Local Gods, Supernatural Punishment, and Religious Cooperation Among the Altai Uriankhai of Mongolia (Pre-Registration)

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1. Background

1.1. Theory

Evolutionary theory draws our attention to a variety of problems inherent in the evolution of cooperation (Smith, 1982). Central to this issue is why individuals would cooperate with others when they can stand to benefit more by being selfish. The evolution of cooperative strategies thus requires mechanisms to ensure that cooperators interact with each other and that the costs of defection outweigh the benefits of cooperating. Humans are exceptionally good at cooperating with each other, with many accounts for how and why this behaviour evolved. With respect to religion, one suggestion is that our ability to infer others' mental states contributes to our appreciation of the potential consequences of our social behaviors. However, anticipating others' behaviors by inferring their motivations runs the risk of exploitation. That is, having the ability to "mind-read" might turn exploitative without other mechanisms in place to uphold cooperation, such as effective mechanisms of punishment. The "supernatural punishment hypothesis" (Johnson & Krüger, 2004; Schloss & Murray, 2011) has been proposed as a potential explanation for human cooperation. While there are various 'flavours' of this general hypothesis (Schloss & Murray, 2011), one account posits that the fear of supernatural consequences will evolve under conditions where the costs of secular punishment and the chances of getting caught outweigh any benefits that could have been obtained by defecting in social dilemmas (Johnson & Bering, 2006). Although based on secular punishment, according to this account fear of supernatural punishment may alter both the perceived costs of secular punishment and the probability of getting caught, and hence promote cooperation. As such, in particular contexts, beliefs in supernatural punishment may represent one mechanism by which people can maintain cooperation.

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Variants of this hypothesis attend to how far this effect can go (Norenzayan, 2013; Roes & Raymond, 2003). One view (Norenzayan et al., 2016) theorizes that as societies scale up through intergroup conflict, gods increasingly become more punitive, more knowledgeable, and more morally concerned. Through time, this auto-catalytic process boosts cooperation beyond parochial boundaries and expands gods' social relevance accordingly. Through conquest and conversion, this heightened prosociality may partly explain the now global ubiquity of the so-called "prosocial" or "moralistic" religions (e.g., Christianity and Islam). In this view, then, beliefs in gods' punishment, knowledge breadth, and moral concern should predict cooperation beyond local parochial boundaries, perhaps especially in more "moralistic" religious traditions.

Previous cross-cultural research using experimental economic games finds that the more individuals claim their gods punish and know, the more likely they are to play honestly and generously toward anonymous co-religionist strangers from geographically distant communities who are unlikely to ever reciprocate (Lang et al., 2019; Purzycki et al., 2016b). This work, however, was limited in a few critical ways that did not address some core aspects of the theory (see Purzycki et al., 2022). First, the bulk of this work examined the association between supernatural punishment beliefs and cooperation between individuals in the "moralistic traditions." In other words, recipients were typically identified as being from the same "moralistic tradition" (e.g., Christianity, Hinduism, and others). As such, this project made no clear contrast between cooperation streams of "moralistic" traditions as compared to other religious traditions. Second, across a range of statistical model specifications, recent analyses found no effect of gods' moral concerns with cooperation (Bendixen et al., 2023). Across a multitude of model specifications and two focal predictors – a scale measuring gods' moral interests and free-list data content, gods' moral concerns – these moral concerns did not have a clear effect on cooperative outcomes to any reliable extent. This suggests that individuals' beliefs about supernatural punishment may shape cooperation to a greater extent than their perceptions about deities' moral concerns. Third, much previous research in this area did not take a causal approach to this question (Hernán & Robins, 2020; Pearl et al., 2016; although for an exception see Bendixen et al., 2023). The extent to which the previously reported associations reflect causal estimates may therefore be difficult to know with any degree of certainty.

Here, we build on this work by examining whether findings regarding supernatural punishment in "moralistic" religious traditions extend to "local" religious traditions, using a measure of 'supernatural belief' which include both punishment and omniscience, while adopting an explicitly causal approach. The focal population of this report is the Altai Uriankhai of Mongolia. Based on the above theory, we anticipate a positive relationship between belief in punitive and knowledgeable gods with more fair and generous offers to geographically distant co-religionists who are unlikely to directly reciprocate.

1.2. Ethnographic Background of Field Site

1.2.1. General background

The field site is Bosgo *bag* (third-level subdivision) of Duut *sum* (administrative unit of a province) in Khovd *aimag* (province), Western Mongolia. This site is located in a mountainous range, the eastern slopes of the east-central area of the Altai Mountains, which is sparsely inhabited by the Altai Uriankhai ethnic community, whose current population is about 3,700 people (in 2024) in two neighboring *sum*s, Duut and Mönkhkhairkhan, and in much fewer numbers in the neighboring Bayan-Ölgii *aimag* as well (Coloo, 1976; Lkhagvasuren, 2010). Roughly 1,500 Altai Uriankhai constitute more than 80% of the total population of Duut *sum*, whose center is Bosgo, 76 km southward from the province center Khovd city. Although they share many cultural and historical ties with the neighbouring Tyvan (endonym: Tyva, see Potanin, 1881) ethnic group in Russia, China, and Mongolia (cf. Mawkanuli, 1999), today most Altai Uriankhais (endonym: Altai Uriankhai) emphasize their Mongolian origins and apparently deny any connection to Tyvans (Atwood, 2004; cf. Mongush, 1996).

In modern Mongolia, the term "Uriankhai" refers to a vaguely defined *yastan* (subethnic group; see Atwood, 2004; Ellis, 2024) in the western part of the country. The Altai Uriyankhai form a distinct and coherent subgroup within this artificially constructed subethnic group, and have likely lived in the Altai region since the second half of the 17th century (Atwood, 2004; Lkhagvasuren, 2010).

The pastoral nomadic Altai Uriankhai community lives in a patriarchal (patrilineal) society with a patrilocal (virilocal) residence structure, consistent with all known Central Eurasian pastoral societies (Chaix et al., 2007; Krader, 1963). The earliest genetic evidence of patrilocal and patrilineal burial practices in Inner Asia has been identified in the Aldy-Bel and Sagly cultures from the territory of the modern neighbouring Tuva Republic, *ca.* 7th/6th century BCE (Mary et al., 2019). This social system appears to have remained continuous and uninterrupted for the past three millennia among Central Eurasian pastoral nomadic societies. Some extent of long-term cultural continuity has also been observed in the Altai Region (Jacobsen-Tepfer, 2023).

1.2.2. Religious Landscape

While Mongolia is ethnically and geographically diverse, the country's primary religious tradition is a complex, syncretic synthesis of Tibetan Buddhism (or Lamaism, "the yellow faith"; see, e.g., Heissig, 1980; Sagaster, 2007) and the so-called Mongolian shamanism (see, e.g., Diószegi, 1961; Purev & Purvee, 2007; "the black faith", Banzarov, 1981), interwoven with spirit-master beliefs and ancestor worship. Since Lamaism persecuted shamanism during the sixteenth and seventeenth centuries, shamanistic beliefs and rituals were likely camouflaged by adopting Lamaist features (Hessig, 1980).

The previous nature of Mongolian shamanism can be reconstructed from shamanic hymns and prayers transmitted orally through the centuries and recorded during mid-twentieth-century field research—provided that elements derived from Lamaism, such as names and conceptions of gods, can be distinguished and set aside. At the same time, Buddhism in Mongolia absorbed many features of shamanism (Atwood, 1996; Hessig, 1980; Pegg, 2001), which appears to have originated in ancestor worship (Hessig, 1980).

The data gained in the present fieldwork fits with that of the historical reports, strongly attending to the local spirit-master beliefs. The majority of Altai Uriankhais' beliefs and ritual practices exhibit relatively limited impacts of Lamaism. Almost every participant denoted several local spirits, such as the Lord/Spirit/Deity (*savdag*) of the Altai (Mountains), the Spirits of land and water ("nature"; *lus savdag*), *Tenger* ('Heaven')/*Mönkh khökh tenger* ('Eternal Blue Sky'; cf. Pegg, 2001), the spirit of Mother and Father (cf. Ancestor worship), *Doloon burkhan od* (the Big Dipper; "Great Bear" / Ursa Major; cf. Banzarov, 1981; Heissig, 1980), the Mountains and Rivers as helping spirits (e.g., *Baatar-Khairkhan*, *Altai Khangai*, *Khongor Khairkhan* (all mountains), *Tsenkheriin gol* (a river), *Tsagaan khad* (a rock), *Gurvan tsenkheriin sakhius* (a protective deity of a rock cave), etc.

Milk or milk tea (*süütei tsai*) offerings (libations) and incense offerings are also common practices of pre-Buddhist origin among religious Mongolians (Hessig, 1980). Milk is widely regarded as a symbol of purity and positive energy. In open spaces, it is customary to sprinkle milk or milk tea before anyone consumes it—a ritual that is practiced independently of Buddhism. During these offerings to the heavens, individuals concentrate solely on positive thoughts, expressing wishes for good fortune, health, longevity, protection from natural disasters, safe travels, and the avoidance of misfortune. The act of sprinkling also includes a respectful offering to the spirits of one's ancestors.

There is a significant difference between the frequency of Buddhist and spirit-master rituals among the Altai Uriankhai. They perform significantly fewer rituals to Buddha than to local spirit-masters. Of the 86 participants who took part in the Religiosity Interview (described in the Methods below), 57 (66%) perform rituals to the Buddha with varying frequency, while 29 (34%) do not. In contrast, 79 (92%) out of the 86 informants perform rituals to spirit-masters with varying frequency, 6 do not, and one informant was unsure.

Other likely animistic and shamanistic religious traditions dating back to pre-Buddhist times include the worship of fire (fire cult) and the celebration of *Tsagaan Sar* ('White Month'), the Mongolian Lunar New Year, and the use of the lunar calendar (Atwood, 1996; Banzarov, 1981; Hessig, 1980). In the daily life of nomadic communities, fire holds a central and sacred role. Each household deeply respects its own fire, treating it with the utmost reverence. Certain substances, such as blood, mucus, and similar materials, are strictly forbidden from being burned in the fire, as doing so is believed to invite misfortune. To preserve the sanctity of the fire,

specific chants and rituals are performed. Additionally, it is taboo to use another family's fire pot, especially the one designated solely for the household fire. It is also believed that children under the age of three can perceive spiritual entities within the flames. The nomadic Mongolian lifestyle is closely intertwined with *Tsagaan Sar* (the White Month or Lunar New Year). Herders regard *Tsagaan Sar* as a symbol of positivity, as it marks the arrival of the warm season and the birth of young animals, signaling the end of the harsh winter. Given that rural households often live at considerable distances from one another, *Tsagaan Sar* serves as an important occasion for social greetings and reunions, typically occurring at least once annually. The recitation of Buddhist sutras (mentioned by 3/20 participants as part of the Religious Landscape Interview [RLI; see Methods below]) by a lama can be considered among the less syncretic Buddhist elements of local ritual tradition. Although traditionally not conceived as such by religious scholars, throughout Mongolia and beyond, many consider Buddha (Khalkha Mongolian: [*Budda*] *burkhan*) to be a punitive, omniscient, and morally concerned deity (Berniūnas et al., 2020; Purzycki & Holland, 2019).

Religious expression takes many forms, but we focus here on practices dedicated to local spirit-masters at ritual cairns, or *ovoo* (depending on dialect, variously referred to across the wider region as *ovaa, obo,* or *oboo*; cf. Anderson & Harrison, 2003; Coloo, 1988). *Ovoo* offerings are a ritual expression of reverence toward *Tenger* (the sky or heavens). Their primary purpose is to seek blessings for good fortune, including protection from natural calamities such as heavy snowfall, drought, and other environmental hardships, as well as to pray for longevity and good health. Prior to hunting, people often appeal to *Tenger* for *hishig*, a term that signifies divine favor, particularly in the form of successful hunting and sufficient food. Offerings of milk and milk tea are commonly made at *ovoo*, in addition to local food customs. These typically include "white products" (such as milk and cheese), sweets (candies and cakes), "black products" (primarily alcoholic beverages, usually vodka in Russia and Mongolia), and "red products" (such as lamb, beef, or horse meat, depending on the deity's preference). Other common offerings include lumps of butter, pure water, fruit, and, in some cases, banknotes (Dumont, 2024).

In a few important ways, *ovoo* piety also bears relevance to the potential expansion of more reliable cooperation. First, ethnographic observations suggest that ritual cairn participation can be a reciprocal affair across disparate families (Mongush, 1992). This is especially pertinent, given that the tradition may have developed in part to mediate territorial boundaries between non-kin under conditions of increased population densities (Purzycki, 2010). Second, previous research suggests that observing others' participation in cairn rites might bolster their perceived trustworthiness (Purzycki & Kulundary, 2018). Third, the sheer breadth of geographical coverage of this tradition suggests a particular utility of unification among Inner Asians. Fourth, the global, culturally independent emergence of similar traditions suggests a particular utility under similar conditions (Sierksma, 1963).

2. Methods

With a few minor updates, we followed the standards, methods, and protocols from the *Evolution of Religion and Morality* (ERM) *Project* (Lang et al., 2023; Purzycki et al., 2016a, 2024). In this case, rather than use preliminary ethnographic interviews to select deities to ask about, we selected the deities–Buddha (*Budda burkhan*) and spirit-masters (*uul usnii ezed;* lit. 'spirits of the Mountains and Rivers') based on our prior knowledge of the religious landscape in our field sites, our interest in these particular deities, and the comparison afforded by previous research conducted in a nearby region (Purzycki & Kulundary, 2018). We translated all original English materials into Standard (Khalkha) Mongolian, back-translated, and subsequently edited for clarity (available here on the project GitHub page: https://github.com/bgpurzycki/GGSL-Project/tree/main/Protocols/Objective%201).

2.1. Theoretical Model

Our estimand (i.e., target of inference) is the causal effect of supernatural beliefs regarding spirit-masters on cooperation with distant co-religionists (*ovoo* practitioners) in two experimental games (the Random Allocation Game [RAG] and Dictator Game [DG]). Based on our assumed data-generating mechanism (see the Directed Acyclic Graph [DAG] in Figure 1), the following covariates are core confounders we need to control for to estimate an unbiased causal effect: age, sex, education, material/food security and number of children (this model was adapted from our core causal model for the wider project, available: https://github.com/bgpurzycki/GGSL-Project/blob/main/Pre-Registration/Objective%201%20-%20Core%20Model/GGSL_Obj1_Core_Causal_Model.pdf). The rationale for this is that each may plausibly cause both religiosity/supernatural punishment and cooperation (Baimel et al., 2022; Inglehart, 2021; Vardy et al., 2022), and hence result in bias if not adjusted for in analyses. While not confounders, we also include features of the game structure which may impact levels of cooperation (game order, comprehension checks) as they may help improve the precision of our estimates (and, at the very least, will not introduce any bias).

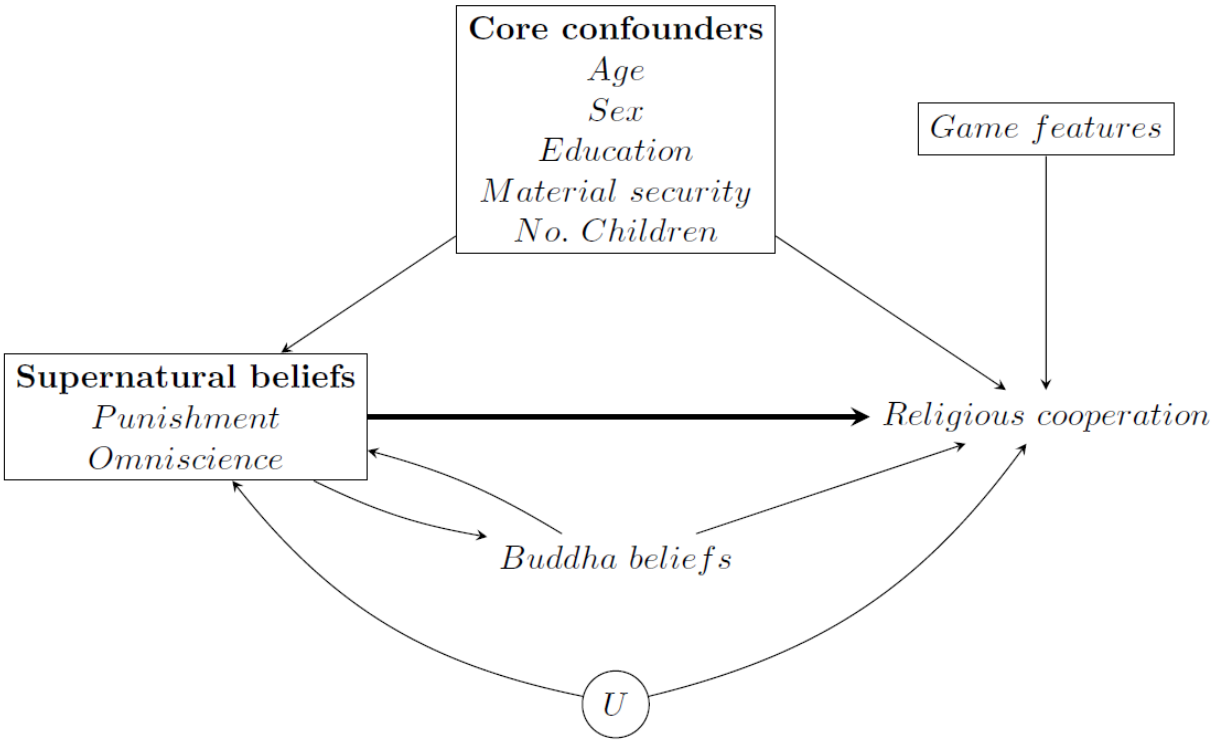

Figure 1: Directed Acyclic Graph (DAG) summarising our causal assumptions regarding the relationship between supernatural beliefs regarding spirit-masters and cooperation with distant co-religionists. The bold arrow denotes the estimand of interest. Note that causal relations between the core confounders are not displayed here. Causal relations between the components of supernatural beliefs are also not displayed here, as our estimand is the joint effect of supernatural beliefs on religious cooperation (see the main text for more discussion on this). *U* = Potential unmeasured confounders.

In addition to this core set of confounders, we will also consider the role of supernatural beliefs regarding an alternative deity, Buddha. Previous research using the ERM data has shown that - across a range of societies - beliefs about local gods are somewhat independent from moralistic gods (Purzycki, Willard, et al., 2022). However, disentangling the complex causal webs between these beliefs is difficult. For instance, perhaps beliefs about Buddha - as they are from a larger "world" religion - impact beliefs about spirit-masters (in which case these Buddha beliefs would be confounders, and need adjusting for in order to estimate an unbiased causal effect). Conversely, individuals who strongly hold beliefs about spirit-masters may believe less in Buddhism (in which case beliefs about Buddha may be a mediator between spirit-master beliefs and cooperation, and hence adjustment for Buddha beliefs may result in overadjustment bias). Alternatively, perhaps beliefs about Buddha and spirit-masters come from a shared, unobserved, latent 'religiosity' factor (in which case adjustment for Buddha beliefs would be again necessary to block this back-door confounding path). On the other hand, it could be that Buddha and spirit-master beliefs are independent of one another (and hence no need to adjust for Buddha

beliefs). It may also be that Buddha and spirit-master beliefs are practically identical (meaning they are not possible to separate). As a final - but non-exhaustive - scenario, perhaps Buddha and spirit-master beliefs continually reinforce and shape one another (in which case both adjusting and not adjusting for Buddha beliefs will lead to bias). As such, given this complexity we will conduct sensitivity analyses comparing results with vs without Buddha beliefs as a covariate to assess whether these different assumptions impact our inferences (assuming Buddha and spirit-master beliefs are not completely overlapping, as assessed via descriptive statistics).

Our exposure variables are a range of supernatural beliefs about spirit-masters, based on two broad categories: punishment and monitoring/omniscience (described in more detail below). Due to the difficulties in separating the causal effects of these religious belief components (e.g., are they independent? Do they reciprocally cause one another? Are they caused by a latent unobserved 'religiosity' factor?), we decided to focus on the joint effect of both religious belief variables together. That is, our focal contrast will be when punishment and omniscience both take the value 0 vs. when punishment and omniscience both take the value 1. This means that we cannot isolate the causal effect of, say, supernatural punishment, by itself, but we do assume that we can measure the joint causal effect of these variables together (hence why causal relations between these individual religious belief components are not modelled in the DAG above).

Although punishment and omniscience mini-scales have been used previously, it is possible that the punishment (and similarly for omniscience) variables do not measure precisely the same thing. For instance, the god's influence in an afterlife (one variable of the punishment mini-scale) could reflect supernatural rewards, in addition to supernatural punishment (it is also possible that the god may only punish living people, with no reach in the afterlife); similarly, for omniscience, spirit-masters may only care/know about the behaviours of local people, not those of people far away (i.e., a local, rather than universal, god). We will therefore repeat analyses using just LGPUNISH for punishment and LGFEEL for omniscience to assess whether we obtain similar results (see below for additional details of these variables).

Our theoretical model assumes no unmeasured confounding, no measurement error or residual confounding, that our causal model is correctly specified, and that our sample is broadly representative of our target population (i.e., wider Altai Uriankhais). As our aim is causal inference, we have endeavoured to make our causal assumptions clear; we will return to whether these assumptions are plausible in the Discussion section of the final paper.

2.2. Materials and Procedure

Initial data collection took place in Summer 2024. During the first two days of fieldwork, we conducted a preliminary Religious Landscape Interview (RLI) with 20 participants – 12 in Khovd city and 8 in Bosgo. The aim of this initial interview was to better understand the religious context, providing ethnographic insight when conducting and interpreting subsequent

quantitative data collection. These individuals were not included in the subsequent experiments. We then administered a Demography Interview (26 questions) and a Religiosity Interview (RI; 62 questions) to all 88 participants who took part in the RAG and DG experiments. The RI included questions about general religiosity, the Moralistic God (MG; i.e., Buddha), Local Gods (LG; i.e., spirit-masters), and participants' thoughts on others.

The interviews and the experiments were primarily conducted in a two-room outbuilding of a private home in Bosgo (80 of the total 88). A smaller number of sessions were held in classrooms at Khovd State University in Khovd city (8 participants). Note that due to errors in data collection of the scale questions in the Religiosity Interview, this questionnaire was asked again to as many of the same participants as possible in the next field season in Summer 2025; however, these errors do not affect any of the variables used here, hence we focus on the data collected in 2024.

2.2.1. Demographics

We asked a wide range of questions pertaining to demography. As already mentioned, of particular importance here are participant age, sex, years of formal education, food insecurity, and number of children which we model as confounders between beliefs and behavioral outcomes.

2.2.2. Religiosity variables

Our supernatural beliefs variables of interest consist of:

1. Punishment: Based on the questions LGPUNISH (Do spirit-masters ever punish people for their behavior? [yes = 1, no = 0]) and LGDIE (Can spirit-masters influence what happens to people after they die? [yes = 1, no = 0]). As per previous ERM work (Purzycki et al., 2016b), these two variables will be averaged together. These variables will be averaged for both theoretical reasons (as they likely measure the same/similar constructs) and practical reasons (to limit the number of interaction terms; see below).
2. Monitoring/Omniscience: Based on the questions LGFEEL (Can spirit-masters see into people's hearts or know their thoughts and feelings? [yes = 1, no = 0]) and LGSEE (Can spirit-masters see what people are doing if they are far away? [yes = 1, no = 0]; note that, for consistency with previous ERM data and other field sites in the project, this question should have been in reference to a specific known but distant town/city, but was not here). As above, answers to these two questions will be averaged together.

We focus on punishment and omniscience as these are key supernatural beliefs which, on both empirical and theoretical grounds (Lang et al., 2019; Purzycki et al., 2016b, 2018), may promote cooperation among distant co-religionists. Note that we do not explore 'moral concerns' here for a number of overlapping pragmatic and conceptual reasons, including: gods' moral concern does not appear to motivate cooperative behaviour (Bendixen et al., 2023; Lang et al., 2019; Purzycki

et al., 2016b), the measurement (and hence interpretation) of questions regarding 'moral concern' is fraught (i.e., different measures of moral concern are not correlated, suggesting they measure different things; Bendixen & Purzycki, 2025), and there were specific issues in Altai Uriankhai with the collection of 'moral concern' scale questions.

2.2.3. Behavioral experiments

To measure cooperative outcomes, we deployed two variants of the Random Allocation Game (RAG; Hruschka et al., 2014) and Dictator Game (DG). In each game type, participants allocated money in two dyads: 1) one cup was reserved for themselves and one was for an anonymous *ovoo* practitioner from Bayandun *sum*, Dornod *aimag*, a district over 2,000 km away in Eastern Mongolia (SELF vs DISTANT condition), and 2) an anonymous local co-religionist *ovoo* practitioner from Duut *Sum* and another anonymous *ovoo* practitioner from Bayandun (LOCAL vs DISTANT condition). Participants first played the RAGs in counterbalanced order, followed by the DGs in counterbalanced order. Recipients were denoted by opaque cups with labels on them. Participants used tokens each worth 1,000 MNT (~$0.30 USD).

In the RAGs, we instructed participants to think of which cup they would like to put a coin into and then roll a fair, 2-colored die. If the die came up black, then they should put the token into the cup they thought of, but if the die came up white, they were supposed to put the token into the cup opposite to what they thought. As participants played alone, they could bias their allocation to favor one recipient or the other, and thus violate the 50% chance of a coin going into any given cup. Each RAG entailed 30 die-rolls. For each DG variant, participants allocated up to 10 tokens. Using pre-tests, we ensured that players understood the rules before playing and knew that they would receive any money allocated to their own cups along with their show-up fee of 20,000 MNT (~$6 USD).

2.3. Statistical Model

Following our DAG, our exposure is the joint effect of religious beliefs of spirit-masters (punishment and omniscience), and our outcomes are RAG and DG (both SELF and LOCAL, with DISTANT as target). As detailed above, our core set of confounders will include: age, sex, education, material/food security and number of children. We will use aggregated binomial models for RAGs, and ordinal models for DGs, with separate models for SELF vs DISTANT and LOCAL vs DISTANT. We will employ Bayesian models using Stan via the package 'brms' (Bürkner, 2017), with four chains with 2,000 iterations (1,000 chains as warm-up). Visual inspection of convergence between the chains, r-hat values close to 1.00 and adequate effective sample sizes will be used to ensure that chains are well-mixed and sufficiently-powered. We will use weakly regularising priors. Analyses will be conducted R version 4.4.1 (R Core Team, 2024).

We will use *g*-computation methods (Hernán & Robins, 2020) to estimate the marginal causal effect of a change in exposures (from both 0 to both 1). For interpretability, these marginal

effects will reflect the average change in the outcome (i.e., average treatment effect) on the count scale (e.g., whether supernatural beliefs cause XX additional donations to DISTANT) based on posterior predictions from the models.

The exposures will first be treated as additive (i.e., independent). To test whether a multiplicative model fits the data better, we will then see whether the inclusion of an interaction term between punishment and omniscience improves model fit via LOOIC (see Bendixen et al., 2023). We perform both of these model specifications as theory regarding supernatural punishment is under-specified and does not make clear predictions regarding the effects of supernatural beliefs on cooperation, but is plausible that there may be synergistic effects of these religious beliefs; for instance, believing in supernatural punishment *and* omniscience might have a larger effect than either when treated independently. However, we note that, due to a relatively small sample size (~90), our analyses may be underpowered to detect said interaction effect (Blake & Gangestad, 2020).

Due to small amounts of missing data, particularly in the religiosity variables (estimated <10% missing per variable), to boost statistical efficiency we will use multiple imputation to create a number of imputed datasets (we estimate approximately 20 imputed datasets, but the final number depends on total proportion of missing data in the complete-case analyses; see White et al., 2011). Given the relatively low levels of missing data per variable, when combined with the large amounts of additional auxiliary information to help impute missing data, we believe that our imputations will meet the 'Missing-At-Random' assumption required for unbiased imputations (Hughes et al., 2019; van Buuren, 2018; White et al., 2011), although we cannot rule out data being 'Missing-Not-At-Random' and hence biased. Multiple imputation will be performed using the 'mice' R package (van Buuren, 2018). These imputed datasets will then be analysed using the 'brm_multiple' command in the package 'brms' to combine estimates from each imputed dataset together. We will use multiple imputation rather than Bayesian imputation in Stan, as multiple imputation is more flexible and easier to both handle missing categorical variables and incorporate auxiliary variables.

In addition to these main analyses, we will also conduct additional sensitivity analyses, as described above, including: i) whether the addition of Buddha beliefs as additional covariates impacts results; and ii) using individual variables of punishment and omniscience, rather than mini-scales of composite variables.

Example scripts demonstrating the proposed analyses on simulated data are available here: https://github.com/bgpurzycki/GGSL-Project/tree/main/Pre-Registration/Objective%201%20-%20Altai%20Uriankhai.

2.4. Sampling and Participants

The sample was drawn from the Altai Uriankhai community in Bosgo *bag*, Duut *sum*, Khovd *aimag*, Mongolia. Using Mongolian population census data (National Statistics Office of Mongolia, 2021) and the online database of the National Statistics Office of Mongolia (National Statistics Office of Mongolia, 2025), we obtained a broadly representative sample in terms of age, sex, community size and birthplace. The sample was primarily composed of members of the Altai Uriankhai community living in or near Bosgo within Duut *sum*, with a smaller number (8 of 88) of participants being Altai Uriankhai who currently reside in Khovd city but were born and raised in Bosgo. No individuals declined to participate. The total number of participants was 88, with 38 males (43% of the sample). The mean age of male participants was 41.4 years (range 18 to 68), and 43.6 years for female participants (range 19 to 76). The predominant occupation among participants was herding: 19 of 38 males (50%) and 17 of 50 females (34%) were identified as herders, comprising 41% of the total sample (36 out of 88). Note that, although 88 participants took part in the initial demographic interviews, two participants did not complete the subsequent religiosity interview and experimental games.

3.5. Pre-registration

Note that data for this study has already been collected, cleaned and processed ready for analysis. Other than the deities selected, the methods protocol, however, was already designed prior to data collection and a part of the project's grant proposal, available here: https://github.com/bgpurzycki/GGSL-Project/blob/main/Pre-Registration/Proposal/TRT_Purzycki.pdf). We therefore have some information about the data and the specific ethnographic context, which has been useful to help understand the complexities of the data (e.g., data collection irregularities regarding scale questions, as noted above) and help inform our causal model and statistical analyses (e.g., levels of missing data to inform imputations, contextual information regarding the relation between Buddhist and spirit-master beliefs). To be fully transparent, descriptive statistics for key variables and regressions based on the core causal model for the wider project (as noted above) were conducted in January 2026 for a project workshop; however, this was *after* the causal model outlined here had been finalized, meaning that this information did not influence our causal model or corresponding statistical approach.

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Disclosure statement
The authors declare no conflicts of interest.

Authors' roles
AM collected data, DM-S and BGP managed the project and contributed to analysis, and BGP designed the protocols. All authors contributed to writing this manuscript.

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Data availability statement
All data and analysis code will be made available on the project GitHub website: https://github.com/bgpurzycki/GGSL-Project/tree/main.

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