

Microfounding Religion

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Abstract

Microfounding religion entails casting members of religion as strategic players who each optimize her own behavior given other players' behavior. An alternative, non-economic, approach is to assume that the members are non-strategic, but are instead motivated to follow divine precepts. I prove an equivalence result — under certain conditions, the behavior of a strategic member is exactly the same as the behavior of a precept follower. Because these conditions are unobservable, it is impossible to ascertain the true motivation of every member. This implies an inherent indeterminacy in choosing the 'correct' model of religious behavior. To microfound religion, therefore, is simply to make a *hypothetical* description of the logic underlying observed behavior, which non-believers may assume to be purely human, but believers can take as divine.

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A FUNDAMENTAL DIFFICULTY

A fundamental problem in formalizing, i.e. mathematically modeling, human behavior concerning religious matters is how to deal with the supernatural. Social scientific approaches to the study of religion recognize, albeit take for granted, that what sets religion apart from other human-made structures that govern behavior, e.g. institutions, organizations, cultural norms, is that religion is premised on faith in the divine. Stark and Bainbridge (1979) explicitly defines religion as “solutions to questions of ultimate meaning which postulate the existence of a supernatural being, world, or force”. Even while more recent papers have eschewed explicit considerations of the divine, the eternal, and the supernatural, the latter actually comprise the edifice on which any theory of religious behavior is built. Perhaps the supernatural is seldom articulated, but without at least an implicit recognition of this premise, how can any model of religious behavior claim to be a model of *religious* behavior?

What social scientists – specifically, economists, actually do when they build mathematical models of religious behavior is to abstract from the literal divine. They have no choice but to do so. To mathematically capture behavior is to stick to what is quantifiable, which precludes the modeling of eternity, of infinity, or of God.

The economist is then left with two options. One is to focus attention on aspects of religious behavior that concern only temporal goods and activities. Thus, since the seminal work of Iannaccone (1992), most, if not all, succeeding economic models of religion have focused on the allocation of finite resources (e.g. time and income) between secular and religious goods and activities (e.g. consumption goods and participation in church activities). Applying optimal control theory from mathematics, the economist solves for the ‘optimal’ allocation by maximizing the ‘utility’ derived from those goods and activities.

Since Iannaccone (1992), economists have remained equivocal as to what such utility could be. Individuals are assumed to derive some “...religious satisfaction ... So, for example, the pleasure and edification I derive from Sunday services ... The analysis does not presuppose any special motives for religious activity, ... but rather assumes merely that religious activities provide utility in proportion to the scarce resources devoted to them” (Iannaccone, 1992).

Notice, then, that an economic model of religion is self-referential by nature – it judges the ‘good’ from performing religious practices against the size of utility that one derives from it. If one adhered strictly to this self-referential approach, the tool offered by economists, that of maximizing utility given limited resources, appears innocuous and even sensible. While it is certainly valid to ask whether self-referential utility is an adequate goal of religious behavior, once one admits

utility as the standard, what would be better than to maximize it?¹

Thus, under the aegis of utility maximization, economists have been able to model religion as a club that provides club goods to its members (e.g. Iannaccone (1992, 1998); as an institution that solves commitment problems between and among its leaders and members (e.g. Glaeser and Scheinkman, 1998; Rubin, 2009) and which may be profit or rent-seeking (Ekelund et al., 1996; Koyama, 2010); and as a culture that is transmitted intergenerationally (i.e. parent to child as in Bisin and Verdier (2001)), socially (i.e. between peers in schools), and institutionally (i.e. by the state or the government). (See, e.g. Carvalho (2016), Carvalho et al. (2024) and Bisin et al. (2023) for models of cultural dynamics.) These models are also essentially strategic, or game-theoretic, in the sense that an individual player’s utility-maximizing choice is conditioned on other players’ choices.²

All these models restrict the set of relevant factors or variables to those that are finite valued. They avoid the fundamental problem of trying to capture what are essentially of infinite value – supernatural beings, eternal rewards and punishments, by ignoring them altogether. One then wonders whether, for the sake of analytical/mathematical rigor, the baby has been thrown out with the bath water.

Another option, seen in Azzi and Ehrenberg (1975), is to tackle the supernatural head on and employ some mathematical tricks to approximate infinite values. Azzi and Ehrenberg assume that an individual derives utility not just from temporal goods and activities, but also from the ‘afterlife’, which she can more likely attain as she performs more religious activities. The authors adopt a time period $t = 1, 2, \dots, n, n+1, n+2, \dots, \infty$ in which the individual lives from time $t = 1$ to $t = n$, dies at $t = n$, and faces an indefinite (i.e. infinite) time horizon starting from $t = n+1$. They model the afterlife as a finite-valued good, but which is obtained at every time period from $t = n+1$ onwards. In other words, the afterlife is an infinite flow or stream of a finite good.

This mathematical trick is quite untenable for two reasons. First, economists already use this trick to model the flow of *temporal* goods whenever the benefits therefrom accrue over a time period that has an uncertain end point. That is, a temporal good does not literally flow for eternity, but one can treat it as an infinite stream whenever there is uncertainty as to when the final flow of the good occurs. One can then calculate the present value of this infinite stream of

¹An alternative to utility maximization entails a teleological approach. That is, religious behavior is oriented towards an absolute notion of good, and not a notion that is relative to the individual. An individual would perform a religious activity, not because she derives some utility from doing so, but simply because she is trying to follow the divine will. For a crude approximation of what such a model could look like, see the next section.

²For surveys of the literature, see Iannaccone (1998), McCleary and Barro (2006), Platteau and Aldashev (2014), Iyer (2016), and Carvalho et al. (2019).

a finite good. Azzi and Ehrenberg essentially distinguish temporal goods from afterlife goods by assuming that the end point of mortal life, i.e. n , is known, whereas the end of the afterlife is not (or non-existent). They are thus able to calculate the present value, at $t = n + 1$, of the afterlife.

Azzi and Ehrenberg's distinction between temporal goods and the afterlife is artificial since in most cases, the end of one's life is uncertain and, therefore, temporal goods also flow indefinitely. Even in the case of suicide or planned death, there may still remain some uncertainty as to whether the individual would go through with it in the end.

Yet even if one were to grant that temporal goods flow over a finite time period whose end is known, a more difficult problem arises. Is the time horizon after death an infinite, linear, progression of time periods? Would time even exist as we know it? That one can even purport to model the afterlife thus seems like a dubious scientific endeavor, as one would have to grapple with issues that are essentially metaphysical.

Thus, what economists have done since Azzi and Ehrenberg is to put blinders on – ignore the supernatural, the eternal, and the divine, in order to adopt a mathematical, rational-choice, utility-maximizing, framework.³ An unarticulated premise in all these models is that when it comes to at least some religious matters, individuals do not actively think about the supernatural, the eternal, and the divine. They instead consider only temporal goods and activities, thereby suspending considerations of infinity. Arguably, however, such approximation of human motivations may be more suitable for non-believers, than believers. Existing models of religious behavior, therefore, may only be capturing behavior of the irreligious.

This paradox remains the elephant in the room.

TWO MODELS OF RELIGIOUS BEHAVIOR

Let us suspend, for the sake of argument, the fundamental problem of dealing with infinity when it comes to modeling religious behavior. In what follows, all mathematical functions are finite-valued.

A particular circumstance or phenomenon which concerns a finite set $n \in \mathbb{Z}_{>0}$ of individuals evokes a behavioral response from each of them. Denote the collection of such behaviors as $\{x_i, \Omega_i^{n-1}\} = \{x_i, \{w_j\}\}$, $j \neq i$, where $x_i, w_j \in W$ and $W \subset \mathbb{R}$ a closed interval. We are concerned with how an individual i might choose her behavior x_i given that the other $|n - 1|$ individuals'

³In fact, Iannaccone (1990, 1992, 1998) avoid the problem of the infinite afterlife while still explaining the result in Azzi and Ehrenberg that religious participation is higher in old age. In particular, these papers posit religious participation as a kind of human capital — as one participates more, one accumulates more religious capital and, in this manner, acquires the habit of practicing religion. Religious human capital and the benefit therefrom is larger towards the end of life, which can explain why older people tend to participate more.

behavior is given by vector $\Omega_i^{n-1} \in W^{n-1}$. That is, faced with behavior profile Ω_i^{n-1} , we posit when individual i might choose either $x_i = x_{s_i}$ or $x_i = x_{p_i}$, both of which we define below.

Let $f_s : W^{n-1} \rightarrow W$ be a continuous function that prescribes to any individual facing a particular behavior profile a utility-maximizing behavior $\omega_s \in W$. That is, $\omega_s = f_s(\Omega_i^{n-1})$ is the optimal behavior for any individual facing Ω_i^{n-1} . However, some types of individuals may be more or less willing or able to adopt this ideal. Thus, given ω_s , an individual can only adopt x_{s_i} according to continuous function $h_{s_i} : W \rightarrow W$, particular to i , that maps optimal behavior to actual behavior. That is, $x_{s_i} = h_{s_i}(\omega_s) = h_{s_i}(f_s(\Omega_i^{n-1}))$, which we call strategic behavior.⁴ Thus, an individual whose behavior is x_{s_i} is strategically motivated.

Consider an alternative continuous function $f_p : W^{n-1} \rightarrow W$ that prescribes to any individual facing a particular behavior profile a behavior $\omega_p \in W$ that follows divine precepts. Thus, one can think of $\omega_p = f_p(\Omega_i^{n-1})$ as behavior that is consistent with the ‘divine will’ for any individual facing Ω_i^{n-1} . However, because of varying degrees of human agency, some individual types may be more or less willing or able to uphold this divine will. Thus, an individual can only adopt x_{p_i} , which takes into account her human agency. Specifically, $x_{p_i} = h_{p_i}(\omega_p) = h_{p_i}(f_p(\Omega_i^{n-1}))$, with $h_{p_i} : W \rightarrow W$ a continuous function, particular to i , that maps the divine will to i ’s actual behavior. We call x_{p_i} precept-based behavior and an individual whose behavior is x_{p_i} precept driven.

One can thus think of two alternative models that can describe an individual’s rationale for her behavior. When confronted with others’ behavior, i.e. Ω_i^{n-1} , an individual behaves as x_{s_i} if she is strategic, and x_{p_i} if she is precept driven. To what extent can we infer the individual’s motivation from her behavior? If one observes that individual’s behavior, can we say that that behavior is x_{s_i} or x_{p_i} ?

To answer this question, consider again the following equations that respectively predict strategic and precept driven behavior of an individual facing Ω_i^{n-1} :

$$x_{s_i} = h_{s_i}(f_s(\Omega_i^{n-1}))$$

$$x_{p_i} = h_{p_i}(f_p(\Omega_i^{n-1}))$$

We start with a trivial case. If for an individual i , $h_{s_i}(f_s(\Omega_i^{n-1})) = h_{p_i}(f_p(\Omega_i^{n-1}))$, any situation induces behavior from an individual that is both strategic and precept driven. That is, given any behavioral profile Ω_i^{n-1} facing i , $x_{s_i} = x_{p_i}$. Because strategic and precept behavior are equivalent, one cannot infer from i ’s observed behavior her actual motivation.

⁴It is strategic because one’s behavior is conditioned on others’.

The more interesting case is when $h_{s_i}(f_s(\Omega_i^{n-1})) \neq h_{p_i}(f_p(\Omega_i^{n-1}))$. It turns out that under certain conditions, one can still get equivalence of strategic and precept-based behavior.

In particular, suppose that $f_s(\Omega_i^{n-1}) = f_p(\Omega_i^{n-1})$, such that given any situation – any behavior profile confronting i , $\omega_s = \omega_p$. In other words, optimizing, or utility-maximizing, behavior coincides with the divine will, and vice-versa. Let us delay discussing the likelihood that this condition is met, and explore for now its theoretical implications.

If h_{s_i} is bijective, then one can write⁵

$$x_{p_i} = h_{p_i}(h_{s_i}^{-1}(x_{s_i})) = g(x_{s_i}),$$

with $g : W \rightarrow W$ thus a mapping from the set of all possible values of x_{s_i} to the set of all x_{p_i} . Since g is continuous, and W is a closed interval and therefore also compact, one can then invoke Brouwer's fixed point theorem. That is, there is a point $x_{s_i}^0$ such that $g(x_{s_i}^0) = x_{s_i}^0$. Since $g(x_{s_i}^0) = x_{p_i}^0$, this implies that there is always a strategic behavior $x_{s_i}^0 = x_{p_i}^0$ that is also precept-driven.

Analogously, if h_{p_i} is bijective, then one can write $x_{s_i} = h_{s_i}(h_{p_i}^{-1}(x_{p_i})) = k(x_{p_i})$, with k a continuous mapping from and to a closed and compact set W . Brouwer's fixed theorem applies: there is a point $x_{p_i}^+$ such that $k(x_{p_i}^+) = x_{p_i}^+$. Since $k(x_{p_i}^+) = x_{s_i}^+$, this implies that there is always a precept-driven behavior $x_{p_i}^+ = x_{s_i}^+$ that is also strategic.

The preceding proves an equivalence result:

Theorem 1 *Equivalence of strategic and precept-based behavior*

A phenomenon is shared by a finite set $n \in \mathbb{Z}_{>0}$ of individuals, which induces each individual i to respond to the behaviors of the other $|n - 1|$ individuals, Ω_i^{n-1} , by choosing her own behavior. If i is strategic, she chooses $x_{s_i} = h_{s_i}(f_s(\Omega_i^{n-1}))$; otherwise, if she is precept driven, she chooses $x_{p_i} = h_{p_i}(f_p(\Omega_i^{n-1}))$.

Let $f_s = f_p$. Then, if h_{s_i} is bijective, there is some strategic behavior $x_{s_i}^0 = x_{p_i}^0$ that is also precept-based. If h_{p_i} is bijective, there is some precept-based behavior $x_{p_i}^+ = x_{s_i}^+$ that is also strategic.

Theorem 1 implies that there are cases in which one would not be able to distinguish whether an individual is strategic or precept driven – both of these motives would yield the same observed behavior. Such cases require two things: that either h_{s_i} or h_{p_i} is bijective, and that $f_s = f_p$. In what follows, I will argue that these conditions are easily met and, therefore, that the equivalence between strategic and precept-based behavior likely to occur.

⁵It can be shown that a bijection always exists between two closed intervals — in our case, W and W .

To examine what bijection of h_{s_i} entails, we first take a concrete example. One can think of $\omega_s = f_s(\Omega_i^{n-1})$ as some unconstrained optimum for an individual i facing profile (Ω_i^{n-1}) . That is, let i derive utility $u(x, \Omega^{n-1})$ from choosing x given that the other individuals choose Ω_{n-1} . Then, $\omega_s = \arg \max_{x \in W} u(x, \Omega_i^{n-1})$ maximizes this utility. In game-theoretic parlance, it is the best response of i . Now, taking into account any constraints that i might have, the actual strategic behavior she adopts is not necessarily ω_s , but $x_{s_i} = h_{s_i}(\omega_s)$. That is, $h_{s_i} : W \rightarrow W$ is simply a function that maps an unconstrained to a constrained optimum. To see that there exists such function, let i 's constraint be given by $\kappa(x, \Omega_i^{n-1}) = c$. Then the constrained optimum x_{s_i} satisfies $u'(x, \Omega_i^{n-1}) - \lambda \kappa'(x, \Omega_i^{n-1}) = 0$ – the first-order condition in constrained optimization, with λ the Lagrangian multiplier. The unconstrained optimum satisfies $u'(x, \Omega_i^{n-1}) = 0$ – that is, when there is no constraint. Thus, the unconstrained optimum is related to, or maps into, the constrained one. The mapping is bijective if a profile Ω_i^{n-1} gives a unique unconstrained optimum ω_s , which it does, since $f_s : W^{n-1} \rightarrow W$ is not multivalued, and a unique constraint, that is, if κ is also not multivalued. In this case, each unconstrained optimum is paired by no more than one constrained optimum, and vice-versa.

The foregoing illustrates that bijection of h_{s_i} is a mild condition and easily satisfied. An important exception is when i has more than one best response to a profile Ω_i^{n-1} (which can give rise to multiple game-theoretic equilibria). In this case, f_s would be multivalued and bijection of h_{s_i} is not met since a constrained optimum would be paired with more than one unconstrained optimum. Of course, an easy technical fix would be to ‘force’ unique best responses — if two behaviors give the exact same utility, assume that the individual strictly prefers one over the other.

Note, however that even if bijection of h_{s_i} is not met, equivalence can still hold if h_{p_i} is bijective. This is likely to hold, and arguably even more easily so. What it simply entails is that for every situation, i.e. Ω_i^{n-1} , there is a definite, unique divine will, which we have assumed since $f_p : W^{n-1} \rightarrow W$ is not multivalued, and that the constraint that prevents an individual from following the divine will is unique to her. That human agency – especially when following divine precepts, is such a personal endeavor makes it easy to assume that the constraints are indeed unique to the individual. As for the uniqueness of the divine will, one can easily conceive the existence of the ‘best’, most ideal behavior for every circumstance, if the best seeks to approximate the perfect nature of the divine. Two behaviors may equally satisfy a human being, i.e. maximize her utility, but can still differ when the criterion is much higher and broader, i.e. approximating the divine.

Thus, bijection of either h_{s_i} or h_{p_i} is actually a mild condition for equivalence. What is

arguably more important is whether $f_s = f_p$ is met. How ubiquitous are circumstances in which what is optimal for the individual is also what the divine wills for that individual? Perhaps plenty, assuming the benevolence of the divine. The point, however, is that it is difficult, if not altogether impossible, to know with certainty what the divine will is for every circumstance. Because one cannot be certain what f_p is, how can one be certain that it is not equal to f_s ? Thus, in matters of religion, how can one know that an individual is sincerely following divine precepts or is only being strategic, or even both?

Notice, then, that even while restricting analysis to quantifiable concepts, one still cannot make clear pronouncements about the validity of a model. For any strategic model of religious behavior, one can write an equivalent precept-based model whenever divine precepts coincide with utility-maximizing behavior. Yet to know when such coincidence occurs is to know what divine precepts are. Such an endeavor would require one to enter into the domain of philosophy and theology and therefore exit from a purely (social) scientific line of enquiry.

SOME EXAMPLES FROM THE LITERATURE

We now look at a few examples of strategic, utility-maximizing, models of religious behavior, and then posit for each an equivalent precept-based interpretation.

The seminal piece is by Iannaccone (1992) who models religion as a club, and religious activities as club goods. Each member of the religious club derives utility from consuming secular goods, from participating in religious/club activities, and from the ‘quality’ of the club, which depends on the number and (average) participation of all the members. Each of them have finite resources – time and material goods, and decides how to allocate these to the production or acquisition of secular goods, and towards religious participation.

By standard results in microeconomic theory, an efficient allocation should be attained when the marginal rates of substitution between the goods and activities equalize.⁶ A complication arises in this case, however, since an individual member’s participation in religious activities do not all accrue only to that individual. Since each individual participation raises the average participation and, therefore, the quality of the religious club, each individual provides external benefits to the other members when she participates in religious activities. This is the nature of a club good. The consequence is that each individual will tend to under provide the club good, i.e. religious participation, and therefore total allocation for the club is inefficient or suboptimal.

⁶The marginal rate of substitution is the rate at which one can give up some amount of one good in exchange for another while keeping utility constant.

One way to induce each individual to increase participation until the efficient allocation is reached is for the club to subsidize participation. However, since the particular club in question is a religion, paying its members to, e.g., attend religious services more frequently, is infeasible. Thus, an alternative to giving subsidies is to raise the cost of acquiring secular goods – for instance, by prohibiting members from consuming certain commodities, or at least stigmatizing consumption thereof. This then acts to shift a member’s resources away from secular-good acquisition towards more religious participation. Iannaccone shows that the higher the value of club quality and the greater the complementarity between religious participation and religious quality, the more likely would we see prohibitions, as this would more effectively shift resources towards participation. Also, if the secular good is a close substitute for club participation, the more likely would it be prohibited, as this would also effectively shift resources towards participation.

An extension is when individuals are heterogeneous in that some are able to produce secular goods more ably than others. For them, it is relatively more costly to channel resources towards religious participation, since they can produce relatively more secular goods using such resources. In this case, the more productive individuals, to whom prohibitions are more costly, would tend to join a religion that would have less prohibition. In equilibrium, the religion that has more prohibitions, or are more demanding, also end up with members who are more committed, i.e. devote more to participation, than to secular goods/activities.

The preceding logic is a tight application of microeconomic principles. Given the setup and assumptions of the model, the results cannot but hold. It is thus unassailable on purely economic, social scientific, grounds.

Of course, a new set of assumptions would bring about an entirely different model. A problem of indeterminacy occurs when such a model yields the same results, for in this case, which model better captures the actual motivations of the individuals? By Theorem 1, we have shown that such an equivalence can occur between a strategic model and a precept-based one when what is strategically optimal is also divinely ordained.⁷ And what is a simple, Occam-razor-like, alternative model to Iannaccone’s than one that assumes that religious prohibitions, rather than set by a club, are actually divinely ordained?

⁷To be precise, Iannaccone’s model is actually not game-theoretic. However, it is ‘strategic’ for our purposes in that the optimal allocation for the club takes into account the externalities generated by each individual’s participation. Thus, it can be cast into the strategic model in section 3 by focusing on maximizing utility from religious participation, and setting as the individual’s constraint the required equilibrium conditions for (club) allocative efficiency. That is, suppose the utility function is $u_s(x, \Omega_i^{n-1})$, where x is i ’s religious participation and Ω_i^{n-1} the religious participation of the other $n-1$ individuals. So i could solve $\max u_s(x, \Omega_i^{n-1})$ subject to i ’s budget constraint and the required allocations between religious participation and the other goods from each individual member that together achieve efficiency for the club.

To be clear, Iannacone is quite careful in that he does not claim that religious prohibitions are set by the club *in order to* obtain optimal levels of religious participation. He does not ‘endogenize’ or model prohibitions as a strategic choice of religious leaders. Rather, he rationalizes the existence of prohibitions by demonstrating that they have a function in the club – specifically, they help the religious club achieve higher levels of religious participation.⁸ That the end result is allocative efficiency does not imply intentionality on the part of religious leaders. They may simply be carrying out the divine will.

In other words, an alternative to human (economic) logic is a divine one. One cannot rule out the possibility that, rather than strategic religious leaders, it is an all-knowing God that ordains the prohibitions precisely in order to encourage greater commitment to religious practices. The end result – that greater prohibition screens out less committed individuals, is the same. In the Old Testament, God gives the Mosaic Law to the Israelites to set them apart as a people. “You shall therefore keep all my statutes and all my rules and do them shall be holy to me, for I the Lord am holy **and have separated you from the peoples, that you should be mine**” (Leviticus 20: 22, 26). Pope Francis, in his general audience on Aug. 11, 2021, reiterates the Catholic Church’s view that “...at that time, a Law like this was necessary, it was a tremendous gift that God gave his people. Why? Because at that time paganism was everywhere, idolatry was everywhere and human behaviour was a result of idolatry. Because of this, the great gift **God gave his people is the law, so they could persevere.**”⁹ (Emphases mine.)

More recently, Seabright (2024) proposes to expand the notion of religious goods and activities: more than a club, a religion is a network or a platform that produces platform goods. Like a club good, an individual’s religious participation generates external benefits to all members, but because the club is actually a network, the externalities are much bigger. Individual participation does not simply raise average participation – rather, external benefits are produced for each connection in the network. Thus, even keeping constant the number of members, a denser network – one with more connections among its members, generates greater aggregate external benefits from participation. Moreover, the nature of a platform is such that it becomes less costly to provide additional goods once the network is in place, which allows a bundling of religious goods and activities.

⁸Besides economic models of religion, many models of institutional change adopt a similar functionalist approach. The same criticism applies – just because there is an economic rationale for the persistence of an institution does not necessarily imply that it was established because of it. (See Desierto and Koyama (2024) for more detailed discussion.)

⁹For the full transcript, see https://www.vatican.va/content/francesco/en/audiences/2021/documents/papa-francesco_20210811_udienza-generale.html (Pope Francis, 2021)

An alternative, equivalent, interpretation is that an individual simply wants to participate, e.g. pray or worship God, in order to follow divine precepts. The denser the network, the larger the aggregate prayer or worship. In fact, perhaps one can read a platform good-like nature of prayer from the New Testament: "...if two of you agree on earth about anything for which they are to pray, it shall be granted to them by my heavenly Father. For where two or three are gathered together in my name, there am I in the midst of them" (Matthew 18: 19-20). The passage suggests not only that prayer from multiple individuals is more efficacious than individual prayer but, more importantly, that it takes only two individuals to generate this effect. Thus, a network of more than two individuals, since it can generate more than one 'prayer-pairing', produces much greater aggregate worship.

While Iannaccone (1992) and Seabright focus on an individual's religious participation, other papers have modeled the activities of religious leaders. An example is the choice of these leaders as to what level of strictness to adopt and enforce on religious members. This is akin to setting prohibitions – the more onerous the prohibitions, the stricter the membership requirements, which Iannaccone treats as exogenous to his model. There are later attempts to endogenize this, notably Montgomery (1996), Carvalho and Koyama (2016), Carvalho et al. (2017), and Barros and Garoupa (2002). (Similar ideas are also in Finke and Stark (1985, 1987); Finke and Stark (1988), and Finke and Stark (2005)).

In these models, each individual chooses a church or denomination that maximizes her utility, and each denomination chooses the level of strictness that is also utility-maximizing to it. For instance, in an application of the Hotelling, spatial location, model, Barros and Garoupa (2002) depict levels of strictness along a continuum – a line. Consider a particular point on this line, a level of strictness a . An individual whose preferred strictness level is nearer a would find it less costly to join a church with strictness a , than an individual whose preferred strictness is farther from it. A benevolent church would then locate itself, or choose a strictness level, that would maximize its members' welfare, which in effect minimizes the costs of joining of as many members as possible. (Thus, the utility of this benevolent church is simply the sum of its members individual utilities.)

What if the divine will is precisely to accommodate such costs? Note, here, that strictness does not necessarily refer to changes in doctrine. Even in the Catholic Church which holds doctrine unchangeable, the principle of subsidiarity gives discretion to the bishop on how to conduct matters in his diocese (for as long as there is no violation of doctrine). Then it could be that what seems like strategic behavior on the part of religious leadership to maximize its members welfare is just

an act of obedience to feed God's flock.

While Barros and Garoupa (2002) assume that the church, or its religious leaders, want to maximize its members' welfare, other models attribute a less benevolent motive. "Anderson et al (1992), Davidson and Ekelund (1997) and Ekelund et al. (1989, 1992, 1996) analyze the actions of the Roman Catholic Church as a corporation aiming at monopolizing the religious market by regulating social norms (e.g. sin and redemption), eliminating competition (e.g. the Crusades) or controlling usury and exchange doctrines, scientific innovations or the marriage market. Yet another possibility in their context is to consider a more selfish objective function: a church maximizes the revenues from rent-seeking" (quoted in Barros and Garoupa, 2002, 560).

Note, however, that even granting that the Catholic Church was a monopoly in medieval times, it does not imply that it was deliberately behaving monopolistically. The accumulation of wealth, for as long as it involves only licit activities, might arguably coincide with the divine precept of 'stewardship'. The Catechism of the Catholic Church (no. 2402) states that God "...entrusted the earth and its resources to the common stewardship of mankind to take care of them, master them by labor, and enjoy their fruits." St. John Chrysostom writes in the 4th century: "For our money is the Lord's, however we may have gathered it" (in "On Wealth and Poverty", p. 49).

Thus, what is apparent rent-seeking by the Catholic Church may be indistinguishable from following a precept to pursue material wealth, especially if such wealth is "used as a tool to serve those in need and to bring glory to God" (St. Paul's First letter to Timothy 6: 17-19).

The problem is compounded because, when religious leaders spend wealth on certain goods, one cannot verify whether such goods are purely secular, or whether they also help attain religious ends. An example are the medieval cathedrals of Europe. Johnson and Acemoglu (2023) take the presence of cathedrals as evidence for rent-seeking by elites. They write: "The wealth generated by technological improvements in agriculture during the European Middle Ages was captured by the nobility and used to build grand cathedrals, while peasants remained on the edge of starvation." In a 2023 interview published by the MIT News Office,¹⁰ Johnson says "We've been struggling to share prosperity for a long time. . . Every cathedral that your parents dragged you to see in Europe is a symbol of despair and expropriation, made possible by higher productivity."

Such a view is only possible by ignoring the full value of cathedrals, including their architectural, artistic, and historical worth and, more importantly during medieval times, their role as places of worship and Christian pilgrimage.¹¹ These magnificent structures were sites of immense piety and devotion. In fact, when the Our Lady of Chartres Cathedral in France was ravaged by fire in

¹⁰<https://economics.mit.edu/news/ai-challenge-only-humans-can-solve>

¹¹For an appreciation of the tremendous importance of pilgrimages in the medieval period, see, e.g. Duffy (2021).

1194, rich and poor alike voluntarily contributed labor and material goods to rebuild it. (See, e.g. O'Reilly (1921) and Clark (1969).) A naive, rent-seeking view would see this as evidence of labor exploitation and expropriation. A believer would have no problem seeing it as a non-strategic act of religious devotion to the Blessed Virgin Mary.

Thus, one cannot categorically say whether or not a church is acting as a monopolistic firm. And yet, on the *supposition* that religions act as (either monopolistic or competitive) firms, one is led to conclude that there is a market for religion.¹² This is why an economist can depict individuals as religious consumers shopping around many options to see which religion or denomination they want to consume; and religious leaders as strategically responding to that demand by supplying the religious market with, e.g. a level of strictness, prohibitions, and even certain laws that have doctrinal basis.

An example of such laws are those relating to usury, or the charging of interest on loans. (See, e.g. Glaeser and Scheinkman (1998), Koyama (2010), and Rubin (2009)). Rubin (2009) studies the particular case of the early Catholic Church, circa 4th century. He astutely points out that prior to Emperor Constantine's Edict of Milan in 313 AD and the adoption of the Catholic Church as the official religion of the Roman empire, the Church had no official ban on charging interest rates, even when prohibitions against usury were already explicitly mentioned in the Old Testament. "You shall not charge interest to your countrymen: interest on money, food, or anything that may be loaned at interest" (Deuteronomy 23: 19-20). "Do not take usurious interest from him, but revere your God, that your countryman may live with you. You shall not give him your silver at interest, nor your food for gain" (Leviticus 25: 35-37). It was only at the Council of Nicaea in 325 AD when the Catholic Church made a definitive pronouncement against usury.

Why such delay? Rubin essentially argues that there was no need to do so when the Church was still persecuted and poor. The following demonstrates the logic.

Since the Catholic Church is committed to helping out the poor, which includes those who are impoverished due to debt, a ban on interest which would prevent overborrowing would obviate the need for the Church to bail out borrowers who default on their loans.¹³ When the Church was persecuted and poor, i.e. prior to the Edict of Milan, it had less wealth to transfer to the poor. People were then less willing to borrow since they knew that the Church had little resources to

¹²This idea, in fact, goes back all the way to Adam Smith. In his "Wealth of Nations", he argues that "self-interest motivates clergy just as it does secular producers; that market forces constrain churches just as they constrain secular firms; and that the benefits of competition, the burdens of monopoly, and the hazards of government regulation are as real for religion as for any other sector of the economy" (Iannaccone, 1998).

¹³Presumably, overborrowing would decrease since the supply of loans would decrease – lenders would be discouraged from lending when they cannot charge interest. This is my own deduction, as Rubin does not actually model the lenders' side.

bail them out. Overborrowing was naturally curtailed. Once the Catholic Church became the official religion and became more wealthy, its capacity to subsidize overborrowing grew, which encouraged more borrowing. The need to ban interest emerged, presumably to stem the flow of credit and prevent overborrowing.

The problem is that while an interest ban was not needed when the Church was poor, it does not mean that it would not have been welfare enhancing. In fact, when the Church was more wealth constrained, could not an interest ban also have discouraged lending and overborrowing? And would this also not have freed up Church resources, allowing the Church to increase transfers to the poor? An implicit requirement seems to be that there was no overborrowing when there was no interest ban. An interest ban would then not be binding – it would not prevent overborrowing when there was no overborrowing to begin with. Otherwise, an interest ban would always be welfare-enhancing – even if it prevents only some overborrowing, this would still free up some Church resources since the Church would have less borrowers to bail out.

If a ban would have been welfare-improving, why was it not instituted by the Church before the Council of Nicaea? Rubin seems to provide the answer in that this would have entailed large enforcement costs, which a wealth-constrained Church would not have been able to afford. “However, at the beginning of the fourth century, the Church had little power to limit the supply of usurious loans, as the vast majority of the population was not Christian and was thus not subject to the Church’s dictates. Indeed, an enactment by Constantine in 325 (same year as Nicaea) legalized moderate interest, **entailing that the Church had no power to enforce the laws through courts**” (quoted in Rubin, 2009) (Emphasis mine.)

Hence, an alternative model would have been a simple enforcement story: the interest ban was always there, it just was not enforceable when the Church had less resources. As noted earlier, anti-usury precepts were already recorded in the Hebrew bible. In Rubin (footnote 18): “The importance of precedent also helps explain why Christians banned interest, for which precedent existed in the Hebrew Bible, instead of banning borrowing, for which no precedent existed.” Also, (footnote 7): “A few of the early Church fathers spoke out against interest, but modern scholars generally agree that these scattered early references to the evils of interest do not imply that taking interest was forbidden in the first 3 Christian centuries (Dow 1992; Divine 1959; Frierson 1969)... Numerous local synods met before the 4th century and would have been primary forums to espouse anti-interest sentiments, but interest was not a topic that was widely discussed, if it was discussed at all (Hefele 1894 1973).”

That the anti-interest sentiments were not espoused prior to the Council of Nicaea does not

mean that the sentiments were not there. Perhaps the Church simply could not enforce them or, as in Rubin, the practical need was not there. In either case, they were not salient in earlier periods, when the Church was persecuted and poor. In this sense, the delayed or gradual establishment of usury laws in the Catholic church is not especially surprising. In fact, the whole of history of the development of Catholic doctrines show that such doctrines, while always true since they are instituted by Christ (God), were only elucidated when circumstances made them salient. At the beginning, there would have been more pressing concerns, especially since Christians were in hiding and being persecuted. The Early Church Fathers were also initially concerned with penning Apologetics and showing how Greek philosophy was not incompatible with the Christian universe. (For a thorough treatment, see Gilson (1955).)

The point is that one can provide a precept-based explanation for the emergence of usury laws. Church leaders wanted to follow divine precepts against usury, but their constraint, i.e. lack of wealth, prevented them from fully implementing it. Thus, one cannot determine the ‘correct’ model. Even if one had the transcript from the Nicene Council and found that the members were considering banning interest explicitly in order to prevent overborrowing, it does not mean that this seemingly strategic move is not also what the divine will is. In fact, Rubin quotes Early Church Fathers – Sts. Basil, Ambrose, and Jerome, who remind Church members that borrowing or consuming beyond one’s means is morally wrong. For instance, “...Borrowing is the beginning of falsity; an opportunity for ingratitude, for senseless pride, for perjury (Basil 1963, pp. 184–85)...Are you rich? Do not borrow. Are you poor? Do not borrow. If you are prospering, you have no need of a loan; if you have nothing, you will not repay the loan (Basil 1963, p. 186)”.

It is simply impossible to determine which type of reasoning convinced any member of the Nicene Council – the strategic motive of preventing overborrowing to conserve Church wealth, or the precept-based reasoning in which God prohibits usury in order to prevent overborrowing and the moral corruption/degradation associated with it. Even if one openly declared one’s motive, it would be cheap talk since both strategic and precept-based motives would lead to the same observed behavior – that of voting in favor of banning interest on loans.

To consider a final example, note the reflexivity of the equivalence result from Theorem 1: a strategic model may have an equivalent precept-based interpretation, but a precept-based model can also have an equivalent strategic interpretation. The latter may be of greater importance. This is because an individual can endow moral legitimacy to otherwise bad (strategic) behavior by precisely claiming that such behavior accords with the divine will. The problem is most acute when that individual is both a secular and a religious ruler, or when there is little separation

between secular and religious authorities.¹⁴

Indeed, Platteau and Aldashev (2014) note that “...recent history offers many examples (Egypt, Sudan, Algeria, Pakistan, Indonesia, and Iraq) showing that cynical political rulers, often with a secular background, use Islam as readily available ideology and instrument of legitimacy to defeat criticism, entrench their power and privileges, or bolster their nationalist credentials”. Such ‘instrumentalization of religion’ is certainly not specific to Islam. In medieval Europe, rulers have used religion to justify nation-building. Prompted by the Protestant Reformation, the 16th century in particular saw a violent alignment of nation states along both political and religious lines. Aldashev and Platteau quote Kaplan (2007, p.102): “...religious enemies, their hatred fanned by confessional ideology became political enemies, and vice versa ... Competitions for power, wealth, or land became cosmic struggles between the forces of God and Satan”.

The preceding demonstrates that, just as it is important not to mistake divine logic for a human (strategic) one, it is perhaps more important not to mistake strategic behavior, especially of rulers, for a divinely ordained one. To this end, political-economy models of religion, even if unfalsifiable, are arguably of great value, since they can reveal plausible strategic motivations underlying the observed actions of a ruler.¹⁵

One such model is provided by Desierto and Koyama (2024) who formally demonstrate that a rent-seeking ruler will persecute a non-dominant religion if, by doing so, members of the dominant religion will refrain from conducting their own pogroms against members of the non-dominant religion. That is, religious persecution of the state can substitute for localized persecution by civilians. The strategic reasoning is that quelling pogroms may be more costly to the ruler than directly persecuting the non-dominant religion, which then dissipates her rents. She would then prefer to persecute officially.

A simple precept-based interpretation would be that the ruler is divinely ordained to combat heresy and maintain order in society, which a strategic ruler can use precisely to justify religious persecution.

¹⁴Johnson and Koyama (2019) argue that when there is no separation between church and state, religious persecution is more likely to occur because the church’s aim of suppressing heresy can be enforced by secular rulers using the coercive powers of the state. In exchange, the church endows legitimacy to the ruler. This ‘bargain’ is what makes religious persecution an equilibrium outcome.

¹⁵See, e.g., Carvalho, Koyama, and Williams (2024); Bisin, Rubin, Seror, and Verdier (2023); Bénabou, Ticchi, and Vindigni (2021); Saleh and Tirole (2021); Auriol and Platteau (2017).

CONCLUDING REMARKS ON INDETERMINACY

This paper has shown that one cannot readily attribute correct motives behind religious behavior. A religious adherent may be acting strategically – choosing behavior that optimizes her utility given others’ behaviors, or is simply trying to follow divine precepts. Both motivations can generate the same observed behavior *when what is utility-maximizing is also in accordance with the divine will, or vice-versa*. This condition can be made to appear to apply to many existing economic models of religion.

A question remains. For what kinds of religious behavior, if any, can one be confident in claiming that what is utility-maximizing is at odds with the divine will? In such cases, there would be no equivalence between a strategic and precept-based interpretation of observed behavior.

My own view is *not* that there are no such cases, but that one cannot know if there are. Even in cases of apparently bad strategic behavior of rulers, e.g. persecuting religious minorities, can one say with certainty that this is not in accord with some divine precept, or that it does not help fulfill some divine purpose in the larger scheme of human history? A ruler may be attempting to fight heresies but, because of her human agency, is constrained from upholding divine ideals and ends up using violence.¹⁶ In moral, Christian, terms, the ruler may want to follow God’s will, but in the exercise of her free will, ends up sinning. This could generate observational behavior that is the same had the ruler instead been acting strategically, e.g. maximizing her rents or power.

There is, therefore, an indeterminacy that is inherent in models of religion, essentially because religious behavior cannot be completely divorced from considerations of divine will. To insist otherwise is to take a dubious stance that religious adherents do not consider the object of their religion – God, when making choices about religion.

Yet to consider what religious adherents might take as divine will is no longer a strictly social scientific enterprise. The divine will presupposes a divine mind from which such will ensues and, therefore, the existence of the divine.¹⁷ Such matters have long been argued by logical positivists – from Rudolf Carnap and A.J. Ayer to Karl Popper, to be outside the purview of scientific observation. For them, there are no clear criteria against which the existence of God can be verified essentially because it is unfalsifiable with empirical observations.¹⁸

¹⁶Recall that our precept-based model precisely allows for human agency.

¹⁷George Berkeley, in “A Treatise Concerning the Principles of Human Knowledge” (1710), uses the necessity of a divine mind as proof of the existence of God. Since there are ideas in the universe that are not perceptible by humans, there must be an ‘omniscient superobserver’.

¹⁸It can be argued that *any* model in the social sciences also suffers a kind of indeterminacy that is not present in models of the physical universe. This is because there are inherent uncertainties that are more pronounced in the social, than in the physical, sciences. See Desierto (2021) for a formal treatment of the issue. See also MacIntyre

Even philosophy has not fully settled the question of whether, and how, the existence of God can be logically demonstrated. St. Thomas Aquinas offers the so-called Five Ways – five logical proofs of God’s existence, and in doing so refutes arguments that the existence of God is either self-evident or a matter of faith and therefore not demonstrable. (Summa Theologica (ST), Part 1, Question 2.) The Catholic Church maintains that knowledge of God “can be known with certainty from the created world by the natural light of human reason” (Catechism of the Catholic Church 36). “... holy Mother Church holds and teaches that God, the beginning and end of all things, may be known with certainty by the natural light of human reason” (Dei Filius 2).

And yet even if the existence of God can be logically demonstrated, it does not follow that the divine will is always demonstrable. Even Aquinas points out that not everything about the divine can be known or knowable. Some are revealed by God through sacred scripture and teaching.¹⁹ Some truths about the divine are therefore taken as given and, in this sense, axiomatic.

This is not surprising, especially in the light of Godel’s impossibility theorems in which Godel shows that no mathematical system is self-contained — there will always be some statements in the system that are unprovable within it. To the extent that logical demonstrations can be formally (mathematically) expressed, Godel’s results should apply.

Thus, for instance, in Aquinas’ Second Way, the necessity of a first efficient cause is indeed demonstrated. But that this first cause is God, or given such name, is actually an axiomatic statement. “Therefore it is necessary to admit a first efficient cause, to which everyone gives the name of God.” (ST Part 1, Question 2, Art. 3). ‘God’ here does not carry any theological substance apart from just being a first efficient cause. As Floyd (2010) points out, it is purely a nominal concept. That God is the first efficient cause, and vice versa, is a syllogism. Of course, Aquinas later on investigates the nature of God, but not when giving proof of his existence. (See also te Velde (44 2006), and Wippel (2006, 46).)

Still, God’s *entire* nature cannot be grasped by the human mind. Aquinas makes this explicit in Summa Contra Gentiles (SCG) when he says: “For the divine essence by its immensity surpasses every form to which our intellect reaches...” (SCG Book 1, ch. 14). However, some aspects of God’s nature may be gleaned from his creation. For instance, “ So when we say, ‘God is good’, the meaning is not, ‘God is the cause of goodness’, but... ‘Whatever good we attribute to creatures pre-exists in God’, **and in a more excellent and higher way**” (ST Part 1, Question 13). (Emphasis mine.)

Suppose, then, that we define the divine will concerning some human interactions as some

(1981), ch. 8.

¹⁹For a nuanced discussion of what is ‘revealable’ in Thomistic theology, see Gilson (1956).

perfection of whatever good will or intention that resides in humans. This then begs the question: what do we consider ‘good’ human intention? Might not this just coincide with what is strategically ‘optimal’ for humans, if the latter’s utility is derived precisely from pursuing unity with the divine will?

We thus have a tautology that cannot be disentangled: divine will is that which is optimal for humans who derive utility from following the divine will. In other words, it is always true that $f_s = f_p$ if f_s maximizes utility derived from following the divine will.

And how do we know that f_s does not actually take this form? Utility functions are unobservable.

Thus, not only because f_p (divine will) is not fully knowable, but also because a person’s utility function and, therefore f_s , is unobservable, that one can never know for certain whether $f_s = f_p$. This means that the possibility of equivalence between strategic and precept-based models always lurks. One is always uncertain whether a strategic or a precept-based model is the correct one.

One may counter, however, that this uncertainty may be bounded, and that one can at least make probabilistic statements about which model correctly captures religious behavior. Let us examine what this would require.

Since one cannot enter the divine mind, one cannot possibly list all the possible divine wills in any given situation. Thus, one cannot know the full support of the distribution of possible divine wills. Suppose, instead, that one can list a subset of possible divine wills and assign probabilities over them. Then, in principle, one should be able to assess how likely a divine precept is the true divine precept, and how similar an alternative utility-maximizing behavior is to that precept.

A key problem that is particular to religious models is that it is very difficult, if not impossible, to agree on what that list of (a subset of) possible divine wills ought to contain. This is because what a believer thinks the divine will can possibly be is endogenous to her religion. Thus, there can be many admissible subsets as there are many religions. Even open-minded atheists can admit a subset of the support of possible divine wills, but this subset would be different to that of a religious adherent’s. Because atheists do not have a religion, they may form their own subset of divine wills by simply taking the union of all the subsets admitted by each religion. To what extent, then, can one find an intersection of all of these subsets of divine wills?

Unless all individuals’ ideas about the divine are sufficiently similar such that everyone can agree on the subset of all possible divine wills and can assign the same probabilities over them, there will be no universal agreement as to how likely is observed religious behavior precept-driven as opposed to strategically motivated. One can, of course, condition the inference based

on one’s religion (or lack thereof) – members of different religions or belief systems could make different probability statements. However, making these statements endogenous to religious beliefs would then undermine the positive, i.e. value-free, nature of the scientific analysis of religious behavior. Even an atheist has to hold an *ex ante* view, albeit hypothetical, about the support of the distribution of possible divine wills and assign probabilities over them in order to be able to infer the probability that an observed behavior is precept-driven or otherwise strategic. How she draws the probability distribution of possible divine wills requires some normative decision as to which possible divine wills are plausible. Ultimately, then, we are left to wonder whether explanations of religious behavior can ever be purely scientific.

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