Material insecurity predicts greater commitment only to moralistic deities: A cross-cultural investigation


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The existential security hypothesis predicts that in the absence of more successful secular institutions, people will be attracted to religion when they are materially insecure. Most assessments, however, employ data sampled from state-level societies with a focus on world religions. Using individual-level data collected in societies that cover the various scales of human social complexity with diverse religious traditions including animism, shamanism, polytheism, and monotheism, we conducted a systematic cross-cultural test ($N = 2027$; 14 societies) of the relationship between material insecurity and religious commitment (indexed by both beliefs and practices). Moreover, we examined the contributions of material security to commitment in two types of religious traditions (moralistic and local) within individuals – providing the first simultaneous test of the existential security hypothesis in world and local religious traditions. Our results indicate that material insecurity increases commitment to moralistic traditions and decreases commitments to local traditions.

Keywords

Religious commitment, existential insecurity, moralistic gods, cross-cultural
1. Introduction

There exists an immense diversity in the form, frequency, and intensity of religious commitments. Thus, scholars of religion have long been interested in answering the related questions of when, in what ways, and with what intensity people demonstrate commitment to their gods (e.g., Atkinson & Whitehouse, 2011; Cohen et al., 2003; Norenzayan, 2016; Power, 2017b; Purzycki & Sosis, 2011; Rappaport, 1999; Xygalatas et al., 2013). Moreover, researchers have taken on the challenge of developing accounts of how specific cultural variants in religious commitments come to spread and persist at the expense of others, resulting in the modern landscape of religious commitments that is dominated by the ‘world’ religions (e.g., Baumard & Chevallier, 2015; Norenzayan et al., 2016). And, an emerging cultural evolutionary synthesis posits that the key to accounting for variation in religious commitments is to consider the adaptive benefits that varied forms of religious commitments may provide to adherents in face of varied socio-ecological challenges (Purzycki & McNamara, 2016).

One such prevalent variant in religious systems is the extent to which they are ‘moralistic’ – i.e., ‘traditions [that] are characterized as those that emphasize adherence to prosocial norms under the threat of punishment by knowledgeable deities explicitly concerned with how we treat each other’ (Purzycki, Ross, et al., 2018, p. 1). Cross-cultural evidence indicates that beliefs in these types of moralistic deities promotes intra-group cooperation (e.g., Lang et al., 2019; Purzycki et al., 2016a) and that they may have evolved in response to the socio-ecological threats to cooperation associated, for example, with living in harsh or resource scarce regions (e.g., Botero et al., 2014; Snarey, 1996). Bentzen (2019) provides compelling global evidence for how largely unpredictable and potentially devastating ecological threats such as the frequency of earthquakes support the persistence of commitments to moralistic world religions over time (see also Sibley & Bulbulia, 2012 for a natural longitudinal experiment of how earthquakes promote religious commitments). Taken together, what the evidence suggests is that in times of duress or insecurity – individuals are prone to seeking out commitment to certain types of religious traditions.

In a cross-national analysis of 191 societies, Norris & Inglehart (2011) provide evidence that existential insecurity (i.e., a perceived vulnerability to societal and personal risks and threats) is a fundamental determinant of the relative strength of religious fervor (in terms of commitment to religious values and practices). In this account – the existential insecurity hypothesis of religious commitments – public demand for and participation in ‘transcendent’ religious traditions (i.e., those that provide a sense of confidence and predictability in a threatening and uncertain world) is greater when existential security is low. When existential security is provided by other means (e.g., effective secular institutions in welfare states), the demand for transcendent religious traditions that have otherwise provided solace from existential problems decreases. Thus, this hypothesis potentially provides a cohesive account of religion’s persistence in developing societies and the relative waning of religious fervor in industrialized societies with wider access to resources. Indeed, even in industrialized societies, religious commitment is positively correlated with income inequality such that those living at lower rungs of the ladder (i.e., in more uncertain circumstances) are more devout than more financially secure others (e.g., Solt et al., 2011). In support of the existential security hypothesis, these results suggest religious commitments – heightened in times of need – may alleviate some of effects of living under uncertain conditions (perhaps by virtue of providing a sense of confidence and predictability in uncertain times or, for example, practices that sustain social support networks in religious communities; see Weigel in this issue).
The crux of Norris & Inglehart’s (2011) hypothesis is that certain types of religious systems offer their adherents specific absolution from the trials and tribulations of uncertain life circumstances – something special that is not on offer from affiliation with other cultural groups. This leads to the prediction that religious commitments, specifically, rather than norm compliance to other types of cultural institutions should adaptively increase under uncertain and insecure conditions. In support of this, Henrich et al. (2019) observed in a natural experiment that variability in past exposure to war in Sierra Leone, Uganda and Tajikistan positively predicted years-later membership and active participation in Christian and Muslim – but not non-religious – social organizations. In addition to providing further evidence for how individuals seek out religious commitments in insecure times, this work points to how moralistic religious traditions may have culturally evolved to “exploit the psychological states created by uncertainty and existential threats as a means to more effectively disseminate themselves” (p. 129; Henrich et al., 2019). In times of need, adherents seek out moralistic deities who offer help and protection. These omnipotent deities, however, are usually also punitive and omniscient – and thus communities of adherents may inadvertently benefit from the cooperative benefits of commitments to moralistic deities. In insecure times, as commitments to moralistic deities increase and communities accrue the parochial cooperative benefits of these specific variants in religious beliefs and practices, they may head into more inter-group conflict – creating a “feedback loop that will drive the cultural evolution of religions” (p. 133; Henrich et al. 2019).

This view stands in stark contrast to some accounts of how secure/insecure living conditions shape religious commitments. For example, Baumard & Chevallier (2015) proposed that moralistic traditions with their focus on less immediate benefits emerge as a result of living in safer, less harsh, and less insecure environments. However, Purzycki, Ross, et al. (2018), in a direct test of this hypothesis, examined whether materially secure individuals attributed their deities with more moralistic qualities - and found no reliable evidence for this hypothesis. That being said, it remains an open question as to whether or not commitments to traditions that differ in their ‘moralistic-ness’ vary as a function of secure/insecure living conditions. Indeed, examinations of the contributions of insecurity to religious commitments often employ large-scale survey data made available by research institutions such as Gallup and the World/European Value Survey. Although these datasets are very valuable for testing these types of predictions, they are limited by their lack of sampling from non-state societies. Consequently, the sampling from nation states and adherents of world religions (e.g., Christianity, Islam, Buddhism, Hinduism) leaves the existential security hypothesis of religion largely untested amongst most of the world’s religious diversity – especially with regards to local traditions in non-state societies – preventing direct tests of how insecurities moderate commitments to traditions that vary in their moralistic qualities. And interestingly, Bentzen (2019) provides evidence that some moralistic traditions (i.e., Buddhism) do not fluctuate in the same way as others in response to insecurities. Thus, future research in this area should also consider variation between moralistic traditions.

To address these concerns, we conducted a systematic cross-cultural examination of the individual-level contributions of perceived food security (an index of existential/material security) to religious commitments directed at two types of deities in a large sample of participants from 14 societies that spans the scale of human social complexity (from hunter-gatherer groups to fully-market integrated urban samples). Moreover, our examination takes into further consideration variation in the form of religious commitments. Across traditions, people express religious commitment in a wide variety of ways. One major dimension of this variation
is differential emphasis on belief and practice (e.g., Cohen, Siegel, & Rozin, 2003; Purzycki & Sosis, 2011), and thus we explicitly examined commitment in terms of both belief and practice.

In brief, we employed a diverse cross-cultural sample to (1) assess the relationship between two forms of religious commitment (mental – i.e., strength of belief; and behavioral – i.e., frequency of ritual performance/participation), and (2) test the contributions of material insecurity to commitment to two types of deities controlling for other demographic variables (i.e., age, sex, years of formal education, and number of children). Lastly, we (3) examined the generalizability of the contributions of material insecurity to religious commitments in different moralistic traditions by contrasting this association in predominantly Christian, Hindu and Buddhist cultural contexts.

2. Methods

2.1. Pre-registration and Open Access

The data for this study was culled from a larger dataset generated by The Cultural Evolution of Religion and Morality project (Lang et al., 2019; Purzycki et al., 2016b, 2016a). Focal variables were selected from the larger dataset and general analytical strategy planned after data collection, but prior to the lead author receiving access to the data. Our pre-registration document is publicly available at https://osf.io/8efwv/; and data and R scripts for analyses at https://osf.io/rq75m/.

2.2. Sample and Deity Selection

Across two waves of data collection, 2,027 individuals from 14 populations participated in the larger study1 (Table 1 summarizes the demographics). We selected two target deities in each site (Table 2). These were selected in pre-test interviews with an additional sample of locals (when available). In these interviews, participants were asked to free-list up to five deities, to rank these deities in order of their importance, to rate the extent of these deities’ knowledge, and how punitive/rewarding they are believed to be. From these ratings, at each site we selected a moralistic deity (i.e., one that was high in moral interest and knowledge/punitiveness) and a local deity (i.e., one that was salient across participants but was rated lower in moral interest, knowledge, and moral concern). Extensive post-test analyses of the selected deities and their believed attributes suggest that by and large, participants did indeed distinguish between these deities along the intended dimensions (for more details, see Lang et al., 2019; Purzycki et al., 2016b; 2018).

At the majority of the sites, the most salient moralistic deity was the Christian god. At predominantly Hindu sites (i.e., Lovu, Mauritius, and Mysore), researchers selected Shiva. At the Inland Tanna, and Tyva sites, the moralistic deities were Kalpapan, and Buddha Burgan (Buddha) respectively. By design, the identities of the local deities were more varied (see Table 2). At the Huatasani and Kananga sites, participants were largely unfamiliar with the local deities identified by the pre-test samples (Apus and Kadima, respectively) and thus, some participants were asked about different deities (Catholic saints and ancestral spirits). At the Lovu and Samburu sites, researchers did not ask questions about local deities.

Table 1. Means (standard deviations) for focal variables by site.

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Data from one additional site (Hadzaland, Tanzania) were excluded from all our present analyses as responses to the focal items were not measured comparably to the other sites.
In Wave I, responses to mental commitment items (i.e., “how often do you think about [deity]?” and “how often do you worry about [deity] thinks about you?”) were coded on the following scale (Scale 1: 0 = very rarely/never; 1 = a few times a year; 2 = a few times per month; 3 = a few times per week; 4 = every day or multiple times per day) except at the Lovu, Mauritius and Yasawa sites where the following response scale was employed (Scale 2: 0 = never; 1 = sometimes, 2 = frequently or often, 3 = always or all the time). In Wave II, response scale 1 was used for the ‘think’ items and scale 2 was used for the ‘worry’ item except at the Sursurunga and Cachoeira sites where scale 1 was employed for both items.

### 2.3. Commitment Measures

#### 2.3.1. Mental Commitment

At all sites, we asked participants “how often do you think about [moralistic/local deity]?” and “how frequently do you worry about [moralistic/local deity] thinks about you?”. These items were correlated across sites to varying degrees (Moralistic deity: \( r = - .16 \) to .61; Local deity: \( r = -.19 \) to .69; see Figures S1 and S2 in supplemental for correlations by site). Responses to these items were on either one of two response scales at different sites, thus for comparison we rescaled responses within sites by dividing responses by the maximum possible scale value participants could have chosen\(^2\). The index of mental commitment (i.e., the extent to which participants reported spending time exerting cognitive effort to think about these deities) is the mean individual response to these two items. Summary statistics of the rescaled belief index scores by site and deity are presented in Table 2. Preliminary analyses of rescaled responses produced poor-fitting models due to lack of variability in commitment at some sites (see Figures S3 and S4 in the supplemental materials; and Table 2, i.e., no reported behavioral commitment to local deity at Yasawa). And thus, for all analyses presented here, we dichotomized the rescaled scores such that they indicated no/low mental commitment (= 0; responses ≤ site-specific mean) or high mental commitment (= 1; responses > site-specific mean).\(^3\)

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\(^2\) In Wave I, responses to mental commitment items (i.e., “how often do you think about [deity]?” and “how often do you worry about what [deity] thinks about you?”) were coded on the following scale (Scale 1: 0 = very rarely/never; 1 = a few times a year; 2 = a few times per month; 3 = a few times per week; 4 = every day or multiple times per day) except at the Lovu, Mauritius and Yasawa sites where the following response scale was employed (Scale 2: 0 = never; 1 = sometimes, 2 = frequently or often, 3 = always or all the time). In Wave II, response scale 1 was used for the ‘think’ items and scale 2 was used for the ‘worry’ item except at the Sursurunga and Cachoeira sites where scale 1 was employed for both items.

\(^3\) We pre-registered our plans to dichotomize scores relative to the site-specific medians. Doing so, however, led to insufficient variability in some sites, so site-specific means were used instead.
2.3.2. Behavioral Commitment

Participants were asked to indicate (0 = no; 1 = yes) whether or not they “perform activities or practices to talk to or appease [moralistic/local deity]?” If participants said yes, they were also asked to indicate how often (0 = very rarely/never, 1 = a few times per year; 2 = a few times per month; 3 = a few times per week; 4 = every day or multiple times per day). We coded participants who indicated that they did not perform activities or practices to talk to or appease the targeted deities as 0 (very rarely/never) on the frequency of ritual performance item. We rescaled reported frequency of ritual performance as we did to the mental commitment items such that raw responses were scaled by the maximum scale value (summary statistics by site and deity are presented in Table 2). For analysis, we again dichotomized responses to indicate no/low behavioral commitment (= 0; response ≤ site-specific mean) and high behavioral commitment (= 1; response > site-specific mean).

Table 2. Religious commitment indicators by site and deity.

<table>
<thead>
<tr>
<th>Sample/Site</th>
<th>Moralistic Deity</th>
<th>Commitment M (SD)*</th>
<th>Commitment M (SD)*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Mental</td>
<td>Behavioral</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cachoeira (Brazil)</td>
<td>Christian God</td>
<td>.94 (.15)</td>
<td>.93 (.21)</td>
</tr>
<tr>
<td>Coastal Tanna</td>
<td>Christian God</td>
<td>.80 (.22)</td>
<td>.81 (.23)</td>
</tr>
<tr>
<td>Huatasani (Peru)</td>
<td>Christian God</td>
<td>.78 (.27)</td>
<td>.74 (.30)</td>
</tr>
<tr>
<td>Inland Tanna</td>
<td>Kalpapan</td>
<td>.76 (.33)</td>
<td>.61 (.46)</td>
</tr>
<tr>
<td>Kananga (DNC)</td>
<td>Christian God</td>
<td>.91 (.16)</td>
<td>.78 (.33)</td>
</tr>
<tr>
<td>Lovu (Fiji)</td>
<td>Shiva</td>
<td>.36 (.17)</td>
<td>.06 (.15)</td>
</tr>
<tr>
<td>Marajó (Brazil)</td>
<td>Christian God</td>
<td>.91 (.17)</td>
<td>.81 (.29)</td>
</tr>
<tr>
<td>Mauritius</td>
<td>Shiva</td>
<td>.69 (.27)</td>
<td>.58 (.42)</td>
</tr>
<tr>
<td>Mysore (India)</td>
<td>Shiva</td>
<td>.64 (.29)</td>
<td>.39 (.44)</td>
</tr>
<tr>
<td>Samburu (Kenya)</td>
<td>Christian God</td>
<td>.86 (.21)</td>
<td>.92 (.23)</td>
</tr>
<tr>
<td>Sursurunga (New</td>
<td>Christian God</td>
<td>.77 (.17)</td>
<td>.72 (.29)</td>
</tr>
<tr>
<td>Ireland)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Turkana (Kenya)</td>
<td>Christian God</td>
<td>.89 (.16)</td>
<td>.78 (.25)</td>
</tr>
<tr>
<td>Tyva Republic</td>
<td>Buddha</td>
<td>.62 (.30)</td>
<td>.49 (.36)</td>
</tr>
<tr>
<td>Burgan</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yasawa (Fiji)</td>
<td>Christian God</td>
<td>.78 (.19)</td>
<td>.28 (.14)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>.77 (.15)</td>
<td>.64 (.25)</td>
</tr>
</tbody>
</table>

Notes. *By-site means and standard deviations are of the rescaled average responses.

2.4. Material Insecurity and Demographics

We created an index of material insecurity by averaging responses to four items asking participants about future food security: “Do you worry that in the next [month/six months/year/five years] your household will have a time when it is not able to buy or produce enough food to eat?” (1 = “yes”, 0 = “no”; Hruschka et al., 2014). Responses to these four items

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4 Note that we aimed to conceptualize mental and behavioral commitment utilizing straightforward questions that were collected at all sites. While the data set comprises also more nuanced questions regarding commitment to supernatural agents, these were problematic/not collected at some sites and we opted for inspecting global effects of material insecurity on commitment across the whole sample (c.f. Vardy et al., this issue, on the more nuanced approach to behavioral and mental commitment).
were strongly correlated ($\alpha = .89$). To determine the unique effect of material security on religious commitment when controlling for other factors, we adjusted the effects of material insecurity for the effects of age, sex, years of formal education and number of children (see Vardy et al. in this issue on how sex differently predicts commitment to moralistic and local gods). By-site summary statistics for all focal variables are presented in Table 1.

2.5. Models and Analytical Strategy

All analyses were conducted in R (R Core Team, 2017). Bayesian models were executed using the brms (Bürkner, 2017) compiler for RStan (Stan Development Team, 2017). Model summary tables were generated with sjPlot (Lüdecke, 2018).

To estimate the contributions of material insecurity to overall religious commitment, dichotomized responses to the two measures of mental commitment and single measure of behavioral commitment were stacked for each deity resulting in up to six binary data points per participant. We modelled mental and behavioral commitments to the examined deities, $c_i$, in a single modelling framework using a mixed-effects logistic regression with the linear predictor logit($p_i$):

$$c_i \sim \text{Binomial}(1, p_i)$$

Model 1A: $\text{logit}(p_i) = \alpha_{j,s} + \beta_{j,m} \cdot g_{1i}$

Model 1B: $\text{logit}(p_i) = \alpha_{j,s} + \beta_{j,m} \cdot g_{1i} + \lambda_{d_i}$

Model 2A: $\text{logit}(p_i) = \alpha_{j,s} + \beta_{j,m} \cdot g_{2i}$

Model 2B: $\text{logit}(p_i) = \alpha_{j,s} + \beta_{j,m} \cdot g_{2i} + \lambda_{d_i}$

To assess the potentially different effects that material insecurity might have on commitments to moralistic and local deities, we interacted the insecurity index, $m_i$, and deity, $g_{1i}$, in all models. In Models 1A (without demographic covariates) and 1B (with demographic covariates), deities were classified as moralistic ($g_{1i} = 1$) or local ($g_{1i} = 0$). Our demographic variables, $d_i$, included grand-mean centered age, participant sex (1 = male), years of formal education, and number of children. In Models 2A (without demographic covariates) and 2B (with demographic covariates), the deity index ($g_{2i}$) was further specified to indicate four categories of deities: 0) local deities not in a Christian majority context; 1) local deities in a Christian context; 2) moralistic deities not in a Christian majority context; and 3) the Christian God. This allowed us to estimate commitment estimates for each kind of deity as it interacted with material security in differing moralistic-tradition contexts. As $c_i$ consisted of three individual-level indices of commitment, we varied intercepts for individuals$^5$, $\alpha_i$, and included varying intercepts for field site, $\alpha_s$, across all models.

All priors were set as uninformative and weakly-regularizing: simple effects $~\text{Normal}(0,1)$; variance components for varying effects $~\text{Exponential}(1)$; and the correlation matrix of the variance components $~\text{LKJCorr}(4)$ (Lewandowski et al., 2009)$^6$. Across all model

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$^5$ Each participant could thus have up to 6 total observations in the model (1 response for each of 2 mental commitment items and 1 response for to the behavioral commitment index per deity [moralistic/local]).

$^6$ The use of weakly regularizing priors systemically protects against overfitting of the model to the data during parameter estimation and underfitting (i.e., not learning enough from the data) which often leads to poor predictions (McElreath, 2015, p. 166).
specifications, the four sampling chains converged ($\hat{R} < 1.01$ for all parameters; 1500 samples), and effective sample sizes were high (target alpha accept rate = .99).

3. Results

3.1. Commitment Descriptives

3.1.1. Is commitment different across deities?
Mental commitment was greater for moralistic deities than the local deities, and especially so at Christian sites (see Figure S3 in supplemental; Christian sites are identified with a cross). At the non-Christian sites (e.g., Inland Tanna, Mysore, Tyva Republic), the extent of mental commitment was more diffusely distributed for both deities. Similarly, behavioral commitment was more frequent toward moralistic deities than toward local deities, again especially at Christian sites (see Figure S4 in supplemental). However, the extent of this difference was more variable for behavioral commitment than it was for mental commitment (e.g., at Yasawa). Note that participants were typically selected on the basis of their association with the moralistic gods. In some contexts, everyone was associated with the moralistic deity by default and that the two traditions these deities index are in harmony or syncretically interwoven, but in others, there are religious markets and/or antagonism between the two traditions; hence, the observed difference in commitment to moralistic and local deities may stem from pre-existing antagonisms at some sites.

3.1.2. Is there a differential emphasis of behavioral and mental religiosity?
Can we see some traditions more consistently emphasizing either belief or practice? Figures 1 (moralistic deities) and 2 (local deities), present the by-site correlations of mental and behavioral commitment. With few exceptions (Yasawa and Cachoeira), the relationships between these two forms of commitment were positive across sites and deities. At Cachoeira, mental commitment for the moralistic deities was near ceiling. At Yasawa, behavioral commitment for the moralistic deity was relatively quite low (although this is potentially capturing consistent and relatively unvaried weekly church attendance). Across sites, the relationship between belief and practice was consistently positive for the local deities. Given these correlations, we created a tripartite index of religious commitment of the dichotomized (0 = no/low; 1 = high) mental and behavioral commitment items for our focal analyses resulting in up to six binary data points per participant. In the supplemental materials, we present the results of treating mental and behavioral commitment separately.
Figure 1. Correlation plots of mental and behavioral commitment toward moralistic deities by site.

Notes: Mental commitment scores are the mean scaled values (participant response divided by the highest possible response value at that site) of responses to the ‘think’ and ‘worry’ items. Behavioral commitment values are: 0 = very rarely/never, 1 = a few times per year; 2 = a few times per month; 3 = a few times per week; 4 = every day or multiple times per day. Data points have been jittered.
Figure 2. Correlation plots of mental and behavioral commitment toward local deities by site.

Notes: Mental commitment scores are the mean scaled values (participant response divided by the highest possible response value at that site) of responses to the ‘think’ and ‘worry’ items. Behavioral commitment values are: 0 = very rarely/never, 1 = a few times per year; 2 = a few times per month; 3 = a few times per week; 4 = every day or multiple times per day. Data points have been jittered. Note that data from Yasawa, Sursurunga, and Kananga sites are not presented as there was no variation in reported behavioral commitments to the local deity.
3.2. Accounting for Religious Commitment

3.2.1. Material Insecurity and Commitment to Local and Moralistic Deities

On average, commitment (indexed by both mental and behavioral items) to moralistic deities was substantially greater than commitment to local deities (OR = 2.74 [2.39, 3.15]; Model 1A, Table 3). The effect of material insecurity on commitment to moralistic deities was 2.23 [1.79, 2.76] times greater than its effects on commitment to local deities. This result was robust to the addition of additional demographic covariates, none of which clearly predicted overall commitment (see Model 1B). Importantly, however, Models 1A and 1B revealed that material insecurity does not predict greater commitment to all types of deities. Indeed, these models’ estimates indicate that commitment to local deities decreases with insecurity (OR = 0.66 [0.54, 0.82]). From the estimates generated by Model 1B, we calculated that the predicted probability of commitment to moralistic deities increased from .63 [.51, .73] to .71 [.61, .80] with insecurity; whereas insecurity lead to the probability of local deity commitment decreasing from .38 [.28, .49] to .29 [.20, .39]. And thus, the difference in commitment to local and moralistic deities was greatest under insecurity (see Figure 3). Supplemental analyses (presented in Table S1 and Figure S5) reveal that this overall pattern seem to be driven by the underlying divergence of increased mental commitment to moralistic deities and decreased behavioral commitment to local deities at high insecurity.

Table 3. Predicting commitment to local and moralistic deities

<table>
<thead>
<tr>
<th>Predictors</th>
<th>Model 1A</th>
<th></th>
<th></th>
<th>Model 1B</th>
<th></th>
<th></th>
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<tbody>
<tr>
<td></td>
<td>Odds Ratios</td>
<td>CI (95%)</td>
<td>Odds Ratios</td>
<td>CI (95%)</td>
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</tr>
<tr>
<td>Intercept</td>
<td>0.62</td>
<td>0.37 – 1.00</td>
<td>0.67</td>
<td>0.41 – 1.10</td>
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<tr>
<td>Material Insecurity</td>
<td>0.66</td>
<td>0.54 – 0.82</td>
<td>0.65</td>
<td>0.53 – 0.80</td>
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</tr>
<tr>
<td>Deity (1 = Moralistic)</td>
<td>2.74</td>
<td>2.39 – 3.15</td>
<td>2.75</td>
<td>2.42 – 3.13</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Insecurity * Deity</td>
<td>2.23</td>
<td>1.79 – 2.76</td>
<td>2.21</td>
<td>1.80 – 2.72</td>
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<td></td>
</tr>
<tr>
<td>Age (centered)</td>
<td>1.01</td>
<td></td>
<td>1.01</td>
<td>1.00 – 1.01</td>
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<tr>
<td>Sex (1 = Male)</td>
<td>0.99</td>
<td>0.88 – 1.11</td>
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<td></td>
<td></td>
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<tr>
<td>Formal Education (yrs.)</td>
<td>0.99</td>
<td>0.97 – 1.00</td>
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</tr>
<tr>
<td>No. of Children</td>
<td>1.01</td>
<td>0.98 – 1.04</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Observations</td>
<td>9591</td>
<td></td>
<td>9591</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Although these demographic variables did not predict overall commitment, this cross-deity null-results may result from underlying differential contributions of these demographics to commitment to moralistic and local deities. For a more focused discussion of how sex, for example, moderates commitment to moralistic and local deities in these samples, see Vardy et al (this issue).
Figure 3. Predicted probability of commitment to local and moralistic deities

Notes: Predictions were made from Model 1B, holding demographic covariates at their mean. Shaded regions are 95% prediction intervals.

3.2.2. The role of Christianity

The deity most frequently surveyed across sites was the Christian God. To assess whether the observed relationship between material insecurity and commitment to local and moralistic deities generalized across different religious traditions, Models 2A and 2B employed a re-specified deity indicator categorically coded as 0 = Local Deity at Non-Christian Site; 1 = Local Deity at Christian Site; 2 = Moralistic deity at non-Christian site; and 3 = Christian God (see Table 4 for model summaries, and results plotted in Figure 4).
Table 4. Predicting commitment to local and moralistic deities in Christian and non-Christian contexts

<table>
<thead>
<tr>
<th>Predictors</th>
<th>Model 2A Odds Ratios</th>
<th>Model 2A CI (95%)</th>
<th>Model 2B Odds Ratios</th>
<th>Model 2B CI (95%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>0.74</td>
<td>0.39 – 1.44</td>
<td>0.83</td>
<td>0.43 – 1.61</td>
</tr>
<tr>
<td>Material Insecurity</td>
<td>0.74</td>
<td>0.53 – 1.04</td>
<td>0.72</td>
<td>0.52 – 1.03</td>
</tr>
<tr>
<td>Deity (Local/Christian site)</td>
<td>0.65</td>
<td>0.31 – 1.36</td>
<td>0.62</td>
<td>0.31 – 1.26</td>
</tr>
<tr>
<td>Deity (Moralistic/Non-Christian)</td>
<td>1.79</td>
<td>1.48 – 2.17</td>
<td>1.79</td>
<td>1.48 – 2.17</td>
</tr>
<tr>
<td>Deity (Christian God)</td>
<td>2.80</td>
<td>1.30 – 5.83</td>
<td>2.67</td>
<td>1.33 – 5.46</td>
</tr>
<tr>
<td>Insecurity * Local/Christian Deity</td>
<td>1.13</td>
<td>0.75 – 1.70</td>
<td>1.13</td>
<td>0.74 – 1.71</td>
</tr>
<tr>
<td>Insecurity * Moralistic/Non-Christian</td>
<td>1.38</td>
<td>0.93 – 2.05</td>
<td>1.36</td>
<td>0.91 – 2.03</td>
</tr>
<tr>
<td>Insecurity * Christian God</td>
<td>1.93</td>
<td>1.29 – 2.85</td>
<td>1.94</td>
<td>1.28 – 2.90</td>
</tr>
<tr>
<td>Age (centered)</td>
<td></td>
<td></td>
<td>1.01</td>
<td>1.00 – 1.01</td>
</tr>
<tr>
<td>Sex (1 = Male)</td>
<td></td>
<td></td>
<td>0.99</td>
<td>0.87 – 1.11</td>
</tr>
<tr>
<td>Formal education (yrs.)</td>
<td></td>
<td></td>
<td>0.99</td>
<td>0.97 – 1.00</td>
</tr>
<tr>
<td>No. of Children</td>
<td></td>
<td></td>
<td>1.01</td>
<td>0.98 – 1.04</td>
</tr>
<tr>
<td>Observations</td>
<td>9591</td>
<td></td>
<td>9591</td>
<td></td>
</tr>
</tbody>
</table>
Figure 4. Predicted probability of commitment to local and moralistic deities by religious tradition

Table 5. Predicted probabilities of commitment by deity and site [95% prediction intervals]

<table>
<thead>
<tr>
<th>Deity</th>
<th>Tradition</th>
<th>Secure</th>
<th>Insecure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local Deity</td>
<td>Non-Christian Site</td>
<td>0.43 [0.29, 0.59]</td>
<td>0.36 [0.22, 0.52]</td>
</tr>
<tr>
<td></td>
<td>Christian Site</td>
<td>0.32 [0.22, 0.44]</td>
<td>0.28 [0.19, 0.39]</td>
</tr>
<tr>
<td>Moralistic Deity</td>
<td>Non-Christian Site</td>
<td>0.58 [0.42, 0.72]</td>
<td>0.57 [0.41, 0.72]</td>
</tr>
<tr>
<td></td>
<td>Christian Site</td>
<td>0.67 [0.55, 0.77]</td>
<td>0.74 [0.63, 0.82]</td>
</tr>
</tbody>
</table>

Notes. Posterior predictions were estimated from Model 2B.
These models suggest that the observed effects of material insecurity on commitment were strongest and most reliable in Christian sites. At Christian sites, the same pattern of results as in the overall analysis was observed (i.e., commitment to God is greatest and commitment to local deities is lowest amongst insecure individuals at Christian sites; see Table 5). As above, these results were robust to the addition of other demographic covariates (see Model 2B). And again, we find that insecurity is most related to greater mental commitment to the Christian God, and decreased behavioral commitments to local traditions (see supplemental Table S2 and Figure S6).

At non-Christian sites, commitment to moralistic and local deities was less reliably related to material insecurity. However, the above analyses collapsed together diverse moralistic traditions - Hinduism (3 sites); Buddhism (1 site) and practice of Kastom (1 site). Thus, we ran four additional models to examine the relationship between insecurity and commitment by moralistic tradition (see Table 6). The results indicate that insecurity was similarly related to commitment in the Hindu samples as in the Christian samples. As all coefficients in the Buddhist and Kastom sites were estimated with a great deal of uncertainty, we refrain from interpreting these results any further. In summary, our results suggest that in Christian and Hindu contexts, the relationship between insecurity and religious commitment is as would be predicted by the existential security hypothesis such that more materially insecure individuals are more committed. Importantly, however, our results provide first evidence for how this might come at the expense of commitment to traditional religions.

Table 6. Predicted commitment (1 = high; 0 = low/no) by moralistic tradition.

<table>
<thead>
<tr>
<th>Predictors</th>
<th>Christian Sites</th>
<th>Hindu Sites</th>
<th>Buddhist Site¹</th>
<th>Kastom Site¹</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OR</td>
<td>CI (95%)</td>
<td>OR</td>
<td>CI (95%)</td>
</tr>
<tr>
<td>Intercept</td>
<td>0.53</td>
<td>0.34 – 0.85</td>
<td>0.39</td>
<td>0.06 – 2.58</td>
</tr>
<tr>
<td>Material Insecurity</td>
<td>0.85</td>
<td>0.68 – 1.06</td>
<td>0.68</td>
<td>0.42 – 1.10</td>
</tr>
<tr>
<td>Deity (1 = Moralistic)</td>
<td>3.78</td>
<td>3.16 – 4.56</td>
<td>2.16</td>
<td>1.71 – 2.71</td>
</tr>
<tr>
<td>Insecurity * Deity</td>
<td>1.65</td>
<td>1.28 – 2.13</td>
<td>1.87</td>
<td>1.13 – 3.16</td>
</tr>
</tbody>
</table>

Observations 6264  2449  426  452
Sites 9  3  1  1

Notes: ¹ These single site analyses were modelled as binomial logistic regressions (no mixed-effects).

4. Discussion

We employed a diverse data set in an examination of the prevalence, form and demographic correlates of religious commitment across cultures in a novel test of the existential security hypothesis. Our results indicate that, across sites, commitment to (as indexed by time spent thinking about and time spent performing rituals for) moralistic deities is greater than to the less-moralistic local deities. And of all the examined deities, the Christian God was consistently the target of the most commitment (at least with regards to how we indexed commitment in our
analyses). Interestingly, the current data suggest that this might very well be at the expense of local traditions as commitment to local deities was most distinct from that of the moralistic deities at Christian and Hindu sites, and especially so in times of insecurity (see also Purzycki et al., this issue, on the interaction between belief in moralistic and local deities).

In a cross-cultural test of the existential security hypothesis of religion (Norris & Inglehart, 2011), we find that insecurity is positively related to commitment to moralistic deities. In Christian and Hindu sites in particular, feeling secure, however, did not predict a waning of all religious commitments as would be predicted by the existential security hypothesis. Although commitment to the moralistic deities was lower amongst secure participants, commitments to local traditions were greater. And thus, these results suggest that the contributions of material security to religious commitment might be better understood as shaping the kinds of religious commitments individuals uphold under difficult life circumstances rather than the strength of their overall devotion. When feeling insecure, commitments to moralistic deities that promise an easier future might serve an anxiolytic purpose (Norris & Inglehart, 2011), but when secure – adherents may be more free to explore other features of their local religious traditions.

Our results, however, could be amenable to alternative interpretations. For instance, it is all together possible that moralistic traditions thrive in materially insecure places. However, in an analysis of a sub-sample of the current data, Purzycki, Ross, et al. (2018) found no evidence that the extent to which deities are attributed with moralistic qualities covaries with material insecurity. Another interpretation may be that all of the mental and behavioral commitment demanded by moralistic traditions leads individuals to feel more insecure. But given the growing body of research on how unpredictable, harsh, and insecurity inducing socio-ecological conditions promote greater religious commitment (e.g., Bentzen, 2019; Botero et al., 2014; Henrich et al., 2019) – we favour our current interpretation that the psychological experience of insecurity orients individuals towards particular kinds of religious commitments – i.e., primarily commitment to moralistic traditions.

The question, however, as to whether people explicitly seek out these moralistic deities because they are moralistic, because they are believed to be powerful (or both) remains an open question for future research. Previous work suggests that in times of need individuals seek out deities that are specifically believed to have capacities for ameliorating/influencing adverse life circumstances (e.g., Kay et al., 2010). And thus in times of need, individuals may not be seeking out ‘moralistic’ deities per se, but rather omnipotent ones. That being said, research also indicates that insecurity promotes and stabilizes harsher norm enforcement within communities (e.g., Gelfand et al., 2017), and moralistic deities may be particularly potent norm enforcers (e.g., Lang et al., 2019; Purzycki, Henrich, et al., 2018). The moralistic deities targeted in our samples, however, were selected for being both omnipotent and moralistic, and thus we cannot rule out these differences here. But importantly, both of these accounts might account for why we find that insecurity increases commitments to specifically moralistic deities and not all targets of devotion.

Yet another interpretation for the differences may be that in societies faced with more uncertain conditions, moralistic traditions are practiced in increasingly antagonistic ways towards commitments to local traditions. Those who experience high insecurity are typically more socially vulnerable, and therefore might still believe in local spirits but cannot take the social risk of expressing these commitments because of antagonism between moralistic and local traditions. In Mauritius, for example, the local deity that we used is often appeased by black magic ceremonies. Although most people practice those ceremonies at least some of the time,
there are strong norms (and actually even legislation) against doing so. For individuals with
resources, being accused of dealing with those spirits may have reputational costs, but for those
with no resources it might be devastating, as it might cut off the only resources left to them
which is their social support network. This is a particularly interesting avenue for future research
as most of the world’s adherents to local religious traditions have been challenged with the (and
often antagonistic) presence of world religions like Christianity. And, there is sparse empirical
evidence for in what ways and with what consequences individuals navigate the demands of
adhering to multiple religious systems. In this vein, our results suggest that individual-level
commitments to different traditions may be quite flexible and adaptive in light of differing socio-
ecological conditions (Purzycki & McNamara, 2016).

Indeed, participants commitments are flexible such that they need not fluctuate
monolithically. In our data, insecurity was most clearly related to decreases in behavioral
commitments to local deities and increases in both forms of commitments to moralistic deities;
whereas the shifts in mental commitments to local deities at different levels of insecurity were
less pronounced. This highlights how mentally committing to varied deities at the same time may
come at a low cost – but that it is difficult, and perhaps especially so under uncertain conditions,
to commit resources (e.g., time) to the practices associated with different traditions. In which
case, individuals seem to adaptively allocate their resources to bolster their commitments to
moralistic traditions perhaps by virtue of the believed (e.g., divine intervention/salvation) and or
actual benefits of doing so (e.g., through the anti-anxioyotic effects of ritual participation
combined with the cooperative benefits of regular participation in collective ritual practices; e.g.,
Lang et al., 2015; Power, 2018).

Our cross-cultural approach is correlational and cross-sectional. Moreover, the data
presented here are not necessarily representative of responses in the broader communities from
which our participants were sampled (with the exception of the Inland Tanna site where almost
the entire community was sampled). Indeed, sampling methods were mixed across field sites
with some sites drawing participants from places of religious worship, others randomly asking
participants on the street, others going door to door throughout specific neighbourhoods.
Importantly, these sampling methods may have differentially restricted the range of observed
religious commitment (i.e., sampling at a place of religious worship is likely to draw from a
population of relatively committed individuals). Thus, the results presented here may be
conservative – in the sense that insecurity could come to discriminate more clearly (and perhaps,
quite differently) in a broader sample of these population. Furthermore, in the interest of cross-
culturally documenting the ebbs and flows of religious commitment, there is an obvious need for
more rigorous longitudinal data. That is, an account of the patterns of religious commitment can
greatly benefit from in-depth efforts to document and account for the change in prevalence and
forms of religious commitment within societies (Power, 2017, 2018; Purzycki, 2013b, 2016).
Indeed, while the current work provides evidence for some cross-culturally stable relationships –
longitudinal data would allow us to more stringently test hypotheses regarding the dynamics of
religious commitments and their relationship to insecurity. Moreover, our analyses considered
only one form of insecurity – food insecurity. Future research will certainly benefit from
considering the relationship between alternative forms of insecurity (resource access vs safety
concerns, for example) that can also vary in intensity and duration (acute vs chronic stressors)
and forms/targets of religious commitments.
In stark contrast to predictions regarding how commitments to moralistic traditions should be greater in ‘safer’ environments (Baumard & Chevallier, 2015), we find that it is commitment to moralistic (not local traditions) that is greatest in insecure times. In their classic study of the existential security hypothesis, Norris & Inglehart (2011) hypothesized that material insecurity increases religious commitment to ‘transcendent’ religious traditions. Despite our sampled traditions all meeting the criteria for ‘transcendent’ traditions, we find that material security only affected commitments in some traditions. Importantly, our results indicate another dimension of between-tradition variability that might account for the types of religious commitments affected by material insecurity. That is, with greater insecurity, individuals invest more deeply in moralistic religious traditions – and sometimes at the expense of less-moralistic ones. Looking forward, our results thus predict that waning commitments to world religions that might accompany more certain living conditions may very well be accompanied by a resurgence in local, or even alternative religious commitments.

Acknowledgements: This project was made possible by the Cultural Evolution of Religion Research Consortium which was supported by a SSHRC partnership grant (#895-2011-1009) and the John Templeton Foundation (grant ID #40603). AB and BGP acknowledge support from the Understanding Unbelief Project, funded by the John Templeton Foundation (grant ID# 60624) and express thanks to Jon Lanman for his encouragement. AB acknowledges support from the Templeton World Charity Foundation (grant ID #TWCF0164). We are thankful for Adam Barnett for being so awesome.

Author Contributions: AB and BGP initiated this study, preregistered the project, planned the analysis, and wrote the manuscript. AB wrote all R code, conducted all analyses, and made all graphs. J.H., A.N., and B.G.P. conceived the original study. C.L.A., Q.D.A., A.B., E.C., E.K.K., C.H., C.L, S.M., R.A.M., C.M., C.P., B.G.P, M.S., T.V., J.L.W., A.K.W., and D.X. collected data. M.L. and B.G.P. managed the dataset and team communication. All authors provided feedback on the manuscript.

Disclosure statement: All authors declare no conflicts of interest.

Data availability: All

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https://doi.org/10.1080/2153599X.2017.1323786


https://doi.org/10.1098/rspb.2018.0023


https://doi.org/10.1007/978-3-642-13968-0_5


https://doi.org/doi:10.1558/jcsr.v1i1.99


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https://doi.org/10.1038/sdata.2016.99


https://doi.org/10.1080/2153599X.2016.1267027


Material insecurity predicts greater commitment only to moralistic deities: 
A cross-cultural investigation

Supplemental Materials


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Figure S1. Correlations [95% CI] between frequency of thinking about moralistic deity and frequency of worrying about moralistic deity.
Figure S2. Correlations [95% CI] between frequency of thinking about local deity and frequency of worrying about local deity.
Figure S3. Density plots of mental commitment by site and deity.

Notes: Christian sites are identified with a cross. Local deity items were not assessed at the Lovu and Samburu sites. Flatter density curves indicate more diffuse responses (i.e., greater variability).
Figure S4. Density plots of behavioral commitment by site and deity

Notes: Christian sites are labelled with a cross symbol. Responses were coded on the following scale: 0 = very rarely/never, 1 = a few times per year; 2 = a few times per month; 3 = a few times per week; 4 = every day or multiple times per day; and then rescaled by dividing by maximum value.
Table S1. Model summaries of predicted commitment [Local v. Moralistic Deities]

<table>
<thead>
<tr>
<th>Predictors</th>
<th>Mental Commitment</th>
<th>Behavioral Commitment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Odds Ratios</td>
<td>CI (95%)</td>
</tr>
<tr>
<td>Intercept</td>
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<td>0.39 – 1.02</td>
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<td>Moralistic Deity</td>
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<td>2.69 – 3.68</td>
</tr>
<tr>
<td>Insecurity * Deity</td>
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<td>1.54 – 2.52</td>
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<td>Observations</td>
<td>6940</td>
<td>2651</td>
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</tbody>
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Table S2. Model summaries of predicted commitment [Local v. Moralistic Deities/Non-Christian and Christian sites]

<table>
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<th>Predictors</th>
<th>Mental Commitment</th>
<th>Behavioral Commitment</th>
</tr>
</thead>
<tbody>
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<td>Odds Ratios</td>
<td>CI (95%)</td>
</tr>
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<td>Intercept</td>
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<tr>
<td>Material Insecurity</td>
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<td>0.59 – 1.24</td>
</tr>
<tr>
<td>Local Deity (Christian Site)</td>
<td>0.62</td>
<td>0.29 – 1.29</td>
</tr>
<tr>
<td>Moralistic Deity (Non-Christian Site)</td>
<td>1.83</td>
<td>1.46 – 2.30</td>
</tr>
<tr>
<td>Christian God</td>
<td>3.37</td>
<td>1.63 – 7.05</td>
</tr>
<tr>
<td>Insecurity * Local Deity (Christian Site)</td>
<td>1.11</td>
<td>0.70 – 1.76</td>
</tr>
<tr>
<td>Insecurity * Moralistic Deity (Non-Christian Site)</td>
<td>1.11</td>
<td>0.71 – 1.79</td>
</tr>
<tr>
<td>Insecurity * Christian God</td>
<td>1.63</td>
<td>1.03 – 2.55</td>
</tr>
<tr>
<td>Observations</td>
<td>6940</td>
<td>2651</td>
</tr>
</tbody>
</table>
Figure S6. Predicted probability of mental and behavioral commitment [Local v. Moralistic Deities/Non-Christian and Christian sites]