A City of God:
Religion, Insurance and Economic Behaviour in Brazil

Tiago Cavalcanti, Sriya Iyer, Christopher Rauh,
Christian Roerig and Maryam Vaziri*

November 3, 2021

Abstract

Using primary data from Brazil collected from 2019-2020, we aim to quantify the link between religion, expectations and economic outcomes. The survey data suggest that religious communities act as a source of informal insurance. Individuals appear to invest more in their religious communities if they can also expect various forms of community support. Particularly, when offered support to find a job, their perceived likelihood of finding a job increases. The degree of this insurance channel varies across different religions and is highest for Pentecostals. Furthermore, we build a theoretical life-cycle heterogeneous agents model and calibrate it to the data. The structural model identifies the job support channel as a by-product of coordinated beliefs in the afterlife.

Keywords: Religiosity, Afterlife beliefs, Insurance, Unemployment
JEL Classifications: Z12

Affiliations: All authors at the University of Cambridge. We are grateful to The Keynes Fund for Applied Economics for providing the funding to support this project.

1 Introduction

Religious communities may provide a source of informal insurance for people in developing countries, often providing public services and extensive community support in environments which may be prone to risk (e.g., Iannaccone, 1992; Chen, 2010; Iyer, 2016). In countries where the provision of welfare support by the state may be limited, religious communities often step in to provide mutual insurance.

In this paper, we examine the role of religion as a form of insurance and community support in Brazil. Brazil is an interesting context to study this issue as it is a multi-religious population with many different Christian and other denominations. It has a long history of deep religiosity, and as an emerging economy, it is a useful context within which to explore the interactions between religion and economic behaviour. In a new survey which we designed as a part of this study, we collect primary data from individuals on their households' characteristics, their religiosity and perceptions about the future from individuals living in the metropolitan region of Rio de Janeiro, Brazil.

Our main finding is that people who invest more in their religious community, as measured by a variety of indicators, also expect more support from that community. This underlines the pervasiveness of religion communities as a form of informal insurance in this society today. The support provided by the community may take various forms, and our survey questions extensively explore psychological help, shelter, or job support. There are interesting differences here across the religious groups. Pentecostals, for example, use the community support more than other groups.

In order to rationalise the findings of our survey, we construct a life-cycle model of consumption and saving with afterlife beliefs and in-kind goods provided by the community. Such goods help individuals to insure against income shocks. We calibrate and estimate model parameters to be consistent with moments from secondary data on employment transitions and from our survey data. We find that community support has a small but non-negligible impact on the employment transition probabilities and is heterogeneous across different religions. One of the key findings from our simulations, and which is new to the literature on the economics of religion, is that this insurance motive is strongly coupled directly with religious beliefs. Particularly, when shutting down any coordinated beliefs in the afterlife in the model, the community support channel vanishes. Therefore, we suggest that, at least in this society, community support may be a by-product of the communities' deeply rooted religious beliefs in the afterlife.

Section 2 reviews the literature in the economics of religion which has relevance for our

study. Sections 3 and 4 explore religion and religiosity in Brazil, presenting the basic findings from the World Value Survey and from our survey data, specifically discussing community support and beliefs in the afterlife. Section 5 presents our basic model and Section 6 fits the model to the data calibrating model parameters. Section 7 discusses the model's basic predictions and provide counterfactual exercises. Section 8 concludes.

2 Literature review

In the theoretical literature on the economics of religion, religious communities are often viewed as clubs, demonstrating the characteristics of clubs with rules for members and privileges for those who belong to these clubs. One of the benefits of religion as a club good is that it offers positive returns, potentially in the form of a social insurance, to its members. These returns can be of a non-monetary, often emotional nature, or more monetary in nature, certainly enhancing the individual's utility. In his seminal paper, Iannaccone (1992) initiated the club good interpretation of religion. He showed that prohibitions and practices such as stigma and sacrifice effectively help religious organisations to screen new members in order to avoid adverse selection such that only the more committed aspirants ultimately join. Building on that framework, Berman (2000) explains why Ultra-Orthodox Jews stay in full time religious education until on average the age of forty, even when their families live in poverty. These sorts of commitments lower adverse selection by the religious institutions and provide an economic and emotional insurance for a religious group to make participation desirable. Closely related to that, Abramitzky (2008) argues that religious ideology plays a key role in sustaining religious communes and mutual insurance using the example of the Israeli Kibbutzim.

Although there have been many developments in the economics of religion since the early work of Iannaccone and others (Iyer, 2016), the club goods model is still the most important way in which we can think of religious groups in an economic framework. A growing strand of literature investigates empirically the role of religion in insuring individuals against negative shocks. This strand of literature can be more or less divided into two perspectives. The first perspective examines economic or emotional outcomes of religious people in the aftermath of aggregate or idiosyncratic shocks, whereas the second takes an ex-ante view and investigates if people anticipate future adverse shocks by participating in religious organizations. This may also be related to the services which religious organisations provide, for example, with respect to religious, social and welfare services (Iyer, 2018). Scheve et al. (2006) also demonstrate that religion and welfare state spending may act as substitute mechanisms which may

insure individuals against adverse events in their lives. Hence countries in which religiosity is high also demonstrate lower levels of welfare state spending, and individuals who are religious may in fact prefer lower levels of social insurance.

Taking the first approach, Clark and Lelkes (2005) analyse how religion might help insure against stressful life events using data from twenty-two European countries. In their analysis, they also distinguish between different religions. In case of sudden unemployment shocks, they find that religious people in general suffer less emotionally. In case of divorce and separation, however, Protestants are protected against this shock while the Catholics are punished. Using micro data on US households, Dehejia et al. (2007) examine how religious organisations insure against income shocks. They find evidence that religious participation mitigates the effect of the shock on both consumption and self-reported happiness of households. Popova (2014) considers the impact of religion in insuring happiness against aggregate shocks in twenty-nine transition economies. In her study, the aggregate shocks are large scale economic and political reforms and she shows that in these countries, the more religious groups are less vulnerable to the aggregate shocks and thus concluding in favour of partial insurance of happiness.

Buser (2015) using self-collected data from Ecuador, empirically tests for the effect of income on religiosity. He finds that higher income leads to higher religious participation and suggests a club good explanation for his results. Ager and Ciccone (2017) exploit common rainfall risk in the 19-th century United States and find that a greater share of population was organized in religious communities in counties with a greater common agricultural risk.

Bentzen (2019, 2020) conducts research to show that religiosity also responds to natural diasters in different parts of the world, and other exogenous shocks, such as for example, the recent Covid-19 virus pandemic across the world (Bentzen 2020). Some of this research suggests that these kinds of large shocks may also be both religiosity inducing and/or religiosity enhancing. Chen (2010) shows that religion, in contrast to a formal insurance, can act as a form of ex-post insurance, effectively combining both perspectives. He investigates the religious participation in Indonesia during the Asian financial crisis. He finds that those who increase their religious activities are those who have been affected more by the crisis. Therefore, religion alleviates the negative impact of economic shocks and smooths consumption even ex-post. He also finds that those who had a higher religious participation before the shock benefit more from the insurance provided by their religious institutions. In line with the feature of ex-post insurance, Ager et al. (2016) document a rise in church membership in regions affected by the Mississippi flood of 1927. Furthermore, Costa et al. (2018) investigate the effect of economic downturns on Pentecostal growth in Brazil. They exploit

the 1990's trade liberalization in Brazil as a natural experiment and show that a 10 percent decrease in expected earnings led to a roughly 1.5 percent increase in the share of Pentecostal individuals.

Our hypothesis is that given that religion can take the form of informal insurance, there could be different levels of insurance as a function of the individual's investment in the religious community. Our contribution to the literature is therefore twofold: First, we collected primary data in Brazil on household-specific religious activities and community level risk-sharing in a series of surveys with the help of the Institute for Religion Studies (ISER) in Rio de Janeiro. To the best of our knowledge, this is the first comprehensive dataset comprising information on religious activities of people and economic characteristics and expectations at the same time. Second, we build a theoretical model in which individuals make different religious investments. We fit the model to match moments from our survey in order to disentangle why individuals make religious investments and how religious participation affects individuals decisions and outcomes.

We explore variation in beliefs and religion denominations to understand the effects of the Pentecostal movement in Brazil on individuals behavior. Pentecostals are a Protestant group within Christianity often described as charismatic churches. However, they do differ from other Evangelical churches. The main difference is that they emphasise speaking in tongues, miracles and healing traditions. This movement also emphasises the inerrancy of scripture, the importance of the Bible and ways to transform lives through faith. While this movement started in America around 1906 under pastor William Seymour, there are about 80 different Pentecostal denominations at present. Pentecostalists are considered fundamentalist Protestants. They do have beliefs such as being born again, speaking in tongues, and faith healing. Examples of Pentecostalist churches include the Assemblies of God and the Church of God, among others. These churches also display other features such as testimony, hand-clapping, prayer and healing.

Evangelical usually refers to Protestant religions that may adhere to teachings of the New Testament and Evangelicals do accept the belief of the three Persons of the Trinity. Evangelical movements in the US have typically been classified as conservative or charismatic. One of the successful Evangelical preachers who called himself a 'religious retailer' and used technology to promote religion was Robert Schuller. A preacher who hosted a TV program from the Crystal Cathedral in Orange County, California for over 40 years called the "Hour of Power", this drew a weekly audience of one and a half million viewers and listeners from about 50 nations worldwide.

In Brazil, Chestnut and Kingsbury (2019) argue that if we examine the history of religion

there, this country was initially colonised by the Portuguese in the 1500s and Catholicism was the dominant religion. Since the 1900s however Pentacostalism has been important, first gaining popularity among the poor in urban slums. Chestnut and Kingsbury also point out that the main Pentacostal denominations of prominence are the Four-Square Gospel, the Universal Church of the Kingdom of God, and Assemblies of God. They argue that "These churches proffer a range of religious products to the urban poor, ranging from Prosperity Theology to faith healing. Impoverished city dwellers, faced with limited opportunities and denied access to basic human needs, nevertheless seek to navigate the difficulties of their daily lives. Faced with somatic diseases and social distress, many seek sacred succor to surmount their troubles...Many find empowerment through conversion and catharsis during spirited services, where they imagine that through sacred power they might be freed from material deprivation."

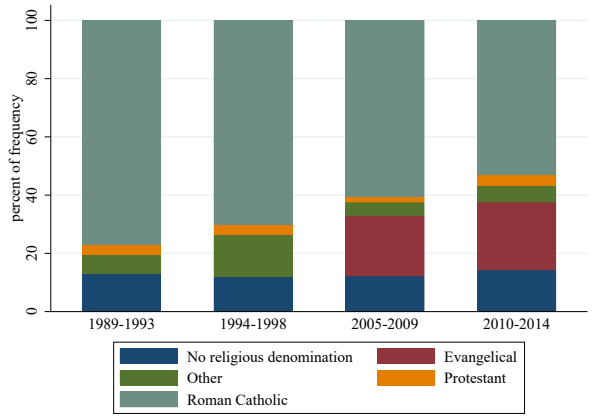
In this paper, we consider the links between religion in Brazil and economic outcomes, through an economic model and survey data, which we outline below.

3 Religion and religiosity in Brazil

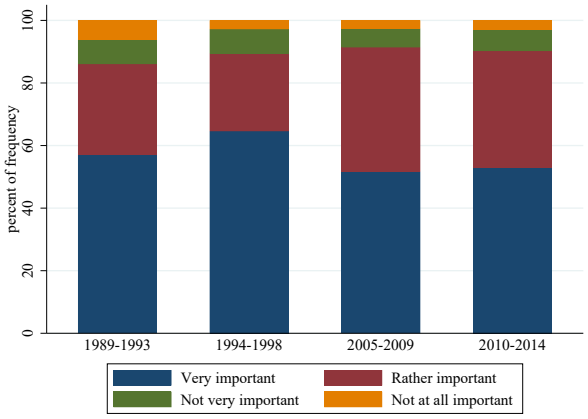
Due to its Portuguese colonial heritage, the predominant religion in Brazil is Roman Catholic. Three decades ago, the share of Catholics in the Brazilian population was almost 80%. Now approximately 50% of Brazilians say they are Catholics - see Figure 1(a). The country is still predominantly a Christian nation. According to the World Value Surveys (WVS), approximately 85% of all Brazilians say they are either Catholics, Evangelicals or Protestants - see Figure 1(a). The fall in Catholicism in the country has been followed by the rise of the Evangelicals. Nowadays, more than 20% of individuals in Brazil say they follow the Evangelical doctrine.

Concomitantly with the surge of Evangelicalism in Brazil is the increase in religiosity and church attendance. In Figure 1(b) we observe that approximately 50% of Brazilians state that religion is very important in their lives. In fact, there is a rise in past decades in the share of Brazilians who say religion is either very important or rather important in their lives. This is also corroborated by Figure 1(c), which shows an increase in the share of individuals who say that they are an active member of a religious organisation. The share of individuals going to Church at least once per week has also risen in recent decades - see Figure 1(d).

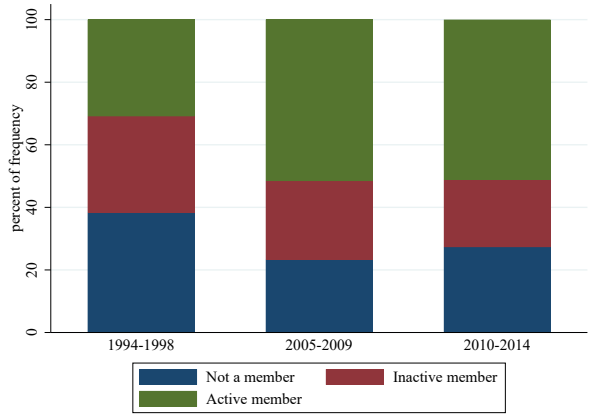
Therefore, the evidence from the World Value Surveys suggests that Brazil is mainly a Christian country, but Evangelicalism and religiosity are on the rise. In order to understand



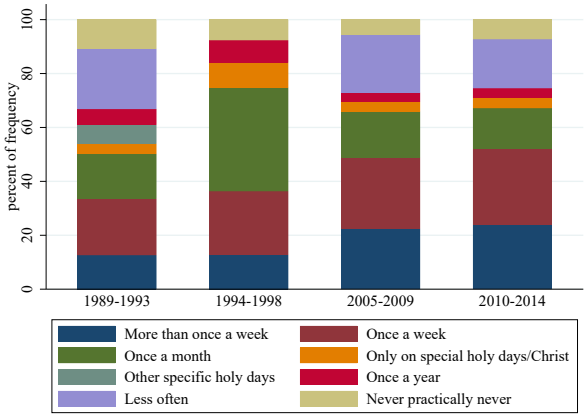
(a) Religious denominations in Brazil over four waves of the World Value Survey



(b) Importance of religion in life in Brazil over four waves of the World Value Survey



(c) Membership in religious organisations in Brazil over three waves of the World Value Survey



(d) Attendance in religious services in Brazil over four waves of the World Value Survey

Figure 1: Religion and religiosity in Brazil. Source: World Value Surveys.

the role of religion, religiosity and how different religion denominations shape individual decisions and outcomes, we first collect primary data in Brazil on households' socio-economic characteristics, religious activities, beliefs, perception about different individual idiosyncratic shocks and community level risk-sharing. This dataset is described in the next Section.

4 Data facts and reduced-form evidence

In this section, we document some facts from Brazil that motivate our work and provide empirical support for some of our modelling strategies. We first present our primary data

collected in the metropolitan area of Rio de Janeiro from 2019-2020 and then we provide some correlations among the main variables of our survey. We find evidence that higher investment in religion is associated with a higher perceived likelihood of finding a job. Further, we explore the underlying motivation behind religious investments. Are investments meant to improve afterlife or are they mainly to insure against employment shocks? Our empirical results suggest that these two channels are complementary.

4.1 Data description

We design and implement an original survey to construct a comprehensive dataset comprising information on individual religious activities, socio-economic characteristics and perception about different risks individuals might face. Our survey questionnaire[1] is divided into three parts. The first part contains basic household demographics and economic characteristics of respondents; the second section of the survey aims to capture individuals' perception about their future and different risks they face; and the third part encompasses questions about religion, religiosity and religious beliefs.

The survey was implemented with the support of the Institute for Religion Studies (ISER) in Rio de Janeiro, a non-governmental organization. Working in partnership with us, ISER conducted two rounds of surveys, approximately 600 field interviews in each round in the metropolitan area of Rio de Janeiro. The first round was implemented from January 2019 to February 2019 and the second round was conducted between April 2020 and May 2020. Figure 2 illustrates the geo-location of interviewees across the metropolitan area of Rio de Janeiro. We collected the data in Rio de Janeiro, the second largest city in Brazil, and its surroundings due to the religious diversity of the region. In order to cover all major religious groups, we ensure certain quotas are met for religious denominations in the data collection procedure. The final sample consists of 25% Catholics, 25% Pentecostals, 16.6% Protestants, 4.2% who believe in spiritualism, 3.2% Umbanda, 1.2% Candomblé and 25% who do not belong to a religion or religious denomination.

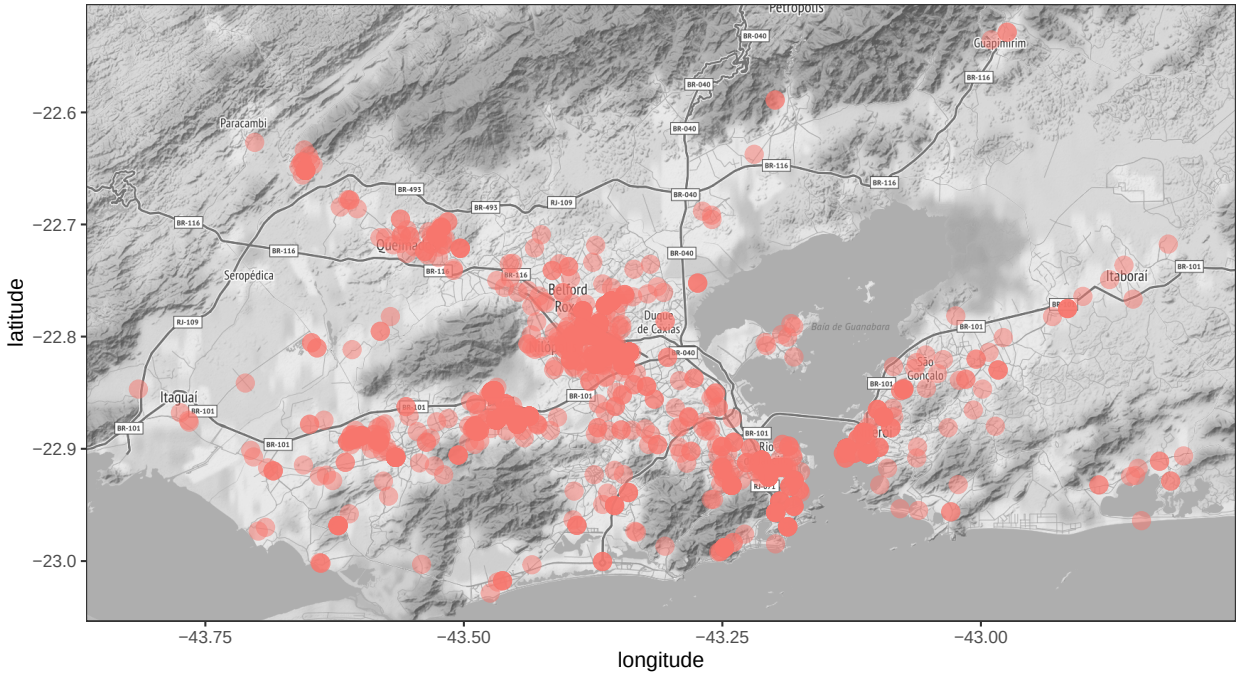
Table 1 lists descriptive statistics for selected variables. The average individual in our sample is 40 years old, non-white, married with children and has obtained a secondary education. The household income of the average individual is R$ 2,000-2,500 (or approximately US$ 400-500). About 54% of the individuals have a formal job and the average number of hours worked per week is 26. Almost 60% of respondents consider themselves to be religious (41%) or very religious (17%).

[1]For the full questionnaire see the website XXX.

Table 1: Descriptive statistics of most relevant variables

	Mean	Sd.	Obs.
Panel A. Demographics			
Age	40.58	13.11	1197
Female (%)	47	50	1197
Non-white (%)	64	47	1197
Married (%)	53	50	1197
Children (%)	70	46	1197
Primary school (%)	25	43	1197
Secondary school (%)	53	50	1197
Higher education (%)	22	41	1197
Panel B. Economic situation and expectations			
Household's monthly income (1: < R$ 500; 12: > R$ 6,000)	5.96	3.38	1095
Employed (%)	67	47	1198
Formal work (%)	55	50	800
Hours worked per week	32	22	1008
Probability of job loss (%)	16	29	979
Probability to find a job (%)	50	39	435
Panel C. Religion			
Belong to religion (%)	76	43	1198
Pentecostal (%)	29	45	1055
Roman Catholic (%)	28	45	1055
Religiousness (0: Non-religious; 3: Very religious)	1.97	0.97	1194
Donate (%)	71	45	1198
Work voluntarily (%)	33	47	1198
Frequency of going to church (0: Never; 6: More than once a week)	3.77	2.09	911
Time spent to pray in average week (1: 0h; 5: >5hs)	2.75	1.13	916
Time spent at religious festivities in average week (1: 0h; 5: >5hs)	1.77	1.21	908
Community support for finding a job (%)	26	44	922
Probability of afterlife (%)	58	45	1154

Figure 2: Geo-location of interviewees in the metropolitan area of Rio de Janeiro



Panel C of Table 1 summarises our data on religious beliefs and investments. In particular, our survey results suggest that more than half of the respondents identify as an active member of a church or religious organisation. As for religious investments 45% of the interviewees financially support their religious organisation with donations and, approximately 20% of all respondents support their religious organisation with voluntary work, yet most of them do less than 10 hours per month. Furthermore, almost 70% of the individuals invest their time by praying at least every day if not several times a day. According to the respondents, there is an average 50% chance of existence of an afterlife.

One of the objectives of this paper is to understand the underlying motivations behind religious investments, and our survey data allows us to explore this channel in more depth. In particular, it is interesting to understand if people invest in religion, either financially or by volunteering to improve their afterlife outcomes or if they view these religious investments as a form of insurance in the face of financial hardships or unemployment. Additionally, religious communities often provide various other types of support (e.g. daycare support, support in finding a job) which may encourage people to participate more in the activities of their religious community. In this section we provide descriptive statistics regarding these investments and later in the paper we further explore these questions both empirically and by using a structural model.

Our survey data suggests that although only 1.5% of respondents receive financial support from their community, many more appear to benefit from practical help. Practical support comes in a variety of forms. Almost a quarter of individuals report to receive support from their Church in finding a job either for themselves or for some family members, 35% receive some help when facing health issues, 20% get some type of educational support, 18% benefit from child care and 19% have some type of psychological (i.e. counselling) support. Thus in our sample, support is coming more through forms of in-kind benefits rather than from direct financial support.

In Table 1 it can be observed that approximately 25% of the respondents who are employed estimate the likelihood of losing their job within the next year at 50% or higher. While only 1% report a monthly income of less than R$ 500 if they keep their job, 18% see their monthly income falling below this threshold in case they lose their job. 75% of those who are looking for a job are convinced that there is at least a 50% chance of finding a job within a year.

4.2 Religious investment to insure against negative financial outcomes

There is ample evidence for the insurance motive that religion provides through community support (e.g. Clark and Lelkes, 2005; Dehejia et al., 2007; Popova, 2014). In order to verify whether this channel might play a role for individuals in our sample, in Table 2 we regress a dummy for whether the respondent reports that he/she would receive community support to find a job, on donations and time invested in the local religious community. Column (3) of this table shows that a one standard deviation increase in donations is associated with a 2.6 percentage point higher probability of receiving community support to find a job, while a one standard deviation increase in time investments is associated with a 11.1 percentage points higher likelihood of receiving community support. In Column (4) we find weak evidence that the two investments are perceived as substitutes as the interaction is negative (p-value= 0.116). These findings are summarised in stylised fact 1 below.

Stylised fact 1: *Higher donations and higher number of hours volunteered in the religious community are associated with a higher probability of receiving support from the religious community to find a job.*

Next, we investigate how individuals assess how community support helps them find a

Table 2: Relation between religious investments and community support to find a job

	(1)	(2)	(3)	(4)
Donations to religious community	0.0593***		0.0257*	0.0325**
	(0.0135)		(0.0145)	(0.0151)
Time invested in religious community		0.1204***	0.1107***	0.1174***
		(0.0146)	(0.0156)	(0.0161)
Donations × time				-0.0207
				(0.0132)
Constant	0.2550***	0.2661***	0.2615***	0.2681***
	(0.0145)	(0.0146)	(0.0148)	(0.0154)
Observations	922	853	853	853
R^2	0.0205	0.0741	0.0776	0.0802

Notes: Standard errors are parentheses; * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

job. We regress the perceived probability of finding a job on a dummy indicating whether or not the respondent receives community support to find a job. In Column (1) of Table 3 we see that respondents who receive community support perceive the likelihood of finding a job to be 9.7 percentage points higher than those who do not received support. In Column (2), we add individual controls and still find the perceived probability to be 8.3 percentage points higher.

Stylised fact 2: *A higher amount of community support is associated with a higher perceived probability of finding a job.*

In order to gain insights into whether respondents perceive a direct relationship between investments, in the form of time or donations, and community support, we present hypothetical scenarios to the respondents. In these scenarios we exogenously vary the amount of investments, while keeping everything else fixed, and ask respondents to predict the level of community support the hypothetical individual could enjoy.

More specifically, we present the following scenario:
Imagine a person named João who lives in your neighborhood. Imagine João donated 500 reais to the local church last year. How likely is he going to get community support? [0 means very unlikely and 100 means very likely]
In the subsequent scenario, we ask them to imagine Pedro, another common Brazilian name, in the same neighborhood who instead invests 100 reais. Then using the two predictions, we can run a regression of perceived community support on changes in donations and include individual fixed effects.

Table 3: Relation between community support to find a job and perceived job finding probability

	(1)	(2)
Community support for finding a job	0.0974**	0.0834*
	(0.0479)	(0.0434)
Age		-0.0106***
		(0.0015)
Woman		-0.1190***
		(0.0393)
Secondary school		0.0256
		(0.0475)
University		0.1499**
		(0.0638)
Low risk area		0.0149
		(0.0411)
Constant	0.4559***	0.8918***
	(0.0254)	(0.0827)
Observations	322	320
R^2	0.0128	0.2043

Notes: Standard errors are parentheses; * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Results are presented in Panel A of Table 4. In the first column, we use the entire sample and find that increasing donations from 100 to 500 reais, on average, is perceived to increase the probability of receiving community support to find a job by 3.5 percentage points. In the following columns we restrict the sample to each religious denomination, and find that within each denomination, the relationship is perceived to be positive and significant. Actually, it is highest for the non-religious who perceive the increase to be 5.2 percentage points.

We then repeat a similar exercise for the impact of time investments (5h vs. 1h per week) on community support to find a job. Since in our survey we present these scenarios after the donation scenarios, we further specify that there are no donations in these cases. The results of the analog regressions can be found in Panel B of Table 4. The average perceived increase in the probability of community support is 6 percentage points, and again is highest among those with no religious denomination (9.2 percentage points).

We further look into perceived baseline levels of community support from the first column of Panel A and Panel B of Table 4. We regress the individual fixed effects on individual characteristics, and display the results in Table 5. Relative to the non-religious, we see that the Pentecostal perceive the baseline level of support, i.e. when donating 100 reais a year or investing 1h per week, as 25 percentage points higher. For other religious denominations

Table 4: Effects of donation and time investment on community support to find a job in hypothetical scenario

Panel A: Effects of donations						
	(All)	(None)	(Cath)	(Pent)	(Prot)	(Other)
Donating 500 instead of 100	0.0352***	0.0523***	0.0306***	0.0291**	0.0335**	0.0216**
	(0.0058)	(0.0161)	(0.0083)	(0.0113)	(0.0134)	(0.0101)
Constant	0.6227***	0.4561***	0.6191***	0.7100***	0.7252***	0.6396***
	(0.0041)	(0.0114)	(0.0058)	(0.0080)	(0.0095)	(0.0072)
Observations	1086	264	257	273	189	103
R^2	0.0636	0.0744	0.0982	0.0467	0.0627	0.0832
Individual FE	Yes	Yes	Yes	Yes	Yes	Yes
Panel B: Effects of time investment						
	(All)	(None)	(Cath)	(Pent)	(Prot)	(Other)
Supporting 5h instead of 1h	0.0600***	0.0915***	0.0605***	0.0545***	0.0232	0.0613***
	(0.0071)	(0.0182)	(0.0140)	(0.0131)	(0.0145)	(0.0179)
Constant	0.6240***	0.4513***	0.6174***	0.6904***	0.7458***	0.6755***
	(0.0050)	(0.0129)	(0.0099)	(0.0092)	(0.0102)	(0.0126)
Observations	1106	264	264	282	190	106
R^2	0.1140	0.1614	0.1253	0.1109	0.0265	0.1850
Individual FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Standard errors are parentheses; * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. The column headings indicate the religious denomination of the respondent

it is also higher than for the non-religious, whereas the difference is smaller for the Roman Catholic. In terms of other covariates, we only find a significant relationship for the university educated who perceive the probability of support at the baseline to be 8-9 percentage points lower than for those who did not finish secondary school.

Given the hypothetical scenarios, we can compute perceived returns to donations and time investments for each survey respondent by subtracting reported community support under the low investment scenario from the high investment scenario. In Table 6 we then regress self-reported investments on perceived returns. In the first column we use the whole sample, while in the second and third column we restrict the sample to the non-religious and religious, respectively. The first three columns refer to donations, while the last three to time investments. We find that respondents with higher perceived returns also investment more both in terms of donations and time. Most importantly, the relationship only holds for the religious respondents, indicating that it is not enough to believe in returns in terms of community support for the job search in order to induce investments.

Table 5: Explaining individual fixed effects

	Donate (1)	Time (2)
Roman Catholic	14.7266***	13.4506***
	(4.2040)	(4.0624)
Protestant	22.0518***	19.5946***
	(4.0922)	(3.9409)
Pentecostal	25.4146***	24.9316***
	(4.4928)	(4.3641)
Other	17.0911***	20.6043***
	(5.4211)	(5.2296)
Age	-0.0310	0.1219
	(0.1143)	(0.1104)
Female	4.5257	4.0362
	(2.8893)	(2.7947)
Secondary school	-5.3125	-5.3140
	(3.5559)	(3.4376)
University	-8.1489**	-8.6675**
	(4.0850)	(3.9474)
Low risk area	-0.9427	-3.9030
	(3.3467)	(3.2232)
Observations	541	548
R^2	0.0894	0.0955

Notes: Standard errors are parentheses; * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. In Column (1) the dependent variable is the individual fixed effect from the regression in Column (1) of Panel A in Table 4, while in Column (2) it is the individual fixed effect from the regression in in Column (1) of Panel B in Table 4.

Stylised fact 3: *Receiving community support does not seem to be a sufficient motivation to induce religious investments.*

Table 6: Relation between perceived returns and investments

	Donation			Time investment		
	All	Non-relig	Religious	All	Non-relig	Religious
	(1)	(2)	(3)	(4)	(5)	(6)
Perceived return donating	0.0168**	-0.0003	0.0276**			
	(0.0078)	(0.0057)	(0.0115)			
Perceived return time				0.0209***	-0.0202**	0.0305***
				(0.0066)	(0.0078)	(0.0074)
Probability of afterlife	0.0033	-0.0079***	0.0036	0.0100***	-0.0115	0.0115***
	(0.0025)	(0.0025)	(0.0032)	(0.0027)	(0.0066)	(0.0028)
Constant	0.0136***	0.0077***	0.0171***	0.0159***	0.0159***	0.0156***
	(0.0020)	(0.0017)	(0.0026)	(0.0022)	(0.0053)	(0.0023)
Observations	522	125	397	407	16	391
R^2	0.0124	0.0756	0.0171	0.0543	0.4959	0.0769

Notes: Standard errors are parentheses; * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. In columns (1)-(3) the dependent variable is the standardized reported amount of donations, and in columns (4)-(6) the standardized amount of time investments. In columns (2) and (5) the samples are restricted to non-religious respondents, while in columns (3) and (6) the samples are restricted to non-religious respondents.

4.3 Religious investment and perceived afterlife outcome

Beyond returns to religious investments in the current life, one reason individuals have been found to engage in religious practices is an expected return upon death, or the afterlife. Using our data, we investigate the relationship between religious investments and the afterlife by regressing respondents' reported probabilities of believing in afterlife on the amount of donations, the time invested in the local religious community, and the time spent praying. In Column (1) of Table 7, we document that a one standard deviation increase in donations is associated with a 2.6 percentage point increase in the perceived likelihood of having an afterlife, while in Column (3) we see that a one standard deviation increase in donations is associated with a 2.8 percentage point increase.

Table 7: Relation between religious investments and the probability of afterlife

	(1)	(2)	(3)	(4)
Donations to religious community	0.0261*			0.0157
	(0.0133)			(0.0159)
Time invested in religious community		0.0053		-0.0193
		(0.0161)		(0.0185)
Time spent praying			0.0276*	0.0381**
			(0.0153)	(0.0180)
Age	0.0007	-0.0011	-0.0015	-0.0019
	(0.0010)	(0.0012)	(0.0012)	(0.0013)
Constant	0.5487***	0.6568***	0.6732***	0.6856***
	(0.0435)	(0.0544)	(0.0529)	(0.0551)
Observations	1154	819	882	813
R^2	0.0042	0.0010	0.0049	0.0093

Stylised fact 4: *Higher perceived probability of afterlife is associated with higher donations and more praying.*

Having documented that religious investments systematically relate to returns in terms of community support and afterlife, we now turn to a model in order to shed light on the relationship between these different types of returns and how they shape individual decisions.

5 The model

In this section we set up a model to understand the incentive of individuals in investing in religious activities. This is a life-cycle model with consumption-savings decisions in which individuals face idiosyncratic shocks. In addition, individuals can donate to their community, provide voluntary work or pray. While all of these activities increase the value of afterlife, donations and and voluntary work also insure the individual in face of adverse shocks. The model allows us to understand the relative importance of each channel and disentangle the effect of religious beliefs from insurance incentives.

5.1 Environment

Individuals age and die stochastically. They can be young adults (y), middle-aged adults (m) or old adults (o) and live either in high crime areas or low crime areas.[2] Both age and crime rate contribute to the probability of survival. Young adults survival probability is $\delta^y_{cr} \in (0,1)$ with $cr \in \{high, low\}$. Individuals can die due to natural causes with probability δ^j_N with $j \in \{y, m, o\}$. There is also the probability that they will die due to getting hit by a crime shock. This is denoted by cr and $high$ refers to high crime areas and low to low crime areas, such that the probability of survival in high crime areas is lower than in low crime areas $\delta^j_{high} < \delta^j_{low}$. More specifically, the probability of dying for individual $j \in \{y, m, o\}$ can be denoted as:

$$1 - \delta^j_{cr} = (1 - \delta^j_N) + \delta^j_N(1 - \delta_{cr}).$$

The first term shows the probability of dying for individual j because of natural causes. The second part shows the probability of surviving the natural causes of death but dying due to crime.

If young individuals survive, then with probability $\gamma^m \in (0,1)$ they become middle-aged adults and with probability $(1 - \gamma_m)$ they remain as young adults. Similarly, middle-aged adults survive with probability $\delta^m_{cr} \in (0,1)$. Conditional on survival, then with probability $\gamma^o \in (0,1)$ they become old adults and with probability $(1 - \gamma_o)$ they remain middle-aged. Old agents survival probability is δ^o_{cr}.

Individuals have one unit of time endowment in each period. They face multiple decisions at any time period: consumption c, amount of donations d, assets a', hours worked h, time prayed p, time in community services t and leisure l. Individuals labor productivity is

[2]The assumption that individuals age stochastically simplies the analysis while keeping the tradeoffs individuals face during the life cycle.

composed by three components:

i. A transitory component: $z \in \{z_0, z_1\}$;

ii. A permanent education component: $\rho \in \{\rho_1, \rho_2, \rho_3\}$; and

iii. An age-specific component: $\epsilon \in \{\epsilon^y, \epsilon^m, \epsilon^o\}$.

Let z_0 be the state when agents are unemployed and z_1 when agents are employed such that $z_1 > z_0$. Therefore, an unemployment shock lowers the productivity of the individual but still allows them to remain active. This can be interpreted for example as an individual engaging in home production. Religion and religiosity affect the transition probability of states. The probability of staying in unemployment depends on community support s_r, where subscript r denotes the individual religion denomination. Community support is a function of the amount donated d and time invested in the community t, such that

$$s_r(d,t) = [\zeta d^\theta + (1-\zeta)t^\theta]^{\frac{1}{\theta}},\ \zeta \in [0,1],\ \theta \leq 1. \tag{1}$$

The probability of staying unemployed is

$$\pi_0(x) - \rho_{cs}\phi_r(s_r),$$

with

$$\phi_r(s_r) = \frac{s_r}{\phi_0 + s_r},\ \phi_0 \geq 0, \tag{2}$$

where variable x denotes individual characteristics, such as age and education. Labor market shocks depend on observed worker characteristics. ϕ_r denotes the probability of receiving community support as a function of donation and time, with ϕ_0 being a religious specific scaling parameter. ρ_{cs} is the efficacy parameter, i.e. the degree to which community support impacts labor market outcomes.

The probability of transiting from unemployment to employment is

$$1 - (\pi_0(x) - \phi_r(s_r)\rho_{cs}).$$

Similarly, the probability of remaining employed is given by

$$\pi_1(x) + \phi_r(s_r)\rho_{cs},$$

where $\pi_1(x)$ is the exogenous component for remaining employed. We assume the effect

of community support to be symmetric for unemployed and employed individuals. This assumption overstates the pure re-employment effect after having been laid off and finding a new job through community support, $(1-\pi_1(x))\phi_r(s_r)\rho_{cs}$.

Therefore, the transition probability matrix of the transitory labour productivity component will be endogenous and religion specific such that:

$$\Pi_{zz'}(x, s_r) = \begin{bmatrix} \pi_0(x) - \rho_{cs}\phi_r(s_r) & 1 - (\pi_0(x) - (\rho_{cs}\phi_r(s_r)) \\ 1 - \pi_1(x) - \phi_r(s_r)\rho_{cs} & \pi_1(x) + \phi_r(s_r)\rho_{cs} \end{bmatrix}. \tag{3}$$

The income of individuals is given by their productivity $z\epsilon\rho$ times their labour supply $(1 - l - p - t)$: $z\epsilon\rho(1 - l - p - t)$ and the wage rate is normalised to one.

The one-period utility depends on consumption and leisure according to:

$$u(c, l) = u(c) + v(l) = \frac{c^{1-\sigma}}{1-\sigma} - \psi\frac{L^{1+\eta}}{1+\eta}, \tag{4}$$

where $u(c)$ an $v(l)$ are both twice differentiable, and strictly increasing and concave. Individuals discount the future and $\beta \in (0, 1)$ is the subjective discount factor.

Depending on religious beliefs, individuals might also believe in afterlife and in a heaven absorbing state. The perceived value of going to heaven is $V_{heaven} \geq 0$. The value of going to hell is normalised to zero. The probability of going to heaven is given by $\pi_{after,r} = prob_{after}(p, s_r)$, where

$$prob_{after}(p, s_r) = \pi_{after,r} = (1 - \zeta_h)\phi_r + \zeta_h\left(\frac{p}{\phi_1 + p}\right),\ \phi_1 \geq 0 \text{ and } \zeta_h \in [0, 1]. \tag{5}$$

Therefore, the probability of going to heave is a weighted average of community services s_r given by (1) and praying time p.

5.2 Optimal decisions

Now, we can define the value function of all agents and their optimal decisions.

5.2.1 Value functions

Young individual problem. Let $V^y(a, z, \rho, r)$ denote the value function of a young individual with religion r, asset a, facing a current transitory productivity shock z and with a

permanent labor productivity ρ. This value function solves:

$$V^y(a,z,\rho,r) = \max_{c,a',d,l,p,t} u(c,l) + \beta\delta^y_{cr} E_{z'}[(1-\gamma^m)V^y(a',z',\rho,r) + \gamma^m V^m(a',z',\rho,r)] \\ +\beta(1-\delta^y_{cr})\pi_{after,r}V_{heaven},$$

subject to (1), (2),

$$c + a' + d = (1+i)a + z\epsilon^y\rho(1-l-p-t), \tag{6}$$

$$c \geq 0,\ a' \geq 0,\ d \geq 0,\ p,l,t \in [0,1]. \tag{7}$$

Equation (6) is the one-period budget constraint for young adults. The left-hand side is the sum of consumption, savings and donations. The right-hand side is the sum of income from asset holdings and labour income. The exogenous interest rate on financial assets is i. Equation (7) denotes the constraints on choice variables. Expectations are taken over the idiosyncratic productivity shock z', accordingly to the transition probability matrix given by (3).

Middle-aged individual problem. Middle-aged individuals solve a problem similar to the one of young individuals. The value function of a middle-aged individual with assets a, labor productivity $z\epsilon\eta$ and religion r is denoted by:

$$V^m(a,z,\rho,r) = \max_{c,a',d,l,p,t} u(c,l) + \beta\delta^m_{cr} E_{z'}[(1-\gamma^o)V^m(a',z',\rho,r) + \gamma^o V^o(a',z',\rho,r)] \\ +\beta(1-\delta^m_{cr})\pi_{after,r}V_{heaven},$$

subject to (1), (2),

$$c + a' + d = (1+i)a + z\epsilon^m\rho(1-l-p-t), \tag{8}$$

and conditions analogously to those described in Equation (7).

Old individual problem. A typical old individual with assets a, labour productivity $z\epsilon^o\rho$ and religion r solves the following problem:

$$V^o(a,z,\rho,r) = \max_{c,a',d,l,p,t} u(c,l) + \beta\delta^o_{cr} E_{z'}[V^o(a',z',\rho,r)] + \beta(1-\delta^o_{cr})\pi_{after,r}V_{heaven},$$

subject to (1), (2),

$$c + a' + d = (1+i)a + z\epsilon^o\rho(1-l-p-t), \tag{9}$$

and choice variables are constrained by the conditions described in Equation (7).

5.2.2 Decisions to invest in religion

As discussed in the previous section, there is weak evidence of individuals perceiving donations and voluntary time as substitutes. We set up the religious investment function as (1) and the following result holds:

Proposition 1 *The optimal trade-off between donation and time in community services is given by*

$$\left(\frac{d}{t}\right) = \left(\frac{\zeta}{1-\zeta}\right)^{1/(1-\theta)} (ze^{y}\rho)^{1/(1-\theta)},$$

and

$$\frac{d\ln\left(\frac{d}{t}\right)}{d\ln(ze^{y}\rho)} = \frac{1}{1-\theta} > 0.$$

Proof: Proof is provided in the Appendix.

This proposition states that the relative resource dedicated to donation as opposed to time depends on the productivity level, which itself depends on age, education and employment status. It also depends on ζ, the relative weight on donations in the production of community services. In addition, for any $\theta < 1$ donations increase by more with income than time invested in community services. Interestingly, results of Proposition 1 are independent of the community services parameter ϕ_0.

The next proposition shows the trade-off between leisure and pray.

Proposition 2 *The optimal trade-off between leisure and pray time is given by*

$$\frac{v'(l)}{\pi'_{after}} = \beta(1-\delta^{i}_{cr})V_{heaven},$$

where $\pi'_{after} = \frac{\partial \pi_{after}}{\partial p} = \zeta_h\phi_2(\phi_2+p)^{-2}$. *In addition, if the value of heaven* V_{heaven} *is not too high such that*

$$V_{heaven} > \frac{\lambda z e^{i}\rho\phi_2}{\beta(1-\delta^{i}_{cr})\zeta_h} \quad i \in \{y, m, o\},$$

then pray time will be zero.

Proof: Proof is provided in the Appendix.

Praying contributes to the probability of going to heaven but it is not an input for individuals to receive community support. Then, it can be that individuals still donate resources to the Church and participate in its activity but they do not believe in afterlife.

But observe from (5) that supporting the community also increases the probability of going to heaven.

Proposition 2 also shows that there is a cutoff for the value of heaven below which individuals will not pray. V_{heaven} has to be larger than the discounted, weight-adjusted intra-temporal marginal cost of praying. This cutoff will be different according to individual characteristics such as age, education, employment status and the crime rate in their neighborhood.

6 Fitting the model to the data

In order to disentangle the effects of religion on individual outcome, we must assign values for the model parameters. We have prior information about some parameters, but other parameters are specific to the analysis at hand and little is known about their magnitudes. Therefore, values for these parameters will be internally estimated such that the model matches key moments of our survey data and from secondary data obtained for Brazil and the city of Rio de Janeiro.

6.1 Calibrated parameters

Table 8 lists the values of those parameters which have been externally calibrated either using default values from the literature or direct empirical counterparts in the data. The model period is assumed to be one year. The discount factor β and the risk-free real interest rate i are chosen to be equivalent to the annual real interest rate of a one-year bond from the Brazilian government in 2018. The parameters defining the shape of the utility functions for consumption, σ, and labour, η, are pretty standard in the literature. The intertemporal elasticity is in line with most of the literature on consumption surveyed by Attanasio and Weber (2010) and also with the Brazil-specific literature that estimates σ in the range from 1 to 3 (e.g., Gandelman and Hernández-Murillo, 2014; Fajardo, Ornelas and Farias, 2012).

Productivity levels for the different age brackets and education levels stem from the National Household Sample Survey (*Pesquisa Nacional por Amostra de Domicílios* - PNAD). In addition, the exogenous component of the employment transition probabilities are calculated from PNAD. Transition probabilities differ by education level and age. In Table 8 the superscript on the transition probability denotes the education level from low education to high education, whereas the values in the brackets are ordered by age group. Data on survival probabilities for the different age groups comes from the World Health Organization's

Table 8: Parameters and targeted values for theoretical model

Externally calibrated			
Parameter	Value	Source	Description
β	0.975	Real interest rate	Discount factor
σ	2	Literature	Relative risk aversion
η	2	Literature	Inverse of the Frisch elasticity
i	0.025	Data	Risk-free real interest rate, 2018
ϵ (three values)	[1.01 0.96 1.07]	PNAD	Life-cycle component of productivity
ρ (three values)	[0.67 1.06 1.28]	PNAD	Schooling component of productivity
z_1	1.08	Data	Productivity level of employed
z_0	0.84	Data	Productivity level of unemployed
π_0^l (y m o)	[0.25 0.20 0.09]	PNAD	Prob. of finding a job, low education
π_0^m (y m o)	[0.33 0.26 0.10]	PNAD	Prob. of finding a job, mid education
π_0^h (y m o)	[0.43 0.27 0.09]	PNAD	Prob. of finding a job, high education
π_1^l (y m o)	[0.75 0.78 0.66]	PNAD	Prob. of remaining employed, low educ.
π_1^m (y m o)	[0.80 0.84 0.74]	PNAD	Prob. of remaining employed, mid educ.
π_1^h (y m o)	[0.87 0.88 0.80]	PNAD	Prob. of remaining employed, high educ.
δ^o	0.875	WHO data	Prob. of survival for the old
δ^m	0.973	WHO data	Prob. of survival for the middle-aged
δ^y	0.99	WHO data	Prob. of survival for the young
δ_{cr} (l h)	[0.99 0.97]	assumption	Prob. of survival in areas with different crime rates
γ^m	0.05	CENSUS	Prob. of ageing
γ^o	0.04	CENSUS	Prob. of ageing
ρ_{cs}	0.08	Our survey	Efficacy of community job support

(WHO) dataset on mortality. The probability of aging, i.e. jumping to the next age group is derived from demographic data from the latest Brazilian census. Given that our age groups span 20 years, it is very close to the probability of 5% of a uniform demographic distribution. The efficacy of community support for a job, i.e. how much more likely it is to find a job if the individual gets community support, is calibrated to the reduced form evidence in Table 3 amounting to roughly 8%. We assume that community support also reduces the risk of being laid off by the same amount (of which part could be interpreted as finding a job within the same period).

6.2 Internally estimated parameters

Table 9 lists all the model parameters which are internally estimated. Since our aim is to quantify the community support channel and afterlife beliefs in shaping individual decisions, we use a minimum distance procedure that targets a set of data moments related to the unconditional and conditional averages of the various forms of religious investments, as well as the probability of receiving community support.

Using the simulated method of moments (SMM), the parameters are chosen such that

Table 9: Internally estimated parameters

Internally calibrated			
Parameter	Value	Source	Description
ψ	14.076	Estimated	Labor disutility
V_{heaven}	20.000	Estimated	Value of heaven
$\phi_0^{Catholics}$	0.049	Estimated	Scale for (services) employment
$\phi_0^{Protestants}$	0.031	Estimated	Scale for (services) employment
$\phi_0^{Pentecostals}$	0.026	Estimated	Scale for (services) employment
ϕ_0^{Other}	0.045	Estimated	Scale for (services) employment
$\phi_0^{Non-religious}$	0.080	Estimated	Scale for (services) employment
$\phi_2^{Catholics}$	0.004	Estimated	Scale for (services) afterlife
$\phi_2^{Protestants}$	0.007	Estimated	Scale for (services) afterlife
$\phi_2^{Pentecostals}$	0.007	Estimated	Scale for (services) afterlife
ϕ_2^{Other}	0.007	Estimated	Scale for (services) afterlife
$\phi_2^{Non-religious}$	0.030	Estimated	Scale for (services) afterlife
ζ	0.617	Estimated	Afterlife services technology
ζ_h	0.282	Estimated	Community services technology
θ	2.051	Estimated	Community services technology (elasticity)

the distance between model moments and their empirical counterparts are minimized. The system of moment equations is over-identified with 44 moments to match 15 parameters. The fit of the structural model is shown in Table 10. Given the amount of model moments to match, the overall fit of the model is good though not perfect. It should be pointed out that the model is overestimating the amount of religious investment by the old generation relative to what we observe in the data. This is mainly driven by the fact that the likelihood to die for old individuals is naturally higher than for the rest of the population and hence they invest more in afterlife in our model. Our parsimonious model contains two dimensions of why individuals make religious investment: to insure against employment shocks and to increase the probability of going to heaven.

Table 10: Model fit

Moment	Data	Model
Average donation as share of household income	0.015	0.010
Conditional average, Catholics	0.012	0.009
Conditional average, Pentecostals	0.023	0.014
Conditional average, Protestants	0.022	0.013
Conditional average, other religion	0.022	0.010
Conditional average, no religion	0.004	0.005
Conditional average, young	0.011	0.006
Conditional average, middle-aged	0.019	0.014
Conditional average, old	0.018	0.041
Conditional average, low crime	0.015	0.009
Conditional average, high crime	0.015	0.016
Average time invested in community per week	0.026	0.017
Conditional average, Catholics	0.017	0.017
Conditional average, Pentecostals	0.030	0.023
Conditional average, Protestants	0.029	0.022
Conditional average, other religion	0.032	0.017
Conditional average, no religion	0.010	0.008
Conditional average, young	0.025	0.010
Conditional average, middle-aged	0.026	0.020
Conditional average, old	0.032	0.063
Conditional average, low crime	0.024	0.014
Conditional average, high crime	0.027	0.026
Average praying time per week	0.015	0.012
Conditional average, Catholics	0.013	0.011
Conditional average, Pentecostals	0.018	0.013
Conditional average, Protestants	0.018	0.012
Conditional average, other religion	0.013	0.013
Conditional average, no religion	0.011	0.011
Conditional average, young	0.013	0.009
Conditional average, middle-aged	0.017	0.013
Conditional average, old	0.019	0.025
Conditional average, low crime	0.014	0.010
Conditional average, high crime	0.017	0.014
Average community support for jobs		
Conditional average, Catholics	0.164	0.173
Conditional average, Pentecostals	0.320	0.383
Conditional average, Protestants	0.353	0.327
Conditional average, other religion	0.250	0.198
Conditional average, no religion	0.050	0.058
Conditional average, young	0.272	0.165
Conditional average, middle-aged	0.258	0.293
Conditional average, old	0.260	0.571
Conditional average, low crime	0.184	0.215
Conditional average, high crime	0.353	0.358
Average working fraction	0.367	0.517

Note: Time as percentage of active time per week, with 16 hours of active time per day.

7 Structural model predictions

With all parameters calibrated and estimated we can now explore how religion affects individual decisions. More specifically, this section analyses different counterfactual scenarios and aims to quantify the extent to which religious beliefs affect economic behavior and outcomes.

7.1 Community support is a by-product of coordinated beliefs in afterlife

The two main incentives for religious investment in the model are returns in the form of community support and increasing the afterlife probability of enjoying the utility from afterlife. Table 11 compares the average level of religious investments for the entire sample to counterfactuals when shutting down specific channels. The first column documents the average religious investments for the benchmark calibrated model. The second column considers the scenario in which there is no informal job insurance through religious communities. In this case, donations and time invested in the community go to zero, while people keep praying in the hope of afterlife.[3]

The third column documents the choices of religious investments in the case there is no belief in afterlife, or if the value of heaven is equal to zero. When setting the value of afterlife to zero, people not only stop praying – which is expected since this is the only motive of why individuals pray in our model – but also there doesn't seem to remain enough incentive for individuals to invest into community support. Our counterfactual results therefore suggest that there is a complementarity between afterlife belief and in-kind religious benefits which determines the incentives for individuals to engage in community activities.

In order to further investigate whether or not this is the case, we compute optimal religious investments for different values of heaven and for various degrees of efficacy of community support. Figure 3 plots the sensitivity of the various religious investments with respect to the value of heaven – Figure 3(a) – and the efficacy of community support in finding a job in case we shut down the afterlife channel – Figure 3(b). There exists a cutoff value for the efficacy of community support below which individuals do not invest at all if there is no additional incentive from beliefs in afterlife. The reduced form evidence from our survey suggests an efficacy of community support below this level. Therefore, the calibrated

[3]Observe that theoretically shutting down the religious insurance channel for the labor market does not necessarily lead to a zero investment in donations and time since they also affect the probability of going to heaven.

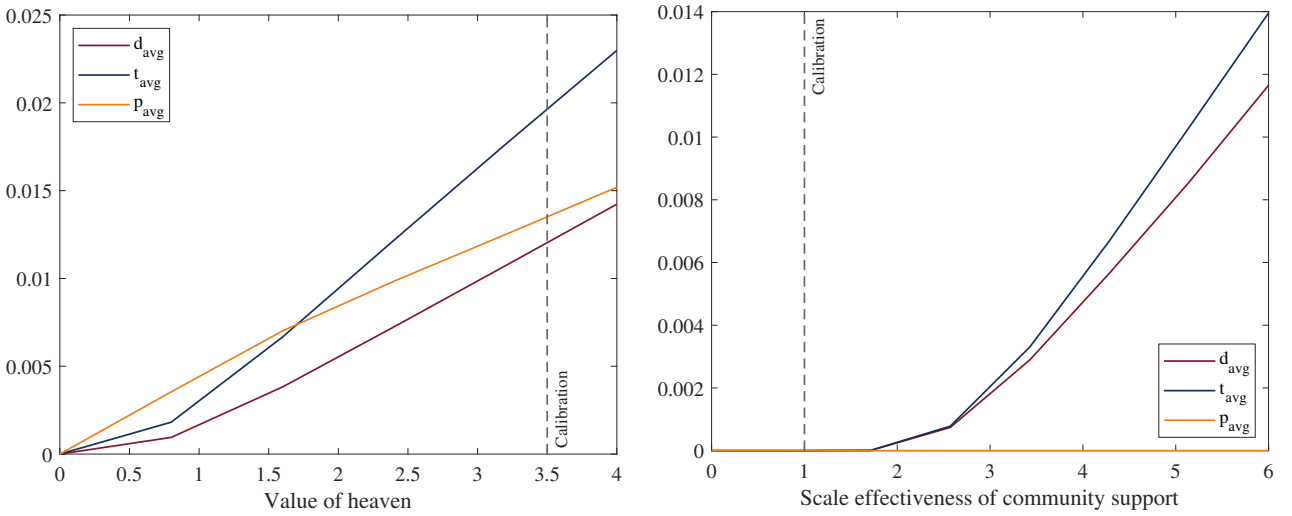
Table 11: Counterfactual religious investments

	Benchmark	No community support	No afterlife	No community support, no afterlife
Donations	0.012	0	0	0
Time invested	0.020	0	0	0
Time praying	0.014	0.014	0	0

Note: Time is denoted as a percentage of active time per week, with 16 hours of active time per day. Donations are denoted as a percentage of mean income.

model indicates that informal insurance via support by religious communities is nested in coordinated beliefs of the communities. Or to put it differently, the expected returns of investing into community support are too little for individuals who do not believe in some greater value of afterlife.

Figure 3: Sensitivity of religious investments to changes in the value of heaven and the effectiveness of community support



(a) Sensitivity w.r.t. value of heaven.

(b) Sensitivity w.r.t. effectiveness of community support ($V_{heaven} = 0$).

Figure 3(a) suggests that the three forms of investment in religion are increasing with the expected value of afterlife. Notice that the time investment in community services increases faster with the value of heaven than pray time and donations.

Table 12: Counterfactual employment transition probabilities

	Benchmark	No community support	No afterlife	No community support, no afterlife
Entire sample				
Probability to stay employed	0.83	0.81	0.81	0.81
Probability to find job	0.75	0.72	0.72	0.72
Catholics				
Probability to stay employed	0.83	0.81	0.81	0.81
Probability to find job	0.74	0.72	0.72	0.72
Pentecostals				
Probability to stay employed	0.84	0.81	0.81	0.81
Probability to find job	0.75	0.72	0.72	0.72
Non-religious				
Probability to stay employed	0.82	0.81	0.81	0.81
Probability to find job	0.73	0.73	0.73	0.73

7.2 The degree of economic insurance varies across different religious communities

Shutting down the community support channel we can also quantify the degree to which community support affects labour market outcomes. Table 12 documents the transition probabilities for employed and unemployed individuals for different scenarios and religion denominations. Comparing the second and the first columns for the entire sample, we observe that relative to the the benchmark without community support the average probability of staying employed is two percentage points lower and the probability to find a job decreases by three percentage points. The magnitude of the effect is determined by the efficacy of community support. Recall that the estimated change in the likelihood of finding job is only 8% higher when receiving community support compared to no support. Furthermore, the degree of economic insurance varies with religious investments and the probability of receiving community support. For instance, the community support channel appears to be slightly stronger in Pentecostal communities than in Catholic communities.

7.3 Welfare analysis

This welfare measure is calculated for the young agent but this will be equivalent for the middle age agents and old adults. Let's write the value function of a young agent described

in our paper:

$$V^y(a,z,\rho,r) = \max_{c,a',d,l,p,t} u(c,l) + \beta\delta^y_{cr}E_{z'}[(1-\gamma^m)V^y(a',z',\rho,r) + \gamma^m V^m(a',z',\rho,r)] \\ +\beta(1-\delta^y_{cr})\pi_{after,r}V_{heaven}.$$

Therefore, let's say that we calculate the baseline and $V^y_b(a,z,\rho,r)$ is the associated value function. Let's $V^y_a(a,z,\rho,r)$ be the value of any alternative (counterfactual) policy. Then, suppose that we want to give the consumer a permanent change in consumption that would make the consumer indifferent to the policy change (we want to give the consumer $(1+\omega)$ in consumption in every period). Then,

$$(1+\omega)^{1-\sigma}V^y_b(a,z,\rho,r)^{life} + \beta(1-\delta^y_{cr})\pi_{after,r}V_{b,heaven} = V^y_a(a,z,\rho,r),$$

where $V^y_b(a,z,\rho,r)^{life}$ corresponds to the life-time utility under the baseline (or the realised value function $-\beta(1-\delta^y_{cr})\pi_{after,r}V_{b,heaven}$). Solving for ω

$$\omega = \left(\frac{V^y_a(a,z,\rho,r) - \beta(1-\delta^y_{cr})\pi_{after,r}V_{heaven}}{V^y_b(a,z,\rho,r)^{life}}\right)^{\frac{1}{1-\sigma}} - 1.$$

This is one measure of welfare and it would consider utility in life and afterlife utility.

An interesting alternative welfare measure is to consider a similar index looking only at c and l (or in life utility) and abstracting for the afterlife utility - say, an economist looking at standard welfare observing the individuals' decisions but not taking into account that individuals value afterlife. This would be:

$$\tilde{\omega} = \left(\frac{V^y_a(a,z,\rho,r)^{life}}{V^y_b(a,z,\rho,r)^{life}}\right)^{\frac{1}{1-\sigma}} - 1.$$

We would therefore need to calculate in all cases in life value function, which is our value function minus the afterlife component ($\beta(1-\delta^y_{cr})\pi_{after,r}V_{heaven}$). Notice the difference between ω and $\tilde{\omega}$. The interpretation will be neat and we could even give a monetary value - looking at average consumption of individuals in Brazil.

The problem in this measure is that when we write

$$(1+\omega)^{1-\sigma}V^y_b(a,z,\rho,r)^{life} + \beta(1-\delta^y_{cr})\pi_{after,r}V_{b,heaven} = V^y_a(a,z,\rho,r),$$

we did not consider the fact that in future periods the agent could die and will not consume.

Table 13: Counterfactual welfare analysis

	w	$\tilde{w}$
No community support	-0.062	-0.054
No afterlife	-0.113	-0.106
No community support, no afterlife	-0.113	-0.106

Therefore, $(1+\omega)$ is not only affecting consumption but also the value relative to afterlife.

The results for the two measures defined above are reported in table 13. This table suggests that with community support welfare is higher by 5-6% in consumption-equivalent terms. The final two rows of the table capture the complementarity between afterlife and community, thus showing in the absence of afterlife beliefs, community support alone, does not lead to welfare-improving investments in religious activities.

8 Conclusion

In this paper we provide new evidence on the link between religiosity and economic outcomes. We collect primary data in the city of Rio de Janeiro on individuals' characteristics, their religiosity and perceptions about the future. We find that people who invest more in donations and time in their religious community expect more support from the community in finding a job and insuring against income shocks. This underlines the role of religious communities as a form of informal insurance. Community support can take various forms from psychological help, shelter, or job support. We focus on the latter channel and construct a structural model to estimate the importance of this channel on individuals' economic behaviour and job market outcomes. We find that community support can have a small but non-negligible impact on the employment transition probabilities and such impact is heterogeneous across different religion denominations. However, this insurance motive seems to be strongly coupled with religious beliefs. Particularly, when shutting down any coordinated beliefs in the afterlife in the model, the community support channel vanishes. Therefore, our findings suggest that community support may be a key by-product of communities' deeply rooted religious beliefs.

ENDNOTE: This paper is still currently in progress and therefore should not be circulated in its current form without the authors' prior consent. We plan to run Monte Carlo simulations in the model in order to investigate whether or not our model matches untargeted moments. In addition, the Monte Carlo simulations would allow us better to understand the

aggregate effects of religion investments and beliefs on the unemployment rate and inequality.

References

Abramitzky, R., 2008. The limits of equality: Insights from the israeli kibbutz. The quarterly journal of economics 123, 1111–1159.

Ager, P., Ciccone, A., 2017. Agricultural risk and the spread of religious communities. Journal of the European Economic Association 16, 1021–1068.

Ager, P., Hansen, C.W., Lønstrup, L., 2016. Church membership and social insurance: Evidence from the great mississippi flood of 1927. Discussion Papers on Business and Economics, University of Southern Denmark 7.

Attanasio, O.P., Weber, G., 2010. Consumption and saving: Models of intertemporal allocation and their implications for public policy. Journal of Economic Literature 48, 693–751.

Bentzen, J.S., 2019. Acts of god? religiosity and natural disasters across subnational world districts. The Economic Journal 129, 2295–2321.

Bentzen, J.S., 2020. In crisis, we pray: Religiosity and the covid-19 pandemic .

Berman, E., 2000. Sect, subsidy, and sacrifice: an economist's view of ultra-orthodox jews. The Quarterly Journal of Economics 115, 905–953.

Buser, T., 2015. The effect of income on religiousness. American Economic Journal: Applied Economics 7, 178–95.

Chen, D.L., 2010. Club goods and group identity: Evidence from islamic resurgence during the indonesian financial crisis. Journal of political Economy 118, 300–354.

Clark, A.E., Lelkes, O., 2005. Deliver us from evil: Religion as insurance .

Costa, F.J.M.d., Marcantonio Junior, A., Castro, R.R.d., 2018. Stop suffering! Economic downturns and pentecostal upsurge. Technical Report. Escola de Pós-Graduação em Economia da FGV.

Dehejia, R., DeLeire, T., Luttmer, E.F., 2007. Insuring consumption and happiness through religious organizations. Journal of public Economics 91, 259–279.

Fajardo, J., Ornelas, J., Farias, .A., 2012. Estimating risk aversion, risk-neutral and real-world densities using brazilian real currency options. Economia Aplicada 16, 567–577.

Gandelman, N., Hernández-Murillo, R., 2014. Risk aversion at the country level. Federal Reserve Bank of St. Louis Working Papers 2014-5 .

Iannaccone, L.R., 1992. Sacrifice and stigma: Reducing free-riding in cults, communes, and other collectives. Journal of political economy 100, 271–291.

Iyer, S., 2016. The new economics of religion. Journal of Economic Literature 54, 395–441.

Iyer, S., 2018. The Economics of Religion in India. Belknap; Harvard University Press. Cambridge Massachusetts.

Popova, O., 2014. Can religion insure against aggregate shocks to happiness? the case of transition countries. Journal of Comparative Economics 42, 804–818.

Scheve, K., Stasavage, D., et al., 2006. Religion and preferences for social insurance. Quarterly Journal of Political Science 1, 255–286.

A Model

First order conditions

Proposition 1 - proof:

Recall the problem of the young (the problem of the middle-aged and old is similar) with assets a, labour productivity $z\epsilon\rho$, expense (health) shock, and religion r is to solve:

$$V^y(a,z,\rho,r) = \max_{c,a',d,l,p,t} E[u(c,l)] + \beta\delta^y_{cr}E_{z'}[(1-\gamma^m)V^y(a',z',\rho,r) + \gamma^m V^m(a',z',\rho,r)] \\ +\beta(1-\delta^y_{cr})\pi_{after,r}V_{heaven},$$

subject to

$$c + a' + d = (1+i)a + z\epsilon^y\rho(1-l-p-t)$$

where i is the interest rate on financial assets.

First let's we denote the second bracket $CV^y(a',z',\rho,r)$ (continuation value when being young), then:

$$V^y(a,z,\rho,r) = \max_{c,a',d,l,p,t} E[u(c,l)] + \beta\delta^y_{cr}E_{z'}[CV^y(a',z',\rho,r)] + \beta(1-\delta^y_{cr})\pi_{after,r}V_{heaven}$$

Hence, for someone who is employed we get:

$$V^y(a,z=e,\rho,r) = \max_{c,a',d,l,p,t} E[u(c,l)] + \beta\delta^y_{cr}[(\pi_1(x) + (1-\pi_1(x))\times\phi_r)CV^y(a',z'=e,\rho,r) \\ +(1-\pi_1(x) - (1-\pi_1(x))\times\phi_r)CV^y(a',z'=u,\rho,r)] \\ +\beta(1-\delta^y_{cr})\pi_{after,r}V_{heaven}$$

And for someone who is unemployed:

$$V^y(a,z=u,\rho,r) = \max_{c,a',d,l,p,t} E[u(c,l)] + \beta\delta^y_{cr}[(\pi_0(x)\times(1-\phi_r))CV^y(a',z'=u,\rho,r) \\ +(1-\pi_0(x)\times(1-\phi_r))CV^y(a',z'=e,\rho,r)] \\ +\beta(1-\delta^y_{cr})\pi_{after,r}V_{heaven}$$

And for now leaving $\phi_r = \phi_r(d,t)$ and $\pi_{after} = \pi_{after}(d,t,p)$ as general functions.

Hence, we can set up the Lagrangian as follows:
Unemployed case:

$$\begin{aligned}\mathcal{L} = u(c) + v(l) + \beta\delta^y_{cr}[(\pi_0(x) \times (1-\phi_r))CV^y(a', z' = u, \rho, r) \\ +(1-\pi_0(x) \times (1-\phi_r))CV^y(a', z' = e, \rho, r)] \\ +\beta(1-\delta^y_{cr})\pi_{after,r}V_{heaven} \\ +\sum \lambda_t[(1+i)a + ze^y\rho(1-l-p-t) - (c+a'+d)]\end{aligned}$$

First order conditions:
FOC w.r.t. c:

$$\frac{\partial \mathcal{L}}{\partial c} = u'(c) - \lambda_t = 0$$

FOC w.r.t. l:

$$\frac{\partial \mathcal{L}}{\partial l} = v'(l) - \lambda_t z e^y \rho = 0$$

FOC w.r.t. d

$$\begin{aligned}\frac{\partial \mathcal{L}}{\partial d} = \beta\delta^y_{cr}\pi_0(x)[CV^y(a', z' = e, \rho, r) - CV^y(a', z' = u, \rho, r)]\frac{\partial \phi_r}{\partial d} + \\ \beta(1-\delta^y_{cr})V_{heaven}\frac{\partial \pi_{after}}{\partial d} - \lambda_t = 0\end{aligned}$$

FOC w.r.t. t:

$$\begin{aligned}\frac{\partial \mathcal{L}}{\partial t} = \beta\delta^y_{cr}\pi_0(x)[CV^y(a', z' = e, \rho, r) - CV^y(a', z' = u, \rho, r)]\frac{\partial \phi_r}{\partial t} + \\ \beta(1-\delta^y_{cr})V_{heaven}\frac{\partial \pi_{after}}{\partial t} - \lambda z e^y \rho = 0\end{aligned}$$

FOC w.r.t. p:

$$\frac{\partial \mathcal{L}}{\partial p} = \beta(1-\delta^y_{cr})V_{heaven}\frac{\partial \pi_{after}}{\partial p} - \lambda z e^y \rho = 0$$

and we have:

$$\frac{\partial \phi_r}{\partial d} = \frac{\partial \phi_r}{\partial s_r}\frac{\partial s_r}{\partial d}$$

$$\frac{\partial \pi_{after}}{\partial d} = \frac{\partial \pi_{after}}{\partial s_h}\frac{\partial s_h}{\partial s_r}\frac{\partial s_r}{\partial d}$$

similarly for t:

$$\frac{\partial \phi_r}{\partial t} = \frac{\partial \phi_r}{\partial s_r}\frac{\partial s_r}{\partial t}$$

$$\frac{\partial \pi_{after}}{\partial t} = \frac{\partial \pi_{after}}{\partial s_h}\frac{\partial s_h}{\partial s_r}\frac{\partial s_r}{\partial t}$$

We can substitute s_h with ϕ_r if we have a separative function for π_{after}.
Combining the FOC wrt d and t gives the intratemporal trade-off between donation and voluntary time:

$$\frac{\beta\delta_{cr}^y\pi_0(x)[CV^y(a', z'=e, \rho, r) - CV^y(a', z'=u, \rho, r)]\frac{\partial \phi_r}{\partial d} + \beta(1-\delta_{cr}^y)V_{heaven}\frac{\partial \pi_{after}}{\partial d}}{\beta\delta_{cr}^y\pi_0(x)[CV^y(a', z'=e, \rho, r) - CV^y(a', z'=u, \rho, r)]\frac{\partial \phi_r}{\partial t} + \beta(1-\delta_{cr}^y)V_{heaven}\frac{\partial \pi_{after}}{\partial t}} = \frac{1}{ze^y\rho}$$

or

$$\frac{A\frac{\partial \phi_r}{\partial s_r}\frac{\partial s_r}{\partial d} + B\frac{\partial \pi_{after}}{\partial s_h}\frac{\partial s_h}{\partial s_r}\frac{\partial s_r}{\partial d}}{A\frac{\partial \phi_r}{\partial s_r}\frac{\partial s_r}{\partial t} + B\frac{\partial \pi_{after}}{\partial s_h}\frac{\partial s_h}{\partial s_r}\frac{\partial s_r}{\partial t}} = \frac{1}{ze^y\rho}$$

Simplifying gives:

$$\frac{\frac{\partial s_r}{\partial d}}{\frac{\partial s_r}{\partial t}} = \frac{1}{ze^y\rho}$$

Hence using the definition for aggregator s_r we get the below result.

Donation- time trade-off:

$$d = (\frac{1-\zeta}{\zeta ze^y\rho})^{1/(\theta-1)}t$$

Result: The trade-off between donation and time is independent of the functional form ϕ_r.

Proposition 2 - proof:

Next to show the trade-off between leisure and pray we combine the FOC wrt l and p:

$$\frac{v'(l)}{\pi'_{after}} = \beta(1-\delta^y_{cr})V_{heaven}$$

where $\pi'_{after} = \frac{\partial \pi_{after}}{\partial p}$
FOC w.r.t. p:

$$\frac{\partial \mathcal{L}}{\partial p} = \beta(1-\delta^y_{cr})V_{heaven}\frac{\partial \pi_{after}}{\partial p} - \lambda z e^y \rho = 0$$

with

$$\frac{\partial \pi_{after}}{\partial p} = \frac{\phi_2}{(\phi_2+p)^2}$$

hence

$$\frac{\pi_{after}}{\partial p} = \frac{\lambda z e^y \rho}{\beta(1-\delta^y_{cr})V_{heaven}}$$

$$p = \sqrt{\frac{\phi_2 \beta(1-\delta^y_{cr})V_{heaven}}{\lambda z e^y \rho}} - \phi_2 \geq 0$$

The FOC result w.r.t. p is virtually the same as above due to separability, just including the weight:

$$p = \sqrt{\frac{\phi_2 \beta(1-\delta^y_{cr})V_{heaven}\zeta_h}{\lambda z e^y \rho}} - \phi_2 \geq 0$$

With the non-negativity condition for p, we get the following boundary condition for V_{heaven} so people pray a positive amount of time:

$$V_{heaven} > \frac{\lambda z e^y \rho \phi_2}{\beta(1-\delta^y_{cr})\zeta_h}$$

Hence, V_{heaven} has to be larger than the discounted, weight-adjusted intra-temporal marginal cost of praying.

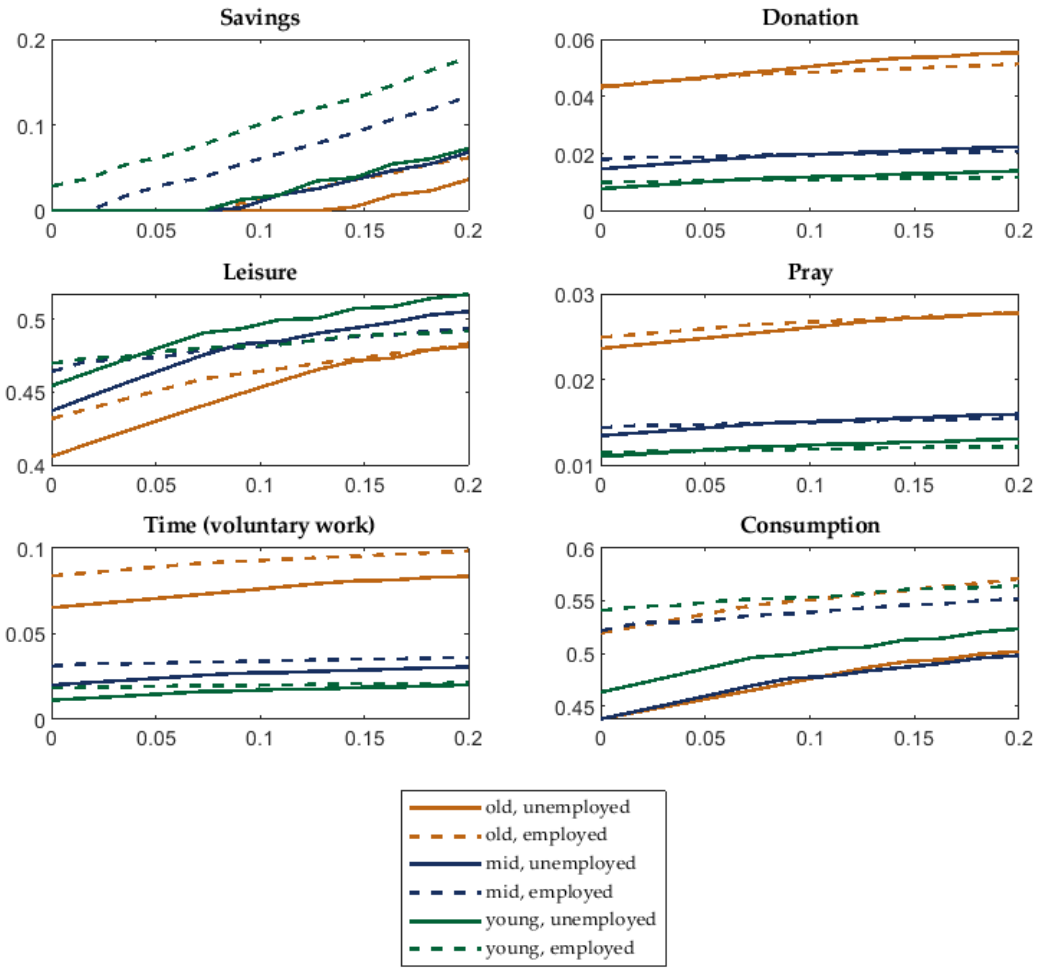


Figure 4: Policy functions for simulated model:
Catholic, low educated, low crime

Numerical Algorithm

This section describes the algorithm used to solve and estimate the model. There are 15 parameters to be internally calibrated as discussed in table **??**. To solve the problem of the household we use value function iteration method and the state variables are asset level, employment status religion, education, and crime level. Assets are defined over 12 grid points

resembling the monthly income bins of the survey. The lower and upper bound of the asset grid adjusts endogenously to generate a more precise distribution over the assets. Employment status changes according to the transition matrix provided in the model section. Given the survey results, we group individuals into 5 main religion groups: Catholics, Protestants, Pentecostals, other religions and non-religious. There are 3 levels of education indication primary school, secondary school or higher education and crime level can be high or low. As it is an overlapping generations model agents are either young, middle-aged or old.

We solve the problem of the households using value function iteration. The resulting policy functions are savings, leisure, donation, voluntary time, pray and consumption. Once we derive the policy functions of each agent, we simulate an economy of 1000 individuals to ensure the aggregate savings rate in the economy is stable over time and we burn in the initial 20 time periods and calculate the aggregate saving rate and distribution using the remaining data points. The initial draw for education, age, religion, crime rate and employment is according to the observed distribution of the survey data. Employment status then changes with probabilities given by the employment transition matrix and individuals age from young to middle aged and middle aged to old with probabilities γ^m and $gamma^o$ respectively. If an individual dies a new person is born with similar education, age and religion level. Once the aggregate saving rate becomes stable, we save the asset distribution resulting from the simulations[4]. Once at a stable state, we calculate 44 moments that are targeted to match their respective counterparts in the data. The parameters of the model then change and adjust to provide the best fit to the data.

[4]Note that it is not necessary to track the distribution over the other state variables as they remain unchanged from the initial distribution observed in the survey data