}^*\left(\bar{I},D\right)>0 \text{ if } (1-2\bar{p})u''\left(\bar{I}-g\right)+\left(\bar{p}-\pi(g)\right)u''\left(\bar{I}-g-D\right)+\\&\left(\bar{p}+\pi(g)\right)u''\left(\bar{I}-g+D\right)-\pi'(g)\left(u'\left(\bar{I}-g+D\right)-u'\left(\bar{I}-g-D\right)\right)<0\end{aligned} \tag{22}$$

$$
\begin{aligned}
&g_D^*\left(\bar{I},D\right)>0 \text{ if } \pi'(g)\left(u'\left(\bar{I}-g+D\right)+u'\left(\bar{I}-g-D\right)\right)\\
&>\left(\bar{p}+\pi(g)\right)u''\left(\bar{I}-g+D\right)-\left(\bar{p}-\pi(g)\right)u''\left(\bar{I}-g-D\right)
\end{aligned}
\tag{23}
$$

The condition for $g_{\bar{I}}^*\left(\bar{I},D\right)>0$ is similar to the technical requirement for the second order condition, i.e., that spiritual insurance channel should not be so extreme that the conventional income effect does not exist.

The condition for $g_D^*\left(\bar{I},D\right)>0$ has clear economic interpretations. On the one hand, $\pi'(g)\left(u'\left(\bar{I}-g+D\right)+u'\left(\bar{I}-g-D\right)\right)$ is the additional benefit of donations through the spiritual insurance channel, when $D$ increases by one. On the other hand, $\left(\bar{p}+\pi(g)\right)u''\left(\bar{I}-g+D\right)-\left(\bar{p}-\pi(g)\right)u''\left(\bar{I}-g-D\right)$ is the expected additional increase in marginal utility with the increase in $D$, which is the income effect, which exists in the model without spiritual insurance. If the spiritual insurance channel is strong enough, the model with spiritual insurance predicts that:

$$
\frac{\partial g^*}{\partial D}>0 \tag{24}
$$

This result differs from that of the model without the spiritual insurance motive in that when income uncertainty increases, donations instead rise. This ends the proof for Proposition 1.

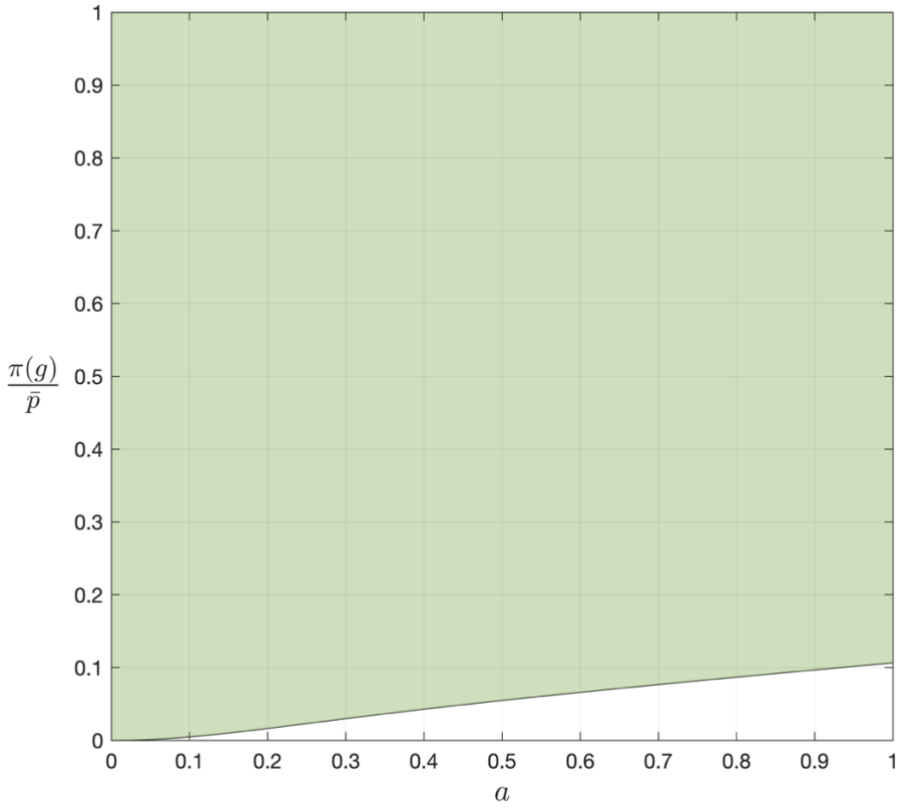
The condition that makes condition (23) hold is not difficult to reach. We use the numerical example to illustrate. We choose the same functional forms as in Auriol et al. (2020). We use a constant absolute risk aversion (CARA) utility function, i.e., $u(c)=1-\exp\{-ac\}$. The magnitude to which the 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 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 donation size to average income ($46/$4067), which gives $g = 0.11$. We then examine whether condition (4) in the paper, i.e., condition (23) here, holds under different values of the coefficient of absolute risk aversion $a$ and the parameter $k$.

We choose $a$ from 0 to 1.0, which correspond at the mean income a range of relative risk aversion (RRA) of 0 to 10. We choose the range of $k$ such that $\pi(g)/\bar{p}$, the perceived probability reduction relative to the objective probability, is from 0 to 1.0.

The result is reported in Figure A1 that show for which parameter combinations of $a$ and $k$ the condition (4) in the paper is satisfied. We report that the condition is satisfied for 94.7% of the parameter pairs we examine. We find that the higher is $\pi(g)/\bar{p}$, the more likely the condition is satisfied, as expected because the ratio is related to the strength of the spiritual insurance channel. We also find that when $a$ increases, the chance that the condition is satisfied decreases, also as expected because a higher risk aversion parameter raises the income effect of increased income uncertainty.

**Figure A1 Numerical Example for Parameter Ranges that Satisfy the Condition (23)**




## A.3. Optimal Donations with Two-Dimensional Risks

In this appendix section, we extend the model to include two dimensions of risks: income risk (subjective belief altered under the influence of the spiritual insurance motive) and expense risk (insurable with the purchase of market-based insurance.) Agents now face two sources of risk, an unavoidable income risk $\tilde{I}$ as discussed in Section A.1., and an expense risk $\tilde{E}$, which can be hedged by purchasing market-based insurance. Assume that the expense loss size is $E$, occurring with probability $q$. There is an available market-based insurance that pays a fraction $\alpha$ of the loss with price $\alpha(1+\lambda)qE$, where $\lambda \geq 0$ denotes the premium loading factor (Eeckhoudt and Schlesinger 2013). The objective function is:

$$
\begin{aligned}
&\max_{g,\alpha} q[(1-2\bar{p})u\left(\bar{I}-g-(1-\alpha)E-\alpha(1+\lambda)qE\right)+\\
&\quad\left(\bar{p}-\pi(g)\right)u\left(\bar{I}-g-D-(1-\alpha)E-\alpha(1+\lambda)qE\right)+\\
&\quad\left(\bar{p}+\pi(g)\right)u\left(\bar{I}-g+D-(1-\alpha)E-\alpha(1+\lambda)qE\right)]+\\
&\quad(1-q)[(1-2\bar{p})u\left(\bar{I}-g-\alpha(1+\lambda)qE\right)+\\
&\quad\left(\bar{p}-\pi(g)\right)u\left(\bar{I}-g-D-\alpha(1+\lambda)qE\right)+\\
&\quad\left(\bar{p}+\pi(g)\right)u\left(\bar{I}-g+D-\alpha(1+\lambda)qE\right)]+\theta v(g):=\\
&\quad \mathrm{E}_{\tilde{I},\tilde{E}}u\left(\tilde{I}-g-(1-\alpha)\tilde{E}-\alpha(1+\lambda)qE\right)+\theta v(g)
\end{aligned}
\tag{25}
$$

We obtain the following the first-order conditions for $g$ and $\alpha$

$$
\begin{aligned}
&-(1-2\bar{p})\left[qu'(y_1)+(1-q)u'(y_2)\right]-\\
&\left(\bar{p}+\pi(g)\right)\left[qu'(y_1+D)+(1-q)u'(y_2+D)\right]-\\
&\left(\bar{p}-\pi(g)\right)\left[qu'(y_1-D)+(1-q)u'(y_2-D)\right]+\\
&\pi'(g)[qu(y_1+D)+(1-q)u(y_2+D)-\\
&qu(y_1-D)+(1-q)u(y_2-D)]+\theta v(g)=0
\end{aligned}
\tag{26}
$$

$$
\begin{aligned}
&\left[1-(1+\lambda)q\right]qE\cdot\left[(1-2\bar{p})u'(y_1)+\left(\bar{p}+\pi(g)\right)u'(y_1+D)+\left(\bar{p}-\pi(g)\right)u'(y_1-D)\right]-\\
&(1+\lambda)q(1-q)E\cdot\left[(1-2\bar{p})u'(y_2)+\left(\bar{p}+\pi(g)\right)u'(y_2+D)+\left(\bar{p}-\pi(g)\right)u'(y_2-D)\right]=0
\end{aligned}
\tag{27}
$$

where $y_1:=\bar{I}-g-(1-\alpha)E-\alpha(1+\lambda)qE$, and $y_2:=\bar{I}-g-\alpha(1+\lambda)qE$. The second-order condition for $g$ holds if we replace the term $u$ in condition (19) with $\mathrm{E}_{\tilde{E}}u$, and the second-order condition for $\alpha$ follows trivially.

Then we conduct a comparative static analysis, and obtain the following proposition:

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

$$
\begin{aligned}
&\pi'(g)[(1+\lambda)(1-q)(u'(y_2+D)-u'(y_2-D))-(1-(1+\lambda)q)(u'(y_1+D)-u'(y_1-D))]>\\
&(1+\lambda)(1-q)[(1-2\bar{p})u''(y_2)+\left(\bar{p}+\pi(g)\right)u''(y_2+D)+\left(\bar{p}-\pi(g)\right)u''(y_2-D)]-\\
&(1-(1+\lambda)q)[(1-2\bar{p})u''(y_1)+\left(\bar{p}+\pi(g)\right)u''(y_1+D)+\left(\bar{p}-\pi(g)\right)u''(y_1-D)]
\end{aligned}
\tag{28}
$$

then donation $g$ and insurance purchase $\alpha$ are negatively related, that is

$$\frac{\partial g^*}{\partial \alpha} < 0, \frac{\partial \alpha^*}{\partial g} < 0 \tag{29}$$

**Proof of Proposition 2**

Rewrite $g^*$ as $g^*(\alpha)$, take the derivative of (26) with respect to $\alpha$, we have

$$\begin{aligned}
&g_\alpha^*\{(1-2\bar{p})[qu''(y_1)+(1-q)u''(y_2)]+\\
&(\bar{p}+\pi(g))[qu''(y_1+D)+(1-q)u''(y_2+D)]+\\
&(\bar{p}-\pi(g))[qu''(y_1-D)+(1-q)u''(y_2-D)]-\\
&2\pi'(g)[qu'(y_1+D)+(1-q)u'(y_2+D)-qu'(y_1-D)-(1-q)u'(y_2-D)]+\\
&\pi''(g)[qu(y_1+D)+(1-q)u(y_2+D)-qu(y_1-D)-(1-q)u(y_2-D)]\} =\\
&\pi'(g)qE\cdot[(1+\lambda)(1-q)(u'(y_2+D)-u'(y_2-D))-\\
&(1-(1+\lambda)q)(u'(y_1+D)-u'(y_1-D))]-qE\cdot(1+\lambda)(1-q)\cdot\\
&[(1-2\bar{p})u''(y_2)+(\bar{p}+\pi(g))u''(y_2+D)+(\bar{p}-\pi(g))u''(y_2-D)]+\\
&qE\cdot(1-(1+\lambda)q)\cdot\\
&[(1-2\bar{p})u''(y_1)+(\bar{p}+\pi(g))u''(y_1+D)+(\bar{p}-\pi(g))u''(y_1-D)]
\end{aligned} \tag{30}$$

Notice also that the terms in the brackets on the left-hand side are exactly the terms in the SOC for $g$, and hence are less than 0. To reach $\frac{\partial g^*}{\partial \alpha} < 0$, the right-hand side of the equality should be greater than 0. That is, a pattern of substitutability between spiritual insurance and market-based insurance exists if the spiritual insurance channel of donation is strong enough.

Similarly, denote $\alpha_g^* = \frac{\partial \alpha^*}{\partial g}$, take the derivative of (26) with respect to $g$, we have

$$
\begin{aligned}
&\alpha_g^* \left[1-(1+\lambda)q\right]^2 qE \cdot \\
&\left[(1-2\bar{p})u''(y_1)+\left(\bar{p}+\pi(g)\right)u''(y_1+D)+\left(\bar{p}-\pi(g)\right)u''(y_1-D)\right]- \\
&\left[(1+\lambda)q\right]^2 (1-q)E \cdot \\
&\left[(1-2\bar{p})u''(y_2)+\left(\bar{p}+\pi(g)\right)u''(y_2+D)+\left(\bar{p}-\pi(g)\right)u''(y_2-D)\right]= \\
&\pi'(g)qE \cdot [(1+\lambda)(1-q)(u'(y_2+D)-u'(y_2-D))- \\
&(1-(1+\lambda)q)(u'(y_1+D)-u'(y_1-D))]-qE \cdot (1+\lambda)(1-q) \cdot \\
&[(1-2\bar{p})u''(y_2)+\left(\bar{p}+\pi(g)\right)u''(y_2+D)+\left(\bar{p}-\pi(g)\right)u''(y_2-D)]+ \\
&qE \cdot (1-(1+\lambda)q) \cdot \\
&[(1-2\bar{p})u''(y_1)+\left(\bar{p}+\pi(g)\right)u''(y_1+D)+\left(\bar{p}-\pi(g)\right)u''(y_1-D)]
\end{aligned} \tag{31}
$$

The terms in the brackets on the left-hand side are also exactly the terms in the SOC, and the right-hand side of the equality is the same as the above condition. Therefore, $\frac{\partial \alpha^*}{\partial g} < 0$ requires that spiritual insurance channel of donation is strong enough. This concludes the proof of Proposition 2.

We further note that the condition (32) is almost the same as the condition (4), except that the condition (28) incorporates the additional expense risk introduced in the extended model. Thus, the interpretation of the condition (28) is similar to that of the condition (4). Specifically, the left-hand side of the condition (33) represents the marginal benefit from the spiritual insurance channel for donating. This term reflects that donation $g$ alters the subjective state probabilities $\pi(g)$, which is the defining feature of the spiritual insurance motive. When the purchase of market-based insurance increases, it reduces the uninsured expense risk, hence the marginal benefit from spiritual insurance decreases. The right-hand side is the expected additional increase in the marginal utility of consumption. This term represents the income effect of uninsured risks on donations, which include the expense risk and the income risk. It represents that the purchase of more insurance reduces the amount of

uninsured risk and brings a positive income effect which should increase donations through $v(g)$.

Comparing the two sides of the condition (34), we see that if the spiritual insurance channel is strong enough to overcome the traditional income effect, then the model will predict that when the purchase of market-based insurance increases, the optimal donation size will decrease, and vice versa. On the other hand, if the spiritual insurance channel is weaker than the income effect or if the spiritual insurance channel is non-existent, the pattern will be reversed.

## Table A1: Moving Window Results of Income Uncertainty Predicting Donations Using Alternative Model Specifications

Notes: This table reports the moving window relationship between income uncertainty and donation using alternative model specifications. Panels A and B report the specifications where donation is calculated using the immediate 3-month period as the dependent variable as in the baseline and income uncertainty is computed using a shorter 6-month or 9-month period as the independent variable, respectively. Panels C to E report the specifications where income uncertainty is computed using 12-month period as the independent variable as in the baseline and donation is calculated using the immediate 1-month, 2-month, or 6-month period as the dependent variable, respectively. Panel F reports a specification with no data overlap across observations, i.e., using only the observations for the 7$^{th}$, the 13$^{th}$, and the 19$^{th}$ months, where donation is calculated using the immediate 3-month period as the dependent variable as in the baseline and income uncertainty is computed using a shorter 6-month period as the independent variable. Other independent variables include income and control variables. Income is the current month's income (in logarithms). Control variables include demographic background variables, and financial wealth (in logarithms). Demographic variables are 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. Individual fixed effect and time fixed effect are controlled. 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.

| Dependent variables | Total donation | Total donation | Total donation | Total donation |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| **Panel A: Computing the income uncertainty measure as the realized income volatility in the last 9 months** | | | | |
| Income uncertainty | 1.99*** | 2.03*** | 2.04*** | 2.04*** |
| | (0.23) | (0.23) | (0.24) | (0.24) |
| Income | | 0.08*** | 0.08*** | 0.07** |
| | | (0.03) | (0.03) | (0.03) |
| Control variables | | | √ | √ |
| Time fixed effect | | | | √ |
| Individual fixed effect | √ | √ | √ | √ |
| Number of IDs | 74,023 | 74,023 | 74,023 | 74,023 |
| Observations | 962,299 | 962,299 | 962,299 | 962,299 |
| R2-Adjusted | 0.371 | 0.371 | 0.371 | 0.371 |
| **Panel B: Computing the income uncertainty measure as the realized income volatility in the last 6 months** | | | | |
| Income uncertainty | 1.08*** | 1.10*** | 1.05*** | 1.02*** |
| | (0.18) | (0.18) | (0.19) | (0.19) |
| Income | | 0.06** | 0.05* | 0.05 |
| | | (0.03) | (0.03) | (0.03) |
| Control variables | | | √ | √ |
| Time fixed effect | | | | √ |

| | | | | |
|---|---|---|---|---|
| Individual fixed effect | √ | √ | √ | √ |
| Number of IDs | 74,023 | 74,023 | 74,023 | 74,023 |
| Observations | 1,184,368 | 1,184,368 | 1,184,368 | 1,184,368 |
| R2-Adjusted | 0.316 | 0.316 | 0.317 | 0.317 |

**Panel C: Donation amount in the immediate 1-month period as the dependent variable**

| | | | | |
|---|---|---|---|---|
| Income uncertainty | 1.06*** | 1.07*** | 1.10*** | 1.13*** |
| | (0.10) | (0.10) | (0.10) | (0.10) |
| Income | | 0.02 | 0.02 | 0.01 |
| | | (0.02) | (0.02) | (0.02) |
| Control variables | | | √ | √ |
| Time fixed effect | | | | √ |
| Individual fixed effect | √ | √ | √ | √ |
| Number of IDs | 74,023 | 74,023 | 74,023 | 74,023 |
| Observations | 888,276 | 888,276 | 888,276 | 888,276 |
| R2-Adjusted | 0.181 | 0.181 | 0.181 | 0.181 |

**Panel D: Donation amount in the immediate 2-month period as the dependent variable**

| | | | | |
|---|---|---|---|---|
| Income uncertainty | 2.00*** | 2.02*** | 2.08*** | 2.12*** |
| | (0.18) | (0.18) | (0.19) | (0.19) |
| Income | | 0.03 | 0.03 | 0.02 |
| | | (0.02) | (0.02) | (0.03) |
| Control variables | | | √ | √ |
| Time fixed effect | | | | √ |
| Individual fixed effect | √ | √ | √ | √ |
| Number of IDs | 74,023 | 74,023 | 74,023 | 74,023 |
| Observations | 814,253 | 814,253 | 814,253 | 814,253 |
| R2-Adjusted | 0.368 | 0.368 | 0.368 | 0.368 |

**Panel E: Donation amount in the immediate 6-month period as the dependent variable**

| | | | | |
|---|---|---|---|---|
| Income uncertainty | 3.82*** | 3.86*** | 3.85*** | 3.81*** |
| | (0.46) | (0.46) | (0.46) | (0.46) |
| Income | | 0.04 | 0.04 | 0.05 |
| | | (0.04) | (0.04) | (0.04) |
| Control variables | | | √ | √ |

| | | | | |
|---|---|---|---|---|
| Time fixed effect | | | | √ |
| Individual fixed effect | √ | √ | √ | √ |
| Number of IDs | 74,023 | 74,023 | 74,023 | 74,023 |
| Observations | 518,161 | 518,161 | 518,161 | 518,161 |
| R2-Adjusted | 0.824 | 0.824 | 0.824 | 0.824 |

**Panel F: Using a specification with no data overlap across observations (i.e., using observations for the 7th, 13th, 19th months, computing the income uncertainty measure as the realized income volatility in the last 6 months)**

| | | | | |
|---|---|---|---|---|
| Income uncertainty | 1.01*** | 1.09*** | 0.91*** | 0.98*** |
| | (0.27) | (0.28) | (0.28) | (0.28) |
| Income | | 0.19** | 0.20*** | 0.32*** |
| | | (0.08) | (0.08) | (0.09) |
| Control variables | | | √ | √ |
| Time fixed effect | | | | √ |
| Individual fixed effect | √ | √ | √ | √ |
| Number of IDs | 74,023 | 74,023 | 74,023 | 74,023 |
| Observations | 222,069 | 222,069 | 222,069 | 222,069 |
| R2-Adjusted | 0.114 | 0.115 | 0.115 | 0.115 |

# Table A2: Moving Window Results of Income Uncertainty Measured by Non-residualized Income

Notes: This table reports the moving window relationship between income uncertainty and donation, where income uncertainty is calculated using the non-residualized log income. The dependent variable is total donation for the current month and next two months. The independent variables include income uncertainty, income, and control variables. Income uncertainty is the standard deviation of past 12 months' income. Income is the current month's income (in logarithms). Control variables include demographic background variables, and financial wealth (in logarithms). Demographic variables are 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. Individual fixed effect and time fixed effect are controlled. 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.

| Dependent variables | Total donation | Total donation | Total donation | Total donation |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| Income uncertainty | 2.11*** | 2.29*** | 2.26*** | 2.32*** |
| | (0.26) | (0.27) | (0.27) | (0.28) |
| Income | | 0.09*** | 0.09*** | 0.07** |
| | | (0.03) | (0.03) | (0.03) |
| Control variables | | | √ | √ |
| Time fixed effect | | | | √ |
| Individual fixed effect | √ | √ | √ | √ |
| Number of IDs | 74,023 | 74,023 | 74,023 | 74,023 |
| Observations | 740,230 | 740,230 | 740,230 | 740,230 |
| R2-Adjusted | 0.514 | 0.514 | 0.514 | 0.514 |

# Table A3: Moving Window Results of Income Uncertainty Measured by Income Growth Rate on Donation

Notes: This table reports the moving window relationship between income uncertainty and donation, where income uncertainty is measured by income growth rate. The dependent variable is total donation for the current month and next two months. The independent variables include income uncertainty, income and control variables. Income uncertainty is the standard deviation of past 12 months' income growth rate after removing the portion that can be explained by demographic background variables, financial wealth (in logarithms), and time-fixed effects. Income is the current month's income (in logarithms). Control variables include demographic background variables, and financial wealth (in logarithms). Demographic variables are 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. Individual fixed effect and time fixed effect are controlled. 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.

| Dependent variables | Total donation | Total donation | Total donation | Total donation |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| Income uncertainty | 1.75*** | 1.77*** | 1.87*** | 1.89*** |
| | (0.19) | (0.19) | (0.20) | (0.20) |
| Income | | 0.05* | 0.06** | 0.05 |
| | | (0.03) | (0.03) | (0.03) |
| Control variables | | | √ | √ |
| Time fixed effect | | | | √ |
| Individual fixed effect | √ | √ | √ | √ |
| Number of IDs | 74,023 | 74,023 | 74,023 | 74,023 |
| Observations | 740,230 | 740,230 | 740,230 | 740,230 |
| R2-Adjusted | 0.514 | 0.514 | 0.514 | 0.514 |

# Table A4: Moving Window Results of Income Uncertainty on Donation

## (Full Set of Control Coefficients)

Notes: This table reports the full set of coefficients of the moving window relationship between income uncertainty and donation. The dependent variable is total donation for the current month and next two months. The independent variables include income uncertainty, income, and control variables. Income uncertainty is the standard deviation of past 12 months' income after removing the portion that can be explained by demographic background variables, financial wealth (in logarithms), and time-fixed effects. Income is the current month's income (in logarithms). Control variables include demographic background variables, and financial wealth (in logarithms). Demographic variables are 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. Individual fixed effect and time fixed effect are controlled. 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.

| Dependent variables | Total donation | Total donation | Total donation | Total donation |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| Income uncertainty | 2.71*** | 2.74*** | 2.84*** | 2.85*** |
| | (0.27) | (0.27) | (0.28) | (0.28) |
| Income | | 0.05* | 0.06** | 0.05 |
| | | (0.03) | (0.03) | (0.03) |
| Financial wealth | | | 0.00 | 0.01 |
| | | | (0.02) | (0.02) |
| Age × Age | | | -0.01** | -0.01** |
| | | | (0.00) | (0.00) |
| Married | | | 0.34 | 0.33 |
| | | | (0.26) | (0.26) |
| **Education (baseline: Graduate school and above)** | | | | |
| Undergraduate | | | -0.42 | -0.42 |
| | | | (0.45) | (0.45) |
| Vocational school | | | -0.51 | -0.50 |
| | | | (0.51) | (0.51) |
| High school and below | | | -0.40 | -0.39 |
| | | | (0.52) | (0.52) |
| **Occupation (baseline: Military personnel, civil servants, and teachers)** | | | | |

| | | | | |
|---|---|---|---|---|
| Agricultural workers | | | -0.10 | -0.06 |
| | | | (0.91) | (0.91) |
| Blue-collar workers | | | 0.10 | 0.09 |
| | | | (0.76) | (0.76) |
| White-collar workers | | | -0.15 | -0.15 |
| | | | (0.76) | (0.76) |
| Service-sector workers | | | 0.20 | 0.21 |
| | | | (0.84) | (0.84) |
| Owner-managers | | | 0.11 | 0.11 |
| | | | (0.86) | (0.86) |
| Executives | | | 0.07 | 0.07 |
| | | | (0.86) | (0.86) |
| Others | | | 0.12 | 0.12 |
| | | | (0.78) | (0.78) |
| **Dependents (baseline: No dependent)** | | | | |
| One dependent | | | -0.96 | -0.97 |
| | | | (0.97) | (0.97) |
| Two dependents | | | 0.14 | 0.12 |
| | | | (0.84) | (0.84) |
| More than two dependents | | | -1.70 | -1.71 |
| | | | (1.50) | (1.50) |
| **Fixed Effects** | | | | |
| Time fixed effect | | | | √ |
| Individual fixed effect | √ | √ | √ | √ |
| Number of IDs | 74,023 | 74,023 | 74,023 | 74,023 |
| Observations | 740,230 | 740,230 | 740,230 | 740,230 |
| R2-Adjusted | 0.514 | 0.514 | 0.514 | 0.514 |

# Table A5: Moving Window Results of Income Uncertainty on Religious and Secular Donation

## (Full Set of Control Coefficients)

Notes: This table reports the full set of coefficients of the moving window relationship between income uncertainty and donation. In Columns (1) and (2), the dependent variables are the religious donation for the current month and next two months. In Columns (3) and (4), the dependent variables are the secular donation for the current month and next two months. The independent variables include income uncertainty, income and control variables. Income uncertainty in Columns (1) and (3) is the standard deviation of past 12 months' income after removing the portion that can be explained by demographic background variables, financial wealth (in logarithms), and time-fixed effects. Positive (negative) income uncertainty in Columns (2) and (4) is the positive (negative) semi-deviation of past 12 months' income after removing the portion that can be explained by demographic background variables, financial wealth (in logarithms), and time-fixed effects. Income is the current month's income (in logarithms). Control variables include demographic background variables, and financial wealth (in logarithms). Demographic variables are 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. Individual fixed effect and time fixed effect are controlled. 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.

| Dependent variables | Religious donation | Religious donation | Secular donation | Secular donation |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| Income uncertainty | 1.73*** | | 1.12*** | |
| | (0.21) | | (0.19) | |
| Positive uncertainty | | 0.63*** | | 0.39*** |
| | | (0.12) | | (0.12) |
| Negative uncertainty | | 1.09*** | | 0.75*** |
| | | (0.27) | | (0.23) |
| Income | 0.06** | 0.06** | -0.01 | -0.01 |
| | (0.02) | (0.02) | (0.02) | (0.02) |
| Financial wealth | 0.01 | 0.01 | -0.00 | -0.00 |
| | (0.01) | (0.01) | (0.01) | (0.01) |
| Age × Age | -0.00 | -0.00 | -0.00** | -0.00** |
| | (0.00) | (0.00) | (0.00) | (0.00) |
| Married | 0.24 | 0.24 | 0.09 | 0.09 |
| | (0.19) | (0.19) | (0.18) | (0.18) |
| Education (baseline: Graduate school and above) | | | | |

| | | | | |
|---|---|---|---|---|
| Undergraduate | -0.04 | -0.04 | -0.37 | -0.37 |
| | (0.25) | (0.25) | (0.38) | (0.38) |
| Vocational school | 0.23 | 0.23 | -0.74* | -0.73* |
| | (0.25) | (0.25) | (0.44) | (0.44) |
| High school and below | 0.09 | 0.09 | -0.48 | -0.48 |
| | (0.24) | (0.24) | (0.46) | (0.46) |
| **Occupation (baseline: Military personnel, civil servants and teachers)** | | | | |
| Agricultural workers | 0.63 | 0.62 | -0.69 | -0.69 |
| | (0.54) | (0.54) | (0.69) | (0.69) |
| Blue-collar workers | 0.62 | 0.63 | -0.53 | -0.52 |
| | (0.52) | (0.52) | (0.54) | (0.54) |
| White-collar workers | 0.40 | 0.41 | -0.55 | -0.55 |
| | (0.51) | (0.51) | (0.55) | (0.55) |
| Service-sector workers | 0.94 | 0.94 | -0.73 | -0.73 |
| | (0.63) | (0.63) | (0.54) | (0.54) |
| Owner-managers | 0.63 | 0.63 | -0.52 | -0.52 |
| | (0.54) | (0.54) | (0.66) | (0.66) |
| Executives | 0.92* | 0.92* | -0.84 | -0.84 |
| | (0.55) | (0.55) | (0.65) | (0.65) |
| Others | 0.62 | 0.62 | -0.50 | -0.50 |
| | (0.53) | (0.54) | (0.55) | (0.55) |
| **Dependents (baseline: No dependent)** | | | | |
| One dependent | -1.17 | -1.16 | 0.20 | 0.20 |
| | (0.80) | (0.80) | (0.54) | (0.54) |
| Two dependents | -0.49 | -0.49 | 0.61 | 0.61 |
| | (0.73) | (0.73) | (0.42) | (0.42) |
| More than two dependents | -0.27 | -0.27 | -1.44 | -1.44 |
| | (0.25) | (0.25) | (1.47) | (1.47) |
| **Fixed Effects** | | | | |
| Time fixed effect | √ | √ | √ | √ |

| | | | | |
|---|---|---|---|---|
| Individual fixed effect | √ | √ | √ | √ |
| Number of IDs | 74,023 | 74,023 | 74,023 | 74,023 |
| Observations | 740,230 | 740,230 | 740,230 | 740,230 |
| R2-Adjusted | 0.489 | 0.489 | 0.548 | 0.548 |

# Table A6: Moving Window Results of Health Shock on Donation

## (Full Set of Control Coefficients)

Notes: This table reports the full set of coefficients of the moving window relationship between health shock and donation. The dependent variables in Columns (1) to (3) are total donation, religious donation, and secular donation for the current month and next two months, respectively, as so do for Columns (4) to (6). The independent variables include health shock, income, and control variables. The definition of health shock in Columns (1) to (3) is incurring medical expenditures that are above the median of the sample in the past three months, and the definition of health shock in Columns (4) to (6) is the amount spending on medical expenditures that are above the median of the sample in the past three months. Income is the current month's income (in logarithms). Control variables include demographic background variables, and financial wealth (in logarithms). Demographic variables are 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, and the unit of the amount of health shock in Columns (4) to (6) is 1,000 USD. Individual fixed effect and time fixed effect are controlled. 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.

| Dependent variables | Total donation | Religious donation | Secular donation | Total donation | Religious donation | Secular donation |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Occurrence of health shock | 1.97*** | 1.82*** | 0.14 | | | |
| (past 3 months) | (0.19) | (0.16) | (0.11) | | | |
| Amount of health shock (past | | | | 8.22*** | 7.80*** | 0.43 |
| 3 months) | | | | (2.34) | (2.20) | (0.35) |
| Income | 0.01 | 0.04 | -0.02 | 0.01 | 0.04 | -0.02 |
| | (0.03) | (0.02) | (0.02) | (0.03) | (0.02) | (0.02) |
| Financial wealth | 0.01 | 0.01 | -0.00 | 0.01 | 0.01 | -0.00 |
| | (0.02) | (0.01) | (0.01) | (0.02) | (0.01) | (0.01) |
| Age × Age | -0.01** | -0.00 | -0.00*** | -0.01** | -0.00 | -0.00*** |
| | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) |
| Married | 0.32 | 0.23 | 0.09 | 0.34 | 0.24 | 0.10 |
| | (0.26) | (0.19) | (0.18) | (0.26) | (0.19) | (0.18) |
| Education (baseline: Graduate school and above) | | | | | | |
| Undergraduate | -0.44 | -0.06 | -0.38 | -0.43 | -0.05 | -0.38 |
| | (0.45) | (0.25) | (0.38) | (0.45) | (0.25) | (0.38) |

| | | | | | | |
|---|---|---|---|---|---|---|
| Vocational school | -0.55 | 0.21 | -0.76* | -0.56 | 0.20 | -0.76* |
| | (0.51) | (0.25) | (0.44) | (0.51) | (0.25) | (0.44) |
| High school and below | -0.41 | 0.09 | -0.50 | -0.43 | 0.07 | -0.50 |
| | (0.52) | (0.24) | (0.46) | (0.52) | (0.24) | (0.46) |
| **Occupation (baseline: Military personnel, civil servants and teachers)** | | | | | | |
| Agricultural workers | -0.51 | 0.23 | -0.75 | -0.17 | 0.55 | -0.72 |
| | (0.91) | (0.57) | (0.69) | (0.91) | (0.53) | (0.69) |
| Blue-collar workers | 0.16 | 0.66 | -0.50 | 0.17 | 0.67 | -0.50 |
| | (0.75) | (0.52) | (0.54) | (0.75) | (0.52) | (0.54) |
| White-collar workers | -0.02 | 0.49 | -0.51 | -0.06 | 0.45 | -0.52 |
| | (0.76) | (0.51) | (0.55) | (0.76) | (0.51) | (0.55) |
| Service-sector workers | 0.34 | 1.05* | -0.70 | 0.33 | 1.04* | -0.71 |
| | (0.83) | (0.62) | (0.54) | (0.83) | (0.63) | (0.54) |
| Owner-managers | 0.18 | 0.67 | -0.49 | 0.16 | 0.66 | -0.49 |
| | (0.86) | (0.54) | (0.66) | (0.86) | (0.54) | (0.66) |
| Executives | 0.18 | 0.99* | -0.81 | 0.16 | 0.97* | -0.81 |
| | (0.86) | (0.55) | (0.65) | (0.86) | (0.55) | (0.65) |
| Others | 0.30 | 0.75 | -0.45 | 0.25 | 0.70 | -0.46 |
| | (0.78) | (0.53) | (0.55) | (0.78) | (0.53) | (0.55) |
| **Dependents (baseline: No dependent)** | | | | | | |
| One dependent | -0.90 | -1.11 | 0.21 | -0.95 | -1.16 | 0.21 |
| | (0.97) | (0.80) | (0.54) | (0.97) | (0.80) | (0.54) |
| Two dependents | 0.16 | -0.46 | 0.63 | 0.16 | -0.46 | 0.63 |
| | (0.84) | (0.72) | (0.42) | (0.84) | (0.72) | (0.42) |
| More than two dependents | -1.69 | -0.24 | -1.45 | -1.72 | -0.27 | -1.45 |
| | (1.49) | (0.24) | (1.47) | (1.50) | (0.25) | (1.47) |
| **Fixed Effects** | | | | | | |
| Individual fixed effect | √ | √ | √ | √ | √ | √ |
| Time fixed effect | √ | √ | √ | √ | √ | √ |

| | | | | | | |
|---|---|---|---|---|---|---|
| Number of IDs | 74,023 | 74,023 | 74,023 | 74,023 | 74,023 | 74,023 |
| Observations | 740,230 | 740,230 | 740,230 | 740,230 | 740,230 | 740,230 |
| R2-Adjusted | 0.515 | 0.490 | 0.548 | 0.515 | 0.489 | 0.548 |

# Table A7: Substitutability between Donations and Insurance Purchases

## (Full Set of Control Coefficients)

Notes: This table reports results examining the substitutability between donations and insurance purchases. The dependent variable is the amount of insurance purchased in the immediate after period, defined as the current month and next two months. The independent variables include income uncertainty, donation occurrence, interaction of income uncertainty and donation occurrence, income, and control variables. Income uncertainty is the standard deviation of the log realized payroll income in the past 12 months after removing the portion that can be explained by demographic background variables, financial wealth (in logarithms), and time-fixed effects. The donation occurrence is dummy variables that is denoted as one when there is at least one total donation, religious donation, and secular donation for the current month and next two months, respectively. Income is the current month's income (in logarithms). Control variables include demographic background variables, and financial wealth (in logarithms). Demographic variables are 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. Individual fixed effect and time fixed effect are controlled. 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.

| Dependent variables | Insurance Purchase | | | | | |
|---|---|---|---|---|---|---|
| Donation type | *Total donation* | *Religious donation* | *Secular donation* | *Total donation* | *Religious donation* | *Secular donation* |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Income uncertainty | 437.27*** | 436.65*** | 435.47*** | 443.30*** | 442.68*** | 435.84*** |
| | (79.25) | (79.25) | (79.22) | (79.87) | (79.67) | (79.40) |
| Donation | -67.15*** | -77.83*** | -53.19 | 157.39 | 278.41** | -17.03 |
| | (20.07) | (22.43) | (35.33) | (103.10) | (127.92) | (159.06) |
| Income uncertainty × | | | | -387.28** | -612.87*** | -62.24 |
| Donation | | | | (186.89) | (234.26) | (283.15) |
| Income | 45.44*** | 45.46*** | 45.38*** | 45.32*** | 45.32*** | 45.37*** |
| | (11.22) | (11.22) | (11.22) | (11.23) | (11.23) | (11.22) |
| Financial wealth | 1.33 | 1.33 | 1.34 | 1.32 | 1.32 | 1.34 |
| | (6.26) | (6.26) | (6.26) | (6.26) | (6.26) | (6.26) |
| Age × Age | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 | 0.91 |
| | (1.20) | (1.20) | (1.20) | (1.20) | (1.20) | (1.20) |
| Married | -163.52 | -163.52 | -163.71 | -163.61 | -163.93 | -163.69 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | (151.42) | (151.42) | (151.42) | (151.42) | (151.43) | (151.41) |
| **Education (baseline: Graduate school and above)** | | | | | | |
| Undergraduate | -1,484.90 | -1,484.79 | -1,484.83 | -1,484.77 | -1,484.82 | -1,484.81 |
| | (1,733.94) | (1,733.94) | (1,733.94) | (1,733.94) | (1,733.94) | (1,733.94) |
| Vocational school | -1,640.87 | -1,640.27 | -1,640.92 | -1,640.69 | -1,640.20 | -1,640.90 |
| | (1,903.03) | (1,903.03) | (1,903.06) | (1,903.03) | (1,903.03) | (1,903.06) |
| | -2,258.63 | -2,258.39 | -2,258.70 | -2,258.66 | -2,258.63 | -2,258.68 |
| High school and below | (2,307.74) | (2,307.75) | (2,307.75) | (2,307.74) | (2,307.75) | (2,307.75) |
| **Occupation (baseline: Military personnel, civil servants and teachers)** | | | | | | |
| Agricultural workers | 135.50 | 136.05 | 135.08 | 136.23 | 136.85 | 135.12 |
| | (425.98) | (425.89) | (425.87) | (425.77) | (425.68) | (425.86) |
| Blue-collar workers | -263.62 | -263.20 | -264.02 | -263.44 | -262.93 | -264.02 |
| | (228.42) | (228.44) | (228.44) | (228.42) | (228.43) | (228.44) |
| White-collar workers | -213.98 | -213.56 | -214.23 | -213.75 | -213.23 | -214.23 |
| | (206.51) | (206.52) | (206.52) | (206.50) | (206.51) | (206.52) |
| Service-sector workers | -1,427.41 | -1,426.61 | -1,427.93 | -1,426.88 | -1,425.82 | -1,427.93 |
| | (1,325.78) | (1,325.80) | (1,325.82) | (1,325.78) | (1,325.79) | (1,325.82) |
| Owner-managers | -98.32 | -97.95 | -98.82 | -97.48 | -96.51 | -98.84 |
| | (244.36) | (244.38) | (244.37) | (244.35) | (244.36) | (244.37) |
| Executives | -234.36 | -233.92 | -235.28 | -233.74 | -232.99 | -235.29 |
| | (244.62) | (244.66) | (244.65) | (244.62) | (244.64) | (244.65) |
| Others | 840.58 | 841.03 | 840.13 | 840.78 | 841.40 | 840.13 |
| | (777.72) | (777.71) | (777.69) | (777.72) | (777.71) | (777.69) |
| **Dependents (baseline: No dependent)** | | | | | | |
| One dependent | -390.91 | -391.11 | -389.81 | -390.05 | -389.34 | -389.85 |
| | (312.23) | (312.22) | (312.23) | (312.24) | (312.25) | (312.23) |
| Two dependents | 36.47 | 36.21 | 36.56 | 37.78 | 38.16 | 36.57 |
| | (90.40) | (90.40) | (90.40) | (90.39) | (90.39) | (90.39) |
| More than two | -295.23 | -294.33 | -294.62 | -294.44 | -293.61 | -294.57 |
| dependents | (224.84) | (224.86) | (224.86) | (224.88) | (224.89) | (224.86) |

| | | | | | | |
|---|---|---|---|---|---|---|
| **Fixed Effects** | | | | | | |
| Individual fixed effect | √ | √ | √ | √ | √ | √ |
| Time fixed effect | √ | √ | √ | √ | √ | √ |
| Number of IDs | 74,023 | 74,023 | 74,023 | 74,023 | 74,023 | 74,023 |
| Observations | 740,230 | 740,230 | 740,230 | 740,230 | 740,230 | 740,230 |
| R2-Adjusted | 0.374 | 0.374 | 0.374 | 0.374 | 0.374 | 0.374 |

# Table A8: The Relation of Donation Behavior with Future Income Uncertainty

## (Full Set of Control Coefficients)

Notes: This table reports the full set of coefficients of the relation of donation behavior with future income uncertainty. The dependent variable is individual income uncertainty of the second year. The independent variables include donation behaviors of the first year, income uncertainty of the first year, income of the first year (in logarithms), and control variables. Donation behavior 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 behavior in Columns (4) to (6) are the amounts of donation, religious donation, and secular donation made in the first year, respectively. Income uncertainty is the standard deviation of the according year's 12 months' income after removing the portion that can be explained by demographic background variables, financial wealth (in logarithms), and time-fixed effects. 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, the unit of donation is 1000 USD, and income uncertainty multiplies by 100 to make the number readable. 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.

| Dependent variables | Income uncertainty (Year 2) | | | | | |
|---|---|---|---|---|---|---|
| Donation type | If donated in Year 1 | | | Donation Amount in Year 1 | | |
| | *Any donation* | *Religious donation* | *Secular donation* | *Any donation* | *Religious donation* | *Secular donation* |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Donation | 0.67 | 0.67 | 0.98 | 0.12 | -0.08 | 0.20 |
| | (0.44) | (0.63) | (0.64) | (0.86) | (1.56) | (1.77) |
| Income uncertainty | 0.37*** | 0.37*** | 0.37*** | 0.37*** | 0.37*** | 0.37*** |
| (Year 1) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) |
| Income | 5.69*** | 5.70*** | 5.69*** | 5.70*** | 5.70*** | 5.70*** |
| | (0.15) | (0.15) | (0.15) | (0.15) | (0.15) | (0.15) |
| Financial wealth | 0.23*** | 0.23*** | 0.23*** | 0.23*** | 0.23*** | 0.23*** |
| | (0.02) | (0.02) | (0.02) | (0.02) | (0.02) | (0.02) |
| Age | 0.07 | 0.07 | 0.07 | 0.07 | 0.07 | 0.07 |
| | (0.07) | (0.07) | (0.07) | (0.07) | (0.07) | (0.07) |
| Age × Age | -0.00*** | -0.00*** | -0.00*** | -0.00*** | -0.00*** | -0.00*** |
| | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) |

| | | | | | | |
|---|---|---|---|---|---|---|
| Female | 1.68*** | 1.69*** | 1.69*** | 1.69*** | 1.69*** | 1.69*** |
| | (0.11) | (0.11) | (0.11) | (0.11) | (0.11) | (0.11) |
| Married | -0.06 | -0.07 | -0.07 | -0.07 | -0.07 | -0.07 |
| | (0.14) | (0.14) | (0.14) | (0.14) | (0.14) | (0.14) |
| **Education (baseline: Graduate school and above)** | | | | | | |
| Undergraduate | -3.55*** | -3.55*** | -3.55*** | -3.55*** | -3.55*** | -3.55*** |
| | (0.17) | (0.17) | (0.17) | (0.17) | (0.17) | (0.17) |
| Vocational school | -3.78*** | -3.78*** | -3.78*** | -3.78*** | -3.78*** | -3.78*** |
| | (0.20) | (0.20) | (0.20) | (0.20) | (0.20) | (0.20) |
| | -4.41*** | -4.41*** | -4.41*** | -4.41*** | -4.41*** | -4.41*** |
| High school and below | (0.20) | (0.20) | (0.20) | (0.20) | (0.20) | (0.20) |
| **Occupation (baseline: Military personnel, civil servants and teachers)** | | | | | | |
| Agricultural workers | -4.14*** | -4.13*** | -4.13*** | -4.12*** | -4.12*** | -4.12*** |
| | (1.36) | (1.36) | (1.36) | (1.36) | (1.36) | (1.36) |
| Blue-collar workers | 0.79** | 0.79** | 0.79** | 0.79** | 0.79** | 0.79** |
| | (0.40) | (0.40) | (0.40) | (0.40) | (0.40) | (0.40) |
| White-collar workers | 2.78*** | 2.78*** | 2.78*** | 2.78*** | 2.78*** | 2.78*** |
| | (0.39) | (0.39) | (0.39) | (0.39) | (0.39) | (0.39) |
| | 0.49 | 0.49 | 0.49 | 0.49 | 0.49 | 0.49 |
| Service-sector workers | (0.47) | (0.47) | (0.47) | (0.47) | (0.47) | (0.47) |
| Owner-managers | 0.87 | 0.87 | 0.87 | 0.87 | 0.88 | 0.87 |
| | (0.62) | (0.62) | (0.62) | (0.62) | (0.62) | (0.62) |
| Executives | 1.56*** | 1.56*** | 1.56*** | 1.56*** | 1.56*** | 1.56*** |
| | (0.43) | (0.43) | (0.43) | (0.43) | (0.43) | (0.43) |
| Others | -0.41 | -0.41 | -0.41 | -0.41 | -0.41 | -0.41 |
| | (0.55) | (0.55) | (0.55) | (0.55) | (0.55) | (0.55) |
| **Dependents (baseline: No dependent)** | | | | | | |
| One dependent | 0.49** | 0.49* | 0.49* | 0.49** | 0.49** | 0.49** |
| | (0.25) | (0.25) | (0.25) | (0.25) | (0.25) | (0.25) |
| Two dependents | -0.03 | -0.03 | -0.03 | -0.03 | -0.03 | -0.03 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | (0.22) | (0.22) | (0.22) | (0.22) | (0.22) | (0.22) |
| More than two | 0.35 | 0.35 | 0.35 | 0.34 | 0.34 | 0.34 |
| dependents | (0.48) | (0.48) | (0.48) | (0.48) | (0.48) | (0.48) |
| Observations | 74,023 | 74,023 | 74,023 | 74,023 | 74,023 | 74,023 |
| R2-Adjusted | 0.351 | 0.351 | 0.351 | 0.351 | 0.351 | 0.351 |

## Table A9: Placebo Test of the Substitutability between Donations and Insurance Purchases

Notes: The table reports the estimates of robustness check regression, in which donation in Table 5 are replaced by different kinds of consumption. The dependent variable is the total amount of insurance purchases for the current month and the next two months. The independent variables include income uncertainty, consumption shock, interaction of income uncertainty and consumption shock, income, and control variables. Income uncertainty is the standard deviation of past 12 months' income after removing the portion that can be explained by demographic background variables, financial wealth (in logarithms), and time-fixed effects. Consumption shock represents whether the individual experience the corresponding type of consumption shock in the same period as insurance purchases, where consumption shock is defined as an individual's average monthly consumption during the period exceeding the client's average monthly consumption during the sample period plus one standard deviation. Income is the current month's income (in logarithms). Control variables include demographic background variables, and financial wealth (in logarithms). Demographic variables are 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. Individual fixed effect and time fixed effect are controlled. 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.

| Dependent variables | Insurance | | | | | | |
|---|---|---|---|---|---|---|---|
| Consumption type | *Total consumption* | *Travelling* | *Catering* | *Utilities* | *Department shop* | *Supermarket* | *Entertainment* |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| Income uncertainty | 330.31*** | 333.20*** | 327.09*** | 338.56*** | 342.67*** | 335.42*** | 337.47*** |
| | (92.16) | (91.28) | (93.35) | (91.56) | (92.56) | (91.29) | (90.51) |
| | -16.84 | 26.24 | -42.31 | 22.32 | 80.5 | 22.16 | 28.41 |
| High-spending dummy | (29.51) | (47.81) | (40.86) | (60.18) | (51.41) | (37.82) | (38.12) |
| Income uncertainty × | 34.06 | -34.05 | 116.87 | -233.83 | -178.31 | -76.5 | -131.97 |
| High-spending dummy | (84.82) | (144.68) | (153.05) | (148.19) | (147.11) | (111.8) | (110.91) |
| Income | -15.69 | -15.63 | -15.83 | -15.98 | -15.42 | -15.57 | -15.33 |
| | (61.72) | (61.7) | (61.62) | (61.65) | (61.68) | (61.69) | (61.71) |
| Control variables | √ | √ | √ | √ | √ | √ | √ |
| Time fixed effect | √ | √ | √ | √ | √ | √ | √ |
| Individual fixed effect | √ | √ | √ | √ | √ | √ | √ |
| Number of IDs | 74,023 | 74,023 | 74,023 | 74,023 | 74,023 | 74,023 | 74,023 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Observations | 740,230 | 740,230 | 740,230 | 740,230 | 740,230 | 740,230 | 740,230 |
| R2-Adjusted | 0.438 | 0.438 | 0.438 | 0.438 | 0.438 | 0.438 | 0.438 |

# Table A10: Substitutability between Donations and Insurance Purchases with No Cash Constraint

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 for the current month and next two months. The independent variables include income uncertainty, donation occurrence, interaction of income uncertainty and donation occurrence, income, and control variables. Income uncertainty is the standard deviation of past 12 months' income after removing the portion that can be explained by demographic background variables, financial wealth (in logarithms), and time-fixed effects. The donation occurrence is dummy variables that is denoted as one when there is at least one total donation, religious donation, and secular donation for the current month and next two months, respectively. Income is the current month's income (in logarithms). Control variables include demographic background variables, and financial wealth (in logarithms). Demographic variables are 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. Individual fixed effect and time fixed effect are controlled. 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.

| Dependent variables | Insurance Purchase | | | | | |
|---|---|---|---|---|---|---|
| Donation type | *Total donation* | *Religious donation* | *Secular donation* | *Total donation* | *Religious donation* | *Secular donation* |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Income uncertainty | 517.18*** | 516.39*** | 515.40*** | 521.78*** | 519.42*** | 516.91*** |
| | (20.63) | (20.62) | (20.62) | (20.67) | (20.64) | (20.64) |
| Donation | -74.38*** | -74.64*** | -70.93*** | 116.03*** | 122.98*** | 96.95*** |
| | (3.89) | (4.48) | (6.71) | (15.44) | (18.21) | (27.06) |
| Income uncertainty × | | | | -329.40*** | -339.63*** | -291.69*** |
| Donation | | | | (27.78) | (33.11) | (48.87) |
| Income | 48.88*** | 48.68*** | 48.87*** | 49.56*** | 49.12*** | 49.10*** |
| | (14.88) | (14.88) | (14.88) | (14.88) | (14.88) | (14.88) |
| Control variables | √ | √ | √ | √ | √ | √ |

| | | | | | | |
|---|---|---|---|---|---|---|
| Time fixed effect | √ | √ | √ | √ | √ | √ |
| Individual fixed effect | √ | √ | √ | √ | √ | √ |
| Number of IDs | 50,687 | 50,687 | 50,687 | 50,687 | 50,687 | 50,687 |
| Observations | 506,870 | 506,870 | 506,870 | 506,870 | 506,870 | 506,870 |
| R2-Adjusted | 0.463 | 0.463 | 0.463 | 0.463 | 0.463 | 0.463 |

## Table A11: Donation Behavior and the Consumption Pass-through of Income Shocks

Notes: This table reports how donation behavior affects the consumption pass-through of income fluctations, 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.

| 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* |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| 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 | √ | √ | √ | √ | √ | √ |
| Observations | 74,023 | 74,023 | 74,023 | 74,023 | 74,023 | 74,023 |
| R2-Adjusted | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 |

# Table A12: The Relationship between Religious Participation and Life Insurance Purchase in the HRS

Notes: This table reports the relationship between religious participation and the amount of life insurance purchases in the HRS panel data from 2002 to 2018 for the United States. The dependent variable is the amount of life insurance purchase. The independent variables are a set of dummy variables for the frequency of church attendance, where the benchmark is from not going to church. Individual fixed effect and time fixed effect are controlled in Columns (1) to (4). Columns (1) to (3) show the estimation results for the full sample, the white sample, and the non-white sample, respectively. Column (4) adds the interaction term for the frequency of church attendance and race. Individual fixed effect and time fixed effect are controlled. Standard errors are clustered at the household level and are reported beneath the estimated coefficient within parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively.

| Sample types | Full sample | White | Non-white | Full sample |
|---|---|---|---|---|
| Dependent variable | | amount of life insurance | | |
| | (1) | (2) | (3) | (4) |
| Baseline: NOT AT ALL | | | | |
| ONE OR MORE TIMES A YEAR | -204.79 | -130.09 | -603.00 | -56.15 |
| | (249.98) | (262.14) | (683.37) | (262.84) |
| TWO OR THREE TIMES A MONTH | -758.85** | -761.84** | -988.80 | -641.20* |
| | (332.33) | (360.03) | (783.57) | (361.30) |
| ONCE A WEEK | -1,398.41*** | -1,292.74*** | -1,767.87** | -1,181.51*** |
| | (363.06) | (398.96) | (834.46) | (399.83) |
| MORE THAN ONCE A WEEK | -1,540.27*** | -1,038.37** | -2,438.26*** | -902.16* |
| | (432.93) | (496.91) | (901.51) | (496.98) |
| non-white × ONE OR MORE TIMES A YEAR | | | | -798.06 |
| | | | | (729.70) |
| non-white × TWO OR THREE TIMES A MONTH | | | | -678.37 |
| | | | | (866.54) |
| non-white × ONCE A WEEK | | | | -933.56 |
| | | | | (927.57) |
| non-white × MORE THAN ONCE A WEEK | | | | -2,152.33** |
| | | | | (1,041.81) |

| | | | | |
|---|---|---|---|---|
| Individual fixed effect | √ | √ | √ | √ |
| Time fixed effect | √ | √ | √ | √ |
| Observations | 83,046 | 62,904 | 20,142 | 83,046 |
| R-squared | 0.218 | 0.200 | 0.245 | 0.218 |