Does Wealth Imply Secularization and Longevity?

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Abstract: We develop a simple life cycle model with endogenous longevity where religious firms influence religious beliefs using donations as an input. The model suggests that either wealth and economic development or competition by religious firms can explain cross-country variation in religious beliefs, but to explain cross-country variation in religious beliefs, longevity, and consumption both development and competition are required. Our results depend on the wealth and substitution effects that accompany economic development and religious market competition.

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1 Introduction

For most of the world wealth is positively associated with longevity (Preston, 1975) and negatively associated with religiosity (Barro and McCleary, 2003). However, not all countries conform with the overall pattern. As shown in Figures 1 and 2, the United States presents a very visible exception. If wealth is measured by real per capita GDP, longevity is measured by average life expectancy at birth, and religiosity is measured by belief in an afterlife, then by these measures the US is very wealthy but also very religious compared to its OECD peers, wealthy and religious but not especially long-lived. While some aspects in Figures 1 and 2 have been explained by economists and sociologists, no satisfactory explanation exists for the general patterns and the United States exception in each of the Figures and no explanation exists at all that connects the two Figures.[1] We fill this gap by developing a simple life cycle model with endogenous longevity and endogenous religious beliefs or faith.

At its core this paper asks: what are the economic forces that drive secularization and longevity? The answer is not at all evident, because as Iannacone (1998) argues previous work on the socioeconomics of religion has left open the question of religious belief formation. For instance, theories following Azzi and Ehrenberg (1975) and Iannacone (1990) emphasize the demand for religion by individuals who base their choices on the perceived returns to religion which depend on a combination of earthly and after-life benefits. These approaches have generally maintained that religious activity depends on exogenous lifetimes while downplaying the role of afterlife benefits. But it seems plausible that religious activity alters the returns to longevity and religious beliefs, just as longevity or beliefs alter the returns to religious activity. Other theories emphasizing the supply of religion by religious organizations have focussed on the forces that influence the market structure for religious firms. While these supply-side approaches can explain why the United States differs from other countries in terms of religious activity (Stark and Iannacone, 1994), they only indirectly address Figure 1 because they also take belief formation as given. Furthermore, the supply-side theories have little to say about Figure 2 because they are silent about connections to other dimensions of individuals' life cycle choices such as their life expectancy. Some of the determinants

[1] The general pattern in Figure 1 has been taken as evidence for the controversial secularization hypothesis that relisiosity wanes with economic development. The hypothesis is often attributed to Weber (1904), though there are other secularization theories that do not imply a negative association between religiosity and development (Gorski, 2000). The secularization hypothesis is controversial, in part because there are a number of instances, such as the United States exception, where the hypothesis fails.

Figure 1: Belief in Heaven and Per Capita GDP in 1990

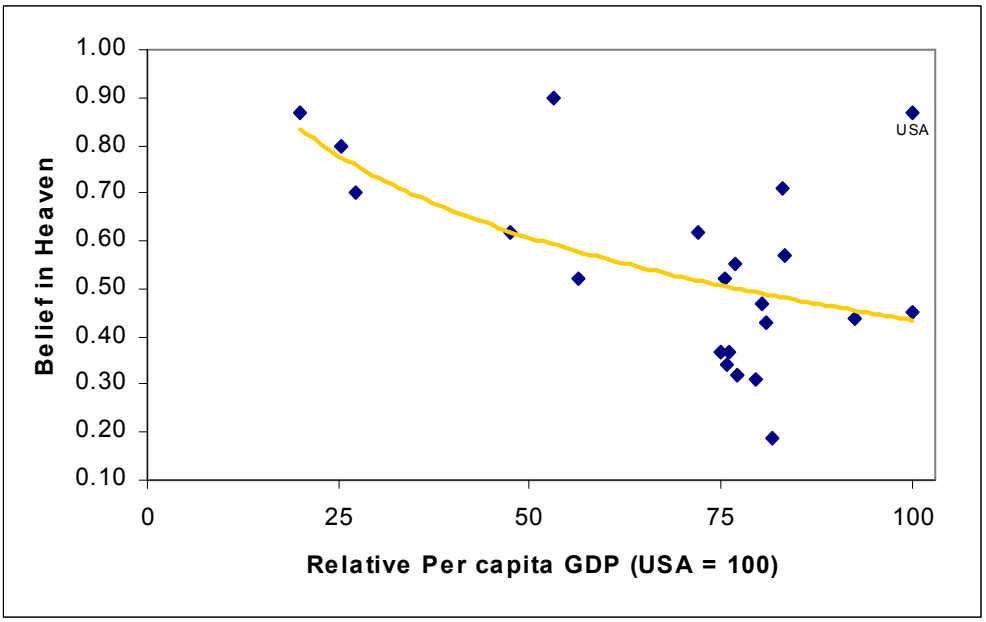
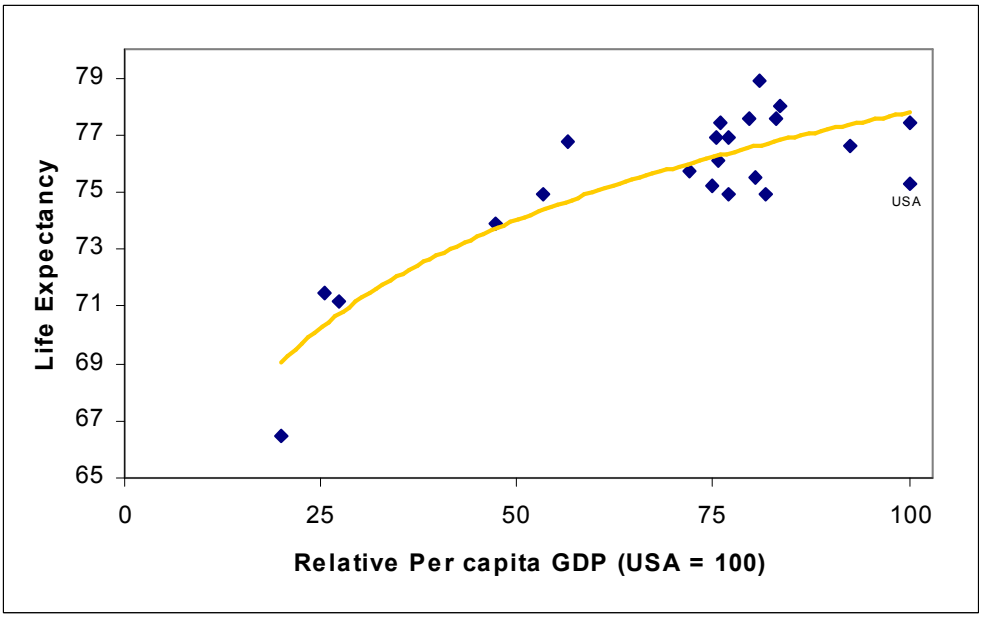


Figure 2: Life Expectancy at Birth and Per Capita GDP in 1990



Notes: Countries in sample: Austria, Belgium, Canada, Denmark, Finland, France, Germany, Iceland, Ireland, Italy, Japan, Mexico, Netherlands, Norway, Poland, Portugal, Spain, Sweden, Switzerland, Turkey, United Kingdom, United States. Source: Barro and McCleary (2003) and OECD. The solid line is a log-linear trend that has been fitted to the data and plotted for illustrative purposes.

of life expectancies have been explored in the longevity production approach by Philipson and Becker (1998). Their model implies that life expectancies vary positively with wealth, which leaves open why the United States has a lower life expectancy than its OECD peers despite higher wealth. Their model also leaves unexplored the connection between religiosity and longevity, despite some controversial research (Sloan, Bagiella, and Powell, 1999) on the links between religion and health.

In developing our framework, we start with the perspective that on a very simple level many religions emphasize good works on earth and certitude about an afterlife. Good works can involve many things such as the giving of time and money, but at its simplest it involves resources given to a religious organization. Religious organizations use these resources to produce credence goods (Iannacone, 1998) by promoting certainty of beliefs about an uncertain and unverifiable afterlife. We model the role of beliefs in a simple equilibrium model with individuals who maximize their lifetime utility, where lifespans are endogenous along the lines of Philipson and Becker (1998), and where the afterlife payoff is determined by a lifetime of good works but there is uncertainty about the afterlife. Religious organizations are assumed to control the technology that produces faith. Faith is modeled simply as greater certainty about the afterlife payoff so that religious firms can be thought of as controlling probability production functions in the spirit of Montgomery (1996). Because faith alters the expected returns to longevity, religion will influence the trade-offs faced by individuals when choosing how long to live, how much to consume, and how much to donate for good works. Also, because faith is produced from donations to religious firms, we emphasize the competitiveness of the market for religious inputs rather than the competitiveness of the market for religious outputs as is usual in the economics of religion literature.

Our framework implies that market competition by religious organizations strengthens faith and religious beliefs by increasing fundraising and donations, but also causes longevity to fall and consumption to either rise or fall. While the effect of competition on religiosity is well understood, we also draw out the implications of how competition affects other dimensions of individuals' life cycle choices. Less understood is how economic development and the higher wealth that accompanies economic development affect religiosity. We make the striking finding that wealth may cause donations and faith to either rise or fall while increasing consumption and longevity. The intuition for the effects of development or competition depends on the balance of wealth and substitution effects that are associated with

development or competition and on the behavior of two relative prices: the relative price of longevity and the relative price of donations or fundraising. We show that our model can explain the general patterns in Figures 1 and 2 and the United States exception as a result of economic development and market competition. We also investigate the role of intrinsic religiosity and technological progress in the production of religion.

2 The Individual's Decision Problem

Individuals are assumed to maximize a conventional lifetime utility function to which we add an explicit afterlife payoff. If we only consider stationary outcomes, then expected lifetime utility is

$$Tu(c) + \pi a(T) \tag{1}$$

where T is the endogenous length of life, c is annual consumption, and $u(.)$ is the value placed on consumption. We assume the typical regularity conditions for $u(.)$ that guarantee an interior solution for consumption. We abstract from discounting and an uncertain length of life, but, as we indicate below, the model can easily be generalized to Yaari's (1965) model with discounting and mortality risk with essentially the same results.

The afterlife is uncertain and described by a finite payoff $a(T)$ if heaven occurs and 0 otherwise and by a probability π that heaven will occur.[2] For the time being we will assume that this probability is exogenous to the individual, but this assumption is key and the subject of the analysis. More on π will be said in the next section where we describe religious organizations. Under our notation, faith is measured on a continuous scale with an atheist having $\pi = 0$ and a true believer having $\pi = 1$. We assume that $a(T)$ increases with T or that the heavenly payoff increases with the length of time good works have been performed. In other words, we assume a Dantean paradise. Though we assume $a'(T) > 0$, because the afterlife is fundamentally non-verifiable, we have no strong position on the sign of $a''(T)$ and for the most part we will simply assume $a''(T) \leq 0$. Normally, an economist would simply take it on faith that there are diminishing returns, which though plausible for most earthly relationships, may not be plausible for the transcendental. One might also consider the sign of $a''(T)$ an empirical matter, but direct tests for an afterlife have yet to

[2] We do not assume there is a hell, for simplicity. Barro and McCleary (2003) show that the belief in heaven and hell may each have distinct implications for economic behavior.

be devised. However, as our comparative statics will show, the assumption of $a''(T) \leq 0$ is consistent with what we know about earthly behavior.

Individuals maximize expected utility subject to a wealth constraint

$$T(c+\tau) = Z \tag{2}$$

where Z is lifetime wealth and τ is annual contributions to the religion, where these donations can be either involuntary or voluntary in which case they are interpreted as good works.[3] We note that the length of life is determined by its value in lifetime utility and constrained by lifetime wealth. We do not explicitly consider the connection between health and longevity. Philipson and Becker (1998) introduce health and longevity production by assuming a convex cost of longevity $M(T)$ that is subtracted from wealth. We do not follow this path here, but instead focus on the effect of having religious beliefs on an afterlife. The main difference between the two approaches is that religious beliefs affect the marginal rate of substitution between longevity and consumption, whereas longevity production affects the relative price between longevity and consumption. Thus, both approaches change the quality-of-life and quantity-of-life trade-off in much the same way, though with a difference of interpretation.

Optimizing individuals set the marginal benefit of living longer equal to the marginal cost of living longer and they do the same for annual consumption (and also donations when these are endogenous). Combining the optimality conditions for consumption and longevity, we obtain a tangency condition that equates the marginal rate of substitution between longevity and consumption and the price of longevity relative to consumption

$$\frac{u(c) + \pi a'(T)}{u'(c)} = c + \tau \tag{3}$$

The relative price of longevity is endogenous and a positive function of annual outlays $c+\tau$, because the wealth constraint is a non-linear function of annual outlays and longevity. The optimality condition reflects a tangency of convex indifference curves in (c, T) space with a wealth constraint that is also convex (for related work see Edlefson, 1981). We put aside the issue of multiple solutions, and only consider the case of a unique interior solution. We

[3] Our results carry over to the more general framework of Yaari (1965) with discounting and mortality risk. In this framework, expected lifetime utility is $A(T)\,u(c) + \pi(\tau)\,a(T)$ and the wealth constraint is $A(T)(c+\tau) = Z$, where $A(T)$ is the annuity value of a security paying one dollar every year until T , or $A(T) \equiv \int_0^T e^{-(\rho+\delta)t}dt$ with ρ the constant rate of time preference and δ the constant hazard rate of death. The essential difference with the present framework is that $A(T)$ replaces T and that one needs to account for the fact that $A(T)$ is not linear T in the comparative static formulas below.

also note that an increase in faith π increases the subjective valuation of longevity relative to consumption. When faced with such a belief shock, individuals seek to reestablish the optimality condition by balancing increases in consumption that raise the relative price of longevity with decreases in consumption that lower the subjective valuation of longevity.

3 Religious Organizations and the Market Structure

To close the model we assume a particularly simple form for the religious organizations and the market conditions they operate under. More general forms are certainly possible, but may obscure the central point of this analysis. We assume first, that religious organizations act as perfect competitive firms in the market for donations and then compare the outcome with the outcome when religious firms have monopsony power and when there is free entry by non-profit religious firms. Initially, we assume that religious donations τ are extracted involuntarily from individuals, but later we will let individuals choose how much τ to supply and firms choose how much τ to demand.

Religious organizations choose τ to maximize production of religious certainty less the cost of acquiring funds τ. The unit cost of acquiring funds is assumed to be a convex function $\theta(\tau)$ that can be interpreted as the cost of fundraising per unit of τ. Production of faith is assumed to take the following simple form $\pi(\tau)$ with $\pi \in [0,1]$ and $\pi' > 0 > \pi''$ or diminishing marginal output because faith is a credence good and credibility is hard fought. In other words, we assume that $\pi(.)$ has the shape of a cumulative distribution function for a continuous random variable. Thus, the religious organization chooses τ to maximize

$$\pi(\tau) - \theta(\tau)\tau \tag{4}$$

The details of the maximization depend critically on the competitive landscape. When the religious organization raises funds in a competitive manner, θ is treated as exogenous by the organization and we have

$$\pi'(\tau) = \theta X^* \quad \text{where} \quad X^* = 1$$

or that funds received by the organization vary inversely with unit fundraising costs. Intuitively, higher unit costs require higher marginal productivity which occurs when funds decline. Fewer funds in turn imply that less faith is produced for the individual.

For comparison, suppose the religious organization has monopsony power with control over its fundraising costs. This assumption is related to the observation that in many countries with state religions, religious organizations act monopolistically (Iannacone, 1998). If we assume convex costs $\theta(\tau)$ with $\theta'(\tau) > 0$ and $\theta''(\tau) \geqslant 0$, then profit maximization implies

$$\pi'(\tau) = \theta X^m \quad \text{where} \quad X^m = 1 + \varepsilon_\theta \equiv 1 + \frac{\tau\theta'(\tau)}{\theta(\tau)} > 1$$

Since $X^m > X^*$ and $\pi''(\tau) < 0$ as well as $\theta'(\tau) > 0$, we have $\tau^m < \tau^*$. In other words, greater competitiveness requires greater fundraising effort in order to satisfy the firm's optimality condition and more fundraising leads to more donations τ and stronger beliefs π.

We, also, consider the case of non-profit religions under free entry, because many countries give religious charitable organizations tax exemptions and non-profit status. Free entry implies that individual profits are driven down to zero with θ again treated as exogenous, or

$$\frac{\pi(\tau)}{\tau} = \theta$$

which can be rewritten as

$$\pi'(\tau) = \theta X^n \quad \text{where} \quad X^n = \varepsilon_\pi \equiv \frac{\tau\pi'(\tau)}{\pi(\tau)} < 1$$

Since $X^* > X^n$, we have $\tau^n > \tau^*$. Thus, free entry and the non-profit condition imply more fundraising and stronger beliefs than under pure competition. This situation may as a short hand be sometimes referred to as "more competitive" than perfect competition in the sense of greater fundraising effort.

We summarize the firm optimality and entry conditions with

$$\pi'(\tau) = \theta(\tau) X^i \tag{5}$$

where

$$X^m = 1 + \varepsilon_\theta > X^* = 1 > X^n = \varepsilon_\pi$$

Because $X^m > X^* > X^n$, we have $\tau^n > \tau^* > \tau^m$ as well as $\pi(\tau^n) > \pi(\tau^*) > \pi(\tau^m)$. In other words, a more "competitive" landscape for religions leads to more fundraising and ultimately to stronger beliefs.[4]

[4]For simplicity, we assume that the profits of religious organizations stay with the organization and are not funneled back to households. We also assume for simplicity that the elasticities ε_θ and ε_π are constant.

We can also show that technological progress is in many ways similar to a more competitive market structure. Technological progress can be in the form of a more efficient belief production technology (higher marginal product π' for all τ) or lower fundraising costs (lower unit cost θ for all τ) by which we mean lower communication and distribution costs. In either case, progress leads to higher τ to satisfy (5) and thus to stronger beliefs and more religious certainty. This might explain the puzzle that a wealthy country like the United States is so religious. Not only is religion very competitive in the United States (and afforded non-profit status), but communication costs are also low. Both factors encourage faith and more religious certainty under our assumptions. The model also implies that secularism in other wealthy countries may be explained by lack of competition among religions or relatively high communication costs either for technological reasons or market interventions (perhaps through state control of communication outlets). The competition interpretation would be in line with the traditional supply-side or markets theory of religion originally put forth by Adam Smith (see Iannacone, 1998), whereas the technological progress interpretation could be thought of as a Schumpeterian view for the diffusion of religion.

4 Comparative Statics with Involuntary Donations

Before we allow a market for donations, we analyze the model's response when involuntary donations can be extracted. Involuntary donations can be thought of as state-assisted religious fundraising when a portion of government tax revenues is channeled to religious organizations. Involuntary donations may also be extracted directly by religions. However, religious organizations differ from the government in the sense that the amount of resources extracted is dictated by the market structure that the religious organizations are assumed to operate under. In other words, lower X^i or greater competitiveness requires more fundraising effort to satisfy the firm optimality and entry condition (5). Since donations are involuntary and beliefs are produced by fiat, this in essence is like a model of persuasive advertising where religious firms affect beliefs directly without explicit consideration for individuals' willingness to contribute funds to religion and the costs of fundraising.

To find the effect of religious competition, we totally differentiate the wealth and optimality conditions (2) and (3). The determinant of the resulting system of equations is

$$\Delta_I = (c+\tau)\,\frac{c+\tau}{c}\sigma_u + \frac{\pi a'}{u'}\sigma_a$$

where $\Delta_I \geq 0$ assuming $\sigma_a \equiv \frac{-a''T}{a'} \geq 0$ and $\sigma_u \equiv \frac{-u''T}{u'} \geq 0$. To understand the effect of religion and religious market organization we proceed by first examining the effect of wealth, followed by the effect of religion, and then the effect of involuntary donations.

Our analysis implies that changes in wealth tend to increase longevity and consumption:

$$\Delta_I \frac{dT}{dZ} = \frac{c+\tau}{c}\sigma_u \geq 0 \quad \text{and} \quad \Delta_I \frac{dc}{dZ} = \frac{\pi a'}{u'}\sigma_a \geq 0$$

Both of our comparative static results are consistent with evidence that consumption and longevity are normal goods when there are diminishing returns of the afterlife payoff. Because consumption generally increases with wealth, and given that $\sigma_u \geq 0$, we must have $a'' < 0$ or $\sigma_a > 0$. We note that if good works are interpreted as private consumption c, then we have a stark and distinctly selfish or Calvinistic interpretation of good works.

Religion has a pure substitution effect on longevity and consumption, because greater religiosity as measured by a higher π for a given τ increases the subjective valuation of longevity while leaving the relative price of longevity unchanged. Because the subjective valuation of longevity increases, religious certainty makes longevity appear relatively cheaper:

$$\Delta_I \frac{dT}{d\pi} = \frac{a'}{u'}T > 0 \quad \text{and} \quad \Delta_I \frac{dc}{d\pi} = -(c+\tau)\frac{a'}{u'} < 0$$

Thus, greater faith by itself tends to increase longevity but decrease consumption. This is consistent with findings that religiosity is associated with better health and longer lifespans. Faith reduces consumption because religious faith increases the payoff to longevity and thus increases the net marginal benefit of living longer. Thus, religious certainty acts like an exogenous reduction in the relative price of longevity and causes a substitution effect that induces individuals to substitute consumption for longevity.

Involuntary donations have both wealth and substitution effects on longevity and consumption. Higher forced donations have a negative wealth effect but also strengthen religious belief. More certainty in the afterlife acts like a decrease in the relative price of longevity in comparison with the subjective valuation of longevity and thus tends to raise life expectancies. These influences are summarized in

$$\Delta_I \frac{dT}{d\tau} = -T\left[\frac{c+\tau}{c}\sigma_u + \left(1 - \frac{\pi a'}{Tu'}\varepsilon_a\right)\right] \quad \text{and} \quad \Delta_I \frac{dc}{d\tau} = \frac{-\pi a'}{u'}\sigma_a + (c+\tau)\left(1 - \frac{\pi a'}{Tu'}\varepsilon_a\right)$$

Intuitively, an increase in τ causes a negative wealth effect that tends to reduce both longevity and consumption. The substitution effect depends on whether τ increases the subjective

valuation of longevity by more or less than it increases the relative price of longevity. If $1 > \frac{\pi' a}{u' T}\varepsilon_a$, then the increase in the relative price of longevity dominates.[5] Under these circumstances, the net substitution effect is to decrease longevity and increase consumption, which implies that the wealth effect on longevity is reinforced, while the wealth effect on consumption is offset. Consumption may either increase or decrease depending on the relative strength of the wealth and substitution effects.

5 A Market for Voluntary Donations

In this section we allow individuals to make voluntary donations of τ towards a purely private good that is used by religious organizations to produce faith or greater certitude about an afterlife. Voluntary donations can also be interpreted as contributing to religious capital as in Iannacone (1990). Under this interpretation, religious capital is the accumulated stock of lifetime sacrifices through donations, or $T\tau$. We continue with the assumption that the components of this stock have differential effects on the expected afterlife payoff with T affecting $a(T)$ and τ affecting $\pi(\tau)$, but one can easily imagine other possibilities.

When the donation of the individual τ is endogenous, we add another optimality condition to the earlier condition (3). Individuals choose donations by equating the marginal benefit of donations to the marginal cost. Rearranging this condition produces an optimality condition that equates the marginal rate of substitution of donations relative to consumption and the relative price of donations:

$$\frac{\pi'(\tau)\, a(T)}{u'(c)} = T \tag{6}$$

where the relative price of donations equals T because of the non-linear wealth constraint.

To complete this model we impose equilibrium in the voluntary contributions market. That is, we equate the firm's demand for funds to the individuals' supply of funds by equating the $\pi'(\tau)$ perceived by individuals in (6) to the $\pi'(\tau)$ desired by firms in (5). Thus, we have

$$\frac{\theta(\tau)\, X^i a(T)}{u'(c)} = T \tag{7}$$

where i indexes the market structure that religious firms are operating under with a decrease in X^i denoting a rise in competitiveness. The primary effect of increased competitiveness

[5] We note that in the next section where τ is endogenous, we will have an additional optimality condition that equates the marginal benefit of donations and the marginal cost of donations, or $\pi' a = T u'$. Thus, assuming $1 > \frac{\pi' a}{u' T}\varepsilon_a$ amounts to assuming that donations are too high relative to their optimum.

is to increase the production of religious certainty π and thus increase the demand for donations by religious organizations. Increased competitiveness also reduces the subjective valuation of donations relative to consumption and thus, acts like an increase in the relative price of donations with a substitution effect of falling donations and rising consumption. The substitution effect on donations tempers the primary effect of increased competition on donations. Because increased competitiveness leads to an increase in religious certainty π, the subjective valuation of longevity relative to consumption increases in (3) which acts like a reduction in the relative price of longevity. Thus, competitiveness tends to reduce consumption and raise longevity (as before when donations were involuntary).

To analyze the comparative static properties of our model, we totally differentiate equations (2), (3), and (7) and solve for the response of the three endogenous variables c, π, and T. The determinant of the resulting system of equations is

$$\Delta_V = (c+\tau)\frac{T}{c}\sigma_u\left\{\frac{c+\tau}{\tau}\varepsilon_\theta + 2\left(1-\varepsilon_a\right)\right\} + T\left\{\sigma_a\frac{\varepsilon_a}{\varepsilon_\pi}\left(\varepsilon_\theta - \frac{\tau}{c}\sigma_u\right) + \left(\varepsilon_a - 1\right)^2\right\}$$

where $\Delta_V > 0$ assuming that the cost of producing faith is sufficiently convex or $\varepsilon_\theta \geq \frac{\tau}{c}\sigma_u$ where $\varepsilon_\theta \equiv \frac{\theta'\tau}{\theta}$. Assuming $\varepsilon_\theta \geq \frac{\tau}{c}\sigma_u$ is not as strong an assumption as it may appear at first glance, because consumption usually is far greater than donations and thus $\frac{\tau}{c}$ is fairly small. To understand the effect of religion and religious market organization we proceed as before and first examine wealth effects, followed by the effect of religion and then the effect of a more competitive religious market structure.

We find that wealth effects are positive for consumption and longevity without special restrictions. One can easily show that voluntary donations are also a normal good when (6) is used instead of (7). By using (7), we capture the equilibrium response of donations to changes in wealth rather than the individual's supply response. The equilibrium response of donations to wealth is ambiguous without special restrictions. In particular, we find that

$$\begin{aligned}
\Delta_V \frac{dT}{dZ} &= \left(\frac{T}{c}\sigma_u\right)\left[\frac{c+\tau}{\tau}\varepsilon_\theta + \left(1-\varepsilon_a\right)\right] > 0 \\
\Delta_V \frac{dc}{dZ} &= \frac{\varepsilon_a}{\varepsilon_\pi}\sigma_a\varepsilon_\theta + \left(1-\varepsilon_a\right)^2 > 0 \\
\Delta_V \frac{d\tau}{dZ} &= \frac{\sigma_u}{c}\left[-\frac{\varepsilon_a\sigma_a}{\varepsilon_\pi}\tau + \left(1-\varepsilon_a\right)(c+\tau)\right] \gtrless 0
\end{aligned}$$

Consumption and longevity respond positively to wealth, but the net effect on donations is ambiguous. The ambiguity arises because higher longevity raises the relative price of

donations relative to consumption in (7) causing a substitution effect that reinforces the wealth effect for consumption and offsets the wealth effect for donations. When the induced substitution effect dominates the original wealth effect, donations fall when wealth rises, which leads to a fall in religiosity.

In other words, wealth has a secularization effect when the following secularization condition holds:

$$\frac{1-\varepsilon_a}{\varepsilon_a}\frac{1}{\sigma_a} < \frac{1}{\varepsilon_\pi}\frac{\tau}{c+\tau}$$

If the secularization condition is violated, greater wealth produces greater religiosity. Whether or not wealth leads to secularization depends on jointly on the outlay share of donations $\frac{\tau}{c+\tau}$, the curvature of the belief technology, and the curvature of the afterlife payoff function. In short, the outcome is determined jointly by demand and supply side parameters.

The secularization condition is more likely when ε_π is low or when ε_a is high and σ_a is low, because the outlay share of donations $\frac{\tau}{c+\tau}$ tends to be quite small under normal conditions. Because the belief production function $\pi()$ has the shape of a conventional cumulative distribution function with a flat range for high values of τ, we conclude that ε_π is low for sufficiently large values of τ. In other words, secularization is more likely to accompany greater wealth when donations and religiosity are high initially, while religiosity is more likely in initially relatively secular societies with low levels of donations.[6] Because the afterlife payoff function $a()$ is concave, the secularization condition is more likely when the afterlife payoff is responsive to earthly lifespans and when life expectancies are low. For example, if $a()$ has a constant elasticity form, then $\sigma_a = 1 - \varepsilon_a$ so that the secularization condition is more likely when ε_a is high and $a()$ is not too concave. More generally, one can show that ε_a falls with T because the elasticity of ε_a equals $1 - \varepsilon_a - \sigma_a \leq 0$.

The secularization condition illustrates the force of wealth and substitution effects on donations and religiosity and can explain differences across countries in religious beliefs as a demand-side phenomenon. In particular, it guarantees that the wealth effects on donations of a change in wealth outweighs the induced substitution effect from a change in wealth. Violation of the secularization condition results in a positive net effect on donations. Thus,

[6] The shape of the belief function means that competition causes a regression to the mean in religiosity. Other shapes for $\pi()$ might cause religiosity to diverge when competition increases. For instance, if the cumulative distribution functions $\pi()$ exhibit flat ranges for low values of τ (something we have ruled out at the onset), then wealth increases cause secular societies to become more secular when the secularization condition holds or more religious when the secularization condition is violated.

development and higher wealth may be associated with either higher or lower religiosity depending on whether the condition is satisfied or violated. However, if we consider Figures 1 and 2, we see that this demand-side explanation is insufficient for explaining the associated cross-country variation in longevity. Specifically, the model implies a positive relationship between longevity and wealth, which generally holds true except for the United States.

If we continue with our earlier assumption that $0 \leq \frac{\tau}{c}\sigma_u \leq \varepsilon_\theta$, then we find that an exogenous increase in religiosity, which we denote intrinsic religiosity, has a positive effect on longevity and donations but a negative effect on consumption:

$$\begin{aligned}
\Delta_V \frac{dT}{d\pi} &= \frac{a'T^2}{u'}\left[\frac{\varepsilon_\theta}{\tau} - \frac{\sigma_u}{c}\right] > 0 \\
\Delta_V \frac{dc}{d\pi} &= \frac{-a'T}{u'}\left[(\frac{c+\tau}{\tau}\varepsilon_\theta + (1-\varepsilon_a)\right] < 0 \\
\Delta_V \frac{d\tau}{d\pi} &= \frac{a'T}{u'}\left[(\frac{c+\tau}{c}\sigma_u + (1-\varepsilon_a)\right] > 0
\end{aligned}$$

Religious certainty has a positive effect on longevity because it raises the subjective valuation of longevity relative to consumption. This is perceived by individuals as equivalent to a reduction in the relative price of longevity and so there is a positive substitution effect on longevity and a negative substitution effect on consumption. Lower consumption and higher longevity increase the subjective valuation of donations in (7), with higher longevity also raising the relative price of donations. The combined effect of greater religious production is that donations rise.[7] Though the United States has higher faith and perhaps donations than other OECD countries, the model suggests that this may not be due to higher intrinsic religiosity. According to our model, higher intrinsic religiosity would also be associated with lower consumption and higher longevity, something that appears to be counterfactual when comparing the United States to its OECD peers.

Finally, the effects of competition in the donations market (where a decrease in X means more competition) on longevity, consumption, and donations are

$$\Delta_V \frac{dT}{dX} = \frac{T^2}{X}\left[(1-\varepsilon_a) + \frac{c+\tau}{c}\sigma_u\right] > 0$$

[7]Religion would have an ambiguous effect on longevity without our assumption that $0 \leq \frac{\tau}{c}\sigma_u \leq \varepsilon_\theta$. The ambiguity arises because the relative price of longevity depends positively on the sum of consumption and donations. Our assumption guarantees that the reduction in consumption from an increase in faith outweighs the increase in donations, so that the price of longevity falls and longevity rises. The assumption is likely to hold in practise because $\frac{\tau}{c}$ usually is small.

$$\Delta_V \frac{dc}{dX} = \frac{-T}{X}\left[(1-\varepsilon_a)(c+\tau) - \frac{\varepsilon_a \sigma_a}{\varepsilon_\pi}\tau\right] \gtrless 0$$
$$\Delta_V \frac{d\tau}{dX} = \frac{-T}{X}\left[\frac{(c+\tau)^2}{c}\sigma_u + \frac{\varepsilon_a}{\varepsilon_\pi}\tau\sigma_a\right] < 0$$

Thus, competitiveness will have opposite effects on longevity and charitable giving and an uncertain effect on consumption. An increase in competitiveness increases the demand for donations by religious organizations. The increase in donations in turn increases the relative price of longevity causing a negative substitution effect for longevity. So an increase in competition undoubtedly reduces longevity and increases donations, which is consistent with our previous result that an increase in involuntary contributions τ reduces longevity. The effect on consumption is ambiguous because it depends on the balance of two substitution effects. First, lower longevity reduces the price of donations relative to consumption which causes a positive substitution effect for donations and a negative substitution effect for consumption. Second, higher donations increase the price of longevity relative to consumption which causes a positive substitution effect on consumption. Interestingly, the net effect on consumption of the two substitution effects depends on whether or not the secularization condition holds. When the secularization condition holds, increased competitiveness in the market for religious donations causes consumption to rise by virtue of a dominating substitution effect from a higher relative price of longevity.

While differences in the competitiveness of religious markets can explain the observed variation in religiosity and longevity across countries, they are insufficient to explain the observed variation in consumption unless the secularization condition is violated for the United States. To see this, note that religious markets are highly competitive in the United States and more or less uncompetitive in the rest of the OECD. Also, note that the United States has higher consumption than its OECD peers. For countries where the secularization condition holds, we find that relatively lower competitiveness results in lower religiosity, higher longevity, and higher consumption. Thus, if the secularization condition holds for all, the model predicts greater religiosity and lower longevity for the United States, which agrees with Figures 1 and 2, but also counterfactually predicts lower consumption in the United States. Alternatively, if the secularization condition is violated in the United States, we find that greater competitiveness can now also result in relatively higher consumption in the United States. While having the secularization condition violated by the United States

is not the only way to explain the Figures, it may provide a more parsimonious explanation of the joint effects of competition and development than if the condition is not violated. If the secularization condition is not violated by the United States, one would have to argue that the competition effect dominates the development effect for religiosity and longevity in order to explain Figures 1 and 2, and that the development effect dominates for consumption in order to explain the relatively higher consumption in the United States.

How do our comparative statics results compare with Figures 1 and 2? Figure 1 shows that religious beliefs and wealth as approximated by per capita GDP are for the most part negatively related, with the United States providing an visible exception. Figure 2 shows that longevity and wealth are positively related, with the United States a small exception. Our comparative statics results suggest that both Figures can be explained as a combination of wealth and competition shocks. Wealth shocks produce a positive longevity response and if the secularization condition is violated a positive effect on donations. Increased religious competition, by contrast, has a negative longevity effect and a positive donations effect. Thus, to explain the United States exception, one could use our model to argue that the secularization condition is violated by the United States so that competition and development forces reinforce each other to produce religiosity in the United States and secularization in the rest of the OECD. For longevity, the model suggests that the negative competition effect on longevity in the United States offsets the positive wealth effect on longevity to create the unexceptional life expectancies in the United States as compared to its OECD peers. Assuming that the secularization condition is violated by the United States would also allow the possibility for comparatively high United States consumption, rather than the low consumption that would be predicted by the model if the secularization condition were not violated.

6 Conclusion

Our analysis has in a very simple model explained the religiosity and comparatively low life expectancy evidenced by the United States as compared to other wealthy nations. Specifically, we explain Figures 1 and 2 as a result of economic development and religious competition. By itself, development and the increased wealth that accompanies development produce a wealth effect and an induced substitution effect by raising the relative price of

donations. Because the wealth and substitution effects offset one another for religious donations and religiosity, we show that secularization occurs when the wealth effect dominates, while religiosity occurs when the substitution effect dominates. We provide a secularization condition that shows under what conditions the wealth effect dominates the substitution effect from development. If the condition is violated by the United States but not by its OECD peers, then it is possible to explain cross-country variation in religiosity and consumption as a result of wealth differences. However, because wealth tends to increase longevity, the unexceptional longevity in the United States is not explained as a result of development. On the other hand, competition in religious markets creates two substitution effects by raising the relative price of longevity and reducing that of donations. Thus, competition by itself can explain cross-country variation in religiosity and longevity, but not consumption unless the secularization condition is violated by the United States. Combining the two forces and assuming that the secularization condition is violated for the United States implies high religiosity in the United States, unexceptional life expectancies in the United States because the competition effect offsets a positive wealth effect, and high consumption in the United States because the wealth effect may now be reinforced by the competition effect.

Our results come out of a simple life cycle model with endogenous longevity where religious firms influence religious beliefs using donations as an input. The key mechanism is that religious market competition for inputs and economic development affect the returns to longevity and the costs of fundraising and ultimately an individual's degree of certainty with respect to the afterlife, which we have termed faith though faith is arguably much more complex than this *reductio*. Our analysis highlights the wealth and substitution effects that come about from competition and development and ultimately drive religious donations and religiosity. In order to focus on the life cycle aspects of religion, we have simplified the analysis along many dimensions that could be fruitfully relaxed. For instance, we have kept capital and wealth exogenous, but it would be of interest to see them determined in a fully specified dynamic general equilibrium model. This would allow us to assess to what extent the dynamic path of religiosity and capital agree with Weber's (1904) hypothesis that economic development and religious beliefs are fundamentally intertwined.

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