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THE CULTURAL EVOLUTION OF PROSOCIAL RELIGIONS

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Short Abstract

We present a cultural evolutionary theory of the origins of prosocial religions, and address two puzzles in human psychology and cultural history: 1) the rise of large-scale cooperation and 2) the simultaneous spread of prosocial religions in the last ten-to-twelve millennia. We argue that these two developments were importantly linked and mutually energizing. We explain how a package of religious beliefs and practices characterized by potent, moralizing supernatural agents, credible displays of faith, and other psychologically active elements conducive to social solidarity selectively spread because they promoted cooperation in increasingly large groups.

Long Abstract

We develop a cultural evolutionary theory of the origins of prosocial religions, and apply it to resolve two puzzles in human psychology and cultural history: 1) the rise of large-scale cooperation among strangers in the last twelve millennia, and 2) the spread of prosocial religions during the same period. We argue that these two developments were importantly linked. We explain how a package of culturally evolved religious beliefs and practices characterized by increasingly potent, moralizing supernatural agents, credible displays of faith, and other psychologically active elements conducive to social solidarity promoted internal harmony, large-scale cooperation, and high fertility, often leading to success in intergroup competition. In turn, prosocial religious beliefs and practices spread and aggregated as these successful groups expanded, or were copied by less successful groups. This synthesis is grounded in the idea that although religious beliefs and practices originally arose as non-adaptive byproducts of innate

cognitive functions, particular cultural variants were then selected for their prosocial effects in a long-term cultural evolutionary process. This framework (1) reconciles key aspects of the adaptationist and byproduct approaches to the origins of religion, (2) explains a variety of empirical observations that have not received adequate attention, and (3) generates novel predictions. Converging lines of evidence drawn from diverse disciplines provide empirical support while at the same time encouraging new research directions and opening up new questions for exploration and debate.

1 INTRODUCTION: TWO RELATED PUZZLES

The vast majority of humans today live in large-scale, anonymous, societies. This is a remarkable and puzzling fact, because, prior to roughly 12,000 years ago[1], most people lived in relatively small-scale tribal societies (Johnson & Earle 2000), which themselves had emerged from even smaller-scale primate troops (Chapais 2008). This dramatic scaling-up appears to be linked to changes that occurred after the stabilization of global climates at the beginning of the Holocene, when food production began to gradually replace hunting and foraging and the scale of human societies started to expand (Richerson et al. 2001). Even the earliest cities and towns in the Middle East, not to mention today's vast metropolises with tens of millions, contrast sharply with the networks of foraging bands that have characterized most of the human lineage's evolutionary history (Hill et al. 2011).

The rise of stable, large cooperative societies is one of the great puzzles of human history because the free-rider problem intensifies as groups expand. Proto-moral sentiments that are rooted in kin selection and reciprocal altruism have ancient evolutionary origins in the primate lineage (de Waal 2008) and disapproval of anti-social behavior emerges even in preverbal babies (Bloom 2013; Hamlin et al. 2007). However, neither kin selection nor reciprocal altruism (including partner choice mechanisms) can explain the rise of large, cooperative, anonymous societies (Chudek & Henrich 2011; Chudek et al. 2013). Genealogical relatedness decreases geometrically with increasing group size, and strategies based in direct or indirect reciprocity fail in expanding groups (Boyd and Richerson 1988) or as reputational information becomes increasingly noisy or unavailable (Panchanathan & Boyd 2003). Without additional mechanisms to galvanize cooperation, groups collapse, fission, or feud, as has been shown repeatedly in

small-scale societies (Forge 1972; Tuzin 2001). Our first puzzle, then, is how some groups, made up of individuals equipped with temperaments and motivations evolved and calibrated for life in relatively small-scale ancestral societies, were able to dramatically expand their size and scale of cooperation while sustaining mutually beneficial exchange? How was this feat possible on a time scale of thousands of years, a rate too slow to be driven by demographic growth processes and too fast for substantial genetic evolution?[2]

Now consider our second puzzle: over the same time period, prosocial religions emerged and spread worldwide, to the point that the overwhelming majority of believers today are the cultural descendants of a very few such religions. These religions elicit deep devotions and extravagant rituals, often directed at Big Gods -- powerful, morally concerned deities who are believed to monitor human behavior. These gods are believed to deliver rewards and punishments according to how well people meet the particular, often local, behavioral standards, including engaging in costly actions that benefit others. In part, out of fear of supernatural punishment, people better comply with norms that they believe the agents monitor. While there is little dispute that foraging societies possess beliefs in supernatural agents, these spirits and deities are quite different from those of world religions, with only limited powers and circumscribed concerns about human morality. It appears that interrelated religious elements that sustain faith in Big Gods have spread globally along with the expansion of complex, large-scale human societies. This has occurred despite their rarity in small-scale societies or during most of our species' evolutionary history (Swanson 1960; Norenzayan 2013).

Connecting these two puzzles, we argue that cultural evolution, driven by escalating intergroup competition particularly associated with settled societies, promoted the selection and assembly of successful suites of religious beliefs and practices that characterize modern prosocial

religions. Prosocial religions have contributed to large-scale cooperation, but they are only one among several likely causes. Religious elements are not a necessary condition for cooperation or moral behavior of any scale (Bloom 2012; Norenzayan 2014). There are several other cultural evolutionary paths to large-scale cooperation, including some that rely upon institutions, norms, and practices unrelated to prosocial religions. These include political decision-making (e.g., inherited leadership positions), social organization (e.g., segmentary lineage systems), property rights, division of labor (e.g., castes), and exchange and markets. The causal effects of religious elements can interact with all these domains and institutions, and this causality can run in both directions, in a feedback loop between prosocial religions and an expanded cooperative sphere.

This cultural evolutionary process selects for any psychological traits, norms or practices that 1) reduces competition among individuals and families within social groups; 2) sustains or increases internal harmony and group solidarity; and 3) facilitates differential success in competition and conflict between social groups by increasing cooperation in warfare, defense, demographic expansion, or economic ventures. This success can then lead to the differential spread of particular religious elements as more successful groups are copied by less successful groups, experience physical or cultural immigration, expand demographically through higher rates of reproduction, or expand through conquest and assimilation. It was this cultural evolutionary process that increasingly intertwined the "supernatural" with the "moral" and the "prosocial." For this reason, we refer to these culturally selected and now dominant clusters of elements as *prosocial religions.*[3]

We have been developing the converging lines of this argument over several years in several places (e.g., Slingerland et al. 2013; Henrich 2009; Atran & Henrich 2010; Norenzayan & Shariff, 2008; Norenzayan 2013). Here, we synthesize and update this prior work and further

develop several empirical, theoretical and conceptual aspects of it. Empirically, we discuss the historical and ethnographic evidence at greater depth and lay out the findings from a new meta-analysis of religious priming studies that specify underlying psychological processes and boundary conditions. Theoretically, we discuss in greater detail one key part of the process that we hypothesize gave rise to prosocial religions – cultural group selection. We also integrate sacred values into our framework, review alternative scenarios linking some religious elements with large-scale societies, and tackle counter-arguments. Overall, we bring together evidence from available historical and ethnographic observation with experimental studies that address several interrelated topics, including signaling, ritual, religious priming, cognitive foundations of religion, behavioral economics, cooperation, and cultural learning.

This account paves the way for a cognitive-evolutionary synthesis, consolidating several key insights. These include (1) how innate cognitive mechanisms give rise, as a by-product, to supernatural mental representations (Atran & Norenzayan 2004; Barrett 2000; Boyer 2001; Lawson & McCauley 1990; McCauley 2011); (2) how natural selection shaped cognitive abilities for cultural learning, making humans a culture-dependent species with divergent cultural evolutionary trajectories (Richerson & Boyd 2005); and (3) how inter-group competition shaped cultural evolution, giving rise to cultural group selection and gene-culture coevolution (Chudek & Henrich 2011; Henrich 2004). By building on these foundations, we hypothesize that cultural evolution has harnessed a variety of proximate psychological mechanisms to shape and consolidate human beliefs, actions, and commitments that converge in increasingly prosocial religions. The result is an account that recognizes, synthesizes and extends earlier and contemporary insights about the social functions of religious elements (Durkheim 1915; Rappaport 1999; Haidt 2012; Wilson 2003; Sosis & Alcorta, 2003).

We begin with the idea that religious elements arose as a non-adaptive evolutionary byproduct of ordinary cognitive functions (Atran & Norenzayan 2004; Bloom 2004; Boyer 1994; Barrett 2004). However, we go beyond cognitive byproduct approaches by tackling historical trajectories and cross-cultural trends in religious beliefs and behaviors, particularly dominant elements of modern religions that are hard to explain in the absence of cultural evolutionary processes and selective cultural transmission. We argue that while religious representations are rooted in innate aspects of cognition, only some of the possible cultural variants then spread at the expense of other variants because of their effects on success in intergroup competition.

Drawing on contributions from adaptationist approaches to religion (Bering 2006, 2011; Bulbulia 2008; Cronk 1994; Johnson & Bering 2006; Sosis & Alcorta 2003; Sosis 2009), we take seriously the important role that religious elements appear to play in shaping the lives of individuals and societies, and recognize that there are crucial linkages between rituals, belief in supernatural monitors and cooperation that these approaches have illuminated across diverse environmental and cultural contexts. Our contribution builds on evolved psychological mechanisms and addresses the phenotypic gambit (the methodological tactic of focusing on phenotype and fitness, setting aside proximate mechanisms, Grafen,1984), but also explores in great detail the cultural learning dynamics and the historical processes that shape religions and rituals in both adaptive, and maladaptive ways. Thus, we argue that our framework reconciles key aspects and insights from the adaptationist and byproduct approaches. It also tackles a range of empirical observations, including some that have not been adequately addressed, and generates novel

predictions ripe for investigation. As such, we present this synthesis as an invitation for a conversation and debate about core issues in the evolutionary study of religion.

2 THEORETICAL FOUNDATIONS

Our synthesis rests on four conceptual foundations: 1) reliably developing cognitive mechanisms that constrain and influence the transmission of religious beliefs; 2) evolved social instincts that drive concerns about third-party monitoring, which in turn facilitate belief in and response to supernatural monitoring; 3) cultural learning mechanisms that guide the spread of specific religious contents and behaviors; and 4) intergroup competition that influences the cultural evolution of religious beliefs and practices.

2.1 RELIABLY DEVELOPING COGNITIVE BIASES FOR RELIGION

The cognitive science of religion has begun to show that religious beliefs are rooted in a suite of core cognitive faculties that reliably develop in individuals across populations and historical periods (Atran & Norenzayan 2004; Barrett 2004; Kirkpatrick 1999; Lawson & McCauley 1990; Bloom 2012; Guthrie 1993; Boyer 2001). As such, "religions" are best seen as constrained amalgams of beliefs and behaviors that are rooted in core cognitive tendencies. Examples of particular interest here are (1) mentalizing (Bering 2011; Frith & Frith 2003; Waytz et al. 2010), (2) teleological thinking (Kelemen 2004), and (3) mind-body dualism (Bloom 2007; Chudek et al. unpublished). Consistent with these hypotheses, individual differences in these tendencies partly explain the degree to which people believe in God, in paranormal events, and in life's meaning and purpose (Willard & Norenzayan 2013).

These cognitive tendencies can be tapped by cultural evolution (they provide potential raw material) in constructing particular elements of religions or other aspects of culture. However, cultural evolution need not harness all or any of these cognitive tendencies. Our argument is, in fact, that some of these have been drafted by cultural evolution in more recent millennia to underpin particular supernatural beliefs, such as an afterlife contingent on proper behavior in this life, because those beliefs promoted success in intergroup competition. Of course, none of these cognitive processes are solely or uniquely involved in religion.

Most relevant to prosocial religions is the evolved capacity for mentalizing (Epley & Waytz 2010; Frith & Frith 2003), which makes possible the cultural recruitment of supernatural agent beliefs (Gervais 2013). Mentalizing, also known as "theory of mind," allows people to detect and infer the existence and content of other minds. It also supplies the cognitive basis for the pervasive belief in disembodied supernatural agents such as gods and spirits. Believers treat gods as beings who possess humanlike goals, beliefs and desires (Barrett & Keil 1996; Guthrie 1993; Bering 2011; Epley et al. 2007; Bloom & Weisberg 2007). This capacity allows believers to interact with gods, who are thought to respond to existential anxieties such as death and randomness (Atran & Norenzayan 2004) and engage in social monitoring (Norenzayan & Shariff 2008). Consistent with the byproduct argument that religious thinking recruits ordinary capacities for mind-perception, thinking about or praying to God activates brain regions associated with theory of mind (Kapogiannis et al. 2009; Schjoedt et al. 2009), and reduced mentalizing tendencies or abilities, as found in the autistic spectrum, predicts reduced belief in God (Norenzayan et al. 2012). Conversely, schizotypal tendencies that include promiscuous anthropomorphizing, are associated with "hyper-religiosity"(Crespi & Badcock 2008; Willard & Norenzayan, unpublished paper).

2.2 SOCIAL INSTINCTS AND THIRD-PARTY MONITORING

Humans likely evolved in a social world governed by community-wide norms or shared standards in which surveillance for norm-violations and sanctioning were carried out by the community (Chudek & Henrich 2011; Chudek et al. 2013). This reputational aspect of our norm psychology means that humans are sensitive to cues of social monitoring (Bering & Johnson 2005), attend keenly to social expectations and public observation (Fehr & Fischbacher 2003), and anticipate a world governed by social rules with sanctions for norm violations (Chudek & Henrich 2011; Fehr et al. 2002). Relevant empirical work indicates that sometimes exposure to even subtle cues, such as drawings of eyes, can increase compliance to norms related to fairness and stealing (Haley & Fessler 2005; Rigdon et al. 2009; Zhong et al. 2010; but see Fehr & Schneider 2010), even in naturalistic settings (Bateson et al. 2006). If the presence of human watchers encourages norm compliance, it is not surprising that the suggestion of morally-concerned supernatural watchers—with greater surveillance capacities and powers to punish—might expand norm compliance beyond that associated with mere human watchers and earthly sanctions (e.g. Bering 2011). We argue that intergroup competition (discussed below) exploited this feature of human social psychology, among others, to preferentially select belief systems with interventionist supernatural agents concerned about certain kinds of behaviors.

2.3 CULTURAL LEARNING AND THE ORIGINS OF FAITH

Humans are a cultural species (Boyd et al. 2011b). More than in any other species, human cultural learning generates vast bodies of know-how and complex practices that adaptively accumulate over generations (Tomasello 2001). To have adaptive benefits, cultural learning involves placing faith in the products of this process, and often over-riding our innate intuitions

or individual experiences (Beck 1992, Henrich forthcoming). Children and adults from diverse societies accurately imitate adults' seemingly unnecessary behaviors (they 'overimitate'), even when they are capable of disregarding them (Lyons et al. 2007; Nielsen & Tomaselli 2010). This willingness to rely on faith in cultural traditions -- over personal experience or intuition—has profound implications for explaining key features of religions (Atran & Henrich 2010).

Much theoretical and empirical work suggests that when deciding to place faith in cultural information over other sources, learners rely on a variety of cues that include:

1) *Content-based mechanisms*, which lead to the selective retention and transmission of some mental representations over others because of differences in their content (Boyer 2001; Sperber 1996). For example, emotionally evocative ideas are more memorable and therefore culturally contagious (Broesch et al. in press; Heath et al. 2001).
2) *Context-based mechanisms* (or model-based cultural learning biases), which arise from evolved psychological mechanisms that encourage learners to attend to and learn from particular individuals (cultural models) based on cues such as skill, success, prestige, self-similarity (Henrich & Gil-White 2001) and trait frequency (Rendell et al. 2011; Perreault et al. 2012).
3) *Credibility Enhancing Displays (CREDs)*, or learners' sensitivity to cues that a cultural model is genuinely committed to their state or advertised beliefs. If models engage in behaviors that would be unlikely if opposing beliefs were privately held, learners are more likely to trust the sincerity of the models, and as a result adopt their beliefs[4] (Henrich 2009; see also Harris 2012; Sperber et al. 2010).

All three classes of learning mechanisms are crucial to understanding how religious beliefs and practices are transmitted and stabilized, why certain rituals and devotions can substantially influence cultural transmission, and why some elements of religions are recurrent and others culturally variable (Gervais et al. 2011). To date, content-based mechanisms have been the main focus and the source of much progress in the cognitive science of religion. This includes work on minimally counter-intuitive concepts (Boyer and Ramble 2001), folk notions of mind-body dualism (Bloom 2004), and hyper-active agency detection (Barrett 2004). However, we argue that context-based cultural learning and CREDs are equally important if we wish to construct a comprehensive account of the differential spread of religious beliefs and behaviors. For example, because people are biased to preferentially acquire religious beliefs and practices from the plurality and from prestigious models in their communities, the exact same or similar god concepts can be the object of deep commitment in one historical period but become a fictional character in another (Gervais & Henrich 2010; Gervais et al. 2011). Also, CREDs help us explain why religious ideas backed up by credible displays of commitment (such as fasts, sexual abstinence and painful rituals) are more persuasive and more likely to spread. In turn, we see why such extravagant displays are commonly found in prosocial religions and tied to deepening commitment to supernatural agents.

2.4 THE CULTURAL GROUP SELECTION OF PROSOCIAL RELIGIONS

We propose that prosocial religions are shaped by *cultural group selection*, a class of cultural evolutionary processes that considers the impact of intergroup competition on cultural evolutionary outcomes. These processes have been studied extensively and have a long intellectual history (Boyd & Richerson 1990; Hayek 1988; Khaldun 1958; Darwin 1871).

Intergroup competition has potentially been shaping cultural evolution over much of our species' evolutionary history, altering the genetic selection pressures molding the foundations of our sociality (Richerson & Boyd 1999, Henrich forthcoming). However, as the origins of agriculture made large, settled, populations economically possible across diverse regions during the last twelve millennia, a regime of intensive inter-group competition ensued that drove up the size and complexity of human societies (Alexander 1987; Bowles 2008; Otterbein 1970; Turchin 2003; Turchin et al, 2013; Carneiro 1970; Currie & Mace 2009).

A class of evolutionary models has revealed broad conditions under which cultural group selection can influence the trajectory of cultural evolution. Intergroup competition can operate through violent conflict, but also through differential migration into more successful groups, biased copying of practices and beliefs among groups, and differential extinction rates without any actual conflict (Richerson et al. unpublished paper). These models show that the conditions under which intergroup competition substantially influences cultural evolution are much broader than for genetic evolution (Boyd et al. 2003; Boyd et al. 2011a; Guzman et al. 2007; Henrich & Boyd 2001; Smaldino, in press). This is in part because cultural evolution can sustain behavioral variation among groups, which drives the evolutionary process, to a degree that genetic evolution does not (Bell et al. 2009; Richerson et al. unpublished paper; Henrich 2012).

Empirically, there are several converging lines of evidence supporting the importance of intergroup competition, including data from laboratory studies (Gurerk et al. 2006; Saaksvuori et al. 2011), archeology (Flannery & Marcus 2000; Spencer & Redmond 2001), history (Turchin 2003; Turchin et al. 2013), and ethnographic or ethno-historical studies (Boyd 2001; Soltis et al. 1995; Atran 2002; Kelly 1985; Currie & Mace 2009; Wiessner & Tumu 1998)—see Richerson et

al. (unpublished paper) for a recent review and Henrich (forthcoming) for the importance of intergroup competition among hunter-gatherers.

While these studies provide evidence of the competitive process in action, experimental evidence reveals that larger and more economically successful groups have stronger prosocial norms—a pattern consistent with cultural group selection models. For example, in a global sample of roughly a dozen diverse populations, individuals from larger ethno-linguistic groups and larger communities were more willing to incur a cost to punish unfair offers in experimental games (Henrich et al. 2010; Henrich et al. 2014), a result which holds after controlling for a range of economic and demographic variables. Even among Hadza foragers, larger camps are more often prosocial in economic games (Marlowe 2004). Similarly, in a detailed study in Tanzania, Paciotti and Hadley (2003) compared the economic game play of two ethnolinguistic groups living side by side, the Pimbwe and the Sukuma. The institutionally more complex Sukuma have been rapidly expanding their territory over several generations, and in fact they played much more prosocially in the Ultimatum Game than the Pimbwe. Cross-nationally, experimental work also reveals a negative correlation between GDP per capita and both people's motivations to punish cooperators in a public goods game (stifling cooperation) and their willingness to cheat to favor themselves or their local in-group (Hermann et al., 2008; Hruschka et al. forthcoming).

Broadly speaking, then, cultural group selection favors complexes of culturally transmitted traits—beliefs, values, practices, rituals, and devotions—that (1) reduce competition and variation within social groups (sustaining or increasing internal harmony), and (2) enhance success in competition with other social groups, by increasing factors such as group size, cooperative intensity, fertility, economic output, and bravery in warfare. Thus, any cultural traits

– whether or not connected to the supernatural -- that directly or indirectly promote *parochial prosociality* in expanded groups (Bowles 2006; Choi & Bowles 2007) could be favored. The issue at hand is whether the crucible of intensive cultural group selection that emerged with the origins of agriculture has shaped the beliefs, commitments, institutions and practices associated with religions in predictable ways over the last twelve millennia.[5]

2.5 THE THEORETICAL SYNTHESIS

We build on these four foundations to construct a synthetic view of modern world religions. We begin from the premise that religious beliefs and behaviors originated as evolutionary byproducts of ordinary cognitive tendencies, built on reliably developing panhuman cognitive templates. Some subset of these cultural variants happened to have incidental effects on within-group prosociality by increasing cooperation, internal harmony, solidarity, and group size. Such variants may have spread first, allowing groups to expand and economically succeed. Or, they may have spread in the wake of a group's successful expansion, subsequently adding sustainability to a group's cultural success. Competition among cultural groups, operating over millennia, gradually aggregated these elements into cultural packages ("religions") that were *increasingly* likely to include:

1) Belief in, and commitment to, powerful, all-knowing, and morally concerned supernatural agents who are believed to monitor social interactions and to reward and sanction behaviors in ways that contribute to the cultural success of the group, including practices that effectively transmit the faith. Rhetorically, we call this "Big Gods", but we alert readers that we are referring to multi-dimensional continuum of supernatural agents in which Big Gods occupy a particular corner of the space. By outsourcing some monitoring and punishing

duties to these supernatural agents, prosocial religions reduce monitoring costs and facilitate collective action, which allows groups to sustain in-group cooperation and harmony while expanding in size.

2) Ritual and devotional practices that effectively elevate prosocial sentiments, galvanize solidarity, and transmit and signal deep faith. These practices exploit human psychology in a host of different ways, including synchrony to build in-group solidarity, CREDs and signals (e.g., sacrifices, painful initiations, celibacy, fasting) and other cultural learning biases (conformity, prestige, and age) to more effectively transmit commitment to others.
3) Additional beliefs and practices that exploit aspects of our psychology to galvanize group cohesion and increase success. These include fictive kinship for coreligionists; in-group ("ethnic") markers to spark tribal psychology, exclude the less committed, and mark religious boundaries; pro-natalist norms that increase fertility rates; practices that increase self-control and the suppression of self-interest; and seeing a divine origin in certain beliefs and practices, transforming them into "sacred" values that are non-negotiable.

2.6 HYPOTHESES

Some specific hypotheses that follow from our general account:

1) Big Gods spread because they contributed to the expansion of cooperative groups. Historically, they coevolved gradually with larger and increasingly complex societies. In turn, larger and more complex societies might have been more likely to transmit and sustain belief in such gods, creating auto catalytic processes that energize each other. One consequence of this process is that group size and long-term stability should positively correlate with the prevalence of Big Gods.

2) All things being equal, commitment to Big Gods should produce more norm-compliance in difficult-to-monitor situations, relative to belief in supernatural agents that are unable or unwilling to omnisciently monitor and punish.
3) Religious behavior that signals genuine devotion to the same or similar gods would be expected to induce greater cooperation and trust between religious members. Conversely, a lack of any devotion to any moralizing deities (i.e., atheism or non-moral or amoral supernatural agents) should trigger distrust.
4) These cultural packages include rituals and devotions that exploit costly and extravagant displays to deepen commitment to Big Gods, as well as other solidarity and self-control building cultural technologies (e.g., synchrony, repetition) and cultural learning biases (e.g., prestige) that more effectively transmit the belief system.
5) Cultural groups with this particular constellation of beliefs, norms and behaviors (i.e., *prosocial religious groups*) should enjoy a relative cultural survival advantage, especially when intergroup competition over resources and adherents is fierce.

In the following sections, we confront these hypotheses with the available empirical data. To address these hypotheses, we first draw on a combination of ethnographic, historical, and archaeological data to show just how different modern prosocial religions are from the religions of small-scale societies, and likely those of our Paleolithic ancestors. This is important because much theorizing by psychologists about the origins of religion often presume that modern gods are culturally typical gods, rather than being the products of a particular cultural evolutionary trajectory. Second, we examine the relationship between commitment to modern world religions and prosocial behavior by reviewing correlational data from surveys and behavioral studies, as well as experimental findings from religious priming studies to address causality. Third, we

examine religion's role in building intra-group trust, as well as commitment mechanisms that galvanize social solidarity and transmit faith. Fourth, we evaluate evidence for the cultural group selection of prosocial religions. Finally, we situate this framework within existing evolutionary perspectives, address counter-explanations and alternative cultural evolutionary scenarios, discuss secularization and conclude with outstanding questions and future directions.

3 BIG GODS AND RITUAL FORMS EMERGE AND SUPPORT LARGE-SCALE SOCIETIES

Consistent with the predictions developed above, the anthropological record indicates that, in moving from the smallest scale human societies to the largest and most complex societies, the following empirical patterns emerge: (1) beliefs in Big Gods go from relatively rare to increasingly common, as these supernatural agents gain more power, knowledge, and concern about morality; (2) morality and supernatural beliefs move from mostly disconnected to increasingly intertwined; (3) rituals become increasingly organized, repetitious and regular; (4) supernatural punishments are increasingly focused on violations of group beneficial norms (e.g., prohibiting theft from co-religionists, including those who are strangers, or demanding faith-deepening sacrifices); and (5) the potency of supernatural punishment increases for key social norms (e.g., salvation, karma, hell/heaven). These patterns are supported by both ethnographic and historical evidence.

3.1 ANTHROPOLOGICAL EVIDENCE

Quantitative and qualitative reviews of the anthropological record suggest that the gods of small-scale societies, especially those found in the foraging societies often associated with life in

the Paleolithic, are typically cognitively-constrained and have limited or no concern with human affairs or moral transgressions (Boehm 2008; Swanson 1960; Wright 2009; Boyer 2001). For example, among the much studied hunter-gatherers in the Kalahari, Marshall wrote (1962, p. 245), "Man's wrong-doing against man is not left to ≠Gao!na's [the relevant god] punishment nor is it considered to be his concern. Man corrects or avenges such wrong-doings himself in his social context."[6] Although some of these gods are pleased with rituals or sacrifices offered to them, they play a small or no part in the elaborate cooperative lives of foraging societies, and rarely concern themselves with norm-violations, including how community members treat each other or strangers. However, as the size and complexity of societies increase, more powerful, interventionist, and moralizing gods begin to appear. Quantitative analyses of the available anthropological databases, including the Standard Cross Cultural Sample (the SCCS provides data for 167 societies, selected to reduce historical relationships) and the Ethnographic Atlas (724 societies), show positive correlations between the prevalence of Big Gods with societal size, complexity, population density, and external threats (Roes 1995; Roes & Raymond 2009; Roes & Raymond 2003). These quantitative data also show powerful moralizing gods appear in less than 10% of the smallest-scale human societies, but become widespread in large-scale societies (see Figure 1). This empirical finding dates back to Swanson (1960), and despite critiques (Underhill 1975) and the statistical control of potential confounding variables (e.g., missionary activity, population density, economic inequality, geographic regions), the basic finding still holds.

Other researchers have arrived at similar conclusions. Stark (2001), for example, found that only 23.9% of 427 preindustrial societies in the Ethnographic Atlas (Murdock 1981) possess a god who is active in human affairs, and is specifically supportive of human morality. Johnson's (2005) analysis supports earlier results, and also reveals correlations linking the presence of

powerful moralizing gods to variables related to exchange, policing and cooperation in larger, more complex societies (see also Sanderson & Roberts 2008). Such gods are also more prevalent in societies with water scarcity--another key threat to group survival (Snarey 1996). In a different analysis, Peoples & Marlowe (2012) find several statistically independent predictors of Big Gods: (1) society size, (2) agricultural mode of subsistence, and (3) animal husbandry. More stratified societies are also more likely to support Big Gods, but in this analysis this effect drops out in the presence of mode of subsistence and community size. Nevertheless, it is has been hypothesized that one way prosocial religions maintain social cohesion in expanding groups is by legitimizing authority, inequality, and hierarchical relations (e.g., Peoples & Marlowe, 2012; Turchin, 2011). In the absence of much intergroup competition, this can lead to exploitation by the elite. However, under intergroup competition, cultural evolution may favor such legitimizing beliefs to sustain both solidarity and re-enforce command and control during crises. Overall, then, far from being a reliably-developing product of our evolved cognition, the modern popularity of Big Gods is a historical and anthropological puzzle (Tylor 1871) – one that requires explanation.

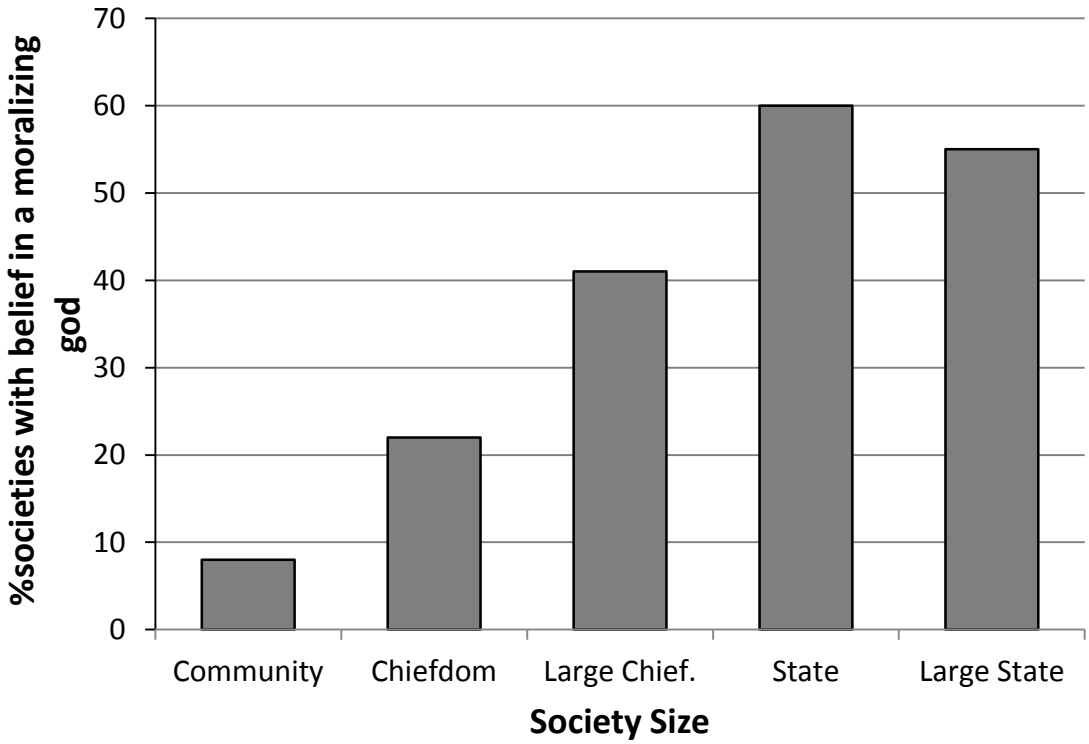

FIGURE 1. INCREASING PREVALENCE OF BIG GODS AS A FUNCTION OF SOCIAL GROUP SIZE IN THE STANDARD CROSS CULTURAL SAMPLE (FROM ROES & RAYMOND, 2003).

We emphasize that although these analyses typically impose a dichotomy on the ethnographic data, our theoretical approach treats this as a continuum and focuses on how intergroup competition influences the selection of cultural elements. For example, while most chiefdoms in Oceania do not possess what would be coded as a "moralizing high god", there's ethnographic reasons to suspect that elements of *mana* and *tapu*, and supernatural punishment, may have been influenced by intergroup competition. These elements may have helped stabilize political leadership, and kept people adhering to increasingly costly social norms. Archaeological and historical evidence, for example, indicates that the spread of divine kingship, spurred by inter island competition, was crucial for the emergence of a state in Hawaii (Kirch 2010). In the Fijian

chiefdoms we study ethnographically and experimentally, the strength of villagers' beliefs in punishing ancestor gods increases in-group biases in economic games (McNamara et al. 2014).

Organized rituals also follow a parallel pattern across societies. In an analysis using the Human Relations Area Files, Atkinson & Whitehouse (2011) found that "doctrinal" rituals—the high frequency, low arousal rituals commonly found in modern world religions (Whitehouse 2004) —are associated with greater belief in Big Gods, reliance on agriculture, and societal complexity. We argue that, among other important roles, doctrinal rituals galvanize faith and deepen commitments to large, anonymous communities governed by these powerful gods.

3.2 ARCHEOLOGICAL AND HISTORICAL EVIDENCE

These comparative anthropological insights converge with archaeological and historical evidence suggesting that both Big Gods and routinized rituals and related practices coevolved with large, complex human societies, along with increasing reliance on food production.

3.2.1 ARCHEOLOGICAL EVIDENCE

While supernatural beliefs are hard to infer archaeologically and such evidence should therefore be interpreted with caution, the material record in Mesoamerica indicates that rituals became more formal, elaborate, and costly as societies developed from foraging bands into chiefdoms and states (Marcus & Flannery 2004). In Mexico before 4000 B.P., for example, foraging societies relied on informal, unscheduled rituals just as modern foragers do (Lee 1979). With the establishment of multi-village chiefdoms (4000-3000 B.P.), rituals expanded and distinct religious specialists emerged. After state formation in Mexico (2500 B.P.), key rituals

were performed by a class of full-time priests using religious calendars and occupying temples built at immense costs. This is also true for the earliest state-level societies of Mesopotamia after 5500 B.P. and India after 4500 B.P. We find similar patterns in pre-dynastic Egypt (6000-5000 B.P.) and China (4500-3500 B.P.), as well as in other North American chiefdoms. In China, for instance, the beginning of the Bronze Age (c. 1500 BCE) is accompanied by a radical elaboration in tomb architecture and burial practices of elites, indicating the emergence of highly centralized and stratified polities bound together by costly public religious ceremonies (Thote 2009). Similar evidence for this can be found in Çatalhöyük, a 9500 B.P. Neolithic site in southern Anatolia (see Whitehouse & Hodder 2010).

3.2.2 HISTORICAL EVIDENCE

Once the written record begins, establishing links between large-scale cooperation, ritual elaboration, Big Gods and morality becomes more tractable. To date, most of the historical work related to this topic focuses on the Abrahamic faiths. Wright (2009) provides a summary of textual evidence that reveals the gradual evolution of the Abrahamic god from a rather limited, whimsical, tribal war god—a subordinate in the Canaanite Pantheon—to the unitary, supreme, moralizing deity of two of the world's largest religious communities. We see the same dynamics at work in other major literate societies.

For instance, although China has sometimes been portrayed as lacking moralizing gods, or even religion at all (Granet 1934; Ames & Rosemont 2009), this is a misconception that scholars in recent years have begun systematically correcting (Clark & Winslett 2011; Slingerland 2013). In the earliest Chinese societies for which written records exist, the worshiped pantheon includes both literal ancestors of the royal line as well as a variety of nature gods and cultural heroes, all

under the dominion of a supreme deity, the "Lord on High" (*shangdi*) or Heaven (*tian*). This Lord on High/Heaven was a Big God in our sense, wielding supreme power over the natural world, intervening at will in the affairs of humans, and intensely concerned with prosocial values. The ability of the royal family to rule was a direct result of their possessing the "Mandate" (lit. "order," "charge") of Heaven, the possession of which was—at least by 1000 BCE or so—seen as linked to moral behavior and proper observance of costly sacrificial and other ritual duties.

Surveillance by morally concerned supernatural agents also appears as a prominent theme in early China. Even from the sparse records from the Shang Dynasty, it is apparent that the uniquely broad power of the Lord on High to command a variety of events in the world led the Shang kings to feel a particular urgency about placating Him with proper ritual offerings. When the Zhou polity began to fragment into a variety of independent, and often conflicting, states (770–256 B.C.E.), supernatural surveillance and the threat of supernatural sanctions remained at the heart of interstate diplomacy and internal political and legal relations (Poo 2009). Finally, the written record reveals an increasingly clear connection in early China between morality and religious commitments. The outlines of moral behavior have been dictated by Heaven and encoded in a set of social norms, and a failure to adhere to these norms—either in outward behavior or one's inner life—was to invite supernatural punishment (Eno 2009).

Similarly, while the highly-organized Greek city states and Imperial Rome are sometimes portrayed as possessing only amoral and fickle deities (e.g., see Baumard & Boyer, 2013), modern scholarship is increasingly rejecting this picture as the result of later Christian apologists' desire to distance the new Christian religion from "paganism." The gods of the Greek city-states received costly sacrifices, were the subject of elaborate rituals, and played an active role in enforcing oaths and supporting public morality (Mikalson 2010: 150-168). Although Roman

religion did not have sacred scriptures or an explicit moral code that was considered the word of the gods, the deities of imperial Rome were seen by the populace as the guardians of what is right and virtuous (Rives 2007: 50-52, 105-131), and the gods were central enough to the public sphere that even the spatial layouts of Roman cities were created around temples dedicated to the major gods (Rives, 2007: 110-111).

One of the challenges of large-scale societies involves the trust necessary for many forms of exchange and credit, particularly long-distance trade (Greif, 2006). Not surprisingly, several Roman gods played a pivotal role in regulating marketplaces and in overseeing economic transactions. Cults dedicated to Mercury and Hercules in the 2nd and 1st c BCE Delos—an important maritime trade center—emphasized public oaths certified by supernatural surveillance and divine punishment in order to overcome cooperation dilemmas in long-distance trade relations (Rauh 1993). In earlier periods, Greek, Roman, Sumerian, and Egyptian gods were also deeply involved in regulating the economic and public spheres. In surveying the Mediterranean region, for instance, Silver (1995: 5) writes, "the economic role of the gods found important expression in their function as protectors of honest business practices. Some deities openly combated opportunism (self-interest pursued with guile) and lowered transaction costs by actively inculcating and enforcing professional standards." The gods also concerned themselves with public morality more broadly. In ancient Egypt, "The two components of the general concept of religion, and at the same time the central functions of kingship, are (1) ethics and the dispensing of justice (the creation of solidarity and abundance in the social sphere through dispensing justice, care, and provisions), and (2) religion in the narrower sense, pacifying the gods and maintaining adequate contact with them, as well as provisioning the dead" (Assmann 2001: 5).

The so-called karmic religions (Hinduism, Buddhism, Jainism) also reflect historical convergences between religion and public morality, although the precise psychological mechanisms are not as well understood as for the Abrahamic religions. Obeyeskere (2002) observes that the notion of rebirth is present in many small-scale societies but disconnected from morality. Gradually, rebirth connects with the idea of ethical causation across lifetimes, and begins to influence the cooperative sphere. In a seminal field study with modern Hindu samples, participation and observation of extreme Hindu rituals such as the Cavadee, practiced among devotees of the Tamil war god Murugan, increased prosocial behavior (Xygalatas et al., 2013). A Hindu religious environment was also shown to induce greater prosocial behavior in a common resource pool game (Xygalatas, in press). Karmic religions are therefore also compatible with the prosocial religious elements in the present framework, though cultural evolution may be harnessing a somewhat different psychology, a question that is ripe for experimental research.

3.2.3 THE "AXIAL AGE"

The "Axial Age" refers to a period between 800 – 200 BCE that marked the birth of "genuine" public morality, individuality, and interior spirituality (Jaspers 1953). Since Jaspers, a common view of the historical record has been that there is a vast cultural chasm between pre-Axial Age amoral religions—demanding mere external ritual observance from their adherents—and Axial Age moral religions, a view that has been echoed by some in the cognitive science of religion (e.g., Baumard & Boyer, 2013). This interpretation is historically questionable on several fronts. To begin with, it fails to recognize the gradual nature of cultural evolution: chiefdoms and early states predating the Axial Age by thousands of years had anthropomorphized deities who intervened in social relations, although their moral scope and powers to punish and reward were

substantially narrower and more tribal than later Axial gods. This is also true in contemporary Fijian chiefdom societies, as noted above. More plausibly, then, there has been a co-evolution of two gradual historical processes: the broadening of the gods' powers and their moral concern, and an expansion of the cooperative sphere.

Moreover, the sheer length of this supposedly crucial historical period should itself raise suspicions about its usefulness as an explanatory category. The transition to prosocial religions emerges at very different time periods in various parts of the globe. Islam, for instance, is a classic example of what we are calling a prosocial religion, both in terms of its doctrinal and ritualistic features and its apparent role in forging the disparate, warring tribes in the Arabian Peninsula into a unified, world historical force. It did not get its start until the 6th century CE—a full 800 years after the close of the "Axial Age."

Finally, there is ample historical evidence that elements of "pre-Axial age" religions were supportive of public morality. In ancient Egyptian religion, for instance, moral behavior was seen as part of *Maat*, the supernaturally-grounded "right order" of the world. One of the Coffin Texts of the Middle Kingdom, "Apology of the Creator God," written between 2181–2055 BCE, includes a passage where said Creator God takes credit for having created morality, and laments that people seem disinclined to follow his moral mandates.[7] Similarly, Hammurabi's code, a Babylonian text from approximately 1772 BCE, is a well-preserved document of a divinely-inspired moral system, capitalizing on fear of Marduk, patron god of Babylon, and the powers of Shamash, god of justice: "When (my god) Marduk had given me the mission to keep my people in order and make my country take the right road, I installed in this country justice and fairness in order to bring well-being to my people." (Bottéro, 2001: 168; for more on moralizing Mesopotamian gods, see Bellah, 2011: 221-224).

There are, of course, important open questions regarding both the ethnographic and historical records that require deeper analysis. In moving this debate forward, it is important to recognize two crucial points that flow from a cultural evolutionary analysis. One, our hypotheses are probabilistic, which allows for multiple causal pathways, including the possibility that in some societies prosocial religions played a minor or no role, or that their role emerged late in the process. Two, the historical trajectories of Big Gods, let alone the suite of elements we call *prosocial religions*, are not an all-or-nothing phenomenon. There is room for transitional gods who are knowledgeable about certain domains but not others, and morally concerned in some respects but not others. As noted, chiefdoms, both in the ethnographic and historical records, appear to fit this intermediate pattern, and are implicated in the expansion of the social scale. Their gods are more powerful and moralizing than those of foragers, but not as full-fledged as the Big Gods of states and empires (Bellah, 2011).

Overall, these ethnographic, historical and archeological patterns are consistent with the idea that the religious elements we have highlighted have spread over human history, and replaced many alternatives. We could have found no pattern, or the opposite pattern; for instance, most hunter-gatherers might have had big, moralizing gods. So in this sense an empirical test was passed, at least provisionally. However, none of this evidence establishes causality, or that any of our key religious elements can cause people to behave prosocially. At least some of these historical and ethnographic data is also consistent with the alternative hypothesis that bigger and more prosocial societies simply projected bigger and more prosocial gods in their own image, or that bigger gods hitched a ride along with other institutional forms. In the last section, we return to the issue of causal arrows and explore the merits of alternative scenarios. But next, we turn to

the issue of the direction of the causal arrow postulated in this theory, and explore whether adherence to the religious elements discussed above directly increases prosociality.

4 RELIGION AND PROSOCIAL BEHAVIOR: PSYCHOLOGICAL EVIDENCE

If certain religious elements can promote prosociality, then we should be able to study these effects using a variety of tools from the social sciences. We focus on whether awareness of Big Gods encourages greater prosocial tendencies by reviewing both correlational and experimental evidence in light of the above hypotheses.

4.1 CORRELATING RELIGIOUS INVOLVEMENT AND PROSOCIAL BEHAVIOR

Several lines of evidence now link participation in world religions with prosociality. A large sociological survey literature shows that religious engagement is related to greater reports of charitable giving and volunteerism (e.g., Brooks 2006; Putnam & Campbell 2010). However, these findings are mostly confined to the American context and based on self-reports, limiting generalizability and inferences to actual behavior.

To avoid the problems of self-report, several studies now show a linkage between prosocial religions and the predicted forms of prosociality using economic games. In an investigation spanning 15 societies from around the globe, including populations of foragers, pastoralists and horticulturalists, Henrich et al. (2010) found an association between world religion (Christianity or Islam) and prosocial behavior in two well-known economic games, the Dictator and

Ultimatum Games. Unlike other studies, this one specifically validated the idea that participation in religions with Big Gods, CREDs, and related practices elicits more prosocial behavior in anonymous contexts, compared to participation in local/traditional religions, controlling for a host of economic and demographic variables. Interestingly, results of this and follow-up studies suggest that commitment to Big Gods is most likely to matter when the situation contains no credible threat of "earthly punishment" in the form of third party monitoring (Laurin et al. 2012b). The effects of participation in a world religion disappear when a secular third-party punisher is introduced.

Other behavioral studies have also found reliable associations between various indicators of religiosity and prosociality, albeit under limited conditions. A study employing a common pool resource game, which allowed researchers to compare levels of cooperation between secular and religious kibbutzim in Israel, showed higher cooperation in the religious kibbutzim than in the secular ones; the effect was driven by highly religious men, who engaged in daily and communal prayer, and took the least amount of money from the common pool (Sosis & Ruffle 2003). Soler (2012) found similar cooperative effects of religious participation among members of an Afro-Brazilian religious group: controlling for various socio-demographic variables, individuals who displayed higher levels of religious commitment behaved more generously in a public goods game and also reported more instances of provided and received cooperation within their religious community (for a similar finding in a Muslim sample in India, see Ahmed 2009).

While these studies are provocative, it should be noted that similar studies conducted with Western, Educated, Industrialized, Rich and Democratic (WEIRD) samples (Henrich et al. 2010) have found that individual differences in religious commitment typically fail to predict prosocial behavior (e.g., Randolph-Seng & Nielsen 2007; Shariff & Norenzayan 2007; Batson et al. 1993).

This inconsistency may arise from several factors, but one an important consideration is that among groups with high trust levels towards secular institutions (the police, courts, governments)—such as the WEIRD students of so many studies—the effect of these institutions crowd out the influence of religion. In this sense, strong secular mechanisms that have emerged recently in some societies can replace the functions of prosocial religions—an issue to which we return below. Or, undergraduates may not have solidified their religious commitments. Either way, psychologists' narrow focus on WEIRD undergraduates may have caused them to miss these important moderating contexts.

In summary, behavioral studies have found associations between religious commitment and prosocial tendencies (for reviews, see Norenzayan & Shariff 2008; Norenzayan et al. 2013), especially when secular institutions are weak, reputational concerns are heightened, and the targets of prosociality are in-group members (co-religionists). However, causal inference in these studies is limited by their reliance on correlational designs. If religious devotion is predictive of prosocial behavior in some contexts, it cannot be conclusively ruled out that having a prosocial disposition causes one to be religious, or that a third variable, such as dispositional empathy or guilt-proneness, causes both prosocial and religious tendencies. To address this issue, we consult a growing experimental literature that induces religious thinking, and subsequently measures prosocial behavior.

4.2 RELIGIOUS PRIMING INCREASES FAIRNESS, COOPERATION, AND COSTLY PUNISHMENT WHILE DECREASING CHEATING

If religious beliefs have a causal effect on prosocial tendencies, then experimentally induced religious thoughts should increase prosocial behavior. Findings support this prediction.

Religious reminders reduce cheating, curb selfish behavior, increase fairness towards strangers, and promote cooperation in anonymous settings for samples drawn from societies shaped by prosocial religions, primarily Abrahamic ones (for a recent review, see Norenzayan et al. 2013). Figure 2 shows the results of a recent meta-analysis of 26 studies from this literature (Shariff et al., unpublished paper), which shows that, overall, religious priming reliably increases prosocial behavior. Importantly, the effect remains robust (though somewhat reduced) after estimating and accounting for the possibility that studies with null findings are less likely to appear in the published literature.

Crucially, analyses looking at religious priming effects on a broad range of psychological outcomes showed that these effects are moderated by prior religious belief. That is, religious priming effects are reliable for strong believers, but vanish for nonbelievers (Shariff et al., unpublished paper). This suggests either that nonbelievers are not responsive to religious reminders, or that there is large variability among nonbelievers as to their responsiveness to religious primes. This is important because it indicates that exogenous religious primes interact with endogenous religious beliefs. Religious priming is shaped by cultural conditioning, and is not merely the result of low-level associations (in addition, this could be interpreted to mean that religious primes are most effective when they are self-relevant, as is often the case in the priming literature, e.g., Wheeler et al. 2007).

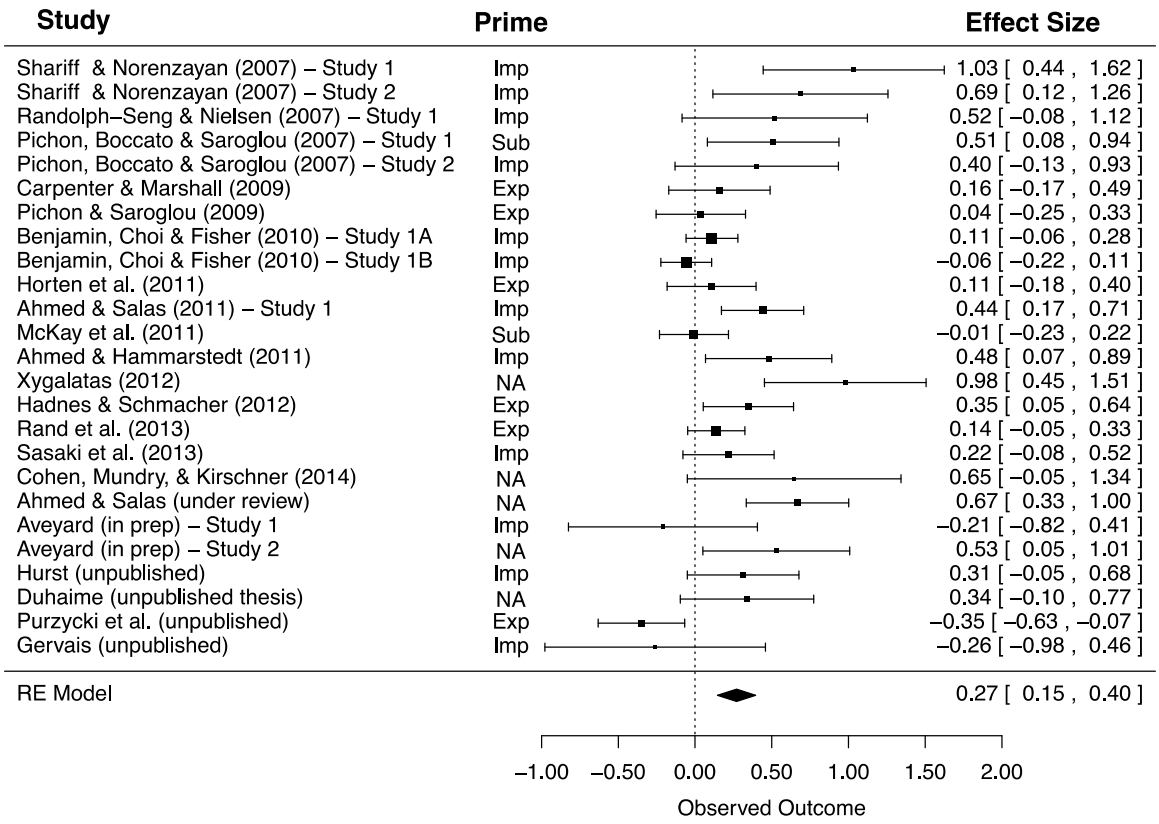

FIGURE 2. A META-ANALYSIS OF RELIGIOUS PRIMING STUDIES SHOWS THAT RELIGIOUS REMINDERS INCREASE PROSOCIAL BEHAVIOR, WITH AN AVERAGE EFFECT SIZE OF HEDGES' G=.27, 95%CI: 0.15 TO 0.40 (FROM SHARIFF ET. AL.UNPUBLISHED PAPER). ERROR BARS ARE 95% CI OF EFFECT SIZES.

The experimental and correlational literatures also reveal several important points about the psychological mechanisms involved:

1. Supernatural punishment and supernatural benevolence have divergent effects on prosocial behaviour. In laboratory experiments, greater belief that God is punishing is more strongly associated with reductions in moral transgressions such as cheating, whereas greater belief that God is benevolent, if anything, has the opposite effect, increasing cheating (Shariff & Norenzayan 2011; Debono et al. 2012). Similarly, at the national level, greater belief in hell relative to heaven is

predictive of lower national crime rates such as burglary, holding constant a wide range of socio-economic factors and the dominant religious denomination (Shariff & Rhemtulla, 2012).

2. Gods are believed to monitor norm violations. Reaction time analyses suggest that believers intuit that God has knowledge about norm-violating behaviors more than they believe God does about other behaviors (Purzycki et al. 2012).
3. Religious priming increases believers' perceptions of being under social surveillance (Gervais & Norenzayan 2012a).
4. Belief in a punishing god is associated with *less* punishing behavior towards free-riders, since participants believe they can offload punishing duties to God (Laurin et al. 2012b). Here, people are doing the opposite of what they think God is doing.

Together, these finding suggest a role linking beliefs in morally-concerned, punitive, supernatural monitors to increases in prosocial behavior. These findings contradict the idea that already prosocial individuals spontaneously imagine conceptions of prosocial deities, or with explanations that suggest that religious priming brings to mind cultural stereotypes linking religion with benevolence, which in turn encourage benevolent behaviors such as generosity (Norenzayan et al. 2013). Finally, our framework predicts cultural variability in religious priming-- --these effects should diminish in cultural contexts, typically in smaller-scale groups, where religious elements and norm-compliance are largely disconnected, the gods have limited omniscience, and are morally indifferent. This hypothesis is open to investigation.

4.3 PROSOCIAL RELIGIONS ENCOURAGE SELF-CONTROL

Participation in prosocial religions cultivates a variety of self-regulatory mechanisms, including self-control, goal pursuit, and self-monitoring—all processes that may also partly explain religion's capacity to suppress selfishness in the interest of the group and promote longevity and health (McCullough & Willoughby 2009). Although most of the supporting evidence is correlational (e.g., Carter et al. 2012), recent experimental studies suggest a causal direction. In a series of experiments (Rounding et al. 2012; see also Laurin et al. 2012a), religious primes were found to increase an individual's willingness to endure unpleasant experiences (e.g., drinking juice mixed with vinegar) and delay gratification (e.g., by agreeing to wait for a week to receive $6 instead of being paid $5 immediately). In addition, religious reminders increased persistence on a difficult task when self-control resources were depleted (Rounding et al. 2012). Other experimental findings (e.g., Inzlicht & Tullett 2010) corroborate these observations, showing that implicit religious reminders enhance the exercising of self-control processes, by, for example, suppressing neurophysiological responses to cognitive error. Self-control is closely related to prosociality, because cooperating or complying with various norms often requires forgoing immediate returns in exchange for some future benefits, group benefits, or afterlife rewards.

Many ritual and devotional practices may have culturally evolved in part by increasing self-control (see below) and performance. For example, Legare and Souza (2012, 2014) have explored how the elements found in widespread rituals, including repetitions, multiple step complexity and supernatural connections, tap aspects of our intuitive causal cognition to increase their perceived efficacy. Believing one is equipped with efficacious rituals may foster self-regulation, persistence and discipline by increasing individuals' confidence in their own success. Ritually enhanced self-efficacy improves performance (Damisch et al 2010).

5 GALVANIZING GROUP SOLIDARITY

Belief-ritual complexes take shape as cultural evolution increasingly exploits a variety of psychological mechanisms to ratchet up internal harmony, cooperation and social cohesion. In this way, prosocial religions bind anonymous individuals into moral communities (Graham & Haidt 2010; Haidt 2012), without prosocial religious elements being necessary for moral capacities or vice versa (Norenzayan, 2014). While many important open questions remain, here we focus on several that appear critical and have received some attention.

5.1 TRASMITTING COMMITTMENT: WHY EXRAVAGANT DISPLAYS DEEPEN FAITH AND PROMOTE SOLIDARITY

The extravagance of some religious rituals has long puzzled evolutionary scientists. These performances demand sacrifices of time, effort, and resources. They include rites of terror, various restrictions on behavior (sex, poverty vows), painful initiations (tattooing, walking on hot stones), diet (fasts and food taboos) and lifestyle restrictions (strict marriage rules, dress codes). Why are extravagant displays of faith commonly found in prosocial religions?

The answer to this question could be found in the way cultural learning biases operate. Belief can be easily faked, which would allow cultural models to manipulate learners by propagating “beliefs” that they did not sincerely hold. One evolutionary solution to this dilemma is for cultural learners to be biased towards acquiring beliefs that are backed up by deeds that would not be performed if the model’s beliefs were not genuine (as well as related strategies for "epistemic vigilance," see Sperber et al. 2010). Though limited, existing experimental work on cultural learning indicates that CREDs play an important role in the transmission of belief or

commitment in multiple domains where cultural influence matters, not just in religious contexts (for review see Henrich, 2009; for more recent evidence, see Willard et al, unpublished paper; Lanman 2012). In prosocial religions, this is of particular importance, given that faith spreads by cultural influence and religious hypocrites can undermine group cohesion. The idea here is that cultural evolution exploited the evolved inclination to attend to CREDs as a mechanism to deepen religious faith and commitment, and thereby promote cooperation.

Religious displays of self-sacrifice are often seen in influential religious leaders, who then transmit these beliefs to their followers. For instance, when male priests of the Phrygian goddess Cybele performed ritualized public self-castrations, they sparked cultural epidemics of Cybele religious revival in the early Roman Empire that often competed with the spread of Christianity (Burkert 1982). Similarly, early Christian saints, by their willing martyrdom, became potent models that encouraged the cultural spread of Christian beliefs (Stark 1996). When religious leaders' actions credibly communicate their underlying belief and commitments, their actions in turn energize witnesses and help their beliefs to spread in a group, and commitment deepens. If, on the other hand, they are not willing to make a significant demonstration of their commitment, than observers–even children–withhold their own commitment to those beliefs. Supporting this idea, Lanman (2012) reports that in Scandinavia, children are less likely to adopt the beliefs of their religious parents if those parents do not display religious CREDs. Conversely, both children and adults, exposed to both religious propositions (implicit or explicit) and CREDs, acquire a deeper commitment or belief in them then they would otherwise.

Once people believe, they are more likely to perform similar displays themselves, which offers another explanation as to why extravagant behaviors are culturally infectious in religious groups. Moreover, CREDs often come in the form of altruistic giving to other in-group members,

further ratcheting-up the level of in-group cooperation in prosocial religious groups. For example, Xygalatas et al. (2013) investigated the prosocial effects of participation in, and witnessing of, the Kavadi, an extreme set of devotional rituals for Murugan, the Tamil god of war, among Hindus in Mauritius. The act of witnessing this intense, pain-inducing set of rituals increased anonymous donations to the temple as much as participating did. Donation sizes were correlated with perceptions of the pain involved. This suggests that extreme ritual worship like this one is likely to be a CRED-like phenomenon in addition to any signaling functions it carries.

Although reliance on CREDs evolved for adaptive reasons originally unrelated to religion, their exploitation by prosocial religions helps explain why (1) religious participants, and especially religious leaders, must engage in sacrifices (e.g. vows of poverty and chastity make leaders more effective transmitters of faith/commitment); (2) martyrdom emerges prominently in religious narratives and actions; and (3) Big Gods are believed to demand extravagant sacrifices and worship, thereby causing CREDs, which in turn deepen faith in these Big Gods.

Finally, cultural evolution may have shaped the rituals of prosocial religions for the effective transmission of standardized religious beliefs and doctrines across large populations. Following Whitehouse's formulation (2004), we propose that cultural evolution may have increasingly favored the "doctrinal mode" of ritual in which some subset of rituals becomes high frequency, low arousal, highly repetitious and obligatory. The idea is that these types of repetitious rituals may cue norm psychology and increase the transmission fidelity of certain religious ideas (Kenward et al. 2011; Herrmann et al. 2013), thereby helping to maintain religious uniformity in large populations, not only among those individuals attending the ritual (more on this below), but across a larger imagined community of co-religionists.

5.2 SYNCHRONY AND FICTIVE KINSHIP

Prosocial religions often harness collective rituals that are characterized by shared synchronous arousal, a phenomenon Durkheim (1915) termed "collective effervescence." Historians have suggested that this synchronous arousal was the key to understanding the military innovation of close-order drill, which increased unit solidarity (McNeill 1982; McNeill 1995). Recent empirical work shows that the experience of synchrony increases feelings of affiliation (Hove & Risen, 2009; also see Paladino et al. 2010; Valdesolo et al. 2010) and facilitates feelings of fusion with the group, which may in turn encourage acts of sacrifice for the group (Swann et al. 2009). This appears to hold even in 4-year olds, where joint music making promotes prosocial behavior (Kirschner & Tomasello 2010). Experimental work has also shown that participation in synchronous song and dance results in greater trust, greater feelings of being on the same team, and more cooperation in economic games (Wiltermuth & Heath 2009). Even witnessing fire-walking puts the heart-rate rhythms of friends and relatives in sync with the walkers (Konvalinka et al. 2011). As noted earlier, synchronous rituals may also impact self-regulation: rowing synchronously with team members leads to higher levels of pain tolerance (Cohen et al. 2010), which should improve team performance.

It has often been observed that prosocial religious groups that often unite people across ethnic, linguistic and geographic boundaries evoke kinship in referring to each other (Atran & Henrich 2010; Nesse 1999). Christians often describe themselves as belonging to a "brotherhood," a common term that often applies today to the global fraternity (*ikhwan*) of Islam (Atran & Norenzayan 2004). In 5th c. BCE China, Confucius famously observed that anyone in the world sharing his moral and religious commitments should be viewed as a "brother" (*Analects* 12.5; Slingerland 2003, p.127), and throughout Chinese imperial history the emperor

was known as the "Son of Heaven" and viewed as the both the mother and father of the populace. There is little experimental work that explores the psychology behind fictive kinship and its relation to religious solidarity. We suggest two possible hypotheses. One is that kinship-psychology partly contributes to the deep trust and commitment that is characteristic of global religious communities. Alternately, it could be that the use of kinship metaphors helps establish the social norms for how one is supposed to treat co-religionists, which allows participants to readily learn proper behavior and to judge and sanction norm-violators (Chudek & Henrich 2011). Either way, we hypothesize that cultural evolution exploits this feature in innate social psychology, rather than it being an automatic misfiring of psychology evolved for survival in ancestral environments.

5.3 SIGNALING RELIGIOUS COMMITMENT AND EXPANDING THE SOCIAL CIRCLE

Through ritual practices and devotions, cultural evolutionary processes often exploit signaling to assort those with high levels of religious commitment from those without (Bulbulia 2004a; Sosis & Alcorta 2003). Empirically, sociological analyses are consistent with the idea that groups that impose behavioral restrictions or taboos have members that are more committed (Iannaccone 1994). Controlling for relevant socio-demographic variables, "strict" Protestant and Jewish denominations (Mormons, Orthodox) show higher levels of church and synagogue attendance and more monetary contributions to their religious communities (despite *lower* average income levels) than do less strict ones (Methodist, Reform). Work by Ginges et al. (2009) affirms that there is a link between ritual participation and parochial altruism—that is, commitment to a combination of in-group cooperation and out-group aggression. Both extensive

survey data and experimental findings from Palestinians and Jewish Israelis in the West Bank and Gaza show that ritual participation predicts more support for suicide attacks against outgroups, independent of religious devotion (as measured by prayer) and a wide range of other factors. These findings by themselves do not conclusively demonstrate that measures of strictness or sacrifice predict community survival and growth (an issue that we explore later). They do, however, demonstrate that group commitment is associated with the ritual participation commonly found in prosocial religions.

One of the pillars on which we build our argument is the hypothesis that human minds are reliably equipped with a set of social instincts related to kinship, reciprocity, status and reputation. In addition, these social instincts are bundled together with tribal instincts for life in groups based on a social identity cued by shared customs, taboos, languages, and practices (Henrich & Henrich 2007; Richerson & Boyd 1999). Our hypotheses suggest that cultural evolution harnessed these social, and particularly tribal, instincts to stretch and expand the social sphere of people to include all co-religionists, even when they lived well beyond the sphere of ethnic identity, reputation, or repeat interaction. Prosocial religions accomplish this in myriad ways, including norms that mark group boundaries, sacralize inequality and vertical relationships within expanding groups (sustain internal harmony), beliefs that describe a group-based primordial essence, or rituals that instill the relevant essence in new initiates. Common boundary markers that spark tribal psychology include distinctive dress, ornamentation, tattooing, bodily mutilation and food taboos. These behaviors can act as boundary markers, signals of commitment, and CREDs that transmit commitment to learners.

One critical boundary-marking in prosocial religions that is of particular interest is distrust of atheists (Gervais & Norenzayan 2013; Gervais, Shariff, & Norenzayan 2011). For atheists

belief is a personal matter on a metaphysical issue. For believers, lack of commitment to supernatural surveillance is a public threat to cooperation and social trust (Gervais et al., 2011; Norenzayan 2013). While there are several factors that are implicated in this prejudice, converging evidence shows that one key driver of religious distrust of atheists is the intuition that people behave better if they are under supernatural surveillance (Gervais & Norenzayan 2013). These boundary-setting processes illustrate that the solidarity-building potential of prosocial religions has a dark side and can turn toxic for people who are seen to fall outside of the imagined moral boundaries. Thus, intra-group cooperation can readily feed into intergroup antagonism, especially when social groups are already in a state of real or imagined conflict. This is a topic of great interest for understanding the conditions under which prosocial religions become accessories to intergroup intolerance and conflict (see for example, Atran & Ginges 2012; Haidt 2012).

5.4 METAPHYSICAL GROUNDING AND SACRED VALUES

Our approach suggests that cultural evolution anchors certain kinds of norms or beliefs—those favoring success in intergroup competition—to a kind of metaphysical bedrock (Durkheim 1915; Rappaport 1999), such as the desires of a widely-accepted and omnipotent deity. Some scholars have argued that distinctively moral norms have a necessary connection to metaphysical beliefs (e.g., Taylor 1989). This suggest that key features of norms such as authority-independence, universal applicability, and emotional salience become more widespread in large-scale societies influenced by Big Gods and in their secular successors, but are likely to be less important or unknown in small-scale societies (Huebner et al. 2010). It is also apparent that such moral norms, or "sacred values," are distinctive in being uniquely resistant to cost-benefit tradeoffs (Ginges et al. 2007; Atran, 2010).

We hypothesize that metaphysically grounded, group-beneficial norms that carry powerful affective force and punitive sentiments play an important role in insulating within-group cooperation from potential defection. Moreover, in larger-scale societies, especially those involving social classes and multiple ethnic groups, subgroups or coalitions will have incentives to push social norms in directions that favor their sub-group, sometimes at the expense of the overall group. If norms are grounded metaphysically, however, self-interested individuals or subgroups pushing to alter norms face a substantial obstacle.

The spread of normative monogamy may provide an illustrative case of self-interest being curtailed by metaphysically rooted norms. The anthropological record indicates that approximately 85% of societies have permitted men to take more than one wife (polygynous marriage), and both empirical and evolutionary considerations suggest that large absolute

differences in wealth should favour more polygynous marriages. Yet monogamous marriage spread across Europe, and more recently across the globe, even as absolute wealth differences expanded. Much evidence now suggests that the norms and institutions of modern monogamous marriage have been favoured by cultural evolution because of their group-beneficial effects. In suppressing intrasexual competition and reducing the size of the pool of unmarried men, normative monogamy reduces crime rates, including rape and murder (Henrich et al. 2012). Historically, Christianity overcame the obstacle presented by elite male interests (kings and nobles) by making monogamy sacred and divinely ordained, and thereby making polygamy not just counter-normative, but heretical. Similarly, Islam, while not enforcing strict monogamy, adopted practices that nevertheless inhibited polygyny, again backed by sacred authority (Henrich et al. 2012). A king or chief may be motivated to change secular laws to suit his immediate needs, but challenging divinely ordained sacred commands is another matter.

In summary, and to emphasize a key point, none of the psychological mechanisms harnessed by cultural evolution in the above account are unique to religion or to prosocial religions. Extravagant displays can be found in a variety of domains where social influence is important, such as in marketing, education, and warfare. Synchrony is widely used, especially in military drill. Fictive kinship is the central organizing principle of the kinship systems that characterize small-scale societies. Many sacred values, such as the notion of the existence of fundamental Human Rights, are found in secular societies, even among atheists (Taylor 1989; Atran 2010). What makes prosocial religions interesting and distinctive is the way that cultural evolution has packaged and interwoven a converging set of mechanisms with commitments to Big Gods and other supernatural beliefs.

6 THE CULTURAL GROUP SELECTION OF RELIGIOUS GROUPS

We now turn to the final argument: cultural evolution, driven by inter-group competition (including warfare) over historical time favored those amalgams of beliefs, norms and rituals (belief-ritual complexes) that most effectively increased internal harmony, elevated in-group cooperation in expanding groups, and promoted success in outcompeting or absorbing rival groups. Since fully documented and quantified cases of long-term historical processes are currently hard to come by we proceed by sketching two converging lines of evidence. First, we highlight ethnographic and historical evidence of cultural group selection in action, where certain belief-ritual packages spread due to the differential survival and/or success of groups. These cases do not conclusively demonstrate all the relevant causal interconnections, but they do establish a prima-facie case that certain rituals and beliefs spread via intergroup competition. Second, to illuminate the causal processes that link the adoption of certain religious beliefs to group success, we examine demographic and economic evidence suggesting that prosocial religions favor faster reproduction and greater economic success.

6.1 ETHNOGRAPHIC AND HISTORICAL CASES

Historical and ethnographic evidence from a variety of sources indicates that particular belief-ritual combinations do spread by cultural group selection. As noted above, even before the emergence of large-scale societies, inter-group competition would have favored solidarity-inducing rituals (Henrich forthcoming). This process can be seen in an ethno-historical study of the evolution of various belief-ritual complexes in the highlands of New Guinea. Central to the emergence of these ritually galvanized ideological systems, which the authors describe as promoting "identity, welfare, and unity" within larger and larger groups over time, is the cultural transmission of these belief-ritual complexes, or elements of them, both within and across linguistic boundaries (Wiessner & Tumu, 1998: 195-196).

Elsewhere in New Guinea, Tuzin has examined the historical co-emergence of a strong group ideology, an intricate form of social organization, a complex ritual system, and a high degree of cooperation and solidarity. In a region where villages often break down when they grow above approximately 300 people, this study of the Ilahita Arapesh reveals how an interlocking segmented moiety system, galvanized by the rehearsal of a secret ritual system called the Tambara, permitted 1,500 people to live together with high levels of cooperation and solidarity, and thereby survive in a very competitive regional environment that has long included both military and economic threats (Tuzin 1976; Tuzin 2001). The basic elements of the belief-ritual complex, which the Ilahita Arapesh elaborated and improved upon, were first imitated from a highly successful and aggressively expanding group called the Abelam around the 1870's. Their acquisition and modification of the Abelam system probably permitted Ilahita's inhabitants to resist being driven out, and has since permitted both military and economic success.

This contextually-rich ethno-historical study fits with recent cross-cultural analyses of small-scale pre-industrial societies showing that greater participation in intergroup warfare (but not within-group violence or intensity of mating competition) predicts more extreme rites for males (Sosis et al. 2007). Whether these rites are commitment signals or CREDS (or both), the findings suggest that increases in inter-group competition favor rituals and devotions that more effectively galvanize commitment, solidarity and cooperation. Groups with these practices increase their odds of surviving, expanding, and being imitated by other groups.

Cultural group selection also operates when individuals preferentially adopt or "convert" to certain cultural packages, based on the success of those groups (Boyd & Richerson 2009). In her study of the spread of Islam into Africa, Ensminger (1997) discussed how Islamic CREDs—abstaining from alcohol, avoiding pre- and extra-marital sex, not consuming blood or pork, and fasting—transmitted greater trust and shared rules of exchange and the use of credit institutions among converted Muslims. This facilitated more trade and greater economic success. The Orma (Kenyan agro-pastoralists), and presumably other African groups, began adopting the religious beliefs along with the associated institutions and rituals. Ensminger (1997) suggests that these Islamic groups not only attracted followers faster than other groups, but also succeeded at times in imposing Islam on conquered groups—another form of cultural group selection that influences the distribution of religious representations.

Finally, at least one quantitative investigation has directly tested the prediction that religious cultural groups, particularly those incorporating extravagant displays, enjoy an advantage in group stability over time over cultural groups that do not (Sosis 2000; Sosis & Alcorta 2003). Sosis compared the group longevity of 19th century America religious and secular communes. Facing various internal and external threats to group stability, communes that were

unable to solve collective action problems were unlikely to survive and prosper. For every year considered over a 120-year span, religious communes were found to outlast secular ones by an average factor of four (Figure 3). Moreover, religious communes were about three times less likely than secular ones to dissolve in any given year as a result of internal conflict or economic hardship. In a subsequent analysis of 83 of these religious and secular communes (Sosis & Bressler 2003), it was found that religious communes imposed more than twice as many restrictions (including food taboos and fasts, constraints on material possessions, marriage, sex, and communication with the outside world), and the number of restrictions predicted religious commune longevity ($R^2 = 0.38$), even after controlling for population size, income, and founding year. Note these are differences in the longevity of the cultural groups (not the individuals within the groups) over a historical time spanning just a few generations.

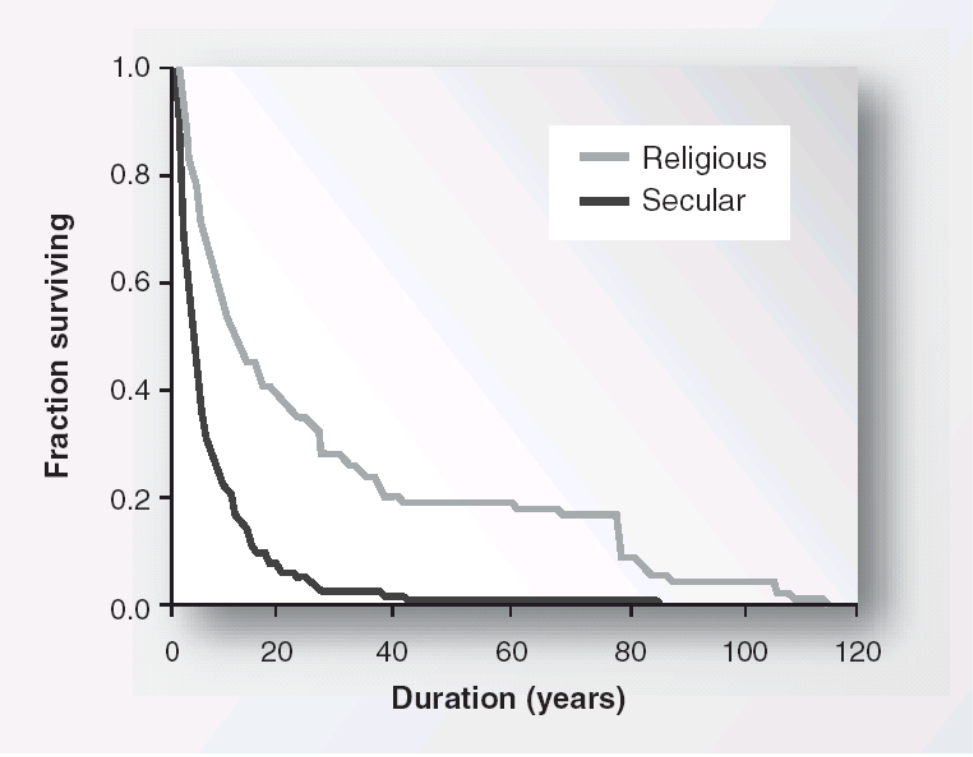

FIGURE 3. RELIGIOUS COMMUNES OUTLAST SECULAR ONES OVER TIME (FROM SOSIS, 2000).

6.2 PROSOCIAL RELIGIONS INFLUENCE REPRODUCTIVE AND ECONOMIC SUCCESS

Cultural group selection can work through a variety of mechanisms. Here, we highlight evidence indicating that the beliefs and practices of prosocial religions generate greater reproductive and economic success. Greater reproduction means a faster rate of production of culture-bearing co-religionists, because children, all else being equal, tend to acquire the religious beliefs of their families and communities. All else being equal, economic productivity also matters because of the obvious advantages it offers in intergroup competition, and because economically less successful groups often copy more successful ones.

Prosocial religions are often pronatalist in orientation: they tend to favor higher fertility rates (Blume 2009; Kaufmann 2010; Norris & Inglehart 2004). This association is both strong and robust across diverse populations. For example, individual-level data from 82 countries reveals a linear relationship between the frequency of religious worship and number of children, with those who worship more than once a week averaging 2.5 children compared to 1.7 (below replacement) for those who never worship. Blume (2009) has examined the Swiss census of 2000 and found that, even after controlling for education and income, Christians, Hindus, Muslims, and Jews all outbred the religiously nonaffiliated. A study comparing the fertility rates of orthodox or atheist European Jews found that the atheists had the lowest birthrate, averaging around 1.5 children per woman, whereas the religious Jews averaged nearly three, with the Haredim in Israel averaging six to eight children per woman (Kaufmann 2010).

At the group-level, societies that are more religious have higher population replacement levels than secular societies, even when countries are matched on national income and education levels (Norris and Inglehart 2004). Time series analyses indicate that, as religiosity declines in a society over time (as has occurred in Europe in the second half of the twentieth century), so do fertility rates. In fact, according to Blume (2009), it is hard to find overwhelmingly secular societies today that are reproducing above replacement levels, despite strong government incentives in welfare-state countries such as France and Germany. Religious positions on women's rights, contraception, sexual orientation, and abortion can be seen in this same light. Indeed, what are called 'family values' in the United States can be best understood as a set of values conducive to producing larger families.

Of course, not all religions encourage reproductive success—consider the celibate Shakers. However, in the argument we have outlined, those religious groups with beliefs and practices that promote rapid population growth would be, all else being equal, expected to outcompete their rivals (whether religious or secular) and take a larger share of the religious market. Exactly how prosocial religions have these effects is an open question. Nevertheless, we think that cultural evolutionary processes play a major role in this reproductive advantage, just as they do in their effects on cooperation. Fertility rates of second generation immigrants to the U.S. can be predicted from the average fertility rates of the home countries of their parents, indicating just how powerful a grip culture can have on reproduction (Fernandez & Fogli 2009). The rapid declines in fertility -- often in just a few generations--following secularization also suggest that these effects are likely to be in an important sense culturally transmitted.

Elements in prosocial religions can also influence the economic performance of groups, which facilitates their cultural success. For example, using panel data from 81 countries,

McCleary & Barro (2006) show that countries with stronger beliefs in a consequential afterlife (e.g., heaven and hell), experience faster economic growth rates, controlling for life expectancy, education, the rule of law, fertility rate, and ratio of investment to GDP. Belief in hell in particular, is found to be a strong predictor of commitment to teaching thrift to children. But, consistent with the secularization trend, greater GDP per capita in turn leads to a subsequent decline in religious beliefs. These effects on economic growth are based on both longitudinal evidence and on extensive statistical controls (Barro & McCleary, 2003). With appropriate caveats, then, these analyses encourage the hypothesis that religious beliefs have effects on economic outcomes. Other correlational analyses show that belief in a personal god, in the afterlife, as well as ritual participation, independently predict harsher judgment of key moral transgressions, including cheating on taxes, accepting a bribe, adultery, and lying (Atkinson & Bourrat 2011).

7 IMPLICATIONS, COUNTER-ARGUMENTS AND CONCLUDING REMARKS

7.1 SYNTHESIZING EXISTING VIEWS ON THE EVOLUTION OF RELIGION

Despite recent progress, the evolutionary study of religion is in its infancy, and important gaps remain in our knowledge and much work needs to be done to reach a more complete understanding. The theoretical framework presented here synthesizes key elements of the two most influential evolutionary approaches to religion to date—the *byproduct* and *adaptationist* approaches. We note that both approaches have their merits and have generated rich theorizing and empirical literatures that have moved the field forward. Our framework builds directly on the

byproduct perspective that religious representations are made possible, and facilitated by reliably developing features of human cognition that were not naturally selected for the production of the religious beliefs or behaviors they now underpin. However, by embedding these ideas within a framework that considers more fully both genetic and cultural inheritance, we can account for a number of key phenomena not explicitly addressed by the cognitive byproduct account.

Two examples illustrate this point. First, while the byproduct account helps explain how people come to mentally represent supernatural agents, it is silent about one of the most critical features of (some) religions, that of *faith or commitment* to particular gods. This is captured by the "Zeus Problem" (Gervais & Henrich 2010), which asks how people in one place and time can acquire belief in, and commitment to, a particular religious representation, while people in another place or time do not, even when exposed to identical representation.[8] We argue that understanding the origin of faith requires not only explaining the cognitive mechanisms that allow people to mentally represent, remember, and transmit religious ideas, but equally crucially how people commit to only a subset of all intuitively conceivable deities. We hypothesize that cultural learning biases, such as CREDs (Henrich, 2009), are a crucial part of the explanation. In this view, if cultural learning cues are altered, significant shifts occur in the particular deities people believe in without altering their content. Second, most byproduct approaches have not explicitly dealt with the body of empirical evidence showing that some religious elements spread by having prosocial effects.[9] In contrast, we offer an argument compatible with central aspects of the cognitive byproduct view, but one that goes further and explains why some, but not most, "thinkable" cultural variants have powerful downstream social effects.

The current framework also accounts for a set of important phenomena that are addressed by two distinct adaptationist theories of religion: costly signaling approaches and the

supernatural punishment hypothesis. Both perspectives accommodate the idea that the cognitions underlying religious beliefs and behaviors may have been evolutionary byproducts, but both highlight their adaptive role (Bering 2006; Sosis 2009). The costly signaling approach, grounded in behavioral ecology, argues that extravagant religious displays are naturally selected for life in cooperative groups, allowing individuals to reliably signal their degree of cooperation or their group commitment to solve the free-rider problem (Bulbulia 2004; Irons 2001; Sosis and Alcorta 2003; Bulbulia 2008). This approach is compatible with cultural variability and cultural evolutionary logic, and indeed recent work in this perspective has begun to integrate costly signaling accounts with models that take into account intergroup competition and cultural evolutionary changes (e.g., Wildman & Sosis, 2011; Sosis & Bulbulia, 2011). We have built a foundation that further promotes such synthesis by incorporating insights from this approach in two ways. First, by emphasizing CREDs as well as signaling, we account for both the cultural contagion generated by these extravagant displays and what they communicate to others about the actor's commitments. Second, by embedding signaling approaches within a cultural evolutionary framework (Henrich 2009), we can explain why people might acquire religious beliefs with varying degrees of commitment, as well as why individuals are more susceptible to acquiring religious beliefs that are backed up by credible displays. Our view also positions specific signals within a cultural evolutionary process that assembles practices and beliefs to exploit signaling logic over historical time.[10]

Another adaptationist account that has garnered interest is the supernatural punishment hypothesis (SPH: e.g., Johnson 2009; Bering 2011; Bering 2006), which argues that a fear of a moralizing god is a naturally selected genetic adaptation targeting moral self-constraint or error management. While our framework and the SPH share similarities, and draw from some of the

same body of evidence, the two differ in several key respects. Whereas we argue that Big Gods were culturally selected in individuals and groups, the SPH argues that fear of moralizing gods is a *genetic adaptation* favored by within-group genetic selection, whose function is to restrain individuals from defection because of the social punishment they personally risk if caught (Johnson & Bering 2006; Schloss & Murray 2011; Johnson 2009). The cultural evolutionary framework and the supernatural punishment hypothesis in principle can be compatible, and we encourage researchers to explore this possibility. However, our interpretation of the current ethnographic evidence raises two key challenges for this hypothesis. One, the available evidence shows that in small-scale societies, and especially among foragers, gods have limited omniscience and little or no moral concern. Two, gods become more moralizing and interventionist as societies scale up and anonymity invades relationships, where the likelihood of escaping social sanctions for defection is greater, not smaller (for further discussion and critique, see Shariff et al. 2010; Norenzayan 2013). Our approach preserves the important insights and evidence from this hypothesis while accommodating what would otherwise be empirical anomalies.

Our framework also circumvents unproductive definitional debates about "religion." Within religious studies, there is no widely-accepted definition of what constitutes "religion," or even if the term itself usefully picks out a coherent category of beliefs or behaviors (Saler 2009; Stausberg 2010). In our framework, the concept of religion merely provides a pithy rhetorical prop to cue readers to the kinds of interrelated phenomena that require explanation. The religious package is a statistical pattern governed by specific hypotheses, rather than a predefined concept with necessary or sufficient features. There is therefore no expectation of a single over-arching definition of religion or clear semantic boundaries, because the package of traits that gets labeled

"religion," while containing recurrent elements, culturally mutates in a predictable fashion, taking different shapes in different groups and at different historical times (Norenzayan 2013; for a similar but distinct account, see Taves 2009).

7.2 COUNTER-ARGUMENTS AND ALTERNATIVE CULTURAL EVOLUTIONARY SCENARIOS

Now that we have situated a cultural evolutionary framework in the broader debates about the evolution of religion, we evaluate the merits of alternative scenarios and counter-arguments in light of the evidence. One obvious possibility we return to is reverse causation – the idea that prosocial religions are a consequence, rather than a cause of social complexity and large-scale cooperation. To sharpen this alternative account, we consider two versions of the question. The broad version is that the causality is bi-directional: prosocial religions are both a cause and a reflection of large-scale cooperation. In other words, they are best characterized as a mutually galvanizing feedback-loop. This is of course compatible with the hypothesis that prosocial religious elements contributed to the expansion of the cooperative sphere. The narrower version is that prosocial religions may be causally inert, only a byproduct of large-scale cooperation (e.g., see Baumard & Boyer, 2013).

We argue this byproduct-only account is difficult to reconcile with the breadth of the evidence for at least three reasons. First, we note that the religious priming data, supported by a meta-analysis, clearly contradict this alternative claim. Second, in the 15-culture experimental study conducted by Henrich et al (2010), where adherence to world religions (relative to local religions) predicted more prosocial behavior in economic games, this effect remains even after controlling for community size (as well as other variables implicated in religion and

prosociality). If both prosocial religions and prosocial tendencies were merely a consequence of societal scale, statistically controlling for community size, market integration, income, education and wealth should eliminate the association between world religion and prosocial behavior. The data did not support this. Third, the cross-cultural ethnographic patterns discussed earlier pose a different kind of challenge to this account. There are multiple statistically independent predictors of Big Gods (e.g., Peoples & Marlowe, 2012). The byproduct-only hypothesis would have to offer piecewise and special case explanations – different accounts would have to be conjured up for why people who live in large anonymous societies, practicing animal husbandry, engaged in agriculture, and exposed to water scarcity imagine Big Gods more than do people in other societies that lack these conditions. The causal hypothesis, in contrast, is backed up by experimental evidence, and it also offers a unified explanation for these cross-cultural patterns, as each of these socio-ecological conditions pose serious collective action problems to which prosocial religions with Big Gods contribute solutions (e.g., Peoples & Marlowe, 2012).

Another cultural evolutionary scenario is that prosocial religions proliferated only after other mechanisms produced a set of conditions in which prosocial religions increasingly became a target of cultural evolutionary pressures. That is, prosocial religions may not have played an original role in enabling the rise of large-scale cooperative societies, but rather, may have been a consequence of them. Once prosocial religions took shape, they then contributed to maintaining and expanding large-scale cooperation[11]. Because the framework we have outlined does not specify a fixed temporal sequence, this scenario is a viable alternative given the available ethnographic, historical, and experimental evidence. We suspect that history will show some cases in which religious elements spread first, then societies expanded, and other cases in which

the societies expanded, and then the religious elements spread and in turn sustained and broadened the expansion. These alternative historical scenarios are ripe for research.

7.3 FROM RELIGIOUS BELIEF TO DISBELIEF

The widespread occurrence of at least some forms of atheism[12] presents an interesting challenge for any evolutionary explanation of religion. Religion, by some evolutionary accounts, is either a suite of adaptive strategies built into evolved psychology, or it is a direct projection from reliably-developing, species-specific, cognitive capacities onto the world. We take up this challenge in the framework presented here and offer an account of secularization. By combining insights from the byproduct approach with cultural evolution, we suggest that psychologically real atheism is possible, even if some cognitive biases—*all else being equal*—push people towards religious belief. Our framework suggests that religious belief—as a joint product of cognitive biases, core existential motivations concerning mortality as well as control and meaning, and cultural learning strategies—may produce distinct psychological pathways that jointly or in isolation lead to disbelief (Norenzayan & Gervais 2013).

Therefore, rather than seeing "atheism" as a single phenomenon, our model treats it as a blanket term for several pathways to disbelief, including (1) *mindblind atheism* associated with deficits in mentalizing; (2) *InCREDulous atheism*, due to lack of witnessing extravagant displays of religious commitment; (3) *apatheism* or indifference to religion induced by the absence of existential threats or material hardship; and (4) *analytic atheism*, where analytic cognitive processes override or block the cognitive intuitions that anchor religious beliefs.[13]

Finally, because this framework tackles both recurrent features of prosocial religions, and historical and cultural changes over time, it gives center stage to questions about the conditions

that give rise to secularization. We argue that, while multiple pathways likely stabilized large cooperative social groups, religiously-driven prosociality was one powerful force. In most of humanity's past, and indeed for most societies even today, the secular mechanisms and institutions that sustain prosociality, were—and often remain—rare or unreliable. Our analysis accommodates the fact that religiosity systematically varies depending on the social conditions that exist in particular populations at particular times. Religious prosociality was once one of the most effective ways to foster exchange among strangers or organize them for cooperative endeavors. However the recent spread of secular institutions since the industrial revolutions—including democratic political institutions, policing authorities, and effective contract-enforcing mechanisms—have ushered in widespread large-scale prosociality without gods.

Our framework therefore provides an account of how secular societies climbed the ladder of prosocial religion and then kicked it away. Prosocial religions may have buttressed a cultural bridge between the small-scale human societies that dominated much of our evolutionary history and the complex secular societies of the modern world. However, with the emergence of strong secular institutions that promote public trust and existential security (Norris & Inglehart 2004), the selective forces that spread and sustained these belief-ritual packages began to ebb. This may have led first to a downgrading of concepts like hell and God's wrath, which would have weakened the forces sustaining prosocial religions, and then gradually to the loss of religious faith itself. Conversely, prosocial religions continue to thrive where existential threats like natural disasters, material insecurity, and inefficient rule of law, remain rampant (e.g., Norris & Inglehart 2004; Sibley & Bulbulia 2012; Bentzen 2013).

Consistent with this, it appears that God and government are both culturally and psychologically interchangeable. Experimentally induced reminders of secular moral authority

had as much effect on generous behavior in an economic game as reminders of God (Shariff & Norenzayan 2007). The effect of participation in a world religion on punishing of selfish behavior disappears when a third-party punisher is introduced into the game (Henrich et al, 2010), also suggesting some psychological interchangeability of supernatural and secular sources of monitoring and punishment. Cross-national surveys show that greater trust in government stability and control undermines religion (Norris & Inglehart 2004), and reduces distrust of atheists among believers (Gervais & Norenzayan 2012b; Norenzayan & Gervais, in press). Moreover, experimental manipulations or naturally occurring events (e.g., electoral instability) that lower faith in one of these external control systems (God or the government) lead to subsequent increases in faith in the other (Kay et al. 2008). While this is a complex question, there are signs that some societies with strong institutions and stable life conditions have passed a threshold, no longer leaning on prosocial religious elements to sustain large-scale prosociality. Some of the most cooperative and trusting societies on earth, such as those in Scandinavia, are also the least religious in the world (Zuckerman 2008).

7.4 CONCLUSION

It is far from clear whether secularization will outpace prosocial religions. Worldwide evidence shows that societies, as they experience the emergence of strong secular institutions that reduce existential insecurity and ensure the rule of law, become more secular (Norris & Inglehart 2004). However, prosocial religions continue to convey a reproductive advantage (Blume 2009; Norris & Inglehart 2004), which means that religious societies are still growing faster than secular ones, countervailing the great inroads made by secularization. As a result, the majority of the world's population remains religious (Norris & Inglehart 2004), and the vast majority of

adherents belong to the prosocial religions. This tension between demographics and economics—along with the corresponding interplays and rivalries between various competing prosocial religions, and the tension between religiosity and secularity—remains a defining feature of modernity (Taylor 2007), and one that will continue to shape the world in the coming century.

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[1] We consider 12,000 years as a convenient starting point when the first human groups in the Middle East began to scale up (cf. Diamond 2005). However, this process unfolded at different times in different regions, and there were fluctuations in the size and social complexity of human groups even in the Pleistocene.

[2] Richerson et al. (2001) show why demographic growth cannot account for this expansion. Note that some evolutionary researchers do not see this as a puzzle, arguing that our "hunter-gatherer-psychology" (e.g., kin and reciprocity psychology) in the absence of any cultural evolution simply "misfires" to create a ready path to large-scale cooperation (Burnham & Johnson, 2005; Dawkins, 2006) The limitations of this argument have been discussed elsewhere (Chudek, Zhao, & Henrich, 2013).

[3] We label these evolutionarily modern religious groups "prosocial" to emphasize the fact that they encourage prosocial behavior among their adherents. It should be noted that we see this prosociality as a form of *parochial altruism* (e.g., Bowles, 2006)—that is, preferentially applied towards in-group members, and when real or perceived intergroup threat is present, coupled with hostility towards out-groups. Moreover, we do not claim that these elements are unique to religious groups. We see no natural partition between "religious" and "cultural" representations; rather what is distinctive and impactful is the convergence of these elements and their cultural evolution in historical time. Finally, we emphasize that our explanatory focus is on "natural religion" -- the lived folk religious beliefs and behaviors among ordinary believers, not the theological doctrines or texts found in some groups (McCauley, 2011).

[4] In this category we include aspects of epistemic vigilance (Sperber et al. 2010) not discussed above in Content or Context biases. Also, we include here cultural transmission of belief or commitment based on hard-to-fake emotional or physiological cues, such as involuntary crying and shaking. Other scholars have considered such behaviors in the context of signaling models (Bulbulia 2008; Frank 1988, Schloss 2008, Slingerland 2014).

[5] In discussing the varying cultural survival rates of religious ideas, traditions, and groups, we take care not to conflate cultural success with moral superiority – a version of the well-known is-ought fallacy (i.e., what is, is good).

[6] Also see Marlowe (2010) for similar observations of Hadza foragers, and for recent quantitative evidence among Tyvan pastoralists in Siberia, see Purzycki (2011) and Purzycki (2013).

[7] Schneider, personal communication. Coffin Text spell 1130; see discussion in Enmarch (2008), and cf. Lazaridis (2008), Assmann, J. (2001).

[8] The related Mickey Mouse Problem asks why people do not worship the minimally counterintuitive agents in cartoons, myths, and folktales (Atran & Norenzayan, 2004; cf. Barrett 2008).

[9] Baumard and Boyer (2013) propose to explain prosocial religions as cultural reflections of evolved moral intuitions, such as proportionality and fairness, and argue against the idea that some religions spread by having prosocial effects. However, as we explain in Section 7.2, this "byproduct only" account falls short of explaining the full range of observations—historical, cross-cultural, and experimental.

[10] We note that formal models of signaling typically produce many different stable equilibria, only some of which are signaling equilibria, and even fewer of which involve any prosocial behavior. Cultural group selection provides a mechanism by which these more group-beneficial signaling equilibria can spread, while at the same time permits us to account for the immense diversity of signaling systems across human societies and their change over historical time (Henrich 2009). Once individuals come to differ in their degrees of commitment to a religious doctrine, signals of various kinds can allow them to assort (honestly) according to their degree of commitment. We think cultural evolution has harnessed both CREDs and signaling mechanisms.

[11] We thank an anonymous reviewer for this suggestion.

[12] For worldwide prevalence of atheists, see Zuckerman (2007).

[13] For a review, see Norenzayan and Gervais (2013) and Norenzayan (2013). See also similar arguments concerning different forms of disbelief and the importance of cultural and linguistic environment to religious disbelief (Banerjee & Bloom, 2013; Lanman 2012; Geertz & Markusson 2010; Bulbulia 2008; McCauley 2011).