THE GREYING CHURCH: THE IMPACT OF LIFE EXPECTANCY ON RELIGIOSITY[*]

Elissaios Papyrakis [a]

Geethanjali Selvaretnam [†, b]

[a] *School of International Development, University of East Anglia*
[b] *School of Economics and Finance, University of St Andrews*

1. Introduction

Many religious establishments have reported a steep decline in outward religious expression and participation in recent years. According to the latest estimates of the World Values Survey Dataset (2009)[1], the percentage of those who regularly attend religious services has fallen below 5% in countries such as Sweden, Norway and Estonia. A recent report on church attendance in the UK by the development NGO Tearfund (2007) suggests that only 15% of the population attend church services at least monthly. Moreover, church attendance appears to be more prevalent amongst older people. The share of regular church attendants in the UK is 26% for those above the age of 65 compared to 11% for those between the age of 16 and 44 (Christian Society, 2008). These figures confirm earlier findings by Smith (1993) on declining church participation and youth membership in Scotland.

However, religiosity is neither low nor on the decline everywhere. Tearfund (2007) reports that membership in Pentecostal churches in the UK has tripled since 1980. Regular church attendance remains very high in countries such as Nigeria, Pakistan and El Salvador, where the percentage of the population who are at least monthly church goers is 95, 91 and 69% respectively (World Values Survey Dataset, 2009).

In recent years, there has been an expanding empirical literature on the determinants of religiosity, exploring cross-country differences in church attendance (see Barro and McCleary, 2003, 2006a, 2006b). Several studies have demonstrated that GDP per capita, government regulation of the 'religion market' and communist suppression are negative determinants of religiosity, while religious pluralism works in the opposite direction. The negative impact of income per capita is in accordance with the rational choice theory of religiosity of Azzi and Ehrenberg (1975), where religious participation is a time-intensive activity that sacrifices income. Hence, the opportunity cost of religious participation increases with real wages. The negative association between religiosity and government regulation, as well as the corresponding positive correlation with pluralism, confirm the 'religion market'

[*] The authors are grateful to Ian Smith for providing useful comments on earlier drafts of the manuscript. All remaining errors are ours.
[†] Correspondence: G. Selvaretnam, School of Economics and Finance, University of St Andrews, St Andrews, KY16 9AL, UK, tel. +44 - 1334 - 46 1956, fax. +44 - 1334 - 46 2444, e-mail gs51@st-andrews.ac.uk
[1] The World Value Survey is carried out by a global academic network of social scientists, surveying the basic values and beliefs of the public in different societies and provides international data on religiosity for a large number of countries.

model by Iannaccone (1991) and Iannaccone and Stark (1994). Their theoretical model predicts that excessive government regulation inhibits competition amongst suppliers of religious services, negatively affecting the quality of their product and religious participation. Barro and McCleary (2003) also confirm that the anti-religion policies of former communist governments still have an enduring impact on religiosity.

In our paper, we contribute to this strand of the literature by exploring the role of life expectancy as an additional determinant of religiosity. Barro and McCleary (2003) find life expectancy to be negatively correlated with religious attendance but pay little attention to the theoretical underpinnings behind the relationship. We believe that much more can be said about the relationship between life expectancy and religiosity, particularly with respect to the time dimension of expected payoffs. Many people hold the view that there is a link between religiosity and the probability of salvation (or more broadly any afterlife benefits). A poll by Newsweek (2002) revealed that an astounding 75% of respondents believed that their actions on earth determined their access to heaven. In many societies, there is a general belief that entrance to heaven is conditional (to some extent) on cumulative religious effort and good conduct during one's lifetime (see Flynn, 2005).

We analyse religiosity through a theoretical decision-making framework, where an individual can choose to be religious when young or defer the decision till s/he is old. The analysis separately examines the decision-making problem of young and old individuals with respect to religious participation and confirms the role of life expectancy in postponing religiosity. Demand for religiosity is determined by the relative benefits and costs of religious adherence when alive and in the afterlife. A merit of our analysis lies in studying religiosity through a cost-benefit framework, where decisions at each point in time depend on expected social and spiritual benefits attached to religious adherence, the probability of entering heaven in the afterlife, as well as the costs of formal religion in terms of time allocated to religious activities. In this respect, a higher life expectancy discounts more heavily any expected benefits and costs in the afterlife and is hence likely to lead to postponement of religiosity and ageing congregations.[2] For the same reason, any contemporaneous benefits linked to religious participation (e.g. in the form of expanding a person's social circle, communal activities, spiritual fulfilment, support and guidance) are likely to weigh more heavily in the decision making process compared to what might happen in the less certain and far distant afterlife.

According to our analysis, religious organizations should be hence prepared to attract older members to the congregations, since individuals are likely to postpone the decision of religiosity when life expectancy is high. While many religious organisations place particular emphasis on increasing youth membership, they should not lose sight of incentives needed to attract older people. As part of a successful strategy to increase overall attendance, religious establishments should aim at

[2] Our analysis is in that respect a discrete-time extension of the Azzi and Ehrenberg (1975) model. In our framework, emphasis is placed on life expectancy as a determinant of the timing of religiosity (rather than its quantitative aspects). Contrary to Azzi and Ehrenberg (1975), expected afterlife benefits are dependent on life expectancy and we analyze decision-making in different intervals of the life-cycle.

reducing any discomfort of entry to religious newcomers, both old and young. In light of rising life expectancy, it is important to emphasise contemporaneous socio-spiritual benefits, rather than uncertain rewards in the afterlife. Our theoretical findings are complemented by a cross-sectional empirical analysis, pointing to a significantly negative impact of life expectancy on religiosity.

The rest of the paper is organised as follows. The next section is devoted to the key elements and assumptions of our theoretical framework. In Section 3, we analyze the decision making of the young and the old, followed by a discussion of the key findings in Section 4. In Section 5, we complement our theoretical analysis with supporting empirical evidence on the nexus between life expectancy and religiosity. Section 6 concludes.

2. Model Specification

Our analysis makes use of a 3-period model of discrete time, where each individual lives for up to two periods (each representing the young and old intervals of one's lifetime), with the third period representing one's life after death (i.e. afterlife). Periods t_{b1} and t_{b2} refer to the young and old period of an individual's life-cycle respectively, while period t_a denotes afterlife. Individuals make decisions in t_{b1} and t_{b2} about if and when to become religious by weighing the anticipated costs and benefits of religious adherence when alive and in the afterlife.

2.1 Life Expectancy and Discount Factors

Life expectancy is captured in the model by the succession probability λ from the young to the old phase of one's life-cycle. Hence, $1-\lambda$ denotes the probability of dying during t_{b1}, while still young.

We assume that individuals place greater weight on earlier periods of consumption (both tangible and intangible) than later ones. We first assume there is a strictly positive rate δ_b $(0<\delta_b<1)$ that discounts expected utility from the second interval of one's life-cycle (t_{b2}, when old) – relative to the first period (t_{b1}, when young). Similarly, we assume a strictly positive factor δ_a $(0<\delta_a<1)$, that discounts expected utility in the afterlife (t_a) relative to the preceding period of one's lifetime (either t_{b1} or t_{b2}, depending on whether life expectancy permits succession from the young to the old phase of one's life-cycle).[3]

2.2 Worldly Costs and Benefits

We assume that, on average, an old individual's earning power is lower compared to a young counterpart (e.g. see Philip and Gilbert, 2007 for related evidence and discussion). A young individual, hence, derives utility W from income-generating activities, while an old individual enjoys a proportion σ of W during the same period (where $0<\sigma<1$). Furthermore, there is an indirect opportunity cost of religious adherence, which comes in the form of foregone income (see Azzi and Ehrenberg, 1975). Religious participation is a time-intensive process, reducing time allocated to

[3] One may also assume that $\delta_a=\delta_b$, with no implications for the model's key findings.

income-earning activities. Therefore, in our model, religiosity reduces the income derived utility of an individual by a proportion γ, where $0<\gamma<1$. For this reason, the opportunity cost of religiosity increases with *W*. This is in line with the negative correlation between religious participation and GDP per capita levels found in empirical studies (see Barro and McLeary, 2006a).

The model takes into consideration that religious participation involves contemporaneous benefits beyond the aforementioned payoffs anticipated in the afterlife, denoted by *B*. We assume that religiosity generates contemporaneous benefits for each religious believer, which come in the form of *spiritual benefits* (i.e. spiritual fulfilment, strength, comfort, guidance) and *social benefits* (i.e. enlargement of social circle, participation in social activities, social status and acceptance). We assume that these are net benefits adjusted for any non-monetary costs of discomfort of religious participation (allowing hence for the possibility of a negative sign). In times and countries where religious adherents are either prosecuted or socially marginalised (e.g. in the early Christian church), these costs are particularly high (see Bruce, 1993 for a discussion). These may also be associated with the unpleasantness of entering an unfamiliar environment or the cost of gathering information about religious organisations, particularly in countries with a free religious market and limited government regulation – such as the US – with a variety of competing religious "products" (see Finke and Stark, 1992; Finke and Iannaconne, 1993).[4]

2.3 Heaven and Hell

Otherworldly compensation in terms of salvation (or damnation if unsuccessful) motivates religious behaviour. Individual perceptions on the existence of heaven and hell in the afterlife and related payoffs will hence influence decisions on religiosity[5]. We assume that an agent, who believes in the existence of heaven and hell, derives utility *H* from entering heaven, and disutility *F* from hell.

We attach a probability *p* to the existence of heaven/hell, reflecting the individual's beliefs on the issue (where $0\leq p\leq 1$)[6]. This suggests that irrespective of one's religiosity, individuals expect to derive zero utility after death with $(1-p)$ probability. Personal beliefs in the existence of heaven and hell vary enormously across countries. According to the World Value Survey Dataset (2009), only 17% of respondents acknowledged belief in heaven in Vietnam, compared to approximately 100% in Jordan and Pakistan[7].

---

[4] It is possible to assume that any contemporaneous benefits of religiosity depend positively on γ without loss of generality.

[5] Although Buddhism and Hinduism do not acknowledge heaven and hell in the Judeo-Christian theological tradition, adherents believe in being "reincarnated into heavenly intermediate stages" dependent on their behaviour when alive (Barro and McLeary, 2007).

[6] The probability attached to the existence of heaven and hell does not need to be identical, although generally the two are highly correlated (World Value Survey Dataset, 2009).

[7] There are also within-country differences in the extent of beliefs in heaven/hell across different religions/denominations (for a US-based survey, see Exline, 2003).

In many religions, the perceived probability of entering heaven or hell depends to a certain degree on the individual's lifetime behaviour. Religious doctrines define the nature of *salvific merit*; i.e. the effect of cumulative human effort on the probability of attaining salvation or damnation. The degree of salvific merit varies across religions, being relatively high in Buddhism and Catholicism, but lower in Protestantism where salvation/damnation is largely seen as predestined. Particularly in religions and denominations of high salvific merit (e.g. Pentecostals within Protestantism), engagement in non-productive religious activities (such as attending religious services, prayers, faith teaching), is important for salvation (see McLeary, 2007 for a detailed exposition). While hard work is generally encouraged by all major religions (particularly across the Protestant denominations), all religions promote to some degree charitable acts and devotion of time and financial aid for community support.

Our model captures this variation in salvific merit across different religions. We assume that the probability of entering heaven (given personal beliefs on its existence) is π $(0 \leq \pi \leq 1)$ if an individual's religiosity extends to both periods t_{b1} and t_{b2}. The probability reduces to $\alpha\pi$ if religiosity is postponed to period t_{b2}, where $0 \leq \alpha \leq 1$. The dependence of salvation on cumulative effort rather than instantaneous experiences is particularly embedded in Pentecostalism[8]. On the contrary, other Protestant branches place less emphasis on the duration and cumulative effort in religiosity as determinants of the outcome in afterlife (i.e. α is close to 1).

We also allow for a positive probability of entering heaven even when an individual refrains from being religious during the whole life-cycle (reflecting the fact that salvation may be a spiritual gift from God rather than strictly determined by personal behaviour). The probability attached to entering heaven without being religious in any period of one's lifetime is given by $\varepsilon\pi$ (where $0 \leq \varepsilon < \alpha$). The higher the degree of salvific merit (as it is the case for Buddhism and Catholicism), the larger is expected to be the perceived difference in the salvation probabilities attached to prior religious behaviour (i.e. the difference between π and $\alpha\pi$ or $\alpha\pi$ and $\varepsilon\pi$).

The model also takes into consideration that individuals, who decide to be religious in the first period of their life cycle, t_{b1}, may decide to discontinue religious practice in the second period of their life cycle, t_{b2}. We assign a probability $\beta\pi$ of entering heaven to such de-churched individuals (*back-sliders* in Christian jargon). Since back-sliding is largely disapproved by most religious establishments, we assume that $0 \leq \beta < \varepsilon$, to capture that a back-slider's probability of entering heaven

[8] One may assume that the probability of entering heaven, π, depends on γ (the share of time allocated to religious activities). We avoid this assumption, as this would allow an inter-temporal substitutability of religiosity; i.e. one might decide to be more religious when old and hence compensate for limited religiosity when young. In our model the emphasis is given to the timing of decision-making (young vs. old) rather than to the amount of effort devoted to religious activities through the whole life-cycle.

cannot exceed that of someone who either becomes religious in t_{b2} alone (i.e $\beta < \alpha$) or consistently remains non-religious (i.e. $\beta < \varepsilon$)[9].

2.4 The Decision Problem

We analyse religiosity through a theoretical decision-making framework, where individuals choose if and when to be religious. They can decide to be either religious or non-religious in the first and second period of their life cycle. We analyse separately the decision-making process of the young and the old. Figure 1 depicts the decision making process for the two periods of an individual's lifecycle.

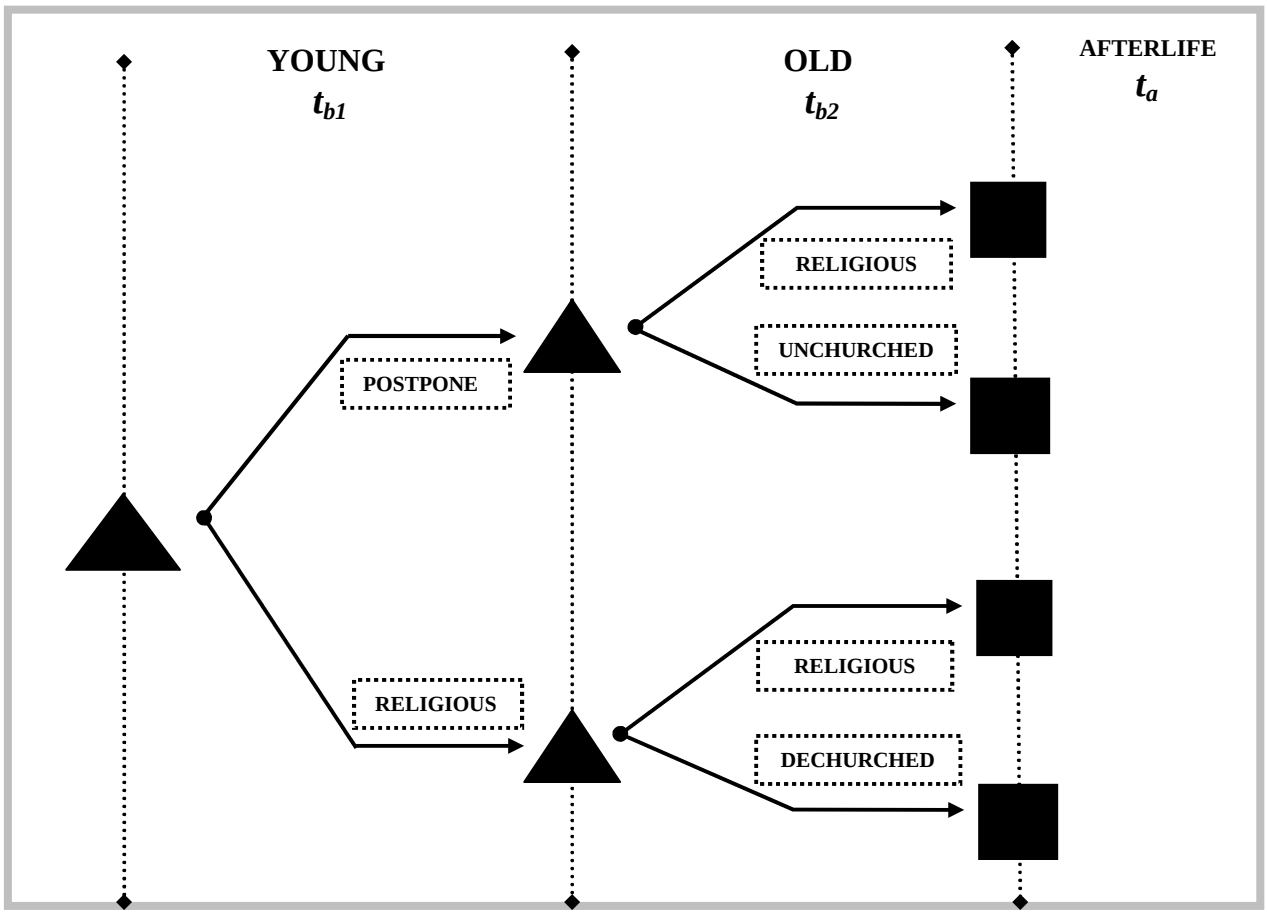

Figure 1. Decision Tree

Each young individual decides at the beginning of t_{b1} whether to be religious or defer the decision, weighing the relative costs and benefits of religiosity. We assume, for simplicity, that individuals can only reverse their initial decision on religiosity at the beginning of t_{b2} but not during the t_{b1} or t_{b2} intervals.

[9] "If they have escaped the corruption of the world by knowing our Lord and Saviour Jesus Christ and are again entangled in it and overcome, they are worse off at the end than they were at the beginning. It would have been better for them not to have known the way of righteousness, than to have known it and then to turn their backs on the sacred command that was passed on to them" (Peter 2:20, Holy Bible).

The old individual's decision in t_{b2} depends on her/his earlier decision in t_{b1}. If the prior decision had been to be religious, s/he will now need to decide whether to continue with it or back-slide (become *dechurched*). If the decision in t_{b1} had been to defer religious participation, s/he will need to decide whether to become religious in t_{b2} or continue to abstain (remain consistently *unchurched* throughout the whole lifecycle).

3. Decision Analysis

In this section we examine how individuals make decisions on religiosity in the first and second period of their life cycle. We begin by analysing the old individual's decision in t_{b2}. This will help formulate how a young individual makes the decision on religiosity in t_{b1}, taking into account his/her likely religious behaviour when old. We assume there is perfect information about all parameters introduced earlier and hence that young individuals can forecast religious behaviour in t_{b2}.

3.1 Decision-Making by the Old

The decision-making problem faced by old individuals in t_{b2} is as follows. Individuals, who had either become religious or postponed religiosity in t_{b1} (when young), now revisit their decision on religious adherence. They weigh the expected benefits and costs of religiosity in t_{b2} and the afterlife, given their prior decision on religiosity in t_{b1}.

We first analyse the decision-making problem of those old individuals, who had previously postponed religious involvement and chose to be non-religious in t_{b1}. An old individual will hence abstain from religious activities, when the net utility of avoiding religiosity exceeds the net utility of religious involvement, as suggested by inequality (1).

$$[(1-\gamma)\sigma W+B] + \delta_a p[\alpha\pi H-(1-\alpha\pi)F] < \sigma W + \delta_a p[\varepsilon\pi H-(1-\varepsilon\pi)F] \qquad (1)$$

The left-hand-side of the inequality gives the expected net utility of reversing the earlier decision on religiosity when young and joining a religious organization when old. The first component, $[(1-\gamma)\sigma W+B]$, relates to utility derived from net income adjusted for the opportunity cost of being religious, the net social and spiritual benefits of religiosity and the reduced earning capacity in t_{b2}. The second term $\delta_a p[\alpha\pi H-(1-\alpha\pi)F]$ captures otherworldly net benefits in the afterlife, where the probability of entering heaven is $\alpha\pi$, reflecting reduced cumulative effort on achieving salvation (due to earlier religious abstention). These benefits are weighted by p, the probability one attaches to the existence of heaven/hell and discounted by δ_a, since the present value of afterlife benefits need to be calculated with respect to the second period of one's life-cycle, t_{b2}.

The right-hand side captures expected utility under continued religious abstention. The first component σW captures income-derived utility, while the second term $\delta_a p[\varepsilon\pi H-(1-\varepsilon\pi)F]$ refers to the discounted net benefits in the afterlife, with

the probability of entering heaven equal to $\varepsilon\pi$, given religious abstention during the whole life-cycle. Inequality (1) can be reduced to,

$$B + \Psi(\alpha-\varepsilon) < \sigma\gamma W \qquad (2)$$

where $\Psi = \delta_a p\pi(H+F)$

We now turn to the second case, where individuals who had decided to be religious in t_{b1} revisit their decision at the beginning of t_{b2}. They now have to decide whether to remain religious or back-slide (i.e. become dechurched). In this case, the second term of inequality (1) on the left hand side adjusts to $\delta_a p[\pi H-(1-\pi)F]$, reflecting continuous religiosity in both periods of the life-cycle and hence increased probability of entering heaven. Instead, a reversal of religiosity between t_{b1} and t_{b2} (i.e. a young person becoming de-churched when old) reduces the probability of entering heaven in the afterlife to $\beta\pi$ on the right hand side of inequality (3). In this case, an initially religious individual decides to become de-churched at t_{b2} if the following inequality holds.

$$[(1-\gamma)\sigma W+B] + \delta_a p[\pi H-(1-\pi)F] < \sigma W + \delta_a p[\beta\pi H-(1-\beta\pi)F] \qquad (3)$$

which is then reduced to,

$$B + \Psi(1-\beta) < \sigma\gamma W \qquad (4)$$

Figure 2 summarises the decisions of old individuals according to inequalities (2) and (4) for different income ranges. The choice to be religious or non-religious at each time interval is denoted by *R* and *N* respectively. We use a two letter combination to indicate decisions over time with the first letter in parenthesis corresponding to decisions in t_{b1}, and the second letter to t_{b2}.

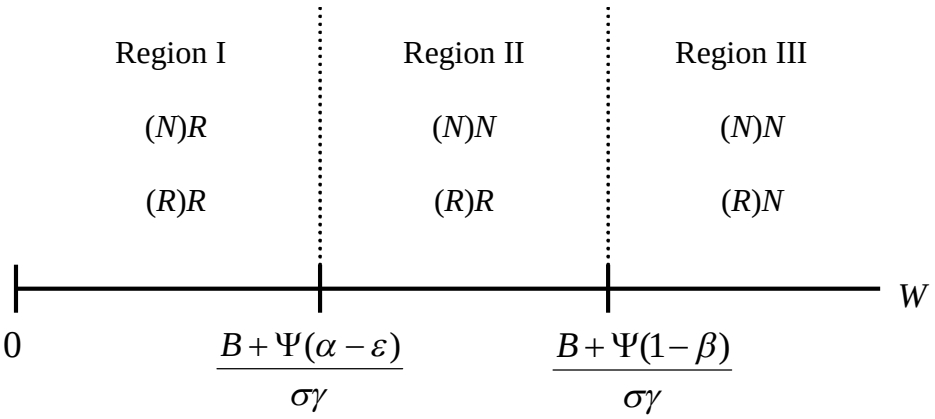

Figure 2. Income and Decision-Making for the Old

For sufficiently low levels of income (i.e. below $[B+\Psi(\alpha-\varepsilon)]/\sigma\gamma$), all individuals will be religious irrespective of their prior decision when young (Region I). Region III illustrates that for sufficiently high levels of income, where $W>[B+\Psi(1-\beta)]/\sigma\gamma$, individuals who had chosen to be religious when young, will

reverse their decision and become dechurched. This reflects the higher opportunity cost of religiosity due to sacrificing higher levels of income. For income levels larger than $[B+\Psi(\alpha-\varepsilon)]/\sigma\gamma$ (i.e. Regions II and III), those individuals who had chosen to be non-religious when young, will remain so when old (these are the unchurched individuals of Figure 1). This threshold income level is lower than $[B+\Psi(1-\beta)]/\sigma\gamma$, since initially non-churched individuals have a lower probability of entering heaven by becoming religious in the second period of their life-cycle compared to those who have been previously religious, and can hence be more easily enticed to give up religiosity for the sake of higher income[10].

An increase in socio-spiritual benefits, *B*, will reduce religious abstention by the old, as can be seen from inequalities (2) and (4); in effect, by expanding region I at the expense of region III in Figure 2. Increased socio-spiritual benefits and/or equivalently a reduction in the discomfort of entry for newcomers render higher levels of income necessary for individuals to abstain from religious participation. A decrease in α and β (or an increase in ε) will have the opposite effect by delinking entry to heaven with prior religious involvement.

3.2 Decision-Making by the Young

In this sub-section we analyse the decision-making problem of individuals who are at the first period of the life-cycle, t_{b1}. A young individual compares the expected benefits and costs of becoming religious without delay against deferring the decision until later, in t_{b2}. We begin by presenting the expected payoffs of a young person under the four possible scenarios outlined in Figure 1. The choice to be religious or non-religious at each time interval is again denoted by *R* and *N* respectively and we use the two letter combination to indicate decisions over time, with the first letter corresponding to decisions in t_{b1} and the second in parenthesis to t_{b2}.

Scenario *N*(*R*): Postpone decision (not religious in t_{b1}) and become religious in t_{b2}.

The payoff to an individual in this scenario is given by expression (5).

$$W+\lambda\delta_b[(1-\gamma)\sigma W+B]+\lambda\delta_b\delta_a p[\alpha\pi H-(1-\alpha\pi)F]+(1-\lambda)\delta_a p[\varepsilon\pi H-(1-\varepsilon\pi)F] \quad (5)$$

The first term *W* captures income-derived utility in t_{b1}, while the second component $\lambda\delta_b[(1-\gamma)\sigma W+B]$ relates to utility from income in t_{b2} (adjusted for the costs and benefits of religiosity) when the older individual joins a religious establishment, weighted by the survival probability λ to the second period of one's life-cycle. The third term, $\lambda\delta_b\delta_a p[\alpha\pi H-(1-\alpha\pi)F]$, captures otherworldly net benefits in the afterlife, assuming survival to t_{b2} with probability λ, where the probability of entering heaven is equal to $\alpha\pi$, reflecting reduced cumulative effort on achieving salvation (note that the benefits have also been weighted by *p*, which is the probability one

[10] It can easily be seen that $B+\Psi(\alpha-\varepsilon)]/\sigma\gamma < B+\Psi(1-\beta)]/\sigma\gamma$, because $\alpha-\varepsilon<1-\beta \rightarrow \beta-\varepsilon<1-\alpha$. This always holds since $0<\beta<\varepsilon<\alpha$.

attaches to the existence of heaven/hell)[11]. The last component, $(1-\lambda)\delta_a p[\varepsilon\pi H-(1-\varepsilon\pi)F]$, relates to utility from heaven/hell if one dies at the end of t_{b1} (and is hence discounted by δ_a alone) without having the opportunity to become religious when old. In this case, the probability of entering heaven is reduced to $\varepsilon\pi$, reflecting the absence of any religious effort.

Scenario *N*(*N*): Postpone decision (not religious in t_{b1}) and remain *unchurched* in t_{b2}.

The expected payoff of consistent religious abstention throughout the whole life-cycle is,

$$W+\ \lambda\delta_b\sigma W+\lambda\delta_b\delta_a p[\varepsilon\pi H-(1-\varepsilon\pi)F]+\ (1-\lambda)\delta_a p[\varepsilon\pi H-(1-\varepsilon\pi)F] \qquad (6)$$

Note that the first and last terms of expression (5) reappear in expression (6). This is because in both cases the individual chooses to be not religious in t_{b1}, and hence income derived utility in t_{b1} and expected payoffs in the after life, t_a, in case of no succession to t_{b2} will remain unchanged. Income derived utility in t_{b2} is given by the second term $\lambda\delta_b\sigma W$, capturing the decision to remain unchurched in t_{b2}. The third term, the expected payoff in the afterlife assuming succession to the second phase of the life-cycle, now adjusts to $\lambda\delta_b\delta_a p[\varepsilon\pi H-(1-\varepsilon\pi)F]$, taking into account a reduced probability of entering heaven, $\varepsilon\pi$, since the individual remains non-religious in both periods.

Scenario *R*(*R*): Be religious in t_{b1} and remain religious in t_{b2}.

The expected payoff from continuous religiosity is given by expression (7).

$$[(1-\gamma)W+\ B]\ +\ \lambda\delta_b[(1-\gamma)\sigma W+\ B]\ +\ \lambda\delta_b\delta_a p[\pi H-(1-\pi)F]$$
$$+\ (1-\lambda)\delta_a p[\pi H-(1-\pi)F] \qquad (7)$$

The first component $[(1-\gamma)W+B]$ relates to utility derived from net income in t_{b1}, adjusted for the costs of being religious, as well as the net social and spiritual benefits of religiosity. The second term $\lambda\delta_b[(1-\gamma)\sigma W+\ B]$ captures the same net benefits for the second period of one's lifetime (when old), discounted by δ_b and weighted by the succession probability λ from the young to the old phase of one's life-cycle. The third term, $\lambda\delta_b\delta_a p[\pi H-(1-\pi)F]$, is the discounted expected utility in the afterlife, assuming a succession probability λ to t_{b2} and the highest probability of entering heaven π due to continuous religiosity. The last term, $(1-\lambda)\delta_a p[\pi H-(1-\pi)F]$, captures the net utility from heaven/hell if low life expectancy prevents succession to the older phase of the life-cycle t_{b2}. The probability of entering heaven is again equal to π reflecting prior engagement in religious activities.

[11] Notice, that both discount factors δ_a and δ_b are used, since the present value of afterlife net benefits need to be calculated with respect to t_{b1}.

Scenario *R*(*N*): Be religious in t_{b1} and become *dechurched* in t_{b2}.

The payoff from discontinued religiosity is given by expression (8). Note that the first and last terms are the same as in expression (7). In both scenarios, the individual chooses to be religious in t_{b1}, and hence income derived utility in t_{b1} and expected payoffs in the afterlife, t_a, in case of no succession to t_{b2} remain the same. The second term captures income derived utility in t_{b2} in case of no religiosity. The third term, that captures afterlife benefits assuming succession to t_{b2}, adjusts to $\lambda\delta_b\delta_a p[\beta\pi H-(1-\pi\beta)F]$, reflecting the lowest probability of entering heaven of a dechurched individual, $\beta\pi$.

$$[(1-\gamma)W+B]+\lambda\delta_b\sigma W+\lambda\delta_b\delta_a p[\beta\pi H-(1-\beta\pi)F+(1-\lambda)\delta_a p[\pi H-(1-\pi)F] \quad (8)$$

Now we can analyse a young individual's decision making process, especially to understand the impact of life expectancy. A young individual weighs the expected benefits and costs of religiosity during the two periods of his/her life-cycle and the afterlife and decides whether to become involved in religious activities in t_{b1} or defer religiosity till t_{b2}. When making this decision, s/he has to take into consideration his/her future decision-making options in t_{b2} when s/he is old. Below, we analyse the possible scenarios young individuals are confronted with in t_{b1}, and examine how increases in life expectancy (captured by λ) encourage postponement of religiosity.

We draw attention to Figure 2. Those individuals who fall into Region I will have to compare *N*(*R*) and *R*(*R*) to decide whether to postpone or not. Likewise those in Region II will compare *N*(*N*) with *R*(*R*), while those in Region III will compare *N*(*N*) and *R*(*N*).

A young individual in Region I (i.e. if $W<[B+\Psi(\alpha-\varepsilon)]/\sigma\gamma$), will compare the net expected utility of postponing religiosity in t_{b1} with an intention to become religious in t_{b2} – scenario *N*(*R*) – with that of immediate and continuous religious involvement throughout the lifecycle – scenario *R*(*R*). Such an individual will hence decide to postpone religiosity if the net benefits of scenario *N*(*R*) exceed those of scenario *R*(*R*), as in inequality (9).

$$\begin{aligned}&[(1-\gamma)W+B] \;+\; \lambda\delta_b[(1-\gamma)\sigma W+B] \;+\; \lambda\delta_b\delta_a p[\pi H-(1-\pi)F]\\ &\qquad +\; (1-\lambda)\delta_a p[\pi H-(1-\pi)F]\\ &\qquad\qquad <\\ &W \;+\; \lambda\delta_b[(1-\gamma)\sigma W+B] \;+\; \lambda\delta_b\delta_a p[\alpha\pi H-(1-\alpha\pi)F]\\ &\qquad +\; (1-\lambda)\delta_a p[\varepsilon\pi H-(1-\varepsilon\pi)F]\end{aligned} \quad (9)$$

With some rearrangement, inequality (9) reduces to

$$B \;+\; \Psi[\lambda\delta_b(1-\alpha)+(1-\lambda)(1-\varepsilon)] \;<\; \gamma W \quad (10)$$

The left-hand-side of inequality (10) is strictly decreasing in life expectancy, λ, since the first derivative of the expression with respect to λ is negative.[12] The postponement condition (10) holds more easily for lower values of λ, suggesting that increases in life expectancy encourage postponement of religious involvement (in effect by discounting expected benefits in the afterlife).

A young individual in Region II (i.e. when $[B+\Psi(\alpha-\varepsilon)]/\sigma\gamma < W < [B+\Psi(1-\beta)]/\sigma\gamma$) compares the net expected utility of remaining unchurched during the whole life-cycle – scenario *N*(*N*) – with that of immediate and continuous religious involvement – scenario *R*(*R*). The individual will hence decide to postpone religiosity if the net benefits of scenario *N*(*N*) exceed those of scenario *R*(*R*), as in inequality (11).

$$\begin{aligned}&[(1-\gamma)W+B] + \lambda\delta_b[(1-\gamma)\sigma W+B] + \lambda\delta_b\delta_a p[\pi H-(1-\pi)F] \\ &\quad + (1-\lambda)\delta_a p[\pi H-(1-\pi)F] \\ &\qquad\qquad < \\ &W + \lambda\delta_b\sigma W + \lambda\delta_b\delta_a p[\varepsilon\pi H-(1-\varepsilon\pi)F] \\ &\quad + (1-\lambda)\delta_a p[\varepsilon\pi H-(1-\varepsilon\pi)F]\end{aligned} \tag{11}$$

which reduces to,

$$(1+\lambda\delta_b)B + \Psi(1-\varepsilon)[1-\lambda(1-\delta_b)] - \gamma(1+\lambda\delta_b\sigma)W < 0 \tag{12}$$

Again, an increase in life expectancy, captured by λ, makes the postponement condition, given by inequality (12), easier to hold.[13]

A young individual in Region III will compare the net expected utility of remaining unchurched during the whole life-cycle – scenario *N*(*N*) – with that of immediate religious involvement in period t_{b1} and backsliding in t_{b2} – scenario *R*(*N*). S/he will hence decide to postpone religiosity if the net benefits of scenario *N*(*N*) exceed those of scenario *R*(*N*), as indicated by inequality (13).

$$\begin{aligned}&[(1-\gamma)W+B] + \lambda\delta_b\sigma W + \lambda\delta_b\delta_a p[\beta\pi H-(1-\beta\pi)F] \\ &\quad + (1-\lambda)\delta_a p[\pi H-(1-\pi)F] \\ &\qquad\qquad < \\ &W + \lambda\delta_b\sigma W + \lambda\delta_b\delta_a p[\varepsilon\pi H-(1-\varepsilon\pi)F] + (1-\lambda)\delta_a p[\varepsilon\pi H-(1-\varepsilon\pi)F]\end{aligned} \tag{13}$$

---

[12] The derivative of the left-hand side of expression (10) with respect to λ is equal to $\Psi[\delta_b(1-\alpha)-(1-\varepsilon)]$. This expression is negative because $0<\delta_b<1$ and $\alpha>\varepsilon \rightarrow 1-\alpha<1-\varepsilon \rightarrow \delta_b(1-\alpha)<1-\varepsilon$.

[13] One can prove that the left-hand-side of (12) is strictly decreasing in λ. The first derivative with respect to λ is negative when $W > [\delta_b B - \Psi(1-\varepsilon)(1-\delta_b)]/\gamma\delta_b\sigma$. In Region II, it also needs to hold that $[B + \Psi(\alpha-\varepsilon)]/\sigma\gamma < W < [B + \Psi(1-\beta)]/\sigma\gamma$. For this income range, the first derivative of the left-hand-side of expression (12) is always

which then reduces to

$$B + \Psi[\lambda\delta_b(\beta-\varepsilon)+(1-\lambda)(1-\varepsilon)] < \gamma W \quad (14)$$

We can show that postponement inequality (14) always holds for income Region III, where $[B+ \Psi(1-\beta)]/\sigma\gamma < W$.[14] In this case, a decrease in life expectancy, λ, will simply reinforce the postponement condition (14) – i.e. the first derivative of the left-hand-side of the expression with respect to λ is equal to $\Psi[\delta_b(\beta-\varepsilon)-(1-\varepsilon)]$, which is negative since $\beta<\varepsilon$ and $0<\delta_b<1$.

4. Discussion of Results

The decision-making inequalities for the young and the old highlight some of the key factors underpinning overall religious participation and its age structure. We have shown that an increase in life expectancy, λ, leads to postponement of religious participation. A higher life expectancy heavily delays expected benefits in the afterlife and in effect discounts them in current decision-making on religiosity. In poorer countries where life expectancy remains low, a larger share of the population (comprising of both young and older members) is concerned about what happens after death. This result is summarised in the next proposition.

Proposition 1. *An increase in life expectancy, λ, increases postponement of religious participation.*

An important message from the analysis is that given an increase in life expectancy, religious establishments should be prepared to accept and expect a 'greying church', with a membership composition skewed towards the older generation. Particularly for religious doctrines that attach a small 'penalty' to the postponement of religiosity (value of α close to 1), individuals are more likely to decide to postpone.

In view of this anticipated continuous shift in demand for religiosity towards the old, steps should be taken by religious establishments to facilitate access to older members of the society, particularly since many of them will be unchurched. This may involve making information about the organisation easily accessible to them; assisting new-comers to follow religious activities without feeling lost or uncomfortable; improving the socio-spiritual benefits for the old etc.

This is not to say that youth membership should be downplayed. The negative effect of a higher life expectancy on religiosity – which in effect reduces concern about life after death – can be counterbalanced by using socio-spiritual benefits that

---

negative since $[\delta_b B - \Psi(1-\varepsilon)(1-\delta_b)]/\gamma\delta_b\sigma < [B + \Psi(\alpha-\varepsilon)]/\sigma\gamma \rightarrow -(1-\varepsilon)(1-\delta_b) < (\alpha-\varepsilon)\,\delta_b$, which always holds, since $\alpha>\varepsilon$.

[14] The income threshold for postponement under (14) is equal to $\{B+\Psi[\lambda\delta_b(\beta-\varepsilon)+(1-\lambda)(1-\varepsilon)]\}/\gamma$. Hence, the postponement condition always holds since $[B+\Psi(1-\beta)]/\sigma\gamma > [B+\Psi(1-\beta)]/\gamma > \{B+\Psi[\lambda\delta_b(\beta-\varepsilon)+(1-\lambda)(1-\varepsilon)]\}/\gamma$ or equivalently $1-\beta > \lambda\delta_b(\beta-\varepsilon)+(1-\lambda)(1-\varepsilon) \rightarrow \beta(1+\lambda\delta_b) > \varepsilon(1+\lambda\delta_b)+\lambda(1-\varepsilon)$, which always holds since $\beta<\varepsilon$ and $0<\lambda,\sigma,\delta_b,\varepsilon<1$.

can be enjoyed in the present life time as a stimulus for the young to participate. Inequalities (10) and (12) reveal that an increase in the contemporaneous socio-spiritual benefits *B*, make the postponement condition more difficult to hold. The increase in such socio-spiritual benefits compensates for the loss of time and income as a result of religious involvement and should be pursued by religious establishments as a means to increase religious participation. This result is stated in the next proposition.

Proposition 2. *An increase in socio-spiritual benefits, B, incentivises religious involvement, particularly when life expectancy, λ, is high.*

Several other parameters influence religious participation. Large benefits associated with access to heaven (and avoidance of hell) – namely *H* and *F* – will tend to stimulate religious involvement. Similarly, a high probability attached to the existence of heaven/hell, *p*, will also work in the same direction. An increased probability of entering heaven through continuous religious involvement, π, will deter postponement of religious participation, while a reduced probability of entering heaven through continuous religious abstention (captured by a lower value of ε) will have the opposite effect. Furthermore, an increase in α (in effect reducing the penalty of delayed religious participation on after-life benefits) will encourage postponement, especially when the probability of imminent death is low.

The religious parameters in our model (i.e. $p, H, F, \pi, \varepsilon, \alpha, \beta$) may be treated as exogenous in individual decision-making, reflecting differences across religious doctrines. However, there is room for prominent religious leaders to influence choices by placing emphasis on the magnitude of some of these parameters.

5. Some Empirical Evidence on Religiosity and Life Expectancy

We estimate cross-country regressions to identify the dependence of religiosity on life expectancy in the tradition of Barro and McCleary (2006a), which has largely influenced the religion-growth literature. We make use of two dependent variables to proxy religiosity, namely, the share of respondents who self-identify themselves as religious people (*Religious Person*), and the share of respondents who attend religious services at least monthly (*Attendance*) for the 1999-2003 period. In all regressions, we include life expectancy at birth in 2000 (*Life expectancy*) as an explanatory variable, since the dependence of religiosity on life expectancy is the focal point of our empirical analysis. Data on religiosity (*Religious Person*, *Attendance*) and *life expectancy* are provided by the World Value Survey Dataset (2009) and the World Bank Development Indicators (2009) respectively. A detailed description of variables used in our empirical analysis is provided in Appendix A1.

In Table 1, we estimate the determinants of self-identification as a *Religious Person*, consecutively alternating the set of explanatory regressors. In regression (1) we include *life expectancy* as the sole explanatory variable of religiosity and find a very strong negative statistical correlation between the two measures. An increase of life expectancy by 10 years (the difference in life expectancy commonly found between Eastern and Western European economies) is associated with an increase in

self-identification as a religious person by 8.4 percentage points. This is a result of significant magnitude, particularly since differences in life expectancy are often of a much larger scale between developed and developing nations.

In regressions (2) and (3) we extend the set of explanatory variables and assess the robustness of the life expectancy coefficient as well as the relevance of additional regressors. In regression (2), we control for the share of the population adhering to the *Catholic* and *Muslim* faith in comparison to other religions. Data on religious adherence by Catholics and Muslims are provided by La Porta et al. (1999). We also include *Income per Capita* in 2000 to control for differences in religiosity and attendance at religious services between richer and poorer countries. Richer nations may experience a higher extent of secularisation as a whole, as suggested by Azzi and Ehrenberg (1975), in which case the coefficient for income per capita is expected to be negative. For attendance at religious services, a high level of income per capita may well indicate an increase in leisure and time spent on communal activities, hence reversing the causality (see Barro and McCleary, 2006a for a discussion). The sign of the dependence on income will be the subject of our empirical investigation. Data on income levels are provided by the Center for International Comparisons (2009), University of Pennsylvania.

Table 1: Religiosity and Life Expectancy

Dependent variable:	*Religious Person* (1)	*Religious Person* (2)	*Religious Person* (3)
Constant	131.91	114.72	129.82
Life expectancy	–0.84***	–1.06***	–0.97***
	(0.17)	(0.35)	(0.35)
Catholics		0.28***	0.26***
		(0.07)	(0.07)
Muslims		0.30***	0.25***
		(0.09)	(0.08)
Income per Capita		–1.91	0.02
		(4.31)	(0.04)
Communist State			–8.94**
			(4.46)
R^2 adjusted	0.13	0.39	0.42
N	61	61	61

*Note: robust standard errors for coefficients in parentheses. Superscripts *, **, *** correspond to a 10%, 5%, and 1% level of significance respectively.*

In column (3) we also incorporate a dummy variable capturing whether the country is or has been communist since 1950 (*Communism State*). Barro and McCleary (2006a) find that even past communism has a long-lasting and negative impact on religiosity and attendance at religious services. Data on communism are provided by Gallup et al. (1999). We find adherence to Islam and Catholicism to have a strong positive impact on self-identification as religious, while a communist present or past has the opposite effect (income effects remain insignificant). More importantly for the scope of our analysis, the statistical significance and magnitude of the life expectancy impact on religiosity remains largely unaffected by the inclusion of additional explanatory factors.

In Table 2, we use the share of respondents who regularly attend religious services (*Attendance*) as a proxy for religiosity and assess the robustness of the life expectancy–religiosity linkage. Column entries (4)-(6) replicate regressions (1)-(3) of Table 1 in the appearing sequence of explanatory variables. The sign and statistical significance of estimated coefficients are in accord with the earlier results reported in Table 1. An increase in life expectancy by 10 years is now associated with a rise of religious services attendance by approximately 15-17%. As an additional robustness check, we incorporate in column entries (7)-(9) variables that capture variation in beliefs in *Heaven*, *Hell* and *God*. Data on the existence of heaven, hell and God are provided by the World Value Survey Dataset (2009) and are based on a yes-or-no answer format of respondents.

As expected, strong beliefs in heaven, hell and God in some form are strongly and positively correlated with religious attendance. We find similar results when the same regressors are included as additional explanatory variables for religious self-identification in Table 1[15]. This is an important result by itself. Life expectancy remains a strong negative determinant of religiosity even after controlling for beliefs in heaven, hell and God, which are variables that are strongly associated with attitudes towards religion.

[15] The proxies for beliefs in heaven, hell and God are not entered simultaneously, as they are highly collinear.

Table 2. Church Attendance and Life Expectancy

Dependent variable:	*Attendance* (4)	*Attendance* (5)	*Attendance* (6)	*Attendance* (7)	*Attendance* (8)	*Attendance* (9)
Constant	153.67	147.35	178.28	108.47	90.97	109.15
Life expectancy	–1.55*** (0.21)	–1.74*** (0.3)	–1.56*** (0.32)	–0.80*** (0.23)	–0.98*** (0.21)	–0.93*** (0.24)
Catholics		0.42*** (0.07)	0.37*** (0.06)	0.27*** (0.05)	0.27*** (0.04)	0.25*** (0.06)
Muslims		0.29*** (0.07)	0.19** (0.06)	–0.03 (0.07)	–0.14** (0.07)	0.03 (0.06)
Income per Capita		0.04 (0.04)	–3.81 (3.58)	–5.10** (2.31)	–1.38 (2.26)	–6.18** (2.63)
Communist State			–17.69*** (4.12)	–8.48* (4.72)	–10.73*** (3.66)	–10.49*** (3.81)
Heaven				49.07*** (10.96)		
Hell					57.66*** (8.19)	
God						59.88*** (12.55)
R^2 adjusted	0.27	0.57	0.66	0.79	0.83	0.77
N	63	63	63	60	60	60

*Note: robust standard errors for coefficients in parentheses. Superscripts *, **, *** correspond to a 10%, 5%, and 1% level of significance respectively.*

6. Conclusion

In recent years, religious establishments have been particularly concerned about decreasing religious expression and participation in most parts of the world. In the UK, church attendance has been consistently on the decline in the past 50 years. Despite the dramatic decrease in religiosity particularly in developed economies, data reveal that the pattern is far from universal. In many sub-Saharan African and Latin American nations, in particular, religious adherence remains strong. Recent theoretical and empirical work has attempted to attribute these diverging patterns in religiosity to several socio-economic variables, including the level of economic development and government regulation of the religion market.

In our paper, we contribute to this strand of the literature by exploring the mediating role of life expectancy in explaining cross-country differences in religious expression, a channel that has so far received little attention in the literature. Decisions on religiosity are inextricably linked to the time dimension of religious costs and anticipated benefits. Most religious beliefs link to some degree the cumulative amount of religious effort to benefits in the afterlife. Increases in life expectancy, in effect, discount these after-life benefits against the life-time costs of religious participation, which often come in the form of sacrificing time and income. Hence, increases in life expectancy encourage postponement of religious involvement, particularly in religion doctrines that do not necessarily link salvation (or afterlife benefits more broadly) to the timing of religiosity.

This is an important finding for two reasons. First, it demonstrates that religious establishments should anticipate to attract older members, particularly in countries which have high life expectancy or expects significant increases in life expectancy (e.g. due to improvements in medical care or decline in critical infection rates). An increased life span allows for postponement of religiosity, without necessarily jeopardising benefits in the afterlife, which are anyway discounted far in the future.

Second, the analysis illustrates that emphasis placed on the provision of socio-economic benefits that can be enjoyed during one's lifetime on earth. The paper shows how current socio-economic benefits can counterbalance the negative impact of life expectancy on religiosity and hence encourage religious involvement. Religions, that largely delink salvation/damnation to the timing and amount of religious effort, will particularly need to resort to such means to boost membership numbers.

Appendix 1: List of variables used in the empirical analysis

Religious Person	The share of respondents that self-identified themselves as religious people between 1999-2003. Source: World Value Survey Dataset (2009).
Attendance	The share of respondents who attended religious services at least monthly between 1999-2003. Source: World Value Survey Dataset (2009).
Life Expectancy	Life Expectancy at birth in 2000. Source: World Bank Development Indicators (2009).
Catholics	Share of Catholics in total population (most data for 1990s). Source: La Porta et al. (1999).
Muslims	Share of Muslims in total population (most data for 1990s). Source: La Porta et al. (1999).
Income per Capita	The logarithm of real GDP per capita in 2000 (2000 U.S. Dollar Prices). Source: Center for International Comparisons (2009) at the University of Pennsylvania.
Communist State	Dummy variable capturing whether the country is or has been communist since 1950. Data provided by Gallup et al. (1999).
Heaven	Share of respondents acknowledging beliefs in heaven (1999-2003 survey). Source: World Value Survey Dataset (2009).

Hell	Share of respondents acknowledging beliefs in hell (1999-2003 survey). Source: World Value Survey Dataset (2009).
God	Share of respondents acknowledging beliefs in God (1999-2003 survey). Source: World Value Survey Dataset (2009).

Appendix 2: Data for key variables used in regression analysis

	ISO	*Attendance*	*Religious Person*	*Life Expectancy*
ALGERIA	DZA	0.502	0.600	70
ARGENTINA	ARG	0.429	0.844	74
AUSTRIA	AUT	0.425	0.795	78
BANGLADESH	BGD	0.672	0.968	61
BELARUS	BLR	0.144	0.275	68
BELGIUM	BEL	0.271	0.681	78
BOSNIA HERZEGOVINA	BIH	0.452	0.744	74
BULGARIA	BGR	0.203	0.517	72
CANADA	CAN	0.359	0.736	79
CHILE	CHL	0.454	0.708	77
CHINA	CHN	0.031	0.147	70
COLOMBIA	COL	0.666	0.852	71
CROATIA	HRV	0.527	0.853	73
CZECH REPUBLIC	CZE	0.116	0.433	75
DENMARK	DNK	0.12	0.765	77
ESTONIA	EST	0.113	0.417	71
FINLAND	FIN	0.141	0.667	78
FRANCE	FRA	0.120	0.466	79
GERMANY	DEU	0.301	0.558	78
GREECE	GRC	0.335	0.797	78
HUNGARY	HUN	0.175	0.59	71
ICELAND	ISL	0.120	0.74	79
INDIA	IND	0.512	0.795	63
INDONESIA	IDN	0.755	0.845	66
IRAN	IRN	0.465	0.95	69
IRELAND	IRL	0.675	0.74	76
ITALY	ITA	0.537	0.86	80
JAPAN	JPN	0.123	0.265	81
JORDAN	JOR	0.467	0.859	71
KOREA, SOUTH	KOR	0.383		76
LATVIA	LVA	0.151	0.769	70
LITHUANIA	LTU	0.316	0.844	72
MALTA	MLT	0.865	0.747	78
MEXICO	MEX	0.747	0.774	74
MOROCCO	MAR	0.480	0.946	69
NETHERLANDS	NLD	0.252	0.617	78

NEW ZEALAND	NZL	0.221	0.525	79
NIGERIA	NGA	0.952	0.966	47
PAKISTAN	PAK	0.913	0.908	63
PERU	PER	0.713	0.883	69
PHILIPPINES	PHL	0.795	0.795	70
POLAND	POL	0.782	0.944	74
PORTUGAL	PRT	0.513	0.881	77
ROMANIA	ROM	0.464	0.848	71
RUSSIA	RUS	0.092	0.657	65
SAUDI ARABIA	SAU	0.442	0.704	71
SINGAPORE	SGP	0.441		78
SLOVAKIA	SVK	0.498	0.815	73
SLOVENIA	SVN	0.307	0.702	76
SOUTH AFRICA	ZAF	0.684	0.789	49
SPAIN	ESP	0.361	0.613	79
SWEDEN	SWE	0.093	0.389	80
TANZANIA	TZA	0.867	0.944	49
TURKEY	TUR	0.401	0.818	70
UGANDA	UGA	0.883	0.940	46
UKRAINE	UKR	0.169	0.753	68
UNITED KINGDOM	GBR	0.201	0.422	78
USA	USA	0.602	0.826	77
VENEZUELA	VEN	0.479	0.786	73
VIETNAM	VNM	0.128	0.384	69
ZIMBABWE	ZWE	0.810	0.886	43

References

Azzi, C. and Ehrenberg, R. (1975), Household allocation of time and church attendance. *Journal of Political Economy*, February 83, 27-56.

Barro, R.J. and McCleary, R. M. (2003), Religion and economic growth across countries. *American Sociological Review*, 68, 760 – 781.

Barro, R.J. and McCleary, R.M. (2006a), Religion and economy. *Journal of Economic Perspectives*, 20, 49-72.

Barro, R.J. and McCleary, R.M. (2006b), Religion and political Economy in an international panel. *Journal for the Scientific Study of Religion*, 45, 149–175.

Barro, R.J. and McCleary, R.M. (2007), Political economy and religion in the spirit of Max Weber, in Nee, V. and Swedberg, R., *On Capitalism*. Palo Alto: Stanford University Press.

Bruce, S. (1993), Religion and rational choice: A critique of economic explanations of religious behaviour, *Sociology of Religion*, 54, 193-205.

Center for International Comparisons (2009), Income Data. University of Pennsylvania: www.pwt.econ.upenn.edu.

Christian Research (2008), *Religious Trends: British Religion in the 21st Century*, Swindon, UK: Christian Research.

Exline, J.J. (2003), Belief in heaven and hell among Christians in the United States: Denominational differences and clinical implications, *Journal of Death and Dying* 47, 155–168.

Finke, R. and Iannaccone, L.R. (1993), Supply-side explanations for religious change. *The Annals of the American Academy of Political and Social Sciences*, 527, 27–39.

Finke, R. and Stark, R. (1992), *The Churching of America 1776-1990*, New Brunswick, NJ: Rutgers University Press.

Flynn, L.B. (2005), *Keep on Keeping on: How to Stay Faithful Serving God*, Carlsbad, CA: Magnus Press.

Gallup, J.L., Sachs, J.D. and Mellinger A.D. (1999), Geography and economic development. *International Regional Science Review*, 22, 179-232.

Iannaccone, L.R. (1991), The consequences of religious market structures: Adam Smith and the economics of religion, *Rationality and Society*, 3, 156–177.

Iannaccone, L.R. and Stark, R. (1994), A supply-side reinterpretation of the 'secularization' of Europe, *Journal for the Scientific Study of Religion*, 33, 76–88.

La Porta, R., Lopez-de-Silanes, F., Shleifer, A. and Vishny, R. (1999), The Quality of Government, *Journal of Law, Economics, and Organization*, 15, 222–79.

McCleary, R.M. (2007), Salvation, damnation, and economic incentives, *Journal of Contemporary Religion*, 22, 49-74.

Newsweek (2002), Visions of Heaven, 12 October 2002.

Philip, L.J. and Gilbert, A. (2007), Low income amongst the older population in Great Britain: A rural/non-rural perspective on income levels and dynamics, *Regional Studies*, 46, 735-746.

Smith, I. (1993), The economics of church decline in Scotland, *International Journal of Social Economics*, 20, 27-36.

Tearfund (2007), Churchgoing in the UK. Teddington, UK.

World Bank Development Indicators (2009), Data on life expectancy at birth.

World Value Survey Dataset (2009), Data on religiosity: www.worldvaluessurvey.org.