

RELIGION AS AN EFFECTIVE CAUSE OF COOPERATION AND SOCIAL COHESION – CONCEPTUAL AND EXPLANATORY CONSIDERATIONS

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Abstract: Religion is well-known to correlate with cooperative behavior, particularly within religious groups. In light of a sudden decline of religion in Western societies and rising indicators of loneliness and social fragmentation, it becomes pressing to understand not only why this connection occurs, but also whether its underlying mechanisms can be sustained under secular conditions. The precise mechanisms driving this effect, however, remain a matter of ongoing debate in the scientific community. There is no shortage of models aiming to explain the phenomenon, and the offered explanations are as numerous and diverse as are the researchers promoting them. This paper argues two main conceptual points from a philosophical point of view: First, many existing models oversimplify the underlying mechanisms by emphasizing one or a few stable explanatory factors, leading to shortcomings in both retrospective explanation and prospective prediction. Second, a more adequate approach requires an actor-oriented model that accounts for fluctuating relationships both within individuals and between individuals and their circumstances. Such models, rooted in recent advancements in causal inference for social networks, recognize that certain factors within and across religious groups are inherently unstable but still secure cooperation through multiple, dynamic pathways. This proposed model promises a more nuanced and scientifically robust reconstruction of the relationship between religion and cooperation.

Keywords: Religion, Cooperation, Social Cohesion, Actor-Oriented Models, Explanatory Adequacy

1. INTRODUCTION

Cooperation can be rational within Prisoner's Dilemma games if there is repeated interaction or small-world interaction (Friedman, 1971). Humans, however, cooperate substantially more than would be predicted by simple game-theoretic models. Apart from a potential biological constant eliciting sociality in humans, it has long been established that religion can strengthen cooperative behavior, notably among the religious (Oviedo, 2016). At the same time, the question of why exactly this well-known effect occurs is disputed in the scientific community until today.

One reason the relationship between religion and cooperation has attracted renewed scholarly attention is the apparent concurrence, in many Western societies, of a sudden decline of religion (Inglehart, 2020) and rising indicators of loneliness and social fragmentation (Barreto et al., 2021; Surkalim et al., 2022). If religious traditions have historically helped sustaining large-scale cooperation beyond kinship ties and immediate reciprocity, then understanding the mechanisms underlying this association becomes theoretically and socially urgent. It is particularly important to determine whether these mechanisms are intrinsically tied to religious forms of life or whether they can be functionally replicated under secular conditions. Addressing this question bears directly on whether increasingly secular societies face structural challenges in maintaining cooperation and mitigating free-riding, or whether alternative institutional configurations can provide comparable stabilizing effects.

There is no shortage of models aiming to explain the phenomenon, and the offered explanations are as diverse as are the researchers promoting them. Economists have sometimes focused on the way religion affects the utility functions of rational individuals in different social settings (Iannaccone, 1992; Levy & Razin, 2012). Psychologists have been interested in the cognitive and emotional states associated with religiosity and their connection to cooperative behavior (Graham & Haidt, 2010; Rand et al., 2013). Neuroscientists have looked at brain mechanisms underpinning pro-social actions (Declerck et al., 2010; Dunbar, 2020; Ten Velden et al., 2017). Sociologists have considered the function of religion in the creation of social relationships such as trust (Sosis & Alcorta, 2003).

In this conceptual paper, we approach the topic from a philosophical and methodological perspective, focusing on the striking diversity, multi-disciplinarity, and mutual inconsistency among models proposed to explain the correlation between religion and cooperation. A common feature of these models is their tendency to emphasize a single class of explanatory factors as primary, framing religion as a driver of cooperation through mechanisms rooted in either economic,

psychological, sociological, or neural causes. Integrated theories designed to recognize the significance of larger numbers of diverse factors and a dynamic progression in time are difficult to find. Additionally, the specific dogmatic teachings and content of the religions in question are difficult to quantify, and they are therefore often missing in these explanations.

Against this backdrop, our primary motivation for this study is the impression that the causal link between religion and cooperation is often modeled in a misleading way. We argue that by emphasizing specific types or categories of factors, many theories overlook that there is no singular, stable causal relationship between religion and cooperative behavior to be found - neither within a community nor within the same individual over time. We therefore propose an alternative approach by claiming that the causal connection between religion and cooperation can be represented best by an adapted version of stochastic actor-oriented models (Snijders, 1996, 2001, 2005; Steglich et al., 2010). Models of this kind have recently been advanced, for instance, for causal inference on social networks (VanderWeele & An, 2013).

In the case of religion and cooperation, such models construe the target phenomenon as generated from a variety of distinct factors that tend to fluctuate both across different religious communities and within the lifespan of the same individual. The factors often induce and stabilize the macroscopic effect of cooperation from different angles, which is why the correlation between religion and correlation is widely observed. Not all of these factors are causally independent from one another, which helps explain why mono-causal models can achieve partial success. The co-activation and fluctuation of the causal factors, however, are central features of the relationship. Singling out one type or class of factors with a presumed constant and universal impact is a fundamental conceptual and explanatory error in the context of religion and cooperation.

We present preliminary evidence supporting the plausibility of our model to encourage further empirical research in its direction. We contend that an encompassing model of this kind can explain observations in the context of religion and cooperation that remain a puzzle for many of the more focused models. For instance, it can account for the observation that diverse religions - despite significant differences in teachings, practices, and institutional structures - are often associated with similarly high levels of cooperation. Additionally, it explains why cooperation rates in religious groups often remain stable even when certain contributing factors are removed or altered. Our model also aligns with the personal accounts of religious individuals when they reflect on their behaviors, beliefs, and experiences over their own life.

Our paper is structured as follows. Section 2 gives a brief overview of the central terms and concepts utilized in this paper. Section 3 reviews some empirical results on the correlation of religion and cooperation, and it reviews several prominent proposals on how the correlation can be modeled. Section 4 critically assesses the adequacy of the models summarized in section 3, whilst section 5 develops a sketch and preliminary defense of our new model. Section 6 summarizes the paper and makes a proposal concerning potential future research on the matter.

2. THEORETICAL FRAMEWORK: TERMS AND CONCEPTS

In this section, we define the two central concepts of our article: religion and cooperation. Building on a widely shared understanding, we define religion as a tripartite phenomenon exclusive to human groups, comprising:

- (i) a system of normative and descriptive metaphysical dogmas or beliefs,
- (ii) a set of joint practices and rituals, and
- (iii) an institutional framing

These three elements are interrelated and typically harmonized. The dogmas and beliefs often include behavioral directives, views on the origin of the world, supernatural beings, and the purpose of human life. They may also offer causal explanations involving supernatural forces. The practices and rituals regulate aspects of life like family, sexuality, food, and time, and contribute to the emotional experience of religion. Rituals often serve to engage with supernatural beings and elicit divine favor. The institutional framing ensures the continuity of the religion, introduces new members to its tenets and practices, trains religious specialists, and enforces behavioral norms.

While these elements are typically interconnected, they can also function independently. Participation in religious institutions may stem from social or personal reasons beyond belief. Conversely, some deeply religious individuals may not participate visibly in institutional contexts (Fizzotti, 2002). This tri-partite structure synthesizes classical theories across disciplines like sociology, psychology, economics, and anthropology. For example, Durkheim (Durkheim, 1995) defined religion as “a unified system of beliefs and practices relative to sacred things [...] which unite into one single moral community called a Church,” corresponding to our three parts: beliefs (i), practices (ii), and institutional community (iii).

In contrast, Graham and Haidt (Graham & Haidt, 2010) focus on religion’s functions, defining it as “a complex system with many social functions, one of which is to bind people together into cooperative communities organized around deities.” This view emphasizes outcomes like cooperation, with implicit reference to beliefs and practices, but gives less weight to institutions. Sosis (Sosis, 2019) sees religion as

“an adaptive complex of traits incorporating cognitive, neurological, affective, behavioral, and developmental elements,” shaped by evolution to address ecological challenges. These traits promote cooperation and communication, enhancing survival. His reference to cognitive and behavioral traits aligns with our parts (i) and (ii), while institutional aspects appear indirectly through their social functions.

Our definition also resonates with Saroglou’s (Saroglou, 2011) “big four” religious dimensions: believing, bonding, behaving, and belonging—which reflect our three parts. Bulbulia (Bulbulia, 2011) defines religious traits as “psychological characteristics associated with commitments and practices respecting gods,” shaped by institutional, developmental, and genetic factors. This again captures dogmatic and ritual aspects (i and ii), with institutions (iii) seen as causal influences.

Turning to cooperation, the term is usually accepted as well-defined in research on religion and prosocial behavior. In game theory and economics, cooperation refers to actions that increase joint or social utility - i.e., outcomes that are Pareto-superior or Pareto-optimal (Raub, 2025). In scenarios like the Prisoner’s Dilemma, individuals face incentives to defect despite mutual benefit through cooperation (Kuhn, 2024). This game-theoretic notion is often used, either directly or approximately, in religion-and-cooperation studies, and we adopt it for our purposes.

However, cooperation in real-world settings often requires more than utility-maximization: it involves coordination, communication, compromise, and shared goals. It takes forms such as teamwork, alliances, or collective action and plays a vital role in social life, politics, trade, and moral community building—domains closely tied to religious practice and belief.

3. LITERATURE REVIEW: EMPIRICAL EVIDENCE AND EXTANT MODELS

In this section, we aim to accomplish two objectives. First, we examine empirical evidence on the correlation between religion and human cooperation, drawing key insights from two review articles by Oviedo (Oviedo, 2016) and Iyer (Iyer, 2016). We then summarize some of the most notable findings from various disciplines over the past 30 years. Our selection of primary studies is based on factors such as the authors’ prominence, the relevance of the topics, and the citation impact of the works. Second, we aim to make sense of the correlational findings by offering a theoretical perspective with several prominent models and theories of the correlational phenomenon. Our overview of relevant models can be generally categorized under four disciplines: a) economic, b) psychological, c) evolutionary, and d) sociological or anthropological models. The goal we pursue with this enterprise is to draw attention, on the one hand, to the striking diversity of the existing theoretical work

on religion and cooperation and, on the other hand, to the tendency of most contributions to emphasize one or few causal factors and to neglect their dynamic character. In our view, both features of the current research are serious obstacles for an adequate explanation of the correlation of religion and cooperation.

Oviedo's (Oviedo, 2016) review focuses on religious attitudes and prosocial behavior, summarizing evidence from priming experiments, cooperation games, and surveys. He finds growing interest in empirically corroborating the religion–pro-sociality link, particularly in in-group contexts, but limited support for universal altruism. Prosocial effects appear context-dependent, with mixed results for out-group interactions and methodological weaknesses such as reliance on self-reports. Oviedo (Oviedo, 2016) concludes religion's influence warrants further exploration in evolutionary and sociocultural terms.

Iyer (Iyer, 2016) examines how religion affects economic outcomes, tracing the field's development and noting evidence that religion fosters cooperation, social capital, and mutual aid. Experimental and evolutionary research links religion to generosity, trust, fairness toward strangers, and broader cooperation. Many religious groups also provide services such as education, exemplified by a national U.S. study of congregations. Likewise, as an example of research empirically uncovering the correlation, anthropologists Sosis and Ruffle (Sosis & Ruffle, 2004) conducted an experiment among members of Israeli kibbutzim focusing on the relationship between ideological commitment, religion and cooperation. Their aim was to determine: (1) if differences in ideological commitment could explain variation in cooperation within and across different kibbutzim, and (2) if some ideologies were more effective in promoting cooperation than others.

The study used the cooperative behavior of residents in Israeli cities as a control group and found that “when city residents and members of collectivized kibbutzim were paired against one another, they displayed similar levels of cooperation.” At the same time, members of collectivized kibbutzim exhibited higher levels of in-group cooperation than members of privatized kibbutzim, i.e. kibbutzim that had abandoned socialist ideology. The authors speculate that these findings highlight “the importance of ideological commitment in promoting cooperation and making it unlikely that our kibbutz-city results are solely a consequence of inherent in-group biases.” Most strikingly, however, the authors found that “...members of collectivized religious kibbutzim, especially males engaged in thrice-daily prayer, exhibited higher levels of in-group cooperation than members of collectivized secular kibbutzim.”

Sosis and Bressler (Sosis & Bressler, 2003) pursued a similar research question. Instead of conducting experiments, however, they analyzed historical data from 83 19th-century intentional communes in the United States to examine whether

religious rituals and teachings correlated with commitment and social solidarity, which in turn could foster intragroup cooperation. All communes faced collective action challenges, but those with more demanding religious obligations survived longer, suggesting that sacrifice fosters commitment and intragroup cooperation. This effect did not appear in secular communes, despite theories that costly practices should boost cohesion in any group—a surprising finding given examples like fraternity initiation rites. As the authors note, “[t]hese results are surprising in light of the fact that several authors have suggested that costly requirements increase cohesiveness in secular groups; fraternity hell weeks are the most common example” (Aimone et al., 2013; Sosis, 2000).

Instead of analyzing cooperation, Tan and Vogel (Tan & Vogel, 2008) in an experimental study with students at European University Viadrina, Germany focused on the related concept of trust and its connection to religious practice. The authors were able to show that trusting increases with the potential trustee’s religiosity. Moreover, “the extent to which trusting increases with a trustee’s religiosity, in turn, increases with a truster’s religiosity.” Trustworthiness also increased with religiosity. Trust and trustworthiness are key especially to repeated cooperation among humans.

Power (Power, 2018) studied a South Indian village and found that religious ritual participants had denser social networks and felt more embedded in their community than non-participants, without distancing themselves from other religious groups. Participation in the intense “imagistic” vow-taker procession significantly increased the likelihood of mutual support ties - 1.3 times more than for non-participants. Cooperation extended beyond in-group boundaries: 9.7% of support ties reported by Hindu residents connected them to people of other faiths, mainly Catholics. Power (Power, 2018) concludes that religious rituals foster social cohesion, with cooperative behavior playing a central role both within and across group boundaries.

Instead of looking at larger social groups, Brody et al. (Brody et al., 1996) investigated the connection of religion in family relationships. Their sample included 90 9-to-12-year-old African American youths and their married parents in the rural south of the United States. As they were able to show, “greater parental religiosity led to more cohesive family relationships, lower levels of interparental conflict, and fewer externalizing and internalizing problems in the adolescents. Formal religiosity also indirectly influenced youth self-regulation through its positive relationship with family cohesion and negative relationship with interparental conflict.”

In conclusion, research across various disciplines has consistently demonstrated a stable correlation between religion and cooperation or social cohesion, especially in in-group settings. However, the key question remains whether a direct causal

mechanism links these phenomena, and if so, in which direction. Alternatively, there may be a common underlying factor influencing both religion on one hand and cooperation and social cohesion on the other, without a direct causal relationship between the two. We now present a selective overview of several models and explanations published over the past 30 years aiming to address this question about the underlying causal mechanism.

- *Economic Models*

Iannaccone (Iannaccone, 1992) applies rational choice theory to view religion as a market phenomenon shaped by supply and demand, where individuals in pluralistic societies choose their religious participation. He models religion as a club good, where satisfaction arises from collective activities rather than solitary ones, noting that experiences like “speaking in tongues” or “ecstatic trances” are more fulfilling when shared. Levy and Razin (Levy & Razin, 2012) analyze how religions enforce behavioral rules with rewards and punishments, showing that religious organizations emerge endogenously to meet adherents’ needs. They identify two payoffs for religiosity: spiritual and material. Their findings reveal that groups with more demanding rituals tend to be smaller, more cohesive, and hold more “extreme” beliefs. This link between religion, extremism, and terrorism has also been studied using club models (Berman & Laitin, 2008; Makowsky, 2012), which have also helped determine optimal congregation sizes (Zaleski & Zech, 1995).

- *Psychological Models*

Graham and Haidt (Graham & Haidt, 2010) offer a social-psychological explanation for how religion fosters cooperation and binds individuals into cohesive communal structures. They address three fundamental questions central to understanding religion: “Why are religious people happier? Why are they more charitable? And why are most people religious?”. According to the authors, the key to answering these questions lies in ritual practice. Building on earlier research (cf. (Wiltermuth & Heath, 2009)), they highlight that individuals who engage in synchronized activities—such as singing, walking, or moving their arms together—demonstrate greater liking, trust, cooperation, and willingness to self-sacrifice compared to those who perform the same behaviors without synchronization (see also (Lang et al., 2017)). Thus, the performance of simultaneous ritual behaviors has a psychological impact, fostering trust and cooperation by positively shaping individuals’ perceptions of one another. Other scholars even make the case that

ritualized behavior helps foster fusion, by blurring the boundary between oneself and others (Whitehouse & Lanman, 2014).

Wojtkowiak (Wojtkowiak, 2018) further highlights the central role of ritual in religious experience and cooperation. However, in contrast to Graham and Haidt, (Graham & Haidt, 2010) she argues that religious commitment is an effect, rather than a cause, of specific forms of collaboration. Rituals, as social actions, typically take place in collective settings, where their transformative potential is directly tied to the level of collaboration. As she observes, “the greater the collaboration in ritual - or the higher the participation in terms of following and engaging in the ritual protocol - the stronger its transformative potential” (Wojtkowiak, 2018).

Beyond the direct effects of rituals (see also (Fischer et al., 2013)), there is the possibility that rituals serve as religious primes. A study by Rand et al. (Rand et al., 2013) involving individuals from various faiths has shown that religious primes can enhance cooperation. However, in this particular project, the primes were not only situational but also explicit and text-based. While some evidence suggests that primes may enhance cooperation, the general picture is still debated. A meta-analysis by Shariff et al. (Shariff et al., 2015) reported robust effects of religious primes on various outcomes, including prosocial behavior. However, this study's methodological rigor has been challenged. Van Elk et al. (Van Elk et al., 2015) reanalyzed the data using two alternative meta-analytic approaches, concluding that current meta-analytical methods may lack the robustness needed to reliably assess the effects of religious priming.

• *Evolutionary Models*

Norenzayan et al. (Norenzayan et al., 2014) propose a theory linking the cultural evolution of prosocial behavior to two puzzles (see also (Bendixen et al., 2021)). The first concerns how humans with varied motivations expanded cooperation in large societies, noting this occurred too quickly for demographic growth and too slowly for genetic evolution. The second puzzle focuses on the spread of prosocial religions, observing that most believers today descend culturally from a few ancient faiths. They argue that while small deities in foraging societies faded, religions worshipping “Big Gods” - powerful, moralistic deities who monitor and reward or punish behavior - became dominant, fostering devotion and complex rituals (Lang & Kundt, 2023; Lang et al., 2019; Norenzayan, 2013; Peoples et al., 2016). Empirical evidence supports that belief in moralizing, punitive gods promote prosociality (Purzycki et al., 2016; Watts et al., 2015).

Peoples and Marlowe (Peoples & Marlowe, 2012) find moral High Gods are most common in societies where cooperation is vital for managing scarce resources.

Foragers are least likely to hold such beliefs, while pastoralists - who used High God concepts to encourage cooperation - are most likely, enhancing productivity and reproductive success (Turchin et al., 2023).

- *Sociological and Anthropological Models*

Sosis and Alcorta (Sosis & Alcorta, 2003) propose the “costly signaling theory,” linking religion to trust and cooperation. They argue that costly rituals and behaviors - like initiation rites, legal adherence, and taboos - signal an individual’s commitment to the group, promoting solidarity and reducing free-riding (Watts et al., 2016). These rituals are costly-to-fake signals indicating dedication to in-group altruism. Believers accept supernatural sanctions, such as eternal hell, making them more trustworthy trading partners (Sosis & Alcorta, 2003). Costly signaling works better in religious contexts than secular ones (Chvaja et al., 2023) and fails in American fraternity hazing (Cimino & Thomas, 2022; Shaver et al., 2018).

Sosis (Sosis, 2004) links costly signaling to higher commitment in religious groups, supported by evidence from communes and kibbutzim. Groups with more committed members more easily achieve goals, explaining growth in demanding churches like Mormons, Adventists, and Jehovah's Witnesses versus declines in liberal Protestant denominations (Sosis, 2004). In a later study, Sosis (Sosis, 2005) focused on the more specific question of whether religion promotes trust. He argues costly religious practices serve as credible signals of trust, deterring defectors and facilitating cooperation. Such costly signals reduce monitoring costs and enhance trust, especially in mobile communities lacking long-term reciprocity (Sosis, 2005).

- *Synthesis*

Whilst all models designed to explain the correlation between religion and cooperation reviewed above appear generally plausible, and whilst some have already received empirical corroboration, it is clear that they differ significantly with respect to the mechanisms deemed central to this phenomenon. As mentioned, Iannaccone (Iannaccone, 1992) and Levy and Razin (Levy & Razin, 2012) focus on individual utilities derived from joint actions with others. In contrast, Graham and Haidt (Graham & Haidt, 2010) attribute the effect to quasi-biological mechanisms, such as joint movements, singing, and walking, which they argue directly foster trust and cooperation. The physiological explanation is very different from the cognitive and intelligence-based utility-improving mechanisms championed by Iannaccone and Levy and Razin (Levy & Razin, 2012).

Further divergence comes from Rand et al. (Rand et al., 2013), who argue that religious literary primes are key drivers of cooperation. Christian imperatives such as “love thy foes” and “walk the extra mile” encourage believers to act beyond self-centered utilities. Such an approach stands in stark contrast to the utility-maximizing models. Norenzayan et al.'s (Norenzayan et al., 2014) evolutionary account of “Big Gods” is not inconsistent with the previous models. It operates at a different conceptual level, however, by exploring how belief in omniscient deities evolved to promote large-scale cooperation within entire societies.

Peoples and Marlowe (Peoples & Marlowe, 2012) offer yet another distinct perspective, positing that High Gods function as external enforcers of cooperation by altering the strategic matrix of the cooperation game. Unlike Iannaccone and Levy and Razin's (Levy & Razin, 2012) utility-focused approach, their model suggests actors accept suboptimal individual outcomes under divine enforcement. Finally, the costly signaling theory by Sosis and Alcorta (Sosis & Alcorta, 2003) adds another layer by emphasizing trust-building mechanisms that go beyond mere utility optimization or physiological effects.

In summary, the models reviewed in this section are strikingly different in how they approach the phenomenon. Moreover, some offer mutually inconsistent accounts of the mechanisms driving the correlation between religion and cooperation, reflecting the complexity and multifaceted nature of the phenomenon.

4. RESULTS

- *Explaining Complex Realities with Simple Models*

While some of the models reviewed in section 3 appear to be mutually inconsistent, they share a tendency to highlight, or focus on, either one primary cause, or a very limited set of causes, of the observed correlation. Furthermore, these causes are typically treated as stable and persistent determinants, and they are not modeled in a dynamic way.

Iannaccone (Iannaccone, 1992) and Levy and Razin (Levy & Razin, 2012) both set into focus the utility individuals derive from joint actions, specifically the benefits of cooperation in religious contexts. By emphasizing individual utilities, these models narrow the explanation to the cognitive and social incentives behind cooperation, without considering broader social or evolutionary dynamics. Peoples and Marlowe's (Peoples & Marlowe, 2012) contribution bears some similarity to such an approach. At the same, they argue that the real mechanism is one of external enforcement and not one of optimization of individual utilities.

Graham and Haidt (Graham & Haidt, 2010), in contrast, identify the main cause in collective religious actions and a quasi-biological mechanism directly fostering trust and cooperation. Neither cognitive cost-benefit calculations, nor evolutionary processes play a relevant role in their model. As yet another causal narrative, Rand et al. (Rand et al., 2013) highlight religious literary primes as key drivers of cooperation. By suggesting that religious texts can alter behavior in ways that transcend self-interest, positioning moral imperatives, they ignore other possible evolutionary, physiological or utility-based explanations.

Norenzayan et al. (Norenzayan et al., 2014) effectively suggests that the adequate level of explanation is not the individual at all, but the societal level at which features of whole societal systems cause further states of those systems. Sosis and Alcorta's (Sosis & Alcorta, 2003) seem to be located somewhere in between the individual and the societal level by claiming that cooperation is achieved through social signaling in religious rituals rather than through direct utilities or physiological mechanisms.

In summary, each of these models aims to explain the relationship between religion and cooperation by focusing on a much-selected number of primary causal chains, all of which are typically perceived as non-dynamical and stable across situations and individuals. Accordingly, the relationships among the causes and effects are usually operationalized by regression analyses and stochastic causal inference.

That this may be a problematic practice in the present context is suggested by the reviewed models themselves. The fact that some of the models are mutually inconsistent and empirically incompatible, suggests that something else must be going on here. Additionally, when considering external anecdotal evidence, such as the testimonies of religious individuals—both past and present—about their non-linear spiritual journeys. Prominent examples are Mother Teresa of Calcutta, who dedicated her entire life to caring for the poor whilst going through phases of immense dogmatic doubt, Rav Abraham Issac Kook of Jerusalem who reflected on doubt in several sermons, as well as Imam Al Ghazali whose book *al-Munqid min ad-Dalal* [Deliverance from Error] has been interpreted as an intellectual autobiography. Doubts arise regarding the adequacy of focused and simplified models in explaining the correlation between religion and individual cooperation. A narrow focus in these models may limit their ability to account for the diverse range of factors that likely contribute to religiously motivated cooperation, which in turn undermines their explanatory and predictive adequacy.

It is due to these different characteristics that, despite their partial empirical success, we suspect that the extant models miss something important about the connection of religion and cooperation. What is needed for an adequate understanding of the correlation is a new kind of model that reflects the complexity,

fluidity, and diversity of religion and its real-world interaction with cooperation. The next section introduces a class of models that display the required features.

• *Stochastic Actor-Oriented Models*

As indicated in section 3, an adequate model of the dynamics between religion and cooperation will have to reflect the complexities of the real-world. The modeling strategies that we have in mind have been applied in causal modeling of social networks (for an informative overview, see (VanderWeele & An, 2013)). Snijders (Snijders, 1996, 2001, 2005) and Steglich et al. (Steglich et al., 2010) have proposed what they call “stochastic actor-oriented models” (SAOM) to identify causal relationships. Social networks represent relations between actors. These relations can receive different semantic interpretations. For the case of religion and cooperation, they may be interpreted as friendships, esteem, trust, cooperation.

SAOMs represent the evolution of social networks by reconstructing the relations and the individual behavior among a (non-changing) set of actors over time. The transitions over the different stages of the network are modeled as a continuous-time Markov chain with stochastic elements (Snijders, 2001). Changes in the global states of the network emerge from choices for the establishment, maintenance, or withdrawal of relations.

The network evolution and the transition from one global state to another can result from many (usually non-observed) small changes occurring between the consecutively observed networks in continuous time (Snijders, 2005). Moreover, SAOMs can include various attributes for the actors in the model. These may be stable (such as gender, ethnicity) or modifiable (such as attitudes, workplaces, religious affiliation) either through stochastic processes or through exogenous changes in the matrix of attributes (Snijders, 1996). SAOMs then connect changes in the choices and relations as a function of the attributes of the actors. The relations themselves are constructed as directed relations, whilst conceptually undirected relations are modeled as mutual directed relations. SAOMs can, but need not, work with single relations only. Instead, multiple and/or valued relations can be represented as well (Snijders, 1996).

A significant advancement in SAOM construction has been the increased flexibility in modeling relationships. Earlier continuous-time Markov chain models were limited by the assumption of dyadic independence, where a dyad—defined as a pair representing the relations between two actors—evolved as independent Markov chains. This imposed a major limitation by excluding interactions involving three or more actors, such as transitive relations (e.g., “I cooperate with those with which my

collaborators cooperate”). Snijders (Snijders, 2001) addressed this limitation by introducing a SAOM that accounts for these more complex relational structures.

Another helpful extension of the potentialities of SAOMs has been introduced by Steglich et al. (Steglich et al., 2010). Earlier modeling proposals faced the difficulty of separating the effects of individual choice behavior from social influence. Before this background, the researchers specify a family of statistical models that are flexible enough to statistically separate the effects of individual choice based on attributes from those of social influence.

Due to these various features and properties, SAOMs are particularly well-suited for modeling the complex correlation between religion and cooperation. First, their actor-oriented approach is a fruitful foundation for this special explanatory project. By emphasizing actor-specific attributes, choices, and dynamics, SAOMs capture the fact that religion operates through individual actors with their individual choices and social pressures. Classical regression analyses are powerful tools to represent relationships between abstract characteristics, processes, or properties such as “costly rituals”, “societal cultures”, “joint physical action”. They are not, however, designed to represent specifically attributes of agents. The actor-centered structure, therefore, makes SAOMs conceptually and practically more appropriate for studying the connection of religion and cooperation.

A second advantage of SAOMs is their ability to model attributes as drivers of choices, allowing for multiple attributes within the same actor to influence the same relational decision. Third, SAOMs are dynamic models, capable of tracking changes in both actor attributes and relationships over time. Given that different religious factors contribute to cooperation within an individual and vary across individuals or over a single individual’s lifespan, SAOMs can effectively model such processes. Moreover, they can represent how high cooperation rates can persist even as underlying influencing factors shift.

Fourth, SAOMs can illuminate specific evolutionary states of social cooperation networks. They can, for instance, demonstrate how a network might experience a sudden decline in relations after a period of fluctuating actor attributes without immediate changes in relational ties. This ability to integrate dynamic changes in both attributes and relations makes SAOMs uniquely capable of capturing the complex, evolving interplay between religion and cooperation.

For the empirical dimension of research on religion and cooperation, it is important that SAOMs can be tested on longitudinal data, and they can be used to make novel predictions. This is not to say that SAOMs always allow disambiguation. Fitting them to the data can be computationally challenging. What makes these models attractive nonetheless is their ability to involve exogenous parameters representing institutional and social influence and to remain highly flexible with

respect to the kinds of chosen parameters. In our case, this may be especially helpful as our tripartite definition of religion can, in principle, be reflected by SAOM's in all its dimensions.

Even more importantly, however, the non-constant character of several conceptually distinct influencing parameters is what many of the models reviewed in section 3 failed to represent adequately. If the models recognize the influence of multiple factors at all, they either tend to neglect the dynamic non-constant character of these, or they do not offer a statistically rigorous treatment of the connection. Especially, in this respect SAOM's offer a much-improved solution to modeling the correlation of religion and cooperation.

Sosis and Alcorta (Sosis & Alcorta, 2003) and Alcorta and Sosis (Alcorta & Sosis, 2005) propose to integrate evolutionary explanations and neuroscientific models of the effect of rituals and meditation on brain functionality. They do not, however, treat these factors in a dynamic manner. Moreover, Sosis and Bressler (Sosis & Bressler, 2003) as well as Sosis (Sosis, 2019) recognize the limitations of costly signaling theory, and they highlight the role of authority and meaning in addition to ritual. They do not, however, offer a rigorous modeling solution that would represent a fundamentally dynamic system. In two recent contributions, Lang and Kundt (Lang & Kundt, 2020, 2023) address the increasing fragmentation of academic disciplines and their failure to collaborate effectively in studying complex cultural phenomena like religion. The authors argue for integrating evolutionary, cognitive, and contextual perspectives into unified research programs to foster mutual inspiration, theory corroboration, and self-correcting refinements, and they emphasize the need for modeling time as a parameter. But, first, Lang and Kundt (Lang & Kundt, 2020, 2023) are not concerned with cooperation primarily, but only with religion as a broad phenomenon. Second, their 3D ("Depth", "Height", "Width") model for adequate explanations of religion, visualized as a tri-axial system, offers a qualitative rather than a rigorous formalized strategy for prediction and explanation.

A notable feature of SAOMs is the fact that, in principle, they can be used to reconstruct single-factor models of cross-sectional data as limit cases, explaining the partial empirical successes of some models reviewed in section 3. Additionally, they can integrate seemingly inconsistent models and datasets into a cohesive framework by accounting for interactive, unstable underlying factors that exert influence at different points in time. This adaptability makes SAOMs particularly powerful for capturing the complex and evolving nature of these relationships.

As already mentioned, preliminary indicative evidence for the adequacy of SAOMs for the case of religion and cooperation can be drawn, among other things, from data suggesting the occurrence of typical changes in religiosity over the lifespan of individuals (Chan et al., 2015; Stoppa & Lefkowitz, 2010). Whilst the strength of

the correlation between religion and cooperation does not seem to depend on age, the underlying motivational attributes tend to undergo gradual transformations for many individuals. SAOMs can be used to infer predictions fitting these verbal reports. For instance, they can be used to reconstruct why with a sudden abolishment of the institutional settings or religion, as in the case of intentional suppression by an occupying military power, the rates of cooperation among the religious might remain just as high as before. At the same time, SAOMs might predict a high risk of collapse whenever the dogmatic factors of a religion fade within a population despite strong institutional embedding.

A partial visualization of an appropriately fitted SAOM is offered by figure 1. The speculative idea behind this visualization is that an empirically successful SAOM modeling the relationship of religion and cooperation will reflect our tri-partite definition of religion in section 2. The three factors stabilize cooperation from different angles, whilst they display a weak mutual dependency at the same time.

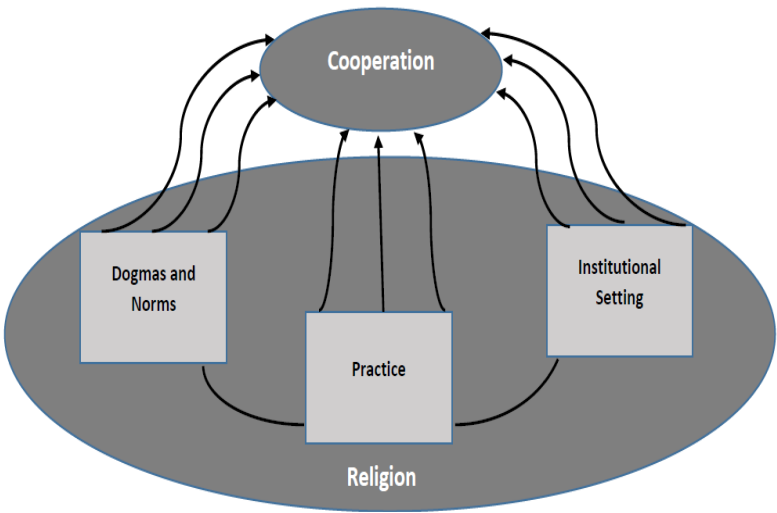


Figure 1: Visualizing an Actor-Oriented Model of Religion and Cooperation. The Arrows indicate the Positive Causal influence of different Factors Subsumed Under the Three Clusters. The Undirected Curves indicate Certain Interdependencies among the Clusters.

5. DISCUSSION

The reasons why we expect the tri-partite definition of religion to align with the most significant influential factors in a properly fitted SAOM are the following: What we call the “dogmas and norms cluster” focuses on propositional belief and conviction in the context of religion, pertaining to supernatural entities characterized

by certain descriptive claims and normative demands. As highlighted by Rand et al. (Rand et al., 2013), belief in such entities can be a powerful source for cooperative behavior. One reason is that the awe felt in front of a powerful and omniscient authority may urge the believer to conduct herself or himself in a way that pleases the powerful entity. The believer may also perceive herself or himself as observed and therefore prefers to do good rather than bad.

Moreover, the dogmatic teachings of religion often pair the existence of supernatural entities with a set of normative demands and the prospect of justice in a future state or the afterlife. In this case, for the believer cooperation may be economically rational in light of the expectation of future reward and punishment for doing the right or the wrong thing. Finally, the believer may cooperate simply from inspiration from a supernatural entity that created the world and her or him. One example of this multifaceted connection of dogmatic belief and cooperation was given by Norenzayan et al. (Norenzayan et al., 2014) who analyzed belief in big gods.

The “religious practice cluster” is reflected by the bulk of studies mentioned above. Sosis and Alcorta (Sosis & Alcorta, 2003) and Sosis (Sosis, 2004, 2005, 2019) saw rituals as costly investments to gain trust, which enhanced cooperation. According to Wojtkowiak (Wojtkowiak, 2018) rituals allow for individual transformation, a shared processing of emotions, and the formation of a group identity. As Buss (Buss, 2019) speculates, religion may activate within humans the phenomenon of ‘kin psychology’ by referring to the clergy as sisters, fathers, brothers, and other familial terms, which facilitates prosocial behavior. This presumption is also reflected in Wiltermuth and Heath (Wiltermuth & Heath, 2009).

Above, we also reviewed Iannaconne (Iannaccone, 1992), who pointed out that cooperative actions like rituals are more sustainable and satisfying when experienced collectively. Levy and Razin (Levy & Razin, 2012) found that religious groups that were more demanding in their rituals were smaller and more cohesive. They also found an interactive effect of rituals and the belief system entertained by the religious individuals.

Another contribution that falls under the religious practice cluster is Bereczkei et al. (Bereczkei et al., 2007). In the view of the researchers, the rituals provide an opportunity to indulge in prestige signaling which induces prosocial behavior. An esteemed individual within a group will maintain that status only as long as it can successfully signal to others its high moral and cooperative status. Rituals, according to this view, are a mechanism to signal this high moral status. They thereby stabilize cooperative behavior towards the esteemed individual (Konvalinka et al., 2011).

The “institutional setting cluster” refers to the fact that all religions (or their factions) over time tend to develop institutions that regulate and organize the

religion. These institutional settings tend to secure cooperation from a different path. Iyer (Iyer, 2016) emphasized the role of social services such as education for the promotion of cooperation. Another classical tool used by religious institutions is the establishment of a separate legal system. The Catholic Church has developed a sophisticated system of church law. The Rabbinical courts are an institution thousands of years old that often regulated not only disputes in religious but also secular matters. The Sharia is a body of religious law that forms an integral part of the Islamic tradition. These systems can sometimes make cooperation the dominant strategy by exerting punishments for non-cooperative behavior. Finally, religious institutional settings secure cooperation far beyond a judicial system. For instance, they tend to install various kinds of positions, jobs and career opportunities that create a web of norms and relationships which by themselves promote and enhance certain forms of cooperation.

Apart from Iyer (Iyer, 2016), the connection of religious institutional frameworks and cooperation are rarely reflected by the studies reviewed above. An exception is Vlerick (Vlerick, 2018), who analyzed the culture induced by religious institutions. The author uses a game-theoretic setting to outline two sets of important “within-group” dynamics that shape institutional religions. The first follow from the necessity to keep the interaction of the participants in an equilibrium state in order to maintain the social institution. The second arise from the competition of institutional features for traction within the group.

All of these various dogmatic, practice-based, and institution-related factors can be expected to be implemented as attributes and behaviors in an encompassing SAOM. Of course, while cooperation rates can be straightforwardly operationalized in standard game-theoretic settings, measuring variables like dogmatic conviction, ritual participation, utility assignments, costly signaling, and institutional embedding is more challenging. These challenges can be addressed, however, by building on the extensive empirical work on religion and cooperation, adapting existing operationalizations of these concepts.

A SAOM fitted in this way could serve both reconstructive and predictive purposes. It could help reinterpret findings reviewed in section 3, shedding light on why qualitatively distinct models achieve partial success. Moreover, it could predict the emergence of cooperative networks within specific subgroups under varying conditions, as well as the decline of cooperation as a cumulative effect of numerous small changes over time, even when these changes are individually insufficient to cause observable shifts. The true potential of such a model, however, can only be evaluated once it has been implemented and tested. Future research should, therefore, target a preliminary version of the envisaged SAOM that integrates and implements some of the results presented in section 3. Starting from such a

preliminary model, a full-scale model of how religion and cooperation connect can then be gradually developed and tested.

6. CONCLUSION

In this paper, we have opened a novel conceptual perspective on the ability of humans to maintain cooperation, trust, and prosocial behaviour. Starting with the well-established observation that cooperation among humans tends to be stronger within religious groups, we demonstrated two things: First, the existing explanations of the correlation of religion, culture and cooperation tend to oversimplify the mechanisms and reasons behind the described phenomenon by characterizing one or a few explanatory pathways as primary. The result is a failure of both retrospective explanation and prospective prediction. Second, only a complex multivariate model based on what has been characterized as “stochastic actor-oriented models” (SAOM) can fully capture the described phenomenon. As an important feature, the variables of this model fluctuate continuously within and, across religious groups, and – despite being unstable themselves – they stabilize cooperation in religious and culture-focused groups from multiple angles.

Future research on the topic should be empirical in focus. A properly fitted SAOM could serve both reconstructive and predictive purposes, helping to reinterpret prior findings, explain the partial success of extant static models, and predict the emergence or decline of cooperative networks under varying conditions. Future research should develop a preliminary SAOM incorporating key findings before evolving it into a comprehensive model of how religion and cooperation are interconnected.

Disclosure statement: For some parts of this article, we used ChatGPT for language optimization purposes. Neither this tool nor other tools were used for additional purposes (e.g. literature search).

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