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The cultural evolution of institutional religions

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ABSTRACT

In recent work, Atran, Henrich, Norenzayan and colleagues developed an account of religion that reconciles insights from the “by-product” accounts and the adaptive accounts. According to their synthesis, the process of cultural group selection driven by group competition has recruited our proclivity to adopt and spread religious beliefs and engage in religious practices to increase within group solidarity, harmony, and cooperation. While their account has much merit, I believe it only tells us half the story of how institutional religions have evolved. Their cultural evolutionary account of religion only looks at the cultural dynamics arising from competition between groups, not at the dynamics arising from within the group. Drawing from game-theoretic analyses of the emergence and cultural evolution of social institutions, I outline two sets of important “within-group” dynamics that shape institutional religions. The first follow from the necessity to keep the interaction of the participants in an equilibrium state in order to maintain the social institution. The second arise from the competition of institutional features for traction within the group. Bringing these dynamics into account enables us to explain prominent features of institutional religions that cannot be satisfactorily explained by the current model of the cultural evolution of religions.

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1. Introduction

In recent work, a number of influential authors in the study of religion—most notably Atran and Henrich (2010), Norenzayan (2013), and Norenzayan et al. (2016)—have argued that the process of cultural group selection has recruited our proclivity to adopt and spread religious beliefs as well as psychological mechanisms strengthening our commitment to these beliefs (such as costly devotions) in order to increase within group solidarity, harmony and cooperation. This process was driven by group competition. In their own words:

cultural evolutionary processes, driven by competition among groups, have exploited aspects of our evolved psychology [...] to gradually assemble packages of supernatural beliefs, devotions, and rituals that were increasingly effective at instilling deep commitment, galvanizing internal solidarity, and sustaining larger-scale cooperation. (Atran & Henrich, 2010, p. 19)

Their account has much merit. It combines the best of both the so-called by-product and adaptive hypotheses without succumbing to their respective weaknesses. Atran and Henrich (2010), Norenzayan (2013), and Norenzayan et al. (2016) side with advocates of the by-product hypothesis in explaining the emergence of religious beliefs in terms of cognitive predispositions such as the over-extension of agency (Barrett, 2000; Guthrie, 1993) and the ease with which minimally

counterintuitive representations—such as representations of ethereal ghosts and gods—spread (Atran, 2002; Barrett, 2004; Boyer, 2001). They do not however turn a blind eye to what Durkheim (1995) has called the “secular utility” of religion. Cultural evolutionary processes, they argue, have indeed recruited these cognitive predispositions to solve the secular problem of maintaining harmony and cooperation in largescale societies. This is not mere conjecture. In support of their hypothesis they provide us with an extensive overview of empirical findings in psychological, historical and anthropological research (Atran & Henrich, 2010, pp. 19–23).

Nevertheless, Atran and Henrich (2010), Norenzayan (2013), and Norenzayan et al. (2016) provide us with only half the story of how these “cultural complexes”—i.e., modern large-scale religions—have evolved (24). Importantly, I will argue that those religions are social institutions. As any other social institution they are shaped by a series of cultural dynamics. One important dynamic is indeed cultural group selection driven by group competition. But, while it is the sole focus of current accounts of the cultural evolution of religion, it is not the only dynamic that enters into play. In order to understand the evolution of institutional religions and explain their features, we should take a series of other cultural dynamics into account. These dynamics do not arise from competition between groups—dynamics I will refer to as “between-group dynamics”—but from within the group. The latter I call “within-group dynamics.” They too have an important role in shaping religious beliefs, devotions and practices.

It should be clear that my aim is not to reject the synthesis proposed by these authors, but to enrich it. The account I am proposing is very much in line with the account they have put forward. Our religious beliefs and practices are indeed the product of both genetic and cultural evolutionary processes. Like Atran and Henrich (2010), Norenzayan (2013), and Norenzayan et al. (2016), I believe that modern religions have been shaped by cultural evolutionary processes recruiting our genetically wired proclivity to adopt religious beliefs and engage in religious devotions and practices. However, while the emphasis on cultural group selection is warranted—it explains the secular utility of institutional religions (Durkheim, 1995)—there are other important dynamics in the mix.

Drawing from game-theoretic analyses of the emergence and evolution of social conventions and institutions (Aoki, 2001; Binmore, 2005; Guala, 2016; Lewis, 1969; North, 1990), I bring these dynamics to light. The upshot of this is not merely conceptual. Bringing these dynamics into account enables us to explain prominent features of institutional religions that cannot be adequately explained by current models of the cultural evolution of religion. More precisely, within-group dynamics explain the existence of important non-adaptive features of institutional religions and the abundance of religious compensators or rewards in institutional religions. It also sheds a new light on the existence of numerous constraints on petitionary prayer and the particular public character of religious practices (as well as the process of secularization in parts of Europe).

In section 2, I explain what it means for a religion to be institutional. I address the question why institutional religions have emerged and briefly outline what cultural dynamics shape their features. In section 3, I zoom in on the “within-group dynamics,” which have been overlooked in Atran and Henrich’s (2010), Norenzayan’s (2013), and Norenzayan et al.’s (2016) account. In section 4, I show how these dynamics enable us to explain prominent features of institutional religions which cannot be satisfactorily explained if we only invoke cultural group selection. In section 5, I conclude.

2. Religion as a social institution

2.1. What are social institutions?

North (1990, p. 3) defines social institutions as “humanly devised constraints that shape human interactions.” Those constraints arise from imposing a deontic profile: an external imposition of costs and rewards associated with particular behaviors. Doing so, social institutions create rights and obligations. Borders, for instance, permit residents to roam within their confines and might not permit foreigners in or impose something on them. Marriage typically permits partners sexual

access to each other, but does not permit it to third parties. Property of an object permits free use to the proprietor and not to third parties. And the list goes on. If there is no deontic profile—no do's and don'ts—governing a particular area of human interaction, that area is not institutionalized.

Defined in this way, it should be clear that religion is not institutional by definition. Religion is possible without any constraints on human interaction. It could very well be a matter of personal conviction or even unconstrained communal experience. Contrast this with a social institution like marriage, which is by definition institutional. Were there no rights and obligations imposed by marriage, it would not qualify as a marriage but rather as unconstrained coupling behavior.

Note that not any type of obligation would make a religion institutional. Only social obligations, the kind of obligations that affect other people. These obligations can be formal, such as sharia law enforced by Muslim courts, or informal such as the Christian obligation to donate charity to the poor. People engaging on their own accord in sacrifices to a deity in order to obtain divine favors, would by this rationale not make a religion institutional since it is not an obligation that is imposed by or affects other people. Note also that the kind of social obligations that make a religion institutional are not per se moral obligations. They can very well be immoral (e.g., hostility towards the outgroup) or amoral (e.g., obligation to fast), as long as they constrain human interaction. In short, the institutional aspect of a religion is not a matter of me versus God, but of me versus others.

Religions, however, cannot be expected to fall neatly into two clearly demarcated categories: institutional and non-institutional. They are distributed along a continuum, ranging from heavily institutionalized religions such as Christianity and Islam to non-institutional (or weakly institutional) religions such as animistic religions. Institutional religions are filled to the brim with social obligations. Tellingly, of the five pillars in Islam, four of them impose obligations—pray 5 times a day, fast once a year, support the needy, and make the pilgrimage to Mecca at least once in a lifetime—while only one concerns belief: belief that there is no god except God. In a similar vein, Christian religions impose a plethora of social obligations on their participants (such as fasting, engaging in charity, and abiding by norms regarding sexuality and reproduction). On the other end of the continuum, you have the non- or barely institutionalized religions such as animistic religions imbuing the world with spiritual essence and interpreting its working along those lines, but crucially not (or at least not to the same extent) organizing human groups in certain ways. The question whether there are any religions (or have been) which are entirely void of any institutionalization—as defined above—is open for debate and would take us beyond the scope of this paper.¹

2.2. Why do social institutions emerge?

Social institutions do not emerge as “*dei ex machina*” for no particular reason. They emerge to solve pre-existing problems of cooperation in particular domains of interaction. These problems of cooperation range from problems of pure coordination to problems of competition (Guala, 2016). A problem of coordination arises when there are different ways of achieving a commonly desired result and the different actors need to agree on a way to achieve this. A good example is driving on the same side of the road to avoid collisions. It does not matter what side is picked, as long as everybody picks the same side. Problems of competition, on the other hand, arise when self-interested individual strategies lead to an outcome that is undesirable for the group. A good example is the use and acquisition of resources. In a non-institutional context where property is not enforced, individual actors will often benefit more from adopting predatory strategies to acquire goods than take the risk of producing goods. The result at the group level is detrimental, since the total amount of resources in this “non-cooperative equilibrium” will be inferior to the amount in the “cooperative equilibrium” where property is sanctioned and since there will be costly conflict (Vlerick, 2016). Many problems, however, are somewhere on a continuum between pure coordination and pure competition. In both cases social institutions are beneficial at the group level.

Similarly, religions have been institutionalized to solve pre-existing problems of cooperation. Were there no such problems to be solved with religion, it would most likely not have been

institutionalized. Our proclivity to adopt religious beliefs and engage in religious practices would not have been recruited to organize social groups. So what kind of cooperation problems are solved by institutional religions? There is no shortage of examples and they include both coordination and competition problems. Wilson (2002) devotes a whole book to the social functionality of religion and discusses a wide range of examples. One striking example is the so-called water temple system in Bali. This “extravagantly otherworldly” system, as Wilson (2002, p. 91) puts it, coordinates when farmers plant and irrigate their rice fields, when they flood or burn it for pest control and when they grow other crops for the same reason. It involves thousands of farmers and is an impressive case of a religious system solving very complex coordination problems in a very efficient way.² It also solves competition problems. It regulates the use of water—ensuring that all farmers have enough to irrigate their fields and do not use more than their fair share—and it imposes the necessary maintenance work on the various waterways (making sure that everybody contributes to keep those vital common goods in good shape).

Other examples of religions solving problems of coordination and competition abound. From preserving fish stock in Native American communities in the Klamath valley (Rossano, 2010, p. 76) over the Jewish ten commandments increasing harmony and cooperation within the community to Calvinism which, according to Wilson (2002, p. 118) “is an interlocking system with a purpose: to unify and coordinate a population of people to achieve a common set of goals by collective action.” In fact, in order to drive his point home that religions are highly adaptive at the group level, Wilson (2002) has taken religions at random from a sixteen-volume encyclopedia of religion³ and found that all of them exhibit secular utility.⁴ They all organize or organized groups in ways that benefited the group by solving problems of cooperation within those groups.

The central question is: why are religious beliefs and practices such efficient tools in solving problems of cooperation? If religion was not particularly well suited to solve these secular problems, it would—as I have pointed out above—most likely not have been institutionalized. This is not a trivial question. There is nothing inherently cooperative about religious beliefs and practices. Nor does entertaining beliefs in supernatural entities and engaging in various practices that would qualify as religious automatically make people more cooperative.

2.3. How do religions solve problems of cooperation?

Before addressing how religions solve problems of cooperation, we must take a step back and briefly discuss the origin of human cooperation. Cooperation is something humans happen to excel at. Throughout our history we sustained high levels cooperation within our groups. For this we evolved a series of moral intuitions motivating us to cooperate with our fellow group members and to punish individuals who did not reciprocate. In short, morality evolved in humans for in-group cooperation. As Tomasello and Vaish (2013, p. 231) squarely state it “from an evolutionary perspective, morality is a form of cooperation” (see also Vlerick, 2017).

While our moral psychology enabled us to cooperate intensively in the small-scale, homogenous hunter-gatherer groups in which we lived for most of our evolutionary history, it is powerless when it comes to maintaining that cooperation and harmony in the large-scale groups that emerged when we traded our hunter-gathering lifestyle for that of sedentary farmers. In this new social context, harmony and cooperation could no longer be sustained by kin-selection (favoring one’s genetic kin) and the moral machinery enabling us to engage in reciprocal altruism (helping fellow group members in the expectation that the favor will be returned in the future). In anonymous and often one-time interactions we can no longer rely on personal acquaintance and reputation tracking (monitoring whether the favors are indeed returned) to ensure that free-riders—who abuse the cooperative system by benefiting from the favors of others while not returning any—don’t get away with their cooperation eroding behavior (see also Atran & Henrich, 2010; Norenzayan, 2013; Norenzayan et al. 2016).

In order to maintain harmony and cooperation in these large groups, a series of important cultural solutions arose. Most notably social institutions such as property, criminal law, and commons management emerged. These institutions imposed punishments on individuals who threatened the harmony and cooperation within the group. Doing so, they protected that harmony and cooperation (Vlerick, 2016). But religion also played an important role. As Teehan (2016, p. 8) points out: “one means for extending the reach of our evolved moral tools was the development of religions.” Modern religions, Teehan (2010, p. 192) argues, are institutionalizations of a moral code to foster cooperation and maintain social cohesion in large-scale societies. Norenzayan’s (2013) seconds that, claiming that religion had a pivotal role in the transition from small-scale hunter-gathering groups to large scale agricultural (and later industrial) groups.

How does this work? How do religious beliefs and practices contribute to scaling human cooperation by solving problems of coordination and competition? They do so in a variety of ways. First, communal participation in religious rituals increases the empathic concern participants have for the other participants. This, in turn, leads them to behave more altruistically towards their fellow worshippers. It increases trust and decreases cheating within the religious community (Teehan, 2016, p. 17).

The actual mechanisms boosting empathic concern through communal religious practices are twofold. Firstly, engaging in synchronous movement, a key element of many communal religious rituals (e.g., synchronous dancing, praying, chanting), increases the empathic concern participants have for one another (Cohen, Mundry, & Kirshner, 2014; Reddish, Bulbulia, & Fisher, 2014; Valdesolo & DeSteno, 2011). Secondly, communal participation in religious practices is a means of signaling in-group status to one another. As Matthews (2012, p. 220) points out, these rituals are “ecologically arbitrary forms of behavior.” In other words, they are peculiar forms of behavior pertaining to a particular group. Engaging in these kinds of behavior functions to signal membership to the group. It shapes a shared identity which in turn binds people together in “close-knit” communities (Wilson, 2002, p. 104). This triggers the empathic concern we naturally feel for people in our close concentric circles (Teehan, 2016, p. 17). For the same reason, many religions use a rhetoric of fictive kinship. God is referred to as the “father” and the faithful are “brothers” and “sisters.” This too is a way to trigger the empathic concern we naturally feel for close kin (Teehan, 2016, p. 17).

In this way, religion—from the Latin “religio,” literally “to bind together”—has historically been a powerful tool to bind (large) groups together in cooperative units. The trust it generates within the group makes it easier for group members to coordinate with one another, as coordination requires trust. (It will only be beneficial for me to do my part in a coordinated effort if I can trust others to do their part). Moreover, the empathic concern it generates within the group plays an important part in overcoming competition problems. People are less likely to cheat one another (even if they could personally benefit from doing so) if they take each other’s well-being at heart. But when it comes to dealing with competition problems, religion has another card up its sleeve.

To overcome the infamous free-rider problem (central to problems of competition), free-riders must be punished (Henrich & Boyd, 2001). If the altruistic cooperation of others can be exploited, individuals who will do so have an edge over cooperators. Therefore they will outcompete these cooperators and erode the cooperation. Other social institutions—such as commons management—maintain cooperation in large groups (where reputation tracking no longer does the trick) by imposing social norms (how much of the common resource one can use, how one must contribute to keep the common resource in good shape, etc.) and punishing transgressors.

The same goes for many institutional religions. They impose social norms and punish transgressors by invoking moral gods.⁵ On the one hand, invoking moral gods punishes transgressors indirectly by motivating people in the group to punish these norm breakers. By framing rules as emanating from the will of God, those rules become sacred. Breaking them becomes a bigger deal than when those rules are perceived as merely “worldly” rules. The moral outrage felt by the people within the group when someone breaks them is therefore increased and so is the likelihood that people will actually punish the wrongdoers⁶ and the severity with which they punish them.

On the other hand the introduction of morally interested gods punishes free-riders directly. It does so by convincing potential free-riders and rule-breakers that their cooperation eroding behavior will be met with supernatural punishment. This is the central claim of the so-called “supernatural punishment hypothesis.” Powerful moralizing gods, such as the Abrahamic God, strongly deter from norm violation, according to Atran and Henrich (2010), Norenzayan (2013), and Norenzayan et al. (2016). They do so because they are believed to punish transgressing behavior (sinners go to hell) *and* to monitor behavior when no one is around to watch. This combination makes them wonderfully suited to keep people in line. The perceived punishment for free-riding is radically increased as is the chance of being caught red-handed. “Watched people are nice people,” Norenzayan (2013) points out.

This is backed by experimental research shows that priming religious people with “a watching god” makes them more altruistic and less likely to cheat (see Atran & Henrich, 2010; Norenzayan, 2013 and Rossano, 2010 for an overview). More generally, a rapidly growing body of empirical research links belief in moral gods with increased prosocial behavior (Ahmed & Salas, 2011; Atkinson & Bourrat, 2011; Johnson, 2005; Johnson & Bering, 2006; Johnson & Kruger, 2004; McKay, Efferson, Whitehouse, & Fehr, 2011; Norenzayan, 2013; Shariff & Norenzayan, 2007, 2011; Shariff & Rhemtulla, 2012).

However, since those supernatural punishments are not actual worldly punishments, the system is vulnerable to exploitation. Free-riders could feign religious beliefs. Doing so, they would convince their fellow group members that they too abide by the sacred rules, while in fact they do not. They could profit from the benefits generated by this intensively cooperating religious group, without engaging in any of the imposed social obligations (since they would not be fearing God’s watchful eye and severe punishments). This is an important problem for prosocial religions. They are, as Iannaccone (1992) points out, “club goods.” They generate a positive return for members.⁷ Therefore, they are inherently vulnerable to free-riding: to being abused by people who profit from being perceived as members without paying their “membership fee” (i.e., not taking on any of the obligations).

In fact, as a reviewer has rightly pointed out to me, this “supernatural punishment system” might even create a selective pressure for the evolution of such free-riding religious hypocrites. They would have a clear advantage in terms of survival and reproduction over religious, norm abiding individuals and therefore pass on more of their non-religious, free-riding predispositions to the next generation.⁸ For the system to survive, therefore, free-riding must be prevented.

What is required to keep free-riders out of the “club,” is a sure-fire way to distinguish genuine believers from religious hypocrites. A “hard-to-fake” signal of genuine commitment (Irons, 2001). Such signaling, as it turns out, is rampant in religions. From fasting and pilgrimages over painful rituals such as flagellation, scarification and reenacted crucifixion to martyrdom, these extravagant practices engaged in by the faithful signal genuine commitment to the religion to fellow worshippers. They do so precisely because they are so costly.

Professing belief in some god is easy, fire-walking to prove one’s commitment not so much. As Irons (2001, p. 298) points out: “other things being equal, the costlier the signal the less likely it is to be false.” This is why these extravagant practices are so common in religions, according to Irons (2001), Sosis (2003, 2006), Bulbulia and Sosis (2011). These practices (culturally) evolved to protect those altruistically cooperating religious communities against free-riding religious hypocrites. They deter potential free-riders from entering the community *and* enable the members to separate the committed members from the less committed ones and discriminate in trust. This is not mere conjecture. On the one hand, Aimone, Iannaccone, Makowsky, and Rubin (2013) have tested the hypothesis that imposing personal sacrifices on members counteracts free-riding in a public good experiment. As expected, they found that groups imposing higher sacrifices were better able to screen out free-riders and increase the public good. On the other hand, Sosis and Bressler (2003, p. 223) found that on average the more costly requirements religious communes impose on their members, the longer-lived these communes are.

As Sosis (2003) points out, these signals must be costly enough to offset the benefits of free-riding. As long as the benefits of joining the religious “club” outweigh the costs to be considered a member, the system is open for abuse. In that case, free-riding religious hypocrites would benefit from performing the costly rituals in order to reap the rewards of the group’s altruism. But this poses a problem. If the costs of signaling membership outweigh the benefits of being a member, why would anyone join? There would be no risk of free-riding, but the religion would no longer be a “club good” (Iannaccone, 1992). This could lead to the demise of the religion.⁹

Sosis (2003) offers a solution to the problem. On the one hand these (costly) ritual practices engender belief. People abhor cognitive dissonance. When their actions are not in line with their beliefs, they often change their beliefs. So by engaging in practices that signal commitment to religious beliefs, people are actually prone to develop that commitment and adopt the beliefs. (Even if initially they may only have partaken in order to reap the benefits of membership to the community). So imposing signals of genuine commitment do not only serve to keep hypocrites out, it also converts hypocrites into true believers.

On the other hand, costly signals need only outweigh the benefits of membership in the perception of outsiders who may otherwise abuse the system. Fasting, frequent praying and pilgrimages are costly for both believers and non-believers. But they are not considered as being as costly by people who genuinely believe that failing to uphold these practices will end in eternal damnation as they are for non-believers who do not entertain such beliefs (Sosis, 2003, p. 103). Costly signals should not deter genuine believers, only potential free-riding religious hypocrites in their cost—benefit analysis.

So in order to solve problems of (large-scale) cooperation, religions have culturally evolved an amalgam of features: rituals for bonding and in-group signaling, supernatural punishers to keep people in line and costly signals to keep free-riders out. These institutional religions recruited our predisposition for entertaining religious beliefs and engaging in religious practices in order to solve secular problems of coordination and competition. In order to properly understand how these “packages of rituals, devotions and beliefs” (Atran & Henrich, 2010, p. 19) have been shaped, we need to take a closer look at what drives their cultural evolution.

2.4. What shapes social institutions?

Social institutions impose a deontic profile (rights and obligations) on members of a group (the participants to the social institution). Doing so they organize the group in a particular way in order to “solve” pre-existing problems of cooperation. In game theoretic terms, social institutions set out the rules of the game and are efficient to the extent that they increase the total payoff of the game for its participants (Binmore, 2005; Vlerick, 2016). Some institutions will be more efficient in solving those pre-existing problems and maximizing the total payoff for the group than others. Groups with such institutions will on average outcompete other groups with less efficient institutions. As the outcome of cultural group selection, the most efficient social institutions or institutional features prevail at the expense of less efficient counterparts. This selective process shaping social institutions is the first dynamic. I call it “between-group dynamics.”

Between-group dynamics come about through group competition and result in the most efficient institutional models (yielding the largest payoff for the group) being selected over less efficient models. This important insight is at the core of the cultural evolution theory of religion proposed by Atran and Henrich (2010), Norenzayan (2013), and Norenzayan et al. (2016). They rightly point out that cultural group selection shaped religious beliefs, practices and devotions in such a way as to galvanize prosocial norms and enhance large scale cooperation. Indeed, religions or religious features that were able to solve the problem of (large-scale) cooperation were selected over other religions and/or religious features.

Note that these cooperation enhancing, culturally adaptive features can come about through blind trial and error or foresighted design or anything in between those two extremes. Some adaptive features may have crept in the religious system through pure chance and subsequently spread. On the

other end of the spectrum, some authority figure may have altered religious beliefs and/or practices precisely to create the intended culturally adaptive feature (such as enhanced cooperation or social harmony). Calvin's reforms, for instance, are said to be specifically tailored to the societal context of 16th Century Geneva in which they were first implemented (Wilson, 2002, p. 71).

While cooperation has been getting all of the attention in Atran and Henrich's (2010) paper, there are other important adaptive features in the deontic profiles imposed by institutional religions that emerge through group competition. Features such as incentivizing procreation, proselytism, as well as out-group hostility and warfare—key features accounting for the cultural success of religions such as Christianity and Islam—have a very important role in spreading a religion. Whereas enhancing cooperation and in-group harmony indirectly promotes the expansion of a religion (through the success of the group at the expense of less efficiently organized groups), the latter features are directly related to spreading the religion. Those features are not solutions to the pre-existing problem(s) solved by institutional religion. They are nevertheless the product of cultural group selection driven by group competition and are directly connected to the cultural success of religions that have integrated them.

Cultural evolution through group competition, however, is not the only dynamic shaping institutional religions and efficiency is not the sole outcome. In addition to between-group dynamics any social institution is also subjected to within-group dynamics. By and large, the latter have been overlooked and bringing them to the attention fosters a series of new insights into what shapes institutional religions.

3. Within-group dynamics

Deontic profiles do not emerge out of thin air, fully formed and ready to enter this cultural selective process. Rather, they emerge from the bottom up. More particularly, they emerge from the dynamic interplay of strategies adopted by the individual participants and are maintained as long as these strategies hold each other in equilibrium. As Guala (2016) points out, institutions are rules in equilibrium. If any participant has an incentive to deviate she will do so. When enough participants do so they change the dynamics of the game, upsetting the equilibrium and ultimately the social institution.

Moreover, competition between institutions and institutional features does not only happen at the level of groups (in which more efficient institutions or institutional features outcompete less efficient counterparts) but also within the group. Some institutions and/or institutional features will get more traction from the members than others and therefore outcompete those. That competitive advantage may come from being more attractive and/or being more protective (i.e., better able to retain its participants). The latter three dynamics—stability (convergence to and maintenance in equilibrium states), attractiveness, and protectiveness—I refer to as “within-group dynamics.” These dynamics, as signposted earlier, have been overlooked by the current cultural evolutionary accounts of religion.

3.1. Stability

The first set of within-group dynamics are the constraints that follow from stability. The costs and rewards imposed on strategies adopted by the participants must be such and must be maintained in such a way that nobody (or at least not many) have an incentive to deviate from acting in the way required to uphold the institution. If many participants do have such an incentive, they will follow suit and the “game” is kicked out of equilibrium. Consequently, the institution either evolves into something else or disintegrates altogether.

Rules, as Guala (2016, p. 7) points out, are only followed to the extent that people are incentivized to do so. Binmore (2005, p. 12), in this regard, argues that social contracts (culturally evolved rights and obligations imposed on the participants of a group) do not (and cannot) require individuals to sacrifice for the group. The same goes for the social obligations imposed by religion. People will only

abide by those rules to the extent that they perceive that it is in their self-interest. This important point has been developed by Stark (1997) who argues that individual religious behavior is based on rational choice. Participants weigh costs and benefits in view of maximizing their net benefit. This imposes an important constraint on the social obligations imposed by religions (as it does for any other social institution). As long as participants have a personal benefit by deviating from the actions the institution imposes on them, they will do so and cause the demise of the institution.

A social institution therefore can only be stable when its participants maximize their personal payoff given the structure of the game (rules) and the strategies adopted by other players. This is known as a Nash equilibrium in game theory. In a Nash equilibrium no player can improve his payoff by unilateral action. Whenever you have a domain of interaction in which all individuals attempt to maximize their payoff independently of one another (without coordinating with the other players) and their payoff depends on what other individuals are doing, that domain of interaction will gravitate to a Nash equilibrium. This happens automatically. Given that all participants to the game pursue their own self-interest, they will alter their strategy as long as they have an interest to do so. The game only stabilizes in a Nash equilibrium, and therefore continues to evolve until it reaches such a point. Those equilibria are ubiquitous. They are found in radically different contexts ranging from naturally selected animal instincts (Smith & Price, 1973), over social conventions (Lewis, 1969), to international law (Ohlin, 2011).

To see how the process works imagine in the context of a pure coordination problem, how a social institution imposing traffic rules might arise. Assuming that in the hypothetical pre-institutional state people drive on both sides of the road, unable to avoid costly collisions with oncoming traffic. Drivers, however, would be incentivized to start driving on the side of the road on which most people drive and the game would soon stabilize to a situation in which all drivers drive on the same side. In this state the game is in Nash-equilibrium, where nobody has an incentive to deviate from her strategy.

The payoff matrix of the “driving game” clearly shows how all drivers benefit from either all choosing the left side or all choosing the right side (and getting a payoff of 10 instead of 0):

| | | |
|-------|--------|--------|
| | Left | Right |
| Left | 10, 10 | 0, 0 |
| Right | 0, 0 | 10, 10 |

Given that the strategy of any given player depends on the payoff structure of the game (or, more accurately in the context of institutions, her perception of the payoff structure of the game) and the strategies adopted by other players (or, again more accurately, her perception of these strategies), the stability of the game depends on two important conditions. The first condition is that the subjective perception of the payoff structure of the game remains more or less constant. The second is that the expectation is maintained that the other players will stick to their strategy in the future. If either the perception of some players of the game changes or they expect other players to deviate from their strategies, these players will be incentivized to alter their strategy because their best response to what other players are doing given the structure of the game changes. Consequently, the game is kicked out of equilibrium.

Aoki (2001, p. 4) points out that if subjective perception is upset and “a state of general perceptual crisis” ensues, there will be a search for new subjective models (new understanding of the underlying structure of the institution) until a new equilibrium is reached. Take Marxism for instance. According to Taylor (1985, 94), Marx’s theory radically changed the perception of capitalist society and its institutions. What appeared to be free contractual exchange between two independent agents (industrial owner and laborer), is now reframed in terms of a power structure, where laborers are forced to sell their labor for subsistence at a price many times lower than the profit they generate for the owners. This changed the subjective perception of these capitalist institutions held by a large chunk of the participants to these institutions—the so-called proletariat—which in turn altered their strategy (opting for revolution) and caused the subsequent demise of the social institutional system.

The stability of a social institution—as explained above—also depends on the expectation that the other participants will act as they have before. It therefore depends on what Lewis (1969) has called “common knowledge.” Common knowledge arises when all the participants do not only know something, but also know that everybody else knows this and that everybody else knows they know this. In the context of social institutions, these recursive inferences create the expectation that the other participants will pursue their strategy, which in turn is necessary for stability.

They do so for the following reason. Given that I know that what others have been doing is a best response to what I’m doing, I can expect them to keep doing what they have been doing as long as I keep doing what I have been doing. They in turn expect me to keep to my strategy to the extent that they keep to theirs (since they too know that my strategy is a best response to theirs). In other words, if we all know, not only what others have been doing but also that they have an incentive to keep doing that as long as everybody else keeps doing what they have been doing and everybody knows this (of everybody else), nobody will have an incentive to change strategy and the game is locked in a stable equilibrium.

In the context of religion, as Stark (1997) argued, it will only be rational for adherents to take on the costly altruistic obligations towards other adherents imposed by the religion, as long as many others do so. Because then the potential payoff outweighs the costs because one can expect to be the recipient of these altruistic gestures from others. In order to determine whether to take on the costs, however, one needs to know that others will also do so (because only then does it become beneficial to do so). For this you need common knowledge.

This common knowledge is created through signaling in-group status. This is the central point of Matthews (2012) “recognition signal hypothesis.” Religious signaling, it should be clear, does not only serve the purpose of keeping free-riders out (solving problems of competition) but also to identify coreligionists (solving problems of coordination). This signaling is often “cheaper,” such as wearing a Muslim veil or a “bindi” (a Hindu dot). Costly signals are only needed for dealing with problems of competition posed by altruistic cooperation (where an individual sacrifices some immediate fitness for a delayed fitness reward), not for dealing with problems of coordination posed by mutualistic cooperation (where there’s an immediate reward for all parties). In the latter case—such as for instance signaling belonging to a religious community for marrying a coreligionist (Matthews, 2016)—there is no risk of dishonest signaling (for the purposes of free-riding) and signaling does not need to be costly.

3.2. Attractiveness

The second kind of within-group dynamics is what I called “attractiveness.” Institutions and/or institutional features do not just compete with each other by organizing groups as efficiently as possible and giving them a competitive edge over other groups (between-group dynamic), they also compete for traction within the group. Individuals will only participate in social institutions in general and religion in particular when they perceive they benefit from it (Binmore, 2005; Guala, 2016; Stark, 1997). Institutional religions therefore compete for allegiance by attracting participation.

The same goes for religions. The idea that religions compete with each other for allegiance is the central point of Finke and Stark’s (1992): “The churching of America.” In their seminal work, they analyze the rise and decline of religious denominations in the US as the outcome of a “free market” competition between these denominations. This is a key insight of the so-called “economics of religion” and has been explored and developed more recently by Jelen (2002). Some religions or religious features get more traction than others. The steep rise of Christianity, for instance, that led to demise of the pagan Roman religion can be attributed according to Stark (1997, p. 167) because “Christianity was by far the best religious “bargain” around.” Three major factors contribute to the attractiveness of a religion.

The first is the extent to which it is centered around salient practices and beliefs. The more those beliefs and practices are intuitively compelling, the more psychologically appealing the religion

becomes. This is nothing new of course. The founding premise of the cognitive science of religion is that religious beliefs and behavior are constrained by human psychological nature. Not only do religious beliefs and practices emerge from cognitive and affective predispositions, these predispositions also hold religions on a leash in their evolution. Intuitively compelling elements keep creeping back into religions, despite the sometimes arduous efforts of theologians to enforce an official doctrine. Boyer (2001, p. 281) aptly refers to this as the “tragedy of the theologian.” When push comes to shove, the beliefs adhered to and the practices engaged in by the members of a religious community are determined by those members. Their predilection for intuitively appealing beliefs and practices steer religion in a particular direction.

Secondly, costly signaling in religion, which Henrich (2009) calls “credibility enhancing displays,” are not only mechanisms to keep religious free-riders out, they are also powerful tools to attract participation. Not because these displays are intuitively appealing to their participants but because they have a persuasive effect. Exposure to these signals of genuine commitment to the religion have been linked to increased theism (Lanman & Buhrmester, 2017). Therefore, in the context of the within-group dynamics developed in this paper, these displays—ubiquitous in institutional religions—can be seen to serve two other functions. The first is to signal commitment to others necessary for creating the expectation that adherents will keep paying the social costs imposed on them (stick to their strategy) which stabilizes the game through common knowledge. The second is to attract participation by showcasing an unwavering commitment to the religion. Martyrdom in early Christianity, for instance, is considered to have had an important instrumental role in spreading Christianity (Stark, 1997).

Thirdly, given that institutions and institutional features compete for allegiance within the group, we can expect there to be many rewarding features in religions. Reasoning from a rational choice model of adherence to a religion, features such as a promised blissful afterlife, forgiving of sins, and being the object of divine love and care, have an important attractive character. Stark calls such features “religious compensators.” He argues that, despite the uncertain nature of these religious promises, “they offer the prospect of huge rewards, rewards that are otherwise not plausibly obtainable from any other source” (Stark, 1997, p. 169). This makes them, and associated with them religions, especially attractive. Consequently, those features can be expected to be rampant, as the outcome of within-group dynamics.

3.3. Protectiveness

In their competition for traction within the group, institutions do not only have a competitive advantage when they are attractive, but also when they are protective. This is especially relevant for religious institutions in the context of a free market of religions (Finke & Stark, 1992; Iannaccone, 1992), where many different denominations compete for allegiance. Religious institutions that make both religious and secular alternatives¹⁰ less attractive will have an edge over others.

Institutional religions do so, according to Iannaccone (1992), by imposing a “tax” on those alternatives. By imposing important behavioral restrictions (such as food taboos rampant in many religions,¹¹ prohibitions to conduct business on Sabbath for Jews, imposed celibacy for catholic priests and monks, etc.) they make alternatives less accessible and therefore ultimately less attractive to their members. These restrictions inhibit participation and reduce productivity in alternative contexts, as Iannaccone (1992, p. 275) points out. It is a powerful mechanism to prevent members of participating in competing institutional contexts (especially in secular institutions). So, in addition to preventing free-riding and attracting participants, imposing costly behavior on the faithful functions a means to protect membership.

In this context, Iannaccone (1997) argues that most successful sects maintain a certain amount of tension with the surrounding society. Similarly, Berman (2000), explains the rise of ultra-orthodox Judaism (where prohibitions and obligations on members are increased) as a protective response to secular alternatives becoming more attractive (because of rising wages). By increasing

the restrictions on the faithful, they are increasingly isolated from the surrounded society and increasingly stigmatized by members of that society. This, in turn, discourages the faithful from joining secular activities.

4. Extending the explanatory scope

A theoretical framework is only as good as its explanatory power. What do within-group dynamics add to our understanding of religion? I believe they explain four prominent features of institutional religions which are either left unexplained by Atran and Henrich's (2010), Norenzayan's (2013), and Norenzayan et al. (2016) explanatory model or—to the very least—are not satisfactorily explained if we only take cultural group selection driven by group competition into consideration.

4.1. Non-adaptive features

The first is that we should expect there to be some non-adaptive features in institutional religion. Features which do not only fail to contribute to solving the pre-existing problem for which the social institution evolved as a solution but actually counteract some of the adaptive features that were selected as the outcome of between-group dynamics. These features are the result of the dynamic interplay between individual, self-interested strategies shaping the deontic profile of the social institution bottom-up.

A good example of such a counteractive non-adaptive feature creeping into to the religious system, I believe, is the Medieval Catholic practice of trading indulgences. This practice reduced the amount of supernatural punishment (time spent in hell or purgatory) one had to undergo for one's sins against payment. It flies in the face of the culturally selected function of religion as enhancing cooperation by enforcing norm abidance through supernatural monitoring and punishment. Transgressors who can afford it, can now buy their way out of punishment and are therefore less incentivized to abide by the rules. It does however make a lot of sense from a within-group perspective in which individuals are out to maximize their personal payoff within the system. Any given time, therefore, that two parties can mutually increase their payoff, they can be expected to do so. Indulgences do just that. They benefit the clergy selling these indulgences and they benefit the people who can afford it. Win-win at the individual level, even though it comes at the expense of the group-level payoff.

To this a reviewer has rightly objected that indulgences do not decrease punishment for deviant behavior, rather they substitute a real worldly punishment (the money one pays for absolution) for an imagined supernatural punishment. However, whereas originally one could only buy indulgences for past sins, the practice evolved so that eventually one could also buy indulgences for future sins one might commit (or even sins one planned on committing). A notorious monk named Johann Tetzel is said to have sold indulgences on the market place claiming that: "even the sins you shall hereafter desire to commit, shall be all forgiven you. There is no sin so great that indulgence cannot remit. Pay, only pay largely, and you shall be forgiven." (Guinness, 1887). To the extent that indulgences were purchased for future sins, it is the reasonable to assume that the practice did (at least in some cases) relax norm abidance for those who could afford it (and therefore was counter adaptive).

Therefore, over and above the fact that human psychology will constrain the process of cultural group selection leading to adaptive features—given that psychological dispositions are recruited by this process (Atran & Henrich, 2010)—constraints to adaptive efficiency also arise from another source. Deontic profiles of institutional religions are not only the product of top-down selective forces (cultural group selection) but also of bottom-up forces. In particular by the dynamic interaction of individuals adopting strategies aimed at maximizing their (individual) payoff.

4.2. Rewarding features

A second important insight is that religious features compete for allegiance within the group. We should therefore expect to see a plethora of rewarding features in institutional religions, such as heaven, an after-life, forgiving of sins, and recourse to petitionary prayer. *Prima facie*, the presence of such features may seem weak evidence for within-group dynamics. After all, couldn't those rewarding features also be explained from a between-group perspective, in which they would have a "carrot" function" to incentivize people to adopt cooperative and other desired behavior? A reward to motivate members of the group to abide by the rules imposed by religion (and selected through group competition).

This line of argument however runs into problems. Shariff and Norenzayan (2011) found out that belief in a rewarding God leads to more cheating than belief in a punishing God. In a similar vein, Shariff and Rhemtulla (2012) argue that belief in hell is much more efficient than belief in heaven in getting people in line. In other words, the stick works better than the carrot. But, as Shariff (in Norenzayan, 2013, p. 52) points out, if you want people to feel good and gain converts, feed them carrots (i.e., give them heaven). Analyzed from the dichotomy of between- and within-group dynamics introduced in this paper, you might say that there is a trade-off between between-group dynamics selecting for punishing features and within-group dynamics selecting for rewarding features. More generally, between-group dynamics increase the payoff at the group level by imposing costs on the individual level, while within-group dynamics increase the payoff at the individual level (often at the expense of group level payoff). The so-called religious compensators (Stark, 1997, p. 169) squarely fit in the latter kind of dynamics and are hard to account for from a cultural evolutionary perspective focused on between-group dynamics.

4.3. Immunization

Thirdly, given that the stability of a social institution depends on a relatively constant and enduring subjective model of the institution by its participants, we can expect there to be constraints on religious practices in order to minimize the chances of what Aoki (2001, p. 4) has called a "cognitive crisis." This is especially relevant in the context of religion which—given the supernatural nature of its belief system—is particularly vulnerable to falsifying evidence.

The most prominent way in which this constraint on practice plays out is in the constraints exhibited in petitionary prayer. Asking god(s) to produce favorable outcomes is common practice in many religious contexts. People typically pray for better health, success, happiness for themselves and their loved ones, etc. Interestingly however, as Boudry and De Smedt (2011, p. 456) point out, although the addressed divinity is typically considered as all-mighty, the way His intervention is solicited is often in a very subtle way. In general, people tend to prefer psychosocial petitionary prayer (e.g., grant me the strength to endure my ordeal) to mechanical petitionary prayer (change the physical world to remove my ordeal). Similarly, praying for better health is common place, but praying for an amputated limb to (magically) grow back is rare (Boudry & De Smedt, 2011, p. 458). In short, interventions which are unambiguously supernatural in nature are typically not requested. Related to this, when people are asked to reflect on the effects of their prayers they describe them in a strikingly indeterminate and abstract way (e.g., support, blessing, trust, etc.), which often stands in stark contrast to the concrete needs that occasioned their prayers (illness, misfortune, etc.) (Barrett, 2004; Janssen, De Hart, & Den Draak, 1990) As Janssen and colleagues point out, "it could be argued that people adapt the intended effects to the experienced effects" (Janssen et al., 1990, p. 105). Add to that the view that "God works in mysterious ways" (Boudry & De Smedt, 2011)—He may have other (read better) plans for me—and you get a nearly foolproof self-confirming system of soliciting divine favors, immune to the unavoidable and blatant falsification that would normally follow from such a practice. The fact that these immunizing strategies entered religious practice makes perfect sense given the necessity to uphold the belief system in the minds of its adherents for the perpetuation of the institution.

4.4. Frequent public practice

A final prediction is that, given the crucial role of common knowledge in stabilizing social institutions, institutional religions will be public affairs. Religious practices can be expected to be carried out in public where everybody can watch and gauge everybody else's commitment. Moreover, these public gatherings can be expected to be frequent. Institutional religion cannot be a private matter, since—as pointed out above—the institutional aspect of religion is not a matter of me versus God, but of me versus others. The common knowledge created by a public context is crucial to cement allegiance. It is more rational for me to participate and engage in the required costly behavior the more people participate. It is also crucial to enable participants to determine their strategy. How much cost I will take on depends on how much others take on and therefore expect me to take on. This—as explained at length above—stabilizes these strategies (I know that you know that I will do so and so, so I know that your strategy won't shift in the expectation that mine won't and vice versa) and maintains the institution.

In this regard, Chwe (2001, p. 4) argues the rationale behind many public rituals is not merely to convey information to each member or to enhance bonding and social harmony (or any kind of emotional effect for that matter), but first and foremost to create common knowledge by “letting audience members know what other audience members know.” Given the importance of common knowledge for the maintenance of social institutions, this hypothesis is—I believe—on the right track with regards to practices and rituals found in institutional religions.

It also fits well with Harvey Whitehouse's (2004) analysis of the existence of different “modes of religiosity.” Whitehouse famously distinguishes the “imagistic” from the “doctrinal” mode. The imagistic mode involves infrequent and highly emotional, bonding rituals engaged in by small scale groups adhering to weakly institutionalized religions (such as the tribes in Papua New Guinea studied by Whitehouse).¹² The doctrinal mode, on the other hand, involves frequent but less emotionally charged public rituals engaged in by large scale groups adhering to heavily institutionalized religions (such as the Muslim call to prayer or the Christian communion). Their function, as pointed out above, is first and foremost to create the necessary common knowledge for the maintenance of the institution. This explains the fact that these “doctrinal” public practices are much more frequent but less emotionally engaging than their “imagistic” counterparts in non-institutional religions.

Interestingly in this context, plummeting church attendance in Western Europe and Scandinavia over the last decades, does not seem to be rooted primarily in a decrease of religious beliefs (such as belief in God or an afterlife). In fact, while the number of believers in these secularizing societies have clearly dropped, the number of people attending religious ceremonies has dropped much more. Religious participation in Sweden, for instance, dropped to 7% in 2001, while belief in God was still at 46%. In Denmark, only 3% of the population attend church weekly, while 62% express belief in God (Norris & Inglehart, 2011, p. 90). In other words, many members of those societies still hang on to (some of the) religious beliefs, but no longer partake in the public rituals.

The reason for this, I believe, is that in secularizing societies there is a demise of the institutional character of religion since all the social functions of institutional religion (solidarity, cooperation, social harmony, etc.) are taken over by secular institutions (welfare programs, strong legal system, etc.). With the demise of the institutional character of the religion, the need to acquire common knowledge fades away and with it the public nature of the religion.

5. Concluding remark

In order to understand many of the features of institutional religions we have to understand what drives their cultural evolution. We must outline the cultural dynamics that shape these packages of beliefs, devotions, and rituals that are ubiquitous in human society. This, of course, is a monumental task. Much work remains to be done. By proposing a new framework outlining the drivers of the

cultural evolution of institutional religions, I dare hope that I have contributed something of value to the emerging science of religion.

Notes

1. Teehan (2016) argues that religion has had considerable influence on human social interaction throughout human history. Similarly, Rossano (2010, p. 131) believes that religion impacted human social organization and behavior at a very early period. This would mean that religion had an institutional role throughout (most of) human history.
2. According to Lansing (1991), the anthropologist who studied the Bali water temple system (Wilson's (2002) account is entirely based on his findings), it is so efficient that when the Dutch arrived there in the 19th century with all their expertise in farming and engineering waterways, they could see no way of improving the rice production.
3. The volume in question has been edited by Eliade (1987).
4. At the time of writing he had reviewed six religious systems from his randomly generated list.
5. This is a rather recent phenomenon in the history of religion. In most religions throughout human history, gods or other supernatural entities were not thought to be interested in the moral behavior of their followers. They were not thought to be interested in how humans behaved towards one another, only in being the recipient of their reverence and offerings. In institutional religions such as Judaism (and later Christianity and Islam), that would change. God became a morally interested party.
6. Punishing somebody is risky behavior (people fight back and you may be the victim of revenge). Therefore motivating people in the group to punish wrongdoers can help to prevent free-riding by increasing the actual punishment of free-riders.
7. This is not mere conjecture and still valid today in most parts of the world. Azzi and Ehrenberg (1975) found that in the US church attendance directly increases the chance of business success.
8. This may sound outlandish, but in fact religiosity is to a certain extent determined by genetic make-up (Hamer, 2005; Eaves, Martin, & Heath, 1990). So it could very well be the target of genetic selection.
9. Religions, as I will argue below, compete for allegiance (see section 3 on within-group dynamics—attractiveness). When there is a much better religious bargain available people can be expected to jump ship.
10. Institutional religions do not only compete with other institutional religions but also with secular institutions that fulfill similar roles (e.g. welfare programs, secular schools). In fact, Hungerman (2011) found that religious congregations in the US are more concerned with secular competition than with religious competition.
11. Food taboos negatively affect an individual's ability to interact with out-group members (Minkin, 1987; Radcliffe-Brown, 1979).
12. Remember how rituals increase bonding and prosociality through synchrony.

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References

- Ahmed, A., & Salas, O. (2011). Implicit influences of Christian religious representations on dictator and prisoner's dilemma game decisions. *Journal of Socio-Economics*, 40, 242–246.
- Aimone, J., Iannaccone, L., Makowsky, M., & Rubin, J. (2013). Endogenous group formation via unproductive costs. *Review of Economic Studies*, 80(4), 1215–1236.
- Aoki, M. (2001). *Toward a comparative institutional analysis*. Cambridge: MIT Press.
- Atkinson, Q., & Bourrat, P. (2011). Beliefs about God, the afterlife and morality support the role of supernatural policing in human cooperation. *Evolution and Human Behavior*, 32, 41–49.
- Atran, S. (2002). *In gods we trust*. New York, NY: Oxford University Press.
- Atran, S., & Henrich, J. (2010). The evolution of religion: How cognitive by-products, adaptive learning heuristics, ritual displays, and group competition generate deep commitments to prosocial religion. *Biological Theory*, 5, 18–30.
- Azzi, C., & Ehrenberg, R. (1975). Household allocation of time and church attendance. *Journal of Political Economy*, 83(1), 27–56.
- Barrett, J. (2000). Exploring the natural foundations of religion. *Trends in Cognitive Sciences*, 4, 29–34.
- Barrett, J. (2004). *Why would anyone believe in God?* Walnut Creek, CA: AltaMira Press.
- Berman, E. (2000). Sect, subsidy and sacrifice: An economist's view of ultra-orthodox Jews. *Quarterly Journal of Economics*, 115, 905–953.

- Binmore, K. (2005). *Natural justice*. Oxford: Oxford University Press.
- Boudry, M., & De Smedt, J. (2011). In mysterious ways: On petitionary prayer and subtle forms of supernatural causation. *Religion*, 41(3), 449–469.
- Boyer, P. (2001). *Religion explained*. New York, NY: Basic Books.
- Bulbulia, J., & Sosis, R. (2011). Signaling theory and the evolution of religious cooperation. *Religion*, 41(3), 363–388.
- Chwe, M. (2001). *Rational ritual*. Princeton, NJ: Princeton University Press.
- Cohen, E., Mundry, R., & Kirshner, S. (2014). Religion, synchrony, and cooperation. *Religion, Brain, and Behavior*, 4, 20–30.
- Durkheim, E. (1995) (1995). *The elementary forms of religious life*. (Karen E. Fields, Trans.). New York, NY: The Free Press.
- Eaves, L., Martin, N., & Heath, A. (1990). Religious affiliation in twins and their parents: Testing a model of cultural inheritance. *Behavior Genetics*, 20, 1–22.
- Eliade, M. (Ed.). (1987). *The encyclopedia of world religions*. New York, NY: Macmillan.
- Finke, R., & Stark, R. (1992). *The churching of America: Winners and losers in our religious economy 1776–1990*. New Brunswick, NJ: Rutgers University Press.
- Guala, F. (2016). *Understanding institutions: The science and philosophy of living together*. Princeton, NJ: Princeton University Press.
- Guinness, H. (1887). *Romanism and the reformation from the standpoint of prophecy*. Toronto: S.R. Briggs.
- Guthrie, S. (1993). *Faces in the clouds: A new theory of religion*. Oxford: Oxford University Press.
- Hamer, D. (2005). *The God gene: How faith is hardwired into our genes*. New York, NY: Anchor Books.
- Henrich, J. (2009). The evolution of costly displays, cooperation and religion: Credibility enhancing displays and their implications for cultural evolution. *Evolution and Human Behavior*, 30(4), 244–260.
- Henrich, J., & Boyd, R. (2001). Why people punish defectors: Weak conformist transmission can stabilize costly enforcement of norms in cooperative dilemmas. *Journal of Theoretical Biology*, 208(1), 79–89.
- Hungerman, D. (2011). Rethinking the study of religious markets. In R. McCleary (Ed.), *The Oxford handbook of the economics of religion* (pp. 257–275). Oxford: Oxford University Press.
- Iannaccone, L. (1992). Sacrifice and stigma: Reducing free-riding in cults, communes, and other collectives. *Journal of Political Economy*, 100, 271–291.
- Iannaccone, L. (1997). Towards an economic theory of ‘fundamentalism’. *Journal of Institutional and Theoretical Economics*, 153(1), 100–116.
- Irons, W. (2001). Religion as a hard-to-fake sign of commitment. In R. Nesse (Ed.), *Evolution and the capacity for commitment* (pp. 290–309). New York, NY: Russell Sage Foundation.
- Janssen, J., De Hart, J., & Den Draak, C. (1990). A content analysis of the praying practices of Dutch youth. *Journal for the Scientific Study of Religion*, 29(1), 99–107.
- Jelen, T. (Ed.). (2002). *Sacred markets, sacred canopies: Essays on religious markets and religious pluralism*. Lanham: Rowman and Littlefield.
- Johnson, D. (2005). God’s punishment and public goods: A test of the supernatural punishment hypothesis in 186 world cultures. *Human Nature*, 16, 410–446.
- Johnson, D., & Bering, J. (2006). Hand of God, mind of man: Punishment and cognition in the evolution of cooperation. *Evolutionary Psychology*, 4, 219–233.
- Johnson, D., & Kruger, O. (2004). The good of wrath: Supernatural punishment and the evolution of cooperation. *Political Theology*, 5, 159–176.
- Lanman, J. A., & Buhrmester, M. D. (2017). Religious actions speak louder than words: Exposure to credibility enhancing displays predicts theism. *Religion, Brain, and Behavior*, 7(1), 3–16.
- Lansing, J. (1991). *Priests and programmers: Technologies of power in the engineered landscape of Bali*. Princeton, NJ: Princeton University Press.
- Lewis, D. (1969). *Convention*. Cambridge: Harvard University Press.
- Matthews, L. (2012). The recognition signal hypothesis for the adaptive evolution of religion. *Human Nature*, 23(2), 218–249.
- Matthews, L. (2016). Mutualistic cooperation – why religion is common but saints are rare. Commentary on Wood, C. Ritual well-being: Toward a social signaling model of religion and mental health. In Willard, A. & Legare, C. (2016). Ritual wellbeing: A simplified model, *Religion, Brain & Behavior*, pp. 31–33. doi:10.1080/2153599X.2016.1156563.
- McKay, R., Efferson, C., Whitehouse, H., & Fehr, E. (2011). Wrath of god: Religious primes and punishment. *Proceedings of the Royal Society B*, 278, 1858–1863.
- Minkins, J. (1987). *The teachings of Maimonides*. Northvale: Aaronson.
- Norenzayan, A. (2013). *Big gods: How religion transformed cooperation and conflict*. Princeton, NJ: Princeton University Press.
- Norenzayan, A., Shariff, A. F., Gervais, W. M., Willard, A. K., McNamara, R. A., Slingerland, E., & Henrich, J. (2016). The cultural evolution of prosocial religions. *Brain and Behavioral Sciences*, 29, 1–65.

- Norris, P., & Inglehart, R. (2011). *Sacred and secular: Religion and politics worldwide*. Cambridge: Cambridge University Press.
- North, D. (1990). *Institutions, institutional change and economic performance*. Cambridge: Cambridge University Press.
- Ohlin, J. (2011). *Nash equilibrium and international law*. Cornell Law Faculty Publications. Paper 572.
- Radcliffe-Brown, A. (1979). Taboo. In W. Lessa & E. Vogt (Eds.), *Reader in comparative religion* (pp. 46–56). New York, NY: Harper & Row.
- Reddish, P., Bulbulia, J., & Fisher, R. (2014). Does synchrony promote generalized prosociality? *Religion, Brain and Behavior*, 4, 3–19.
- Rossano, M. (2010). *Supernatural selection: How religion evolved*. New York, NY: Oxford University Press.
- Shariff, A., & Norenzayan, A. (2007). God is watching you: Priming god concepts increase prosocial behavior in an anonymous economic game. *Psychological Science*, 18, 803–809.
- Shariff, A., & Norenzayan, A. (2011). Mean gods make good people: Different views of god predict cheating behavior. *International Journal for the Psychology of Religion*, 21, 85–96.
- Shariff, A., & Rhemtulla, M. (2012). Divergent effects of belief in heaven and hell on national crime rates. *PLoS ONE*, 7, e39048.
- Smith, J., & Price, G. (1973). The logic of animal conflict. *Nature*, 246, 15–18.
- Sosis, R. (2003). Why aren't we all Hutterites? Costly signaling theory and religious behavior. *Human Nature*, 14(2), 91–127.
- Sosis, R. (2006). Religious behaviors, badges, and bans: Signaling theory and the evolution of religion. In P. McNamara (Ed.), *Where god and science meet* (pp. 61–86). Westport, CT: Praeger.
- Sosis, R., & Bressler, E. (2003). Cooperation and commune longevity: A test of the costly signaling theory of religion. *Cross-Cultural Research*, 37, 211–239.
- Stark, R. (1997). *The rise of Christianity: How the obscure, marginal Jesus movement became the dominant religious force in the western world in a few centuries*. San Francisco, CA: Harper Collins.
- Taylor, C. (1985). *Philosophical papers part 2: Philosophy and the human sciences*. Cambridge: Cambridge University Press.
- Teehan, J. (2010). *In the name of God: The evolutionary origins of religious ethics and violence*. London: Wiley-Blackwell.
- Teehan, J. (2016). Religion and morality: The evolution of the cognitive nexus. In J. Liddle & T. Shackelford (Eds.), *The Oxford handbook of evolutionary psychology and religion*. Advance online publication. doi:10.1093/oxfordhb/9780199397747.013.11
- Tomasello, M., & Vaish, A. (2013). Origins of human cooperation and morality. *Annual Review of Psychology*, 63, 231–255.
- Valdesolo, P., & DeSteno, D. (2011). Synchrony and the social tuning of compassion. *Emotion*, 11, 262–266.
- Vlerick, M. (2016). Explaining universal social institutions: A game-theoretic approach. *Topoi*, 35(1), 291–300.
- Vlerick, M. (2017). Better than our nature? Evolution and moral realism, justification, and progress. In M. Ruse & R. Richards (Eds.), *Handbook of evolutionary ethics* (pp. 226–239). Cambridge: Cambridge University Press.
- Whitehouse, H. (2004). *Modes of religiosity: A cognitive theory of religious transmission*. Walnut Creek, CA: Alta Mira Press.
- Wilson, D. S. (2002). *Darwin's cathedral*. Chicago, IL: Chicago University Press.