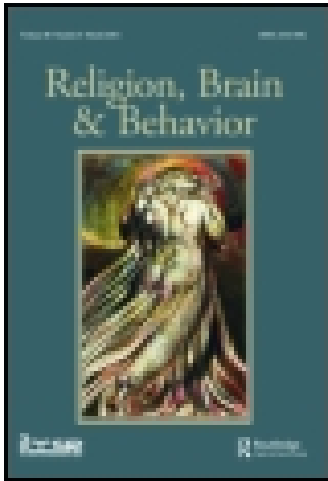


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Supernatural punishment, in-group biases, and material insecurity: experiments and ethnography from Yasawa, Fiji

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Threat of supernatural punishment can promote prosociality in large-scale societies; however, its impact in smaller societies with less powerful deities is less understood. Also, while perceived material insecurity has been associated with increasing religious belief, the relationships between insecurity, supernatural punishment beliefs, and prosocial behavior are unclear. In this study, we explore how material insecurity moderates the supernatural punishment beliefs that promote different expectations about distant, anonymous strangers among a sample of villagers living in Yasawa, Fiji. We examined this relationship by employing an economic game designed to measure local recipient favoritism vs. egalitarian, rule-following behavior. Using indices of three different “punishing” agents – the Christian God (“Bible God”), the deified ancestors (*Kalou-vu*), and the police – we find that increased belief in Bible God punishment predicts less local recipient favoritism at low and moderate but not high material insecurity. Punishing *Kalou-vu* also predicts less favoritism at low and moderate insecurity, but more favoritism at high insecurity. Police punishment poorly predicts favoritism, suggesting that secular authority has less impact on isolated communities. We discuss implications for understanding how different kinds of supernatural and secular agent beliefs impact prosocial behavior.

Keywords: economic games; favoritism; Fiji; gods’ minds; insecurity; supernatural punishment

1. Theoretical background: religion, supernatural monitors, and material insecurity

In contemporary world religions, supernatural agents are believed to monitor and punish norm violations toward other people, especially if the victims are co-religionists (Johnson & Bering, 2006; Johnson & Krüger, 2004; Norenzayan, 2013; Schloss & Murray, 2011; Shariff, 2011). Comparative work using behavioral experiments across diverse societies shows that adherence to religions with big, moralizing gods predicts more equitable treatment of even anonymous others (Ahmed, 2008; Ahmed & Hammarstedt, 2011; Atkinson & Bourrat, 2011; Bourrat, Atkinson, & Dunbar, 2011; Henrich et al., 2010; Johnson, 2005; McKay, Efferson, Whitehouse, & Fehr, 2011; Shariff & Norenzayan, 2011; Shariff & Rhemtulla, 2012). Among North Americans, correlational studies show associations between belief in a more punitive God and less cheating (Shariff & Norenzayan, 2011). Studies that implicitly prime “God” suggest a causal link between belief and behavior, suggesting that religious reminders increase cooperation and honesty even when the targets are strangers (Ahmed & Salas, 2011; McKay et al., 2011; Norenzayan & Gervais, 2011; Norenzayan & Shariff, 2008; Pichon, Boccato, & Saroglou,

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2007; Randolph-Seng & Nielsen, 2007). Finally, trust among strangers appears to be facilitated by a shared belief in watchful, moralizing, punitive supernatural agents (Norenzayan, 2013; Ruffle & Sosis, 2010; Shariff, 2011; Sosis, 2005; Tan & Vogel, 2008; see Purzycki & Arakchaa, 2013 for an example of ritual participation associated with non-moralistic deities also facilitating trust).

However, the observation that supernatural agents vary across contemporary traditions outside of Abrahamic faith complicates religious prosociality through supernatural agent beliefs (Armstrong, 1993, 2006; Boyer, 2001; Norenzayan, 2013; Purzycki & Sosis, 2011; Shariff, Norenzayan, & Henrich, 2010; Wright, 2009). Importantly, supernatural agents are documented to vary in omniscience, omnipotence, and the degree to which they care about moralized strategic social information [“moralized” here meaning social actions deemed to indicate a deeper, fundamental goodness or badness of an actor as opposed to violations of conventions that have nothing to do with a deeper sense of good or evil (see Boyer, 2001; Purzycki, 2013; Purzycki & Sosis, 2011; Purzycki et al., 2012; Willard & McNamara, 2012)].

Variation in supernatural agent minds combined with prosocial effects of religious belief points to an important hypothesis: varying models of supernatural punishment corresponding to different deities should predict different patterns of costly social norm adherence. However, empirical evidence outside Western populations and with non-Abrahamic deities has been limited (for exceptions, see Soler, 2012; Xygalatas et al., 2013). In addition, some efforts to interpret the behavioral effects of belief have not invoked God as a punisher of norm violations (for a review, see Preston, Ritter, & Hernandez, 2010). Our present research addresses these gaps by examining the effects of beliefs on norm adherence among a population in Yasawa, Fiji with coexisting traditions of belief in both the Christian God and in local ancestor gods.

An independent line of research has long linked existential or material insecurity to both religion and norm adherence (Boyer & Lienard, 2007; Gmelch, 1971; Homans, 1941; Malinowski, 1948). Empirically, a combination of cross-national correlations and experimental priming studies shows that perceived insecurity influences religious norm adherence at both the societal (Fincher & Thornhill, 2011; Gray & Wegner, 2010; Norris & Inglehart, 2004; Zuckerman, 2007) and individual level (Kay, Gaucher, McGregor, & Nash, 2010; Laurin, Shariff, Henrich, & Kay, 2012; Norenzayan, Dar-Nimrod, Hansen, & Proulx, 2009). Further, feelings of insecurity often push believers to have faith in religion (Gray & Wegner, 2010; Kay, Shepherd, Blatz, Chua, & Galinsky, 2010; Laurin et al., 2012; Norris & Inglehart, 2004). Studies showing reliance on God’s punishment as a source of control in an unpredictable world also suggest that secular governments serve a similar role (Laurin et al., 2012; Shariff & Norenzayan, 2007). Indeed, when governmental stability is threatened, individuals in some populations can look to God for a renewed sense of order in the world, and vice versa (Kay, Gaucher, Napier, Callan, & Laurin, 2008; Kay, Shepherd et al., 2010). Broad, cross-national surveys indicate decreasing religious devotion as threats from famine, pestilence, violence, and environmental changes diminish due to increasingly effective secular systems (Gray & Wegner, 2010; Norris & Inglehart, 2004; Zuckerman, 2007).

Material insecurity is also linked to norm compliance and sanctioning. Experimentally, uncertainty has been shown to increase compliance with local norms and the sanctioning of norm-violators. For example, experimental reminders of death (Burke, Martens, & Faucher, 2010; Jong, Halberstadt, & Bluemke, 2012; Norenzayan & Hansen, 2006) and even threats to one’s basic understanding of the world (Heine, Proulx, & Vohs, 2006; Proulx & Heine, 2010) promote greater adherence to and justification of the current

social systems, even by individuals who are actively repressed by these systems (Jost & Hunyady, 2005). Hogg and colleagues have shown that participants jolted by uncertainty are more likely to defend cultural values (Hogg, 2007; Hogg, Adelman, & Blagg, 2010; Smith, Hogg, Martin, & Terry, 2010). Field data are broadly consistent with the experimental patterns, as environmental disturbances, vulnerability to earthquakes, and high disease prevalence can shift focus to especially favor local norms and religious affiliations (Fincher & Thornhill, 2011; Sibley & Bulbulia, 2012; Van de Vliert, 2011).

Taken in the context of supernatural agent punishment beliefs, this work linking insecurity to religion suggests an additional hypothesis: variation in material insecurity may interact with supernatural punishment beliefs along with the violations that supernatural agents care about. First, variability in the content of beliefs about divine minds (e.g., who and what they care about, their capacities to detect and punish norm violations, etc.) should predict different patterns of behavior toward outsiders. However, because perceived insecurity should also shift preferences toward favoring the local in-group, supernatural punishment beliefs that might otherwise promote cooperation with outsiders could be superseded by preferences to promote the in-group. In that case, knowledge of supernatural punishment beliefs may no longer be useful in predicting behavior.

2. The study

We explore these ideas with data from Yasawa Island, Fiji. Yasawans often endorse simultaneous belief in distinct kinds of supernatural beings: the Christian God (Bible God) and various ancestor gods (*Kalou-vu*). Thus, they present an opportunity to examine how distinct kinds of supernatural agents might lead to different behavioral consequences. Further, traditional fisher-horticulturalist practices expose Yasawans to significant and variable amounts of material insecurity, which compel Yasawans to rely on fellow villagers.

2.1. The site

Yasawa is the northernmost island in the Yasawa Island chain, located off the western coast of Fiji's main island, Viti Levu. We sampled from one *yavusa* – the largest unit in the traditional, kin-based Fijian political system – collectively ruled by one hereditary chief.¹ Most Yasawans subsist as fisher-horticulturalists. Cooperation is essential for daily life and is organized around the traditional Fijian kin-based social hierarchy.² Regular *solu* (“offerings”) feature communal meals and rituals. Marriages across villages promote cooperation among all Yasawan villages. Conversely, Yasawans often see norm violations against increasingly distant outsiders as increasingly permissible (Henrich, 2008); although villagers are generally friendly and hospitable to everyone, they also find it more acceptable to steal from high-end tourist resorts than known members of the village. While the resorts regularly employ locals, many villagers are fired for stealing shortly after starting work (this may also be related to the traditional needs-based distribution and redistribution routinely employed among Yasawans, as documented in Gervais, 2013). Consequently, far more villagers have experience working at a resort than are currently employed there.

2.1.1. Bible God and *Kalou-vu* in Yasawa

Many native Fijians believe in both the Christian Bible God (*Kalou ni vola*, “God of the book”)³ and less powerful deified ancestors, or *Kalou-vu* [“root/ancestor god;” Katz, 1999; Ryle, 2010; Tomlinson, 2009; *Kalou-vu* are also deeply associated with *yaqona*/

kava ceremonies, (see Shaver, 2014; Shaver & Sosis, 2014)]. These differing supernatural agents promote different expected social interactions beyond the immediate in-group. The Bible God is often seen as more universally concerned about morality above and beyond daily village affairs. Further, the Bible God wants people to be honest and cooperative with all followers, regardless of location. Conversely, the *Kalou-vu* are the mythical progenitors of clans within a particular area. These spirits are often believed to focus on village customs that the Bible God overlooks and they punish violations with spirit possession, bad luck, illness, or death. As such, *Kalou-vu* direct attention toward the immediate in-group by maintaining the ancient kin-based social interactions essential to village life.

2.1.2. Material insecurity in Yasawa

Yasawans' geographical position and dependence on subsistence horticulture creates greater material insecurity than is found in many other parts of Fiji. During cyclone (*cagilaba* or "murderous winds") season, which lasts from November to April, Yasawa's geographical position and slender shape makes it a frequent and highly vulnerable target. For example, in December 2012, Yasawa Island suffered a direct hit from a category four cyclone, Cyclone Evan. Storms of a similar magnitude tend to hit Yasawa at least once every decade. The 2012 cyclone destroyed many houses and most of the 2013 cassava crop. Further east, taro gardens are kept as the crop of last resort for such emergencies. However, taro requires wet, swampy conditions to thrive. Because Yasawa's arid landscape can support only limited taro cultivation, taro is not a viable emergency reserve there.⁴ In the dry winter seasons, fires often destroy crops as well. In such times of hardship, Yasawans turn to foraging for wild edible plants (e.g., yams) growing on the scrubby hillsides and *Saccharum edule* (*dule*, a grass similar to sugar cane with edible flowers) along marshy coastal areas. Moreover, although Yasawans do often have access to a variety of non-local foods, island-wide shortages of staples like sugar and flour are common. Thus, Yasawans are exposed to local ecological conditions; their subsistence thus relies on traditional food production techniques and aid from kin.

The nearest economic markets are on Viti Levu, and are mainly accessed by a 6–13-hour boat ride in frequently rough sailing conditions. Local, family-run canteens provide some access to non-local foods like canned fish and flour but are themselves dependent upon shipments from Viti Levu. Thus, their distance from these markets makes it difficult for Yasawans to rely on non-local resources during emergencies like the natural disasters mentioned above. Additionally, Yasawans' ability to interact with these markets via currency is also largely dependent on the sale of locally produced goods and interactions with the tourist industry. Further, governmental intervention in daily village life is minimal. The government provides a primary school, some building projects, a nurse's station, and variable emergency aid in the event of major storms. However, there is no police presence on the island – the nearest police station is on another island and mainly serves the resorts.

2.2. Random Allocation Game measuring local favoritism

To measure local favoritism, we deployed the Random Allocation Game (RAG; Hruschka et al., forthcoming). Economic games are useful tools for measuring social behavior in a controlled fashion, and have been used widely in comparative work across diverse human populations (Bauer, Cassar, Chytilová, & Henrich, 2014; Henrich et al., 2005; Henrich et al., 2010; House et al., 2013; Rustagi, Engel, & Kosfeld, 2010; Wiessner, 2009). Much

evidence indicates that they, in part, capture internalized social norms (Henrich, Ensminger, Barr, & McElreath, 2014; Kimbrough & Vostroknutov, 2013; Rand, Greene, & Nowak, 2012) for behavior in particular circumstances (Andreoni, 1995; Cookson, 2000; Cronk & Wasieleski, 2008; Liberman, Samuels, & Ross, 2004), as well as motivations to help and reciprocate in repeated interactions.

In the RAG, participants distribute a pile of coins between two recipients represented by two cups. Using a two-colored die, participants use the outcome of a die roll to choose in which cup to place each coin. While playing, participants are supposed to follow the following rules:

- (1) Mentally pick one of the two cups.
- (2) Roll the die.
- (3) If the die comes up black, place a coin in the cup originally selected in step 1. Alternatively, if the die comes up white, place a coin in the other cup.
- (4) Repeat until all the coins have been placed in either cup.

All steps occur silently and in private; no other observable declaration is ever made. When finished, participants cover the coin-filled cups with lids, carry them on a tray to a different building for payment, pass the tray through a window so they cannot be seen by the pay-out administrator, and are given their pay-outs.

Because each allocation decision is made mentally and in private, there is ample opportunity to ignore the rules and give more coins to one recipient than the die roll would otherwise dictate. Importantly, participants can bend the rules without having to believe they are fundamentally dishonest people (which of course would only matter if honesty is a normative value). Therefore, experimental scenarios like the RAG can subtly evoke preferences favoring one recipient even when existing norms (e.g., norms valuing honesty or equitable rule-following) might otherwise curb more obvious favoritism (Batson, Thompson, Seufferling, Whitney, & Strongman, 1999; Greene & Paxton, 2009; Jiang, 2013). Although we cannot tell which specific coin allocations were in violation of the rules, as coin distributions deviate further from the expected binomial distribution, the probability of rule bending increases.

In our study, participants played two cup conditions. In the first condition, participants distributed 30 coins between themselves (self-cup) and a stranger living on another island (hereafter referred to as “outsider”).⁵ In the second condition, participants distributed coins between a randomly selected member of their own *yavusa* (hereafter referred to as “insider”) and a different outsider. Games were assigned in counterbalanced order for all participants.

2.3. Operationalized hypotheses

Our version of the RAG pits a recipient from the same *yavusa* (insider) and self against an anonymous stranger from another island (outsider). We predict:

- (1) RAG allocations will deviate from the expected binomial distribution in favor of the local recipients (self and insiders). Because the RAG operates by pitting the preference for rule following against a preference for allocations to a particular recipient, we predict that participants will prefer to benefit locals. Thus, increasing odds of local recipient allocations should reflect this local-favoritism preference. Conversely, decreasing odds of local recipient allocation should reflect the preference for following game rules. These game rules happen to promote dispassionate

allocation regardless of recipient. Thus, to the extent that we find evidence of participants bending game rules, this rule bending should be to the benefit of local recipients.

- (2) Beliefs about supernatural punishment will predict different odds of allocating to locals:
 - A. Bible God: Because the Bible God is concerned about social behavior toward the individuals outside local communities, Yasawans should exhibit higher allocations to outsiders – thus less favoritism to local recipients – as the Bible God is more seen as more punishing.
 - B. *Kalou-vu*: Because the *Kalou-vu* are primarily concerned about the local community (*yavusa*), believing in a more punitive *Kalou-vu* should result in higher allocations (thus higher favoritism) to self and insiders (local recipients).
 - C. Police: Because police have little impact on daily Yasawan life, they should show little predictive relationship with local recipient favoritism. Unlike the deities, there is no way for the police to know what people did in the game.
- (3) The relationships between belief variables and odds of allocating to a local recipient will change as a function of perceived material insecurity:
 - A. Bible God: Because material insecurity promotes local, immediate in-group focus – countervailing the benevolence to outsiders encouraged by the Bible God – Bible God punishment should be less predictive of allocations as insecurity increases.
 - B. *Kalou-vu*: Because the *Kalou-vu* are concerned about the *yavusa*, punishing *Kalou-vu* should predict increased local recipient favoritism as insecurity rises.
 - C. Police: Although we expect police to poorly predict favoritism, they still relate to out-group concern. Therefore, any relationship with allocations should diminish as insecurity rises.

3. Methods

Data were collected in two phases (lasting 5–10 minutes and 20–30 minutes, respectively) in June and July 2011. We first measured perceptions of Bible God, *Kalou-vu*, and police punishment. Days later, participants played the RAG, following which measures of perceived material insecurity were taken.

3.1. Participants

Participants ($N = 30$; age 17–71 years, $M = 40.4$; formal education 5–16 years, $M = 8.97$; 16 men; see Table 1) were randomly selected from an existing demographics database. Villagers all spoke and understood Standard Fijian. Study materials were translated into Standard Fijian and back-translated into English by research assistants fluent in both languages, and checked for quality. All study materials were read to participants due to variable literacy among villagers.

3.2. Punishment scores

Participants rated how well the Bible God, *Kalou-vu*, and police were described by 14 adjectives (positive: forgiving, comforting, loving, compassionate, kind, gentle, peaceful;

Table 1. RAG allocations, insecurity, belief, and demographic variable descriptive statistics.

Variable	<i>n</i>	<i>M</i>	SD	Min	Max
In-group allocations	30	17.9	4.94	10	30
Self allocations	30	18.9	4.82	12	30
Financial insecurity	30	2.97	1.4	0	4
Food insecurity	30	2.83	1.44	0	4
Material insecurity	30	5.8	2.52	0	8
Bible God punishment	30	-0.53	0.78	-2.71	0
<i>Kalou-vu</i> punishment	30	0.76	1.85	-3.43	5.57
Police punishment	30	-0.27	1.36	-3.14	2.86
Age	29	40.41	13.57	17	71
Years of formal education	30	8.97	2.3	5	16

negative: punishing, harsh, terrifying, angry, fearsome, vengeful, jealous) on a scale from 1 (completely agree) to 7 (completely disagree). Positive and negative items were averaged; the positive average was subtracted from negative to form a punishment score. Higher scores indicate belief in a more punishing deity. This scale has been used among North Americans (Shariff & Norenzayan, 2011). Cronbach's alphas for the Bible God ($\alpha = 0.81$), *Kalou-vu* ($\alpha = 0.87$), and police ($\alpha = 0.75$) all indicate acceptable internal reliability.

3.3. RAG

The second phase took place one week later according to Virtues in Conflict Project protocol (Hruschka et al., forthcoming). The RAG was followed by interviews measuring perceived material insecurity.⁶ As noted above, our RAG had two conditions: in one condition, participants chose between allocating coins to self vs. an outsider; in the second, participants chose between a random insider vs. an outsider. For each condition, participants were allocated 30 20-cent coins (\$6 FJD = approximately half a day's wage). Cups were labeled with a line drawing and in Fijian (Figure 1). Participants used a six-sided die – with three black sides and three white sides – to determine coin allocation. Participants gathered in groups of eight to complete the introduction and consent before receiving index cards numbered 1–32⁷ (1–8 = day 1, 9–16 = day 2, etc.) selected randomly to determine participation order. Participants waited in the sitting area and were asked to avoid discussing the study until data collection had ended. One villager, often monitored by Henrich, kept conversation about the study in the sitting area to a minimum; he was also the final participant. The RAG was conducted in private; participants sat so that only the experimenter could see their back at a distance of 12 feet, but could not see their game activity. Pre-roll cup selections were not stated aloud or recorded in any way. A researcher who could not see the participants counted the final coin allocations, and identification numbers maintained confidentiality.

3.4. Material insecurity

After the RAG, participants moved to another room, where a second research assistant conducted the interviews including material insecurity. Both food and financial insecurity were measured with a series of four yes/no questions. Food insecurity questions asked:

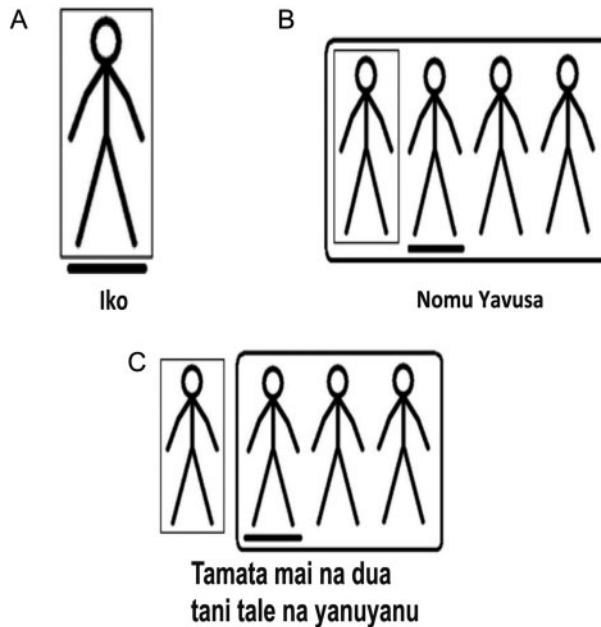


Figure 1. Line drawings with Standard Fijian labels used to denote coin recipients. A: (you) for self; B: (your *Yavusa*) for insiders; C: (person comes from one other island) for outsiders.

“Do you worry that in the next [one month/six months/one year/five years] your household will have a time when it is not able to buy or produce enough food to eat?” All “yes” answers were added together to create a food insecurity score, with 4 being the most insecure. Food insecurity was internally reliable ($\alpha = 0.85$). Similarly, financial insecurity questions asked: “Do you worry that your household will have to pay for a big event (such as a wedding, funeral, festival, or illness in the family whether planned or not) in the next [one month/six months/one year/five years] that your household will not be able to pay for alone?” Financial insecurity was also internally reliable ($\alpha = 0.81$). All eight insecurity questions were added into a single composite measure of material insecurity; the combined material insecurity scale was also internally reliable ($\alpha = 0.87$).

Finally, participants went to a researcher in a second house to receive their earnings. Participants were free to leave after signing their receipts. After the final day of data collection, research assistants delivered insider allocations according to a randomized list of non-participating *yavusa* members. Research assistants delivered outsider allocations to people on another island chosen at random at the end of the field season.

4. Results

We use demographic and belief variables to predict the odds of allocating a coin to a local recipient. Because these data include multiple coin allocations per participant, we use hierarchical logistic regression (model in section 4.2.1) to account for the non-independence of each participant’s repeated coin allocations (Bates, 2010; Gelman & Hill, 2007). The lower level of this hierarchical regression is each of the 60 coin allocations (30 for self vs. outsider and 30 for insider vs. outsider; conditions were aggregated using a dummy code).⁸ The second, higher level of the hierarchical regression is on the individual

participant. Thus, we can use higher-level, across-participant variables to predict individual odds of giving a coin to a local recipient.

We test our hypotheses using (1) second-level, across-participant belief variables to predict odds of giving a coin to a local recipient across each participant's 60 coin allocations, and (2) analyze how across-participant material insecurity moderates the change in odds of giving a coin to a local recipient across differing levels of punishment beliefs about each supernatural or secular agent. Table 2 shows the zero-order correlations among variables. First, the strongest relationship in the data set shows that those who gave more coins to themselves also gave more to insiders ($r = 0.71, p < .001$). Table 2 also shows a significant correlation between food insecurity (FI) and financial insecurity (EI) ($r = 0.54, p = .002$).⁹ Because of the positive correlation between the two insecurity measures (food and financial), analysis will consider moderation effects of the combined material insecurity score. Data were analyzed using the lme4 package (Bates, Maechler, & Bolker, 2011) for R (R Core Development Team, 2008).

4.1. Was there favoritism?

To address our first hypothesis – that deviations from an equal distribution should favor local recipients – we first look at the distribution of allocations across the sample as a whole, which can indicate whether the rule bending is likely to have happened at all. To do so, we aggregated each participant's total number of coins in their insider cup for the insider vs. outsider condition (insider allocations: range = 10–30; $M = 17.9$, mode = 16) and self-cup for the self vs. outsider condition (self-allocations: range = 12–30; $M = 18.9$, mode = 20). We then compared these allocations to the binomial distribution as would be expected if participants were following the rules to use the chance die rolls to determine all coin allocations. Such a distribution of aggregated individual allocations should illuminate subtle rule bending (e.g., more 16/14 allocations than would be expected by chance) as well as excessive rule bending (e.g., 30/0 allocations that are hugely unlikely to happen by chance). Figure 2 depicts the percentage of the sample offering each possible number of coins (self in light gray, insider in dark gray) compared to the theoretical binomial distribution (in black). This binomial distribution indicates what proportion of the sample would be expected to result in each allocation distribution based on chance alone. Figure 2 shows distinct discrepancies toward higher-than-expected allocations for both self and insiders, providing evidence for some rule bending in favor of locals. For example, the binomial expectation (black) predicts that less than 1% of the sample would allocate 27 coins to either themselves or an insider. However, approximately 7% of the sample actually allocated 27 coins to themselves (light gray) or to an insider (dark gray).

4.2. Predicting favoritism

Having established that some rule bending in favor of local recipients did occur, we use hierarchical logistic regression to predict the odds of allocating a coin to insiders. We regress *within-participant* odds of allocating a coin (60 per participant) to a local recipient against *across-participant* measures of beliefs about supernatural and secular punishment. We also control for participant age, sex, and education.

Table 2. Zero-order correlations among variables.

	In-group offers	Self offers	Food insecurity	Financial insecurity	Material insecurity	Bible God	<i>Kalou-vu</i>	Police	Sex	Age
Self offers	0.71 (30)***									
Food insecurity	-0.26 (30)	-0.16 (30)								
Financial insecurity	0.22 (30)	0.1 (30)	0.58 (30)***							
Material insecurity	-0.03 (30)	-0.04 (30)	-	-						
Bible God	-0.02 (30)	0.1 (30)	-0.29 (30)	-0.17 (30)	-0.26 (30)					
<i>Kalou-vu</i>	0.32 (30)†	0.27 (30)	-0.02 (30)	0.13 (30)	0.06 (30)	0.36 (30)†				
Police	0.07 (30)	0.17 (30)	-0.08 (30)	0.16 (30)	0.04 (30)	0.29 (30)	0.23 (30)			
Sex	-0.01 (30)	0.19 (30)	-0.16 (30)	-0.17 (30)	-0.18 (30)	0.02 (30)	-0.26 (30)	-0.19 (30)		
Age (years)	-0.3 (29)	-0.26 (29)	0.24 (29)	0.12 (29)	0.2 (29)	0.01 (29)	-0.42 (29)*	-0.22 (29)	0.07 (29)	
Education (years of schooling)	-0.22 (30)	-0.19 (30)	0.14 (30)	-0.03 (30)	0.06 (30)	-0.05 (30)	0.14 (30)	-0.1 (30)	-0.16 (30)	0.18 (29)

Note: Sample n in parentheses. Men are coded as 1; negative correlations with sex indicate higher values for women than men.

* $p < .05$, ** $p < .01$, *** $p < .001$, † $p < .1$.

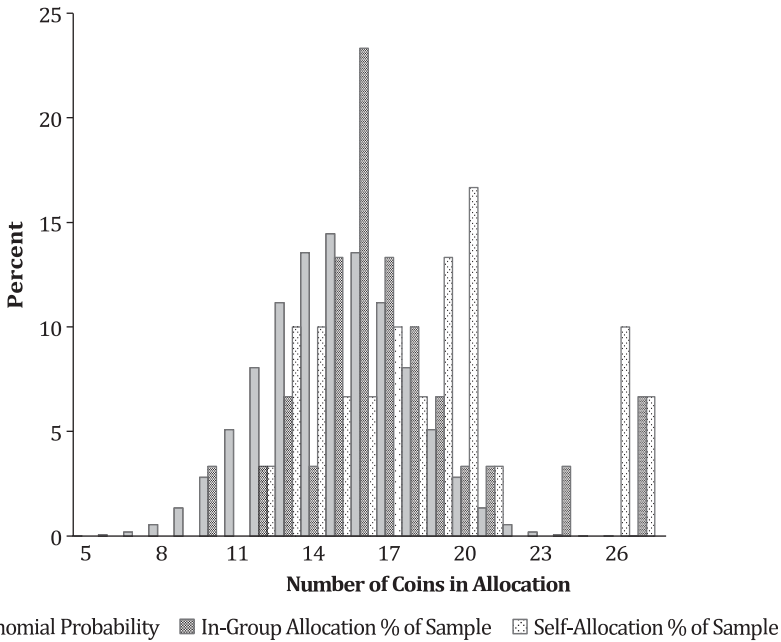


Figure 2. Percentage of sample giving to either self or in-group compared to theoretically expected outcome based on the binomial distribution.

4.2.1. The multilevel model

$$P(\text{coin in self or insider cup})_{ij} = b_{0j} + \varepsilon_{ij} \tag{4:1}$$

$$b_{0j} = b_{00} + b_{01}\text{Punishment belief score}_j + b_{02}\text{Material insecurity}_j + b_{04}\text{Age}_j + b_{05}\text{Male}_j + b_{06}\text{Education}_j + b_{07}\text{Punishment belief score} \times \text{Material insecurity}_j + u_j \tag{4:2}$$

Where *i* is a coin allocation (level 1) and *j* is a participant (level 2). Thus, in equation 4.1, we allow each participant to have a unique baseline predicted odds of allocating to insiders *b*_{0*j*} (intercept). This individual, random intercept is itself a function of equation 4.2, where *b*₀₀ is the grand mean intercept across all participants, and *u*_{*j*} is each participant’s random deviation from *b*₀₀. Equation 4.1 simultaneously provides a single, overall rate of change in odds (slope) per unit change in across-participant (level 2) predictors.

The moderating effect of insecurity is captured as an interaction term in equation 4.1. As with any interaction, this coefficient in the model allows us to assess whether the rate of change in odds of allocating to a local recipient significantly changes across punishment beliefs, *and* whether this rate of change differs at varying levels of material insecurity. Age, years of formal education, and sex are added as controls. Punishment belief scores, age, and education are centered at their mean values. Self vs. insider recipient conditions are added in the model as a dummy variable with insider as the reference. Women are the reference group for sex; the sex coefficient represents men’s difference from women.

Although centering variables at their mean is useful when zero is not meaningful in the raw metric, zero is a meaningful reference point for material insecurity (here, zero indicates the lowest possible material insecurity); thus, material insecurity is considered at zero.

4.2.2. Effects of belief at low material insecurity

We address our second main hypothesis – that belief in punitive deities should reduce odds of local recipient allocations – by investigating three models, one each for the Bible God, *Kalou-vu*, and police, as moderated by material insecurity.¹⁰ In Table 3, we show how effects of these predictors change with demographic controls added and subtracted from the models. Sex is marginally significant only in the full model for Bible God punishment; thus, it is retained in both reduced Bible God models but not the *Kalou-vu* or police reduced models. Similarly, *Kalou-vu* punishment is marginally significant for both the Bible God and police punishment full models; thus *Kalou-vu* punishment is retained in all models.

The Bible God models show a dramatic decrease in odds of allocating to locals as the Bible God is seen to be more punitive ($OR = 0.22$, $CI.95 [0.05, 0.99]$, $z = 1.98$, $p = .048$; note this is at low material insecurity). However, the interaction between material insecurity and Bible God punishment shows an odds ratio larger than 1 ($OR = 1.22$, $CI.95 [0.99, 1.51]$, $z = -1.87$, $p = .06$). Thus, although odds of allocating to locals decreases as the Bible God is seen as more punitive at low material insecurity, the effect weakens as material insecurity increases. Increasing perception of *Kalou-vu* punishment also predicts lower odds of allocating to locals ($OR = 0.63$, $CI.95 [0.37, 1.07]$, $z = 1.72$, $p = .09$), although the rate of decrease in these odds is not as large as for Bible God punishment. The significant interaction between *Kalou-vu* punishment scores and material insecurity ($OR = 1.09$, $CI.95 [1.02, 1.18]$, $z = -2.42$, $p = .02$) also indicates that, even when *Kalou-vu* are seen as punitive, the odds of allocating to locals rise as material insecurity increases. Police, on the other hand, are neither significantly moderated by insecurity, nor do their estimates appear as large as either supernatural being (while also failing to reach statistical significance).

4.2.3. Favoritism at different levels of material insecurity

We address our third main hypothesis – that the predictive effects of punishment beliefs should change across varying levels of material insecurity – by using Aiken and West's (1991) approach to investigate how the simple slopes of belief change across levels of material insecurity. We consider the simple slopes of belief at low (0, the lowest possible insecurity rating), medium (4), and high (8) material insecurity. All the following analyses hold age and education at their average with female and in-group as the reference.

As shown in Figure 3, at low material insecurity, the odds of local recipient allocation drops significantly as Bible God punishment scores increase (showing more punishment; $OR = 0.22$, $CI.95 [0.05, 0.99]$, $z = 1.97$, $p = .048$). At the medium levels of material insecurity, these odds still decrease as the Bible God is seen as more punitive; this relationship is marginally significant ($OR = 0.48$, $CI.95 [0.23, 1]$, $z = 1.94$, $p = .053$). However, the odds of local recipient allocation is not well predicted by perceptions of the Bible God at the highest level of material insecurity ($OR = 1.08$, $CI.95 [0.7, 1.67]$, $z = -0.35$, $p = .73$).

Figure 4 shows that *Kalou-vu* punishment predicts less favoritism when material insecurity is low and more favoritism when material insecurity is high. Low material insecurity predicts a lower probability of allocating a coin to locals when *Kalou-vu* are

Table 3. Full and reduced models for material insecurity as moderator for predicting odds of giving a coin to local recipients as predicted by Bible God (BG), *Kalou-vu* (KV), and police (P) punishment scores.

	BG full	BG model 1	BG model 2	KV full	KV model 1	KV model 2	P full	P model 1	P model 2
Bible God	0.22 [0.05,0.99]*	0.22 [0.04,1.07]†	0.22 [0.04,1.07]†	0.85 [0.58,1.23]	0.86 [0.6,1.24]	–	0.9 [0.59,1.35]	0.93 [0.62,1.4]	–
Kalou-vu	1.16 [0.98,1.39]†	1.18 [1.01,1.38]*	1.19 [1.02,1.39]*	0.63 [0.37,1.07]†	0.57 [0.34,0.98]*	0.59 [0.35,0.99]*	1.18 [0.97,1.42]†	1.16 [0.98,1.36]†	1.15 [0.98,1.34]†
Police	1.11 [0.90,1.38]	1.09 [0.89,1.34]	–	1.15 [0.93,1.42]	1.1 [0.90,1.34]	–	1.30 [0.84,2.02]	1.36 [0.88,2.11]	1.37 [0.88,2.12]
Material insecurity	0.93 [0.82,1.06]	0.92 [0.81,1.05]	0.92 [0.81,1.05]	1.0 [0.9,1.11]	0.99 [0.89,1.1]	1.0 [0.91,1.11]	0.98 [0.86,1.11]	0.95 [0.84,1.07]	0.96 [0.85,1.07]
Condition (self)	1.17 [0.96,1.43]	1.17 [0.96,1.42]	1.15 [0.96,1.42]	1.17 [0.96,1.43]	1.17 [0.96,1.42]	1.17 [0.96,1.42]	1.17 [0.96,1.43]	1.17 [0.96,1.42]	1.17 [0.96,1.42]
Age	0.99 [0.97,1.02]	–	–	1.0 [0.98,1.02]	–	–	1.0 [0.97,1.02]	–	–
Sex (male)	0.63 [0.37,1.08]†	0.66 [0.38,1.13]	0.69 [0.4,1.17]	0.78 [0.46,1.33]	–	–	0.69 [0.39,1.22]	–	–
Education	0.93 [0.84,1.04]	–	–	0.93 [0.83,1.04]	–	–	0.93 [0.83,1.05]	–	–
BG*MI	1.22 [0.99,1.51]†	1.22 [0.98,1.52]†	1.23 [0.98,1.53]†	–	–	–	–	–	–
KV*MI	–	–	–	1.09 [1.02,1.18]*	1.11 [1.03,1.19]**	1.1 [1.02,1.19]*	–	–	–
P*MI	–	–	–	–	–	–	0.97 [0.9,1.05]	0.95 [0.88,1.03]	0.95 [0.88,1.03]
Constant	2.15 [0.89,5.17]†	2.3 [0.92,5.72]†	2.32 [0.93,5.79]†	1.43 [0.69,2.97]	1.66 [0.86,3.21]	1.53 [0.81,2.89]	1.55 [0.66,3.66]	2.15 [1.02,4.53]*	2.09 [1.01,4.34]*

Note: Full models include all predictors plus mi*punishment for each supernatural or secular agent. Reduced models show how estimates change as non-significant demographic variables (model 1) and non-significant belief variables (model 2) are dropped from the model. All models show effects for low material insecurity (mi = 0). Estimates are presented as odds ratios with 95% confidence intervals in square brackets; odds ratios larger than 1 indicate lower odds of giving a coin to the outsider – and thus greater likelihood of favoritism – as the value of that predictor increases.

* $p < .05$, ** $p < .01$, *** $p < .001$, † $p < .1$.

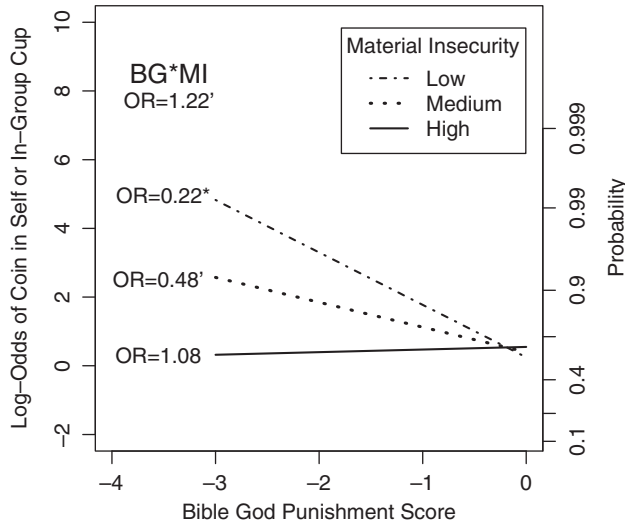


Figure 3. Interaction plot of Bible God punishment predicting favoritism at low, medium, and high material insecurity. Punishment scores range from forgiving (negative scores) to punishing (positive scores).

perceived as more punitive, although this relationship is marginal ($OR = 0.63$, $CI.95 [0.37, 1.07]$, $z = 1.72$, $p = .09$). *Kalou-vu* punishment scores poorly predict odds of local recipient allocations at moderate levels of material insecurity ($OR = 0.91$, $CI.95 [0.69, 1.18]$, $z = 0.72$, $p = .47$). However, more punishing *Kalou-vu* perceptions significantly predict *higher* odds of allocating to locals when material insecurity is high ($OR = 1.3$, $CI.95 [1.07, 1.58]$, $z = -2.67$, $p = .008$). Interestingly, this is opposite to the relationship

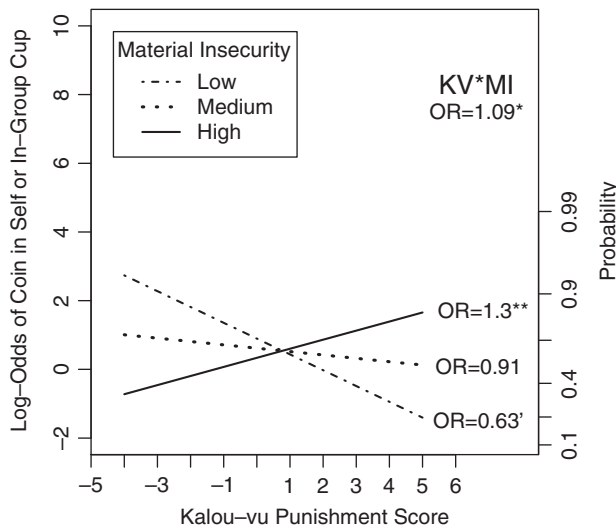


Figure 4. Interaction plot of *Kalou-vu* punishment predicting favoritism at Low, medium, and high material insecurity. Punishment scores range from forgiving (negative scores) to punishing (positive scores).

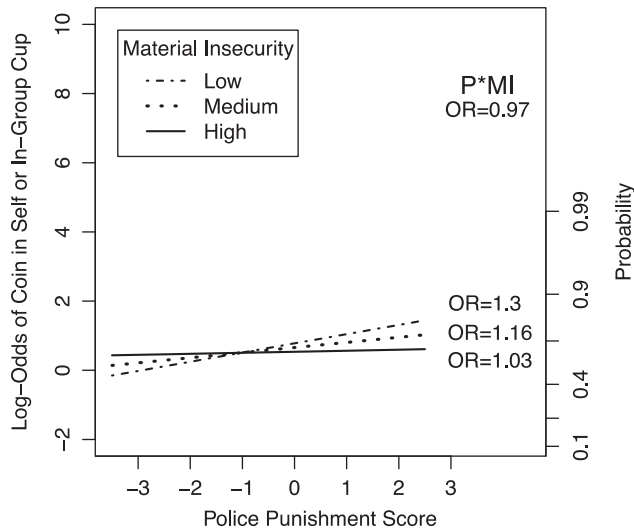


Figure 5. Interaction plot of police punishment predicting favoritism at low, medium, and high material insecurity. Punishment scores range from forgiving (negative scores) to punishing (positive scores).

between favoritism and a punishing monotheistic God in previous studies (Shariff & Norenzayan, 2011) and depends on material insecurity.

Police punishment (Figure 5) has no significant interaction with material insecurity ($OR = 0.97$, $CI.95 [0.9, 1.05]$, $z = 0.73$, $p = .46$). Furthermore, police punishment fails to significantly predict allocations at any level of material insecurity (low: $OR = 1.3$, $CI.95 [0.84, 2.02]$, $z = -1.19$, $p = .23$; medium: $OR = 1.16$, $CI.95 [0.91, 1.47]$, $z = -1.22$, $p = .22$; high: $OR = 1.03$, $CI.95 [0.73, 1.46]$, $z = -0.17$, $p = .87$). Although these trends do not reach significance, the direction of these predictions is opposite to both Bible God and *Kalou-vu* punishment.

5. Discussion

Our findings suggest that punitive supernatural monitors predict lower amounts of RAG favoritism toward local recipients in the context of a village in Yasawa, Fiji. Both the powerful Bible God and the local, less powerful *Kalou-vu* show this effect. These results present an interesting extension to existing theories of supernatural punishment and cultural evolution of religion. First, we demonstrate that supernatural punishment beliefs can be shown to significantly predict behavior toward outsiders in an experimental scenario designed to test in-group favoritism. However, we find evidence to support that what a supernatural agent cares about makes a difference for predicting behavior. Further, variation in perceived material insecurity can moderate the predictive impact that beliefs have on behavior, providing a countervailing force that further diminishes the potential prosociality boost from belief in supernatural punishment.

Yasawans believe that the Bible God and *Kalou-vu* have differing interests in how locals interact with outsiders. Consequently, as perceived material insecurity rises, the relationships between supernatural punishment beliefs and probable RAG favoritism change accordingly. The Bible God is believed to focus on and care equally about all believers – both near and far. Therefore, increasing belief in the Bible God as a punisher

predicts a sharp decrease in odds of allocating to locals – but only when Yasawans see their material resources as secure. As Yasawans become more worried about material resources, Bible God punishment beliefs no longer predict local favoritism. This is not to say that participants who are highly insecure and who see God as a punisher bend rules less often or express less favoritism, but rather that the relationship between punishing Bible God beliefs and allocations diminishes.

On the other hand, the *Kalou-vu* are not as interested in out-groups as the Bible God; their focus is on maintaining traditional norms. Following traditional norms is essential to leading a good Fijian life, free of illness and misfortunes (Katz, 1999). As part of following an appropriate, traditional lifestyle, needy members of the village expect to receive more support, while the well-off are expected to give to those in need (Gervais, 2013). Thus, if one has relatively secure material resources, then traditional Fijian norms favor giving to others what they are due – and thus allow the preference for humility in the face of the game rules to win out over preference for allocating to local recipients. Indeed, *Kalou-vu* punishment beliefs predict less local recipient favoritism when material resources are secure – in line with this normative expectation. However, when times are tight, traditional Fijian norms favor the family. Further, as the mythical ancestral foundation of clans in the local area, *Kalou-vu*'s primary concern is for the immediate in-group. Thus, as material insecurity rises, more punitive *Kalou-vu* beliefs gradually predict *higher* odds of local recipient allocations. Particularly given the *Kalou-vu*'s insider focus, any behavior that does not favor locals when resources are scarce is counter-normative and potentially subject to *Kalou-vu* punishment.

Villagers' self-reports following other economic game decisions toward out-groups corroborate these findings (McNamara, Norenzayan, & Henrich, 2011). When asked to play a Dictator Game with an anonymous stranger, many villagers expressed concern about “wasting” money by giving it away. Participants knew that they would use the money wisely, but they did not know how the stranger would use it. At the same time, many also reported the good “Christian” response was to share the money. Thus, even though sharing is valued to an extent, some villagers consider it worse to squander resources on outsiders.

Police punishment failed to show any significant relationship to odds of local recipient allocations. This makes sense given the minimal impact that national-level authority has on daily village life, but we need more comparative evidence to directly test whether or not this is the case. Secular authority should only suppress antisocial behavior when experienced as a regular and reliable source of third-party influence. In line with previous studies, insecurity in these villages may also push reliance away from secular authority and toward religious control (Gray & Wegner, 2010; Kay, Shepherd et al., 2010; Norris & Inglehart, 2004). Had this study been conducted in the city, this secular influence may have shown a stronger relationship to favoritism. Further, an effect of secular control may have been detected if this study had instead included local human authorities like the village chief or elders. Finally, it could be that police for these villagers are similar to minor deities in some cultures – unconcerned and far away. However, they are known to be totally human and unable to respond to rule violations that they are not aware of. Thus, the hypothesis that secular control only matters when it is present and reliable remains a viable explanation.

6. Conclusion: implications and future directions

Our results indicate a complex relationship between supernatural punishment beliefs, material insecurity, and behavior toward strangers. Further experimental study is needed to determine if evoking norm systems promoting differing out-group orientations can overcome the in-group favoring effects of material insecurity. Additionally, our single measure of material insecurity should be compared against other more precise measures of uncertainty in future studies. Further, our results emerge without explicit manipulation and so cannot establish firm causality.

Despite these limitations, our results suggest that further study on what supernatural agents care about, and how these supernatural agent concerns relate to believers' perceived insecurity, are important pieces to understanding religion's place in human prosociality. Although we still face potential additional, unmeasured variables driving material security, belief, and allocations, our findings lend a degree of ecological validity to the hypothesized links between supernatural agent minds, supernatural punishment, and cooperative behavior toward distant others. Many theoretical approaches to religious prosociality and the evolution of religion include an assumption that belief has uniform effects across believers (see e.g., Bering, 2006; Johnson, 2009; Johnson & Bering, 2006; Johnson & Krüger, 2004; Norenzayan, 2013; Schloss & Murray, 2011; Shariff, 2011; Wilson, 2003). However, when considered within this existing theoretical framework, our results suggest that individual variations in response to belief are meaningful and require further study. Additionally, our results suggest that understanding the mind of God requires more than simply knowing if God will punish; contents of beliefs, specifically what and whom God cares about, also matter. Because the results suggest that punitive supernatural agents' scope of concern has different effects on favoritism as a function of material insecurity, these results also show the need for further study on how beliefs interact with ecological conditions. Our results support the hypothesis that supernatural punishment can indeed reduce local favoritism when material insecurity is low or moderate. However, when material insecurity is high, we show that a punitive supernatural agent focused on the in-group may amplify local favoritism, to the detriment of outsiders.

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Supplemental data

Supplemental data for this article can be accessed [here](#).

Notes

1. There is substantial regional variation in some aspects of traditional Fijian ways of life. In Yasawa, *yavusas* form chiefdoms with one or two villages. Elsewhere in Fiji, chiefdoms may encompass multiple *yavusa*. See Supplementary Online Material for more detail.
2. See Supplementary Online Material for more on sex-based division of labor and associations with belief, insecurity, and RAG favoritism.
3. Elsewhere in Fiji, the Christian God is also referred to as *Kalou dina*, or “true God.” While the phrase *Kalou dina* is understood in Yasawa, the term is not used locally. This “true God” terminology also connotes the Christian God’s higher status above the *Kalou-vu* in Fijian socio-spiritual hierarchy. The *Kalou dina* takes care of the universe, and the *Kalou-vu* take care of local matters within their area of influence. Although the *Kalou-vu* mostly focus concern on the traditional matters of village life, they are sometimes believed to see and affect the people in their lineage (who are thus under their influence) from afar. Yasawans also often pray to the Bible God for help and forgiveness when an angry *Kalou-vu* is suspected of causing illness or other troubles. Evangelical missionizing in Yasawa has rebranded the *Kalou-vu* as *tevoru* or “devils/demons.” *Tevoro* can cause general bad luck, illness, or death, and are also responsible for the power that sorcerers use to harm others. Importantly, people are most vulnerable to *tevoru* power when they fail to lead a proper traditional life – similar to behaviors that may provoke a *Kalou-vu*. How *tevoru* compare to *Kalou-vu* in protecting the *vanua* (the land and its people) is an active topic of our ongoing research.
4. The stream running through Teci village in the center of the island is the only place with sufficient water for taro gardens. Only a handful of Teci villagers actually consume the taro grown here, and then only in the past decade.
5. Our participants likely assumed that this was another Christian indigenous Fijian. Fiji has a large population of ethnic Indians who are Hindu or Muslim. However, Indo-Fijians are rare except on the main islands of Vanua Levu and Viti Levu. Conversationally, Yasawas often refer to Viti Levu as “the mainland” in contrast to, for example, the other islands in the Yasawan chain; they rarely refer to these large islands with substantial Indo-Fijian populations as “islands.”
6. For analysis of additional vignette and social closeness interview data, see McNamara and Henrich (submitted).
7. An additional two participants were dropped from analysis because they did not complete the supernatural and secular punishment interview.
8. Self and insider are aggregated because previous analysis showed the same patterns of results when conditions were analyzed separately. We retain a dummy coded variable to account for the different conditions in the present, aggregated analysis to maintain statistical control on any differences that may not have emerged when the conditions were analyzed separately.
9. Food insecurity correlates negatively with both insider and self-allocations while financial insecurity correlates positively with both – although neither reaches statistical significance. Using the predictors separately shows the same patterns of results, with similar effect sizes but more statistically significant estimates (see SOM).
10. To avoid over-fitting, Table 3 models include punishment x insecurity interactions considered independently; see the SOM for models with all interactions together.

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