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RETAKE



Testing the Big Gods hypothesis with global historical data: a review and “retake”

Harvey Whitehouse ^{a,†}, Pieter François^{a,b,†}, Patrick E. Savage^{a,c,†}, Daniel Hoyer^d, Kevin C. Feeney^e, Enrico Cioni^f, Rosalind Purcell^f, Jennifer Larson^g, John Baines ^h, Barend ter Haarⁱ, Alan Covey ^j, and Peter Turchin ^{k,l}

^aCentre for the Study of Social Cohesion, University of Oxford, Oxford, UK; ^bSt Benet’s Hall, Oxford, UK; ^cFaculty of Environment and Information Studies, Keio University, Fujisawa, Japan; ^dGeorge Brown College, Toronto, Canada; ^eTerminusDB, Dublin, Ireland; ^fSeshat: Global History Databank, Evolution Institute, San Antonio, FL, USA; ^gDepartment of Modern & Classical Language Studies, Kent State University, Kent, OH, USA; ^hFaculty of Oriental Studies, University of Oxford, Oxford, UK; ⁱDepartment of Chinese Language and Culture, Asia-Africa-Institute, University of Hamburg, Hamburg, Germany; ^jDepartment of Anthropology, University of Texas Austin, Austin, TX, USA; ^kDepartment of Ecology and Evolutionary Biology, University of Connecticut, Storrs, CT, USA; ^lComplexity Science Hub Vienna, Wien, Austria.

ABSTRACT

This Retake article presents a corrected and extended version of a Letter published in *Nature* (Whitehouse et al., 2019) which set out to test the Big Gods hypothesis proposing that beliefs in moralizing punitive deities drove the evolution of sociopolitical complexity in world history. The Letter was retracted by the authors in response to a critique by Beheim et al. (2021). Correction of errors in the coding and analysis of missing data to address this critique does not, however, significantly change the main findings of the original *Nature* Letter. We report the results of a major reanalysis of Seshat data following expansion of the codebook and database and substantial improvements to our data management methods. We also employ a more direct statistical methodology to test theories of evolutionary causality. Together, these results show a compellingly convergent picture, confirming the headline finding of the original Letter in *Nature*, which shows that the largest increases in social complexity do indeed precede Big Gods in world history and that Big Gods did not contribute to the evolution of sociopolitical complexity as predicted by the Big Gods hypothesis.

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1. Introduction

The origins of religion and of complex societies represent evolutionary puzzles. The Big Gods hypothesis offers one possible solution to both puzzles by proposing that beliefs in moralizing supernatural punishment evolved culturally to facilitate cooperation among strangers in large-scale societies. According to the Big Gods hypothesis, beliefs in supernatural enforcement of a wide range of moral norms governing human affairs facilitated the earliest increases in sociopolitical complexity associated with the prehistoric transition from foraging to farming and, therefore, “Big Gods were one critical causal factor that contributed to the rise of large groups unleashed by agriculture” (Norenzayan, 2013, pp. 120–1). Later formulations of this hypothesis, however, have

CONTACT Harvey Whitehouse  harvey.whitehouse@anthro.ox.ac.uk; Peter Turchin  peter.turchin@uconn.edu

[†]These authors contributed equally to this study.

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emphasized that Big Gods formed part of a package of religious innovations that “coevolved gradually with larger and increasingly more complex societies” (Norenzayan et al., 2016).

The association between Big Gods and big societies has mainly been supported by three forms of evidence: psychological experiments (Henrich et al., 2010; Lang et al., 2019; Norenzayan & Shariff, 2008; Purzycki et al., 2018; Shariff et al., 2016; Shariff & Norenzayan, 2007), cross-cultural comparative analyses (Baumard et al., 2015; Botero et al., 2014; Gray & Watts, 2017; Johnson, 2005; Peoples & Marlowe, 2012; Raffield et al., 2019; Roes & Raymond, 2003; Watts et al., 2015), and historical case studies (Norenzayan, 2013; Norenzayan et al., 2016). Evidence supporting the Big Gods hypotheses is controversial, however. For example, the assumption that psychological experiments on contemporary indigenous populations can be extrapolated to ancestral hunter-gatherer societies prior to Western contact has been strongly challenged (Singh & Glowacki, 2021).

Three cross-cultural studies that explicitly analyse temporal causality have come to contrasting conclusions. One, which applied phylogenetic comparative methods to infer historical changes in Austronesian religions, reported that Moralizing High Gods (treated as synonymous with “Big Gods”; Gray & Watts, 2017) “follow political complexity”, whereas “broad supernatural punishment drives political complexity” (Watts et al., 2015). Similar conclusions were reached in an analysis of historical and archaeological data from Viking-age Scandinavia (Raffield et al., 2019). Another study of Eurasian empires has reported that Big Gods followed, rather than preceded, the rise of complex, affluent societies (Baumard et al., 2015). The present work extends the findings of all three studies by utilizing a global sample of polities rather than only regional ones. Further, our approach augments that of Watts et al. by utilizing historical data rather than inferred phylogeny and it improves upon all previous studies by using more sophisticated measures of sociopolitical complexity, which in previous research were admittedly very crude (Baumard et al., 2015) (e.g., binary classification of societies as either high or low complexity). One of the difficulties in assessing the literature on moralizing religions is that different studies have utilized different measures of supernatural moral enforcement, some focusing, for example, on supernatural agency (e.g., the Abrahamic God), others including nonagentic forms of supernatural sanctioning (e.g., karma in Buddhism) and in the process generating a plethora of partially overlapping constructs and terms, ranging from moralizing high god to broad supernatural punishment (Johnson, 2018; Norenzayan et al., 2016; Raffield et al., 2019; Watts et al., 2015).

The historical case studies offered in support of the Big Gods hypothesis have been severely criticized, with the editor of a special issue of the journal *Religion* devoted to the Big Gods hypothesis summarizing it as showing “blatant neglect of modern scholarship in comparative religion”, concluding overall that the hypothesis does not stand the test of scrutiny by professional historians (Stausberg, 2014). Previous rebuttals of such criticisms have emphasized the statistical nature of the claim, such that some exceptions to this trend are possible (e.g.,

“We suspect that history will show some cases in which religious elements spread first, and then societies expanded, and other cases in which the societies expanded, and then the religious elements spread and in turn sustained and broadened the expansion.” [Norenzayan et al., 2016, p. 18]).

The systematic approach to world history adopted here allows us for the first time to quantitatively test the proposed “statistical causal relationship” (Norenzayan, 2015) on a global scale.

To facilitate this systematic approach, we utilized *Seshat: global history databank*, which contains data on 121 variables from 372 polities (independent political units) that occupied 35 geographical regions across the globe from the beginning of the Neolithic period to the beginning of Industrial and/or Colonial periods (François et al., 2016; Turchin, Whitehouse, et al., 2020; Whitehouse et al., 2016). We used a recently developed and validated measure of sociopolitical complexity condensing 51 sociopolitical complexity variables into a single principal component capturing three-quarters of the observed variation (Turchin et al., 2018; see Shin et al., 2020 for discussion of potential improvements to this measure of sociopolitical complexity). To chart the appearance of Big Gods in relation to the rise of sociopolitical complexity, we used a range of variables suggested by the theoretical

literatures in multiple waves of data coding and analysis, designed to capture the emergence of beliefs in moralizing supernatural enforcement thought to be of relevance to cooperation in large-scale social formations.

The first paper to test the Big Gods hypothesis using Seshat data, published in *Nature*, concluded that the sharpest rises in sociopolitical complexity *precede* Big Gods in world history, rather than the other way around (Whitehouse et al., 2019). Following the submission of a Matters Arising critique (Beheim et al., 2021), however, the *Nature* paper was retracted by the authors (Whitehouse et al., 2021) at the request of the journal's editors. Here, we begin by summarising the original findings reported in *Nature* and the chain of events that led to the paper's retraction, notably the mislabeling of some data on the presence of Big Gods as unknown prior to the dates of first appearance, rather than absent or inferred absent (an error that was compounded and obscured by analysis code that inappropriately converted all unknown ["NA"] values to absent [0]). We show that after correcting these errors, the results of the original paper stand. Next, we briefly summarize the results of extensive additional analyses that we have performed using improved quantitative measures of Big Gods. These further strengthen our findings. We also discuss the evidential basis for making inferences about features of Big Gods in past societies.

2. Did Big Gods precede complex societies in world history? A review of the evidence

In this section, we summarise efforts to use *Seshat: Global History Databank* to test the Big Gods hypothesis using direct evidence from world history. The aim has been to establish when Big Gods appeared in world history, relative to the rise of sociopolitical complexity, in order to shed light on the role of moralizing religion in the cultural evolution of cooperation. We consider here the *Nature* paper findings, the effects of correcting errors in the data and analysis, and the results of subsequent efforts to develop a more nuanced coding scheme and improved data management methods. Analysis of the data in all these cases has produced highly convergent results, indicating that *Big Gods were not one of the evolutionary drivers of sociopolitical complexity*.

Testing the Big Gods hypothesis using Seshat data requires a measure of sociopolitical complexity in world history. To accomplish this, for the purposes of the *Nature* paper we assembled data on more than 50 aspects of sociopolitical complexity measured in polities (independent political units) that occupied 30 geographical regions from the beginning of the Neolithic to the beginning of industrial and/or colonial periods. This work, first published in *PNAS* (Turchin et al., 2018), provides a validated measure of sociopolitical complexity condensing nine "complexity characteristics" based on 51 distinct variables, which capture such dimensions of complexity as social scale, hierarchical levels, and institutional sophistication, into a single principal component capturing more than three-quarters of the observed variation.

We also required a method of operationalizing the concept of Big Gods, and a means of coding for their presence or absence in ancient belief systems. This requirement is complicated by lack of consensus in the field about what features of moralizing supernatural enforcement are most relevant to the rise and spread of sociopolitical complexity (Gray & Watts, 2017; Johnson, 2005; Murdock, 1967; Peoples & Marlowe, 2012; Roes & Raymond, 2003; Watts et al., 2015). The Big Gods hypothesis has itself changed over time, being presented initially as a cultural innovation necessary for the rise of sociopolitical complexity (Norenzayan, 2013) and then later, in a more diluted version of the hypothesis, as just one possible element within a suite of variables or cultural packages that contributed to increases in sociopolitical complexity, even if not to its initial appearance and spread (Norenzayan et al., 2016). Despite the conceptual difficulties, however, we require a method of characterising Big Gods such that their presence or absence in human history can be coded.

The term Big God implies that at least two aspects of moralizing religion are predicted to have important evolutionary consequences: bigness, which relates to the scope of supernatural supervisory prominence in the morality of human affairs (Purzycki et al., 2016); and godness, which

implies the presence of culturally postulated superhuman agents (McCauley & Lawson, 2002). In order to code for the presence or absence of these features in ancient societies, we initially utilized two clusters of variables: a cluster pertaining to Moralizing High Gods (MHG), requiring that a high god who created and/or governs the cosmos actively enforces human morality; and a cluster pertaining to Broad Supernatural Punishment (BSP), capturing beliefs in supernatural agents or forces capable of supernaturally enforcing three types of prosociality relevant to cooperation in complex societies (reciprocity, fairness, and loyalty to in-group). Both MHG and BSP variables, which were intended to capture a range of characteristics that we took to be at least provisionally indicative of the presence of Big Gods, were utilized in our *Nature* paper. It is important to note that, historically, the MHG variable employed by the Ethnographic Atlas has been used as the primary proxy of Big Gods or related theories of the coevolution of religion and sociopolitical complexity. However, while some of our original analyses used only this “MHG” variable (e.g., Extended Data Fig. 3 and Table 4 from Whitehouse et al., 2019), most of our analyses combined both MHG and BSP into a single variable labeled “moralizing gods”. While our primary goal was to use these variables to test the Big Gods hypothesis, we also framed it as a test of the related but distinct “Supernatural Punishment Hypothesis”. However, these two hypotheses make different claims about the prehistoric ubiquity of moralizing beliefs, and the degrees of missing data for MHG and BSP are quite different. As a result, both our analyses and Beheim et al.’s (2021) reanalyses suffered from confusion regarding how best to test the Big Gods hypothesis and what the “true” level of missing data should have been.

One of the main challenges confronting any attempt to test the Big Gods hypothesis is to capture the extent to which the gods are concerned about the morality of human behavior. This is not straightforward because the gods may be morally concerned to a limited extent in all cultural systems (e.g., from children’s fairy tales to widely known superstitions). If such beliefs are to have any measurable effect on prosocial behavior and the rise of sociopolitical complexity, then morality must be elevated to a higher status in the religious system. In our corrected analyses, we have used a new proxy for “Big Gods” that we argue is more appropriate for historical analyses than either MHG (which is arguably too narrow to capture all features of moralizing religion hypothesized to drive sociopolitical complexity) or BSP (which is arguably too broad, covering moralizing concerns associated with “small” gods and local cooperation). This new proxy is our measure of moralizing religion which we code as present if the primary concern of the religion pertains to cooperation in human affairs, rather than the behavior of humans toward the supernatural realm, for example by discharging ritual obligations (see below and SI for more detail). In the SI, we refer to this binary measure of moralizing religion as Moralizing Supernatural Concern is Primary or MSCP. We adopt this binary measure of moralizing religion for historical reasons, to reflect the same approach in earlier work that we are retaking in the present context for the purposes of comparison, but we have elsewhere developed a more nuanced approach to conceptualizing the role of Big Gods which provides a series of graduated measures of moralizing religion, allowing researchers to trace the rise of this phenomenon at a more granular level in world history (Turchin et al., 2022).

This approach allows us to target more directly than other measures those aspects of the Big Gods construct that are most likely to assist in the evolution of large-scale societies. In the subsections that follow, we review the results of a series of efforts to test the Big Gods hypothesis, concluding that the disconfirming evidence is increasingly robust and difficult to rebut on scientific grounds.

2.1. The *Nature* paper revisited

In the *Nature* paper, as briefly noted above, we operationalized the Big Gods variable by using a combination of established measures known as Moralizing High God (MHG) and Broad Supernatural Punishment (BSP). BSP was defined, following Watts et al. (2015), as follows:

“For BSP to be coded as present in a culture there must be the concept of a supernatural agent or process that reliably monitors and punishes selfish actions, and this concept must (i) be widely advocated within the community, (ii) involve punishment of a broad range of selfish behaviours and (iii) apply to a wide range of community members”.

This conceptualization of BSP is so broad, however, that it could easily apply to moral transgressions that matter only to very localized forms of cooperation or only to those aspects of moral reasoning postulated in the literature (Curry et al., 2019; Haidt & Graham, 2007) that affect cooperation in small groups. Thus, in order to test the Big Gods hypothesis, we needed a way of narrowing down the focus onto moral domains relevant to the establishment of large-scale cooperation. We therefore elected to focus on three main forms of BSP: (1) fairness (sharing of resources, such as dividing disputed resources, bargaining, or redistribution of wealth); (2) reciprocity (for example, fulfilling contracts, returning gifts, repaying debts or upholding trust); and (3) in-group loyalty (the need to remain loyal to unrelated members of the same coalition in cases such as helping coreligionists or going to war for one’s group).

For analysis purposes, our MHG and BSP variables were combined into a single variable which we refer to in this paper simply as Big Gods, since that is the construct these variables were designed to capture. Figure 1 (copied from the retracted *Nature* paper) shows the temporal and geographical distribution of the direct evidence on the appearance of Big Gods in our sample. Although societies in all 30 regions possessed beliefs about appeasing supernatural agents through the performance of rituals, in 10 out of the 30 regions there was no evidence for moralizing gods before their introduction by colonial powers. The remaining 20 regions displayed a diverse range of 15 different systems of belief in moralizing gods: in some the first evidence of Big Gods came in the form of MHG and in others it came in the form of BSP. The first appearance of Big Gods in our sample was in Egypt, where the concept of supernatural enforcement of *Maat* (order) is attested by the Second Dynasty, around 2800 BCE. This was followed by sporadic appearances in local religions throughout Eurasia (Mesopotamia [around 2200 BCE), Anatolia [around 1500 BCE) and China [around 1000 BCE)) before the wider spread of universalizing religions began during the first millennium BCE with Zoroastrianism and Buddhism, followed later by Christianity and Islam. Although these four universalistic religions, and especially Christianity and Islam, would later become spread very widely, local forms of moralizing religion were present well before they arrived in some regions. For example, the

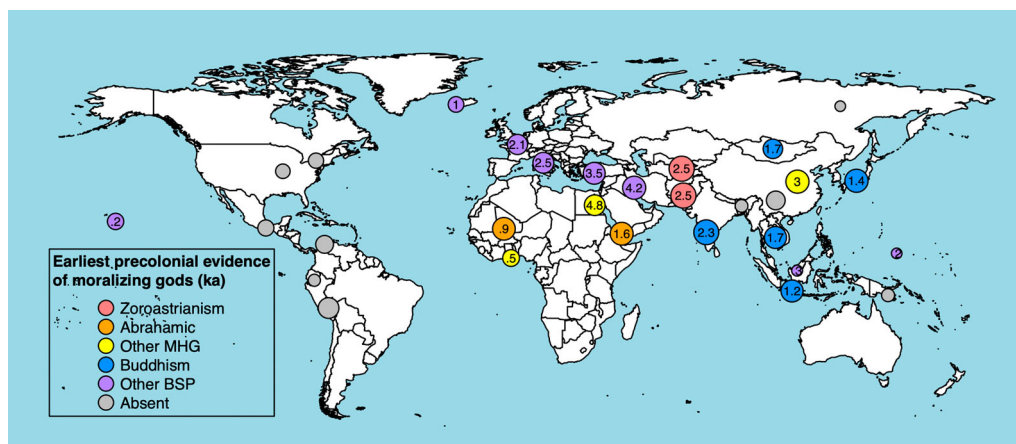


Figure 1. (copied from Whitehouse et al., 2019). Locations of the 30 sampled regions on the world map, labelled according to precolonial evidence of moralizing gods. The area of each circle is proportional to social complexity of the earliest polity with moralizing gods to occupy the region or the latest precolonial polity for regions without precolonial moralizing gods. For regions with precolonial moralizing gods, the date of earliest evidence of such beliefs is displayed in thousands of years ago (ka), coloured by type of moralizing gods. The three transnational religious systems representing the first appearance of moralizing gods in more than one region—Zoroastrianism, Abrahamic religions (Judaism, Islam and Christianity) and Buddhism—are coloured red, orange and blue, respectively, whereas other local religious systems with beliefs in MHG or BSP are coloured yellow and purple, respectively.

idea that unworthy rulers could lose the Mandate of Heaven appeared in China many centuries before the arrival of Buddhism.

We argued in the *Nature* paper that the diverse range of religious systems represented in our global sample made it possible to draw more general conclusions about religion than had previously been possible and concluded that Big Gods usually follow, rather than precede, the rise of sociopolitical complexity. We pointed out that in 10 out of the 12 regions analysed, the transition to Big Gods came within 100 years after exceeding a sociopolitical complexity value of 0.6 (corresponding roughly to a population in the order of one million). This threshold did not seem to correspond to the point at which societies develop writing, which might have suggested that Big Gods were present earlier but were not preserved archaeologically. Although we could not rule out this possibility, the fact that written records preceded the development of Big Gods in 9 out of the 12 regions analysed (by an average period of 400 years) suggests that such beliefs were not widespread before the invention of writing. Furthermore, existence of written records is not the only, and often not the best, basis for making inferences about moralizing aspects of religion in past societies (we return to the discussion of such empirical issues below).

The empirical strategy adopted in the *Nature* paper was to focus on the first appearance of Big Gods in a stratified sample of world regions. Accordingly, variables such as moralizing high god (MHG) were treated as present after the first appearance and absent before. As we said in the article: “Thus, a coding of high gods as present, active and specifically supportive of human morality was coded as MHG being present, whereas all other types were coded as absent.” Unfortunately, the data file that was posted online at the time of publication contained a large number of data points that were mislabeled as “unknown” rather than “absent” or “inferred absent”. Additionally, one of the analysis scripts inappropriately converted “NA” (unknown) values to “0” (absent; line 17 at <https://github.com/pesavage/moralizing-gods/blob/master/RegrDat.R>). This error converting NAs to 0s unfortunately obscured the first mislabeling error, preventing us from identifying and correcting it prior to publication. These errors came to light as a result of a critique submitted to *Nature* by Beheim et al. (2021), along with a call for the retraction of the original Letter. In response to this critique, we corrected the mislabeling error and associated missteps in the data analysis and wrote to the editors at *Nature* requesting that they publish an Author Correction.

Our efforts to pinpoint the dates of first appearance of moralizing gods were intended to establish not only when evidence of presence is first available but also to establish or reasonably infer the absence of moralizing gods prior to those dates, or to clarify that there is no evidence either way (justifying a code of unknown). Once that information had been gathered in consultation with experts, the data should have been labeled accordingly prior to the analysis being conducted. Since this was not done, we acknowledged that an Author Correction was needed. Nevertheless, as our Correction request explained, correcting the mislabeling and data analysis errors had no effect on the results of our main analysis, which compared growth rate of sociopolitical complexity before versus after the first appearance of moralizing gods. The results of the logistic regression (Extended Data Table 2), however, were affected. The original Extended Data Table 2 was:

Extended Data Table 2 | Logistic regression results predicting moralizing gods

Parameter	Coefficient estimate (\pm SE)	z-value	Pr(> z)
(Intercept)	-7.9 ± 0.9	-8.7	<.001
Sociopolitical complexity (SC)	9.9 ± 1.5	6.8	<.001
Time (100-year lag)	3.7 ± 0.7	5.5	<.001
Language phylogeny	11.6 ± 5.5	2.1	.04
Geographical proximity	-2.5 ± 1.3	-2.0	.04
Time (200-year lag)	0.9 ± 0.7	1.3	.19

This model includes parameters for sociopolitical complexity and for geographical, temporal and cultural relationships, ordered by absolute z-value (see Methods for details). SE, standard error. Pr, probability.

In the Correction request, we asked that the original table be replaced with this corrected version:

Extended Data Table 2 | Logistic regression results predicting moralizing gods (corrected)

Parameter	Coefficient estimate (± SE)	z-value	Pr(> z)
(Intercept)	−10.1 ± 1.7	−6.1	<.001
Sociopolitical complexity (SC)	13.2 ± 2.6	5.0	<.001
Language phylogeny	23.8 ± 10.6	2.2	.03
Geographical proximity	−0.4 ± 1.7	−0.25	.80
Time (100-year lag)	19.1 ± 1457	0.01	.99
Time (200-year lag)	−11.7 ± 1457	−0.01	.99

The corrected model included parameters for sociopolitical complexity and for geographical, temporal and cultural relationships, ordered by absolute z-value. SE, standard error. Pr, probability.

Our original conclusion stemming from the logistic regression analysis was unchanged: “This analysis revealed that sociopolitical complexity was a stronger predictor of moralizing gods than temporal, geographical or linguistic relationships, and remained highly significant even after controlling for these relationships”. However, the z and P values needed be changed:

from “z = 6.8, degrees of freedom (d.f.) = 800, $P < 1 \times 10^{-11}$ ”

to “z = 5.0, degrees of freedom (d.f.) = 800, $P < 1 \times 10^{-6}$ ”.

2.2. Retraction and retake

The *Nature* editors declined our Correction request and insisted that the original paper should be retracted. Authors were offered the opportunity to lead the retraction and assured that if they declined to do so, an editorial retraction would be carried out. The rationale provided by *Nature*’s editors consisted of two statements: “Conclusions dependent on contested assumptions cannot be used to support scientifically rigorous claims” and “Given that novel conclusions can no longer be proven beyond doubt, *Nature* can no longer stand by this paper”. These statements are puzzling because in social science research, *all* conclusions are “dependent on contested assumptions” and *no* conclusions can be “proven beyond doubt”. This is particularly true of quantitative analysis of cultural data where disagreement about data coding and analytic techniques is pervasive. Lacking was any indication of the specific errors that allegedly made our results not only “contested”, but “invalid”. The *Nature* paper was the result of work involving scores of collaborators over nearly ten years, and throughout that lengthy process not one of the collaborators involved in the work, immersed as they have been in the intricacies of the data and methods, has indicated loss of confidence in the main findings. However, all authors recognized the value of further enhancing our methods of data management and expert review. The new Retake format advertised by *Religion, Brain, and Behavior* (Bulbulia et al., 2021) has provided a suitable opportunity to do exactly that.

In order to produce the present Retake, we have extended the Seshat codebook and overhauled our methods of data management. Even though retraction was arguably an inappropriate course of action, there were several ways in which the methods of the *Nature* paper could be improved. In particular, the stated intention to code Big Gods as absent prior to first appearance was an admittedly crude approach. Although we found robust evidence that Big Gods never arose endogenously in some regions of the world, despite the evolution of highly complex social formations, in those regions where Big Gods *were* adopted more effort could have been made to buttress codings of absent or inferred absent prior to first appearance. While expert confirmation of the first appearance of Big Gods was intended to capture the point at which Big Gods first appear (absent before and present after), this issue was not probed as explicitly and thoroughly as it could have been. Thus, in addition to our well-established procedures for codebook development and data entry

in collaboration with project experts, the latest research reported in this Retake article involves a set of novel quality assurance mechanisms and other methodological innovations.

These innovations include the creation of tables in which all Big Gods variables had to be coded not only as present or absent, but a decision of genuinely unknown had to be explicitly argued for, so that such codings could be excluded from statistical analysis. In the interests of precision, our coding conventions allowed us to distinguish between a situation in which we had direct evidence that moralizing religion was absent or present from one in which the evidence implied rather than directly showed that it was absent or present (leading to codings of inferred absent or inferred present). This was done in order to ensure that the data reflect the best state of current knowledge and do not misleadingly code data as missing or unknown when sufficient evidence exists to make inferences. Additionally, our coding scheme allows research assistants to issue a temporary code of suspected unknown, which was later converted by an expert to unknown (or another code, if there was evidence for it). Another crucial innovation was the establishment of a new data-butchessing process in which the rationale for coding decisions recorded in tables was checked and double-checked with regional experts and then subjected to further review by a newly established Data Review Board (DRB), comprising three historians (DH, PF, and JL) and a complexity scientist (PT) and led by an anthropologist (HW). As well as the material in the tables, the DRB had access to detailed analytic narratives (Turchin et al., 2022) – extended textual material relevant to the coding decisions recorded in the tables, assembled as part of a major volume currently in progress under the title *Seshat History of Moralizing Religions* (Larson et al., [In Prep](#)).

As explained in the introductory part of this section, our latest analyses focus on the first appearance of moralizing religion in the evolution of religious systems. While we could have subjected the earlier variables used in the retracted *Nature* paper to the same rigorous data recoding checks, butchessing methods, and DRB treatment as our latest moralizing religion variables, we decided it would be a more efficient use of our limited time and resources to focus instead on the issue of whether the morality of human cooperation is the primary concern of the religion since our variables focusing on this were already at an advanced stage of development and provided a natural next step in our efforts to test the Big Gods hypothesis. Moreover, as we explain below, focusing on the question of whether or not the morality of human cooperation was a primary concern in the religions under consideration allowed us to draw insightful comparisons with our original findings reported in *Nature* in ways that would not otherwise have been possible.

The moralizing religion construct includes both agentic and nonagentic mechanisms of enforcement, recognizing the possibility that it could be present in varying ways and to measurably differing degrees. In some contemporary religions, such as the numerous branches of Christianity and Islam, the morality of human cooperation occupies centre stage in the belief system, postulating supernatural enforcement of moral norms across a great range of human activities and interactions. The key question asked in the Retake research was whether or not beliefs in moralizing religion drove the rise of sociopolitical complexity. To capture the first appearance of moralizing religion in world history we used a binary measure, coding this feature as present when the principal concerns of supernatural agents or forces pertained to cooperation in human affairs. It was coded absent when the primary concern in the religion was the behavior of humans towards the supernatural realm, for example by discharging ritual obligations, such as placating or manipulating the gods. See Methods, Appendix and <http://seshatdatabank.info/methods/code-book> for further details, including distinctions between present/absent and inferred present/inferred absent and unknown.

Data collection for the “MSCP” variable (see above), designed to capture the first appearance of moralizing religion, involved matching each of our fully trained research assistants with one or more experts (recognized authorities on the polity in question, typically holding a relevant doctorate and occupying a faculty position in a university with relevant publications in peer reviewed journals). Initial input by the experts focused on providing help with assembling initial reading lists or, where necessary, advice on how to interpret some of the key scholarly debates. Research

assistants gathered the information necessary to put forward a provisional coding recommendation, together with a condensed overview of the data used to buttress that coding, highlighting any areas of uncertainty. These codes were based on scholarly sources and fully referenced. In addition to the codes of absence, presence, and unknown, a coding of inferred absence (or presence) was used when direct evidence of moralizing religion was sparse or lacking but indirect evidence made clear that it was more likely to have been absent (or present) than not. This approach was designed to avoid a situation in which researchers inaccurately coded the trait unknown when in fact what was known was substantially more than nothing. In addition, moralizing religion could be coded as first absent but then present during transitional periods or could be coded in multiple ways simultaneously where experts disagreed, thus providing grounds for more than one coding outcome. Research assistants then conducted consistency checks.

Coding recommendations and the data provisionally used to buttress them were then presented to experts for further review, often in multiple iterations. In total, more than fifty experts contributed to checking the data used across all the studies reported here and the names of these scholars are listed on the Seshat website as project collaborators. When Seshat experts pointed out disagreements in the literature or disagreed among themselves on a particular coding, we kept a record of this so that multiple analyses could be run taking into account contrasting interpretations. Finally, the DRB reviewed the resulting coding recommendations and supporting data. At this stage the DRB could approve codes as ready for analysis or request further review, involving additional experts to address remaining points of uncertainty. The DRB was also responsible for ensuring at this point that coding conventions were consistently applied across all Natural Geographic Areas (hereafter NGAs). This was a crucially important step because regional specialists cannot be expected to see how the coding conventions are interpreted and applied across all world regions. Only when the DRB was satisfied that the rationales for coding decisions and the associated buttressing statements were transparently and compellingly buttressed by data, following a set of agreed coding conventions, were the data frozen and converted into the correct syntax for the machine-readable part of the data. As such, responsibility for final coding decisions relating to data frozen for publication was assumed by the DRB rather than being outsourced to contributing experts. Despite a very fast-moving push towards a much-welcomed increase in robustness and transparency in terms of data-quality control, a fully mature set of standards for the wider field is still lacking (Slingerland, Atkinson, et al., 2020). With our procedures, as detailed above, we have aimed at being as robust and transparent as possible.

In the remainder of this section, we report the results of our analyses of the new Retake data, which strongly support the original findings of the retracted *Nature* paper. All analyses reported in this article are based on the Equinox2020 data release of the Seshat Databank (Turchin, Hoyer, et al., 2020) and were performed in R version 4.0.2 (2020-06-22). For our statistical analyses we restricted this dataset of 35 Seshat NGAs to 31. The Crete and Galilee NGAs were added too recently to include data for the MSCP variable, while in the case of the Kansai and Southern China Hills NGAs the process of data quality checks did not reach our quality assurance threshold for inclusion in the dataset (nevertheless we report in the SI the effects of running the analysis with or without these two unbuttressed NGAs, which turns out to have only a negligible impact on the overall result). Thus, the analysis included in total 309 of the 372 unique polities from the Equinox2020 data release of the Seshat Databank.

Dynamic Regression Analyses. To investigate the potential causal relationship between our measures of moralizing religion (MSCP) and socio-political complexity – here measured as the first principal component of 51 separate variables capturing different aspects of complexity, following Turchin et al., 2018 (see SI for further details; hereafter we refer to this measure as “SPC1”) – we fitted a dynamic regression model to the data in which potential predictors enter as lagged variables. This approach has been previously described (Turchin, 2018) and applied (see Turchin et al., 2018, 2022) to Seshat data. It allows us to examine the effects of potential predictor variables while controlling for serial autocorrelations, geographic cultural diffusion, and shared cultural history. The

general regression model takes the following form:

$$Y_{i,t} = a + \sum_{\tau} b_{\tau} Y_{i,t-\tau} + c \sum_{i \neq j} \exp \left[-\frac{\delta_{i,j}}{d} \right] Y_{j,t-1} + h \sum_{i \neq j} w_{ij} Y_{j,t-1} + \sum_k g_k X_{k,i,t-1} + \epsilon_{i,t}$$

On the left side, $Y_{i,t}$ is the response variable (either MSCP or SPC1) in a polity occupying NGA i at time t . We sampled polities (or quasipolities) within specific NGAs at century intervals (time step $\Delta t = 100$ years). The first term on the right side of the equation, a , is the regression constant (intercept). The second term represents the autoregressive terms, meaning the influences of previous occurrences of MSCP within an NGA, with $\tau = 1, 2, \dots$ (number of centuries) referring to time-lagged values of Y . For example, this means that $Y_{i,t-1}$ accounts for the presence or absence of MSCP 100 years before t . The third term accounts for the potential influences of geographic diffusion on MSCP, with c representing the regression coefficient for importance of diffusion and using a negative-exponential form to relate the distance between society i and society j ($\delta_{i,j}$) to the influence of j on i . Here d scales the effect of distance on geographic diffusion. We use $d = 1000$ km because this value approximates the average distance between neighbor NGAs. We avoid potential issues of endogeneity by again applying $Y_{j,t-1}$ to produce a weighted average of the occurrence of MSCP in geographic proximity to i in the previous century, with weight diminishing to 0 as distance between i and j increases. The fourth term accounts for potential shared cultural history where w represents the influences of linguistic similarity. This weight is set to 1 if society i and society j share the same language, 0.5 for the same linguistic genus, 0.25 for the same linguistic family, and 0 if they are different linguistic families. Linguistic genera and families were derived from Glottolog (Hammarström et al., 2017) and the World Atlas of Language Structures (Dryer & Haspelmath, 2013). The penultimate term reflects the influence of predictor variables where g_k are regression coefficients and $X_{k,i,t-1}$ is the time-lagged effect. Finally, $\epsilon_{i,t}$ is the error term.

Timing of SPC1 increases relative to MSCP. This analysis tested whether sociopolitical complexity in our sample increased more rapidly following the appearance of MSCP. We examined trajectories of SPC1 in Natural Geographic Areas (NGAs) for which at least two centuries of SPC1 data were available both before and after the appearance of MSCP. This threshold leaves us with 17 NGAs. We have also investigated the effect of increasing the threshold, but found that it did not affect the general result (see *Supplementary Results*).

Results

Figure 2 and Table S2 show the temporal and geographical distribution of the appearance of moralizing religion in our sample of polities for which data on MSCP is available. Although societies in all regions possessed beliefs about appeasing supernatural agents through the performance of rituals, the degree of supernatural enforcement of morality in human affairs varied widely (Figure 2). The first appearance of moralizing religion in our sample was in Egypt, where the concept of supernatural enforcement of *Maat* (order) is attested by the late Second Dynasty, around 2800 BCE. While partially moralizing aspects of morality appear sporadically in local religions throughout Eurasia (e.g., Mesopotamia around 2200 BCE, Anatolia around 1500 BCE and China around 1000 BCE) fully moralizing religions where moralizing supernatural concern is primary (MSCP) do not appear again until the spread of transnational religions began during the first millennium BCE. The diverse range of religious systems represented in our global sample makes it possible to draw more general conclusions about religion than have previously been possible.

Our Retake analysis shows that there is a strong statistical association between sociopolitical complexity and moralizing religion (Figure 2). However, the Big Gods hypothesis advances a stronger claim than that, by positing a statistical causal relationship in which moralizing religion contributes directly to the rise of sociopolitical complexity (Norenzayan, 2015). The longitudinal (time-resolved) nature of Seshat data enables us to test this evolutionary hypothesis using dynamic

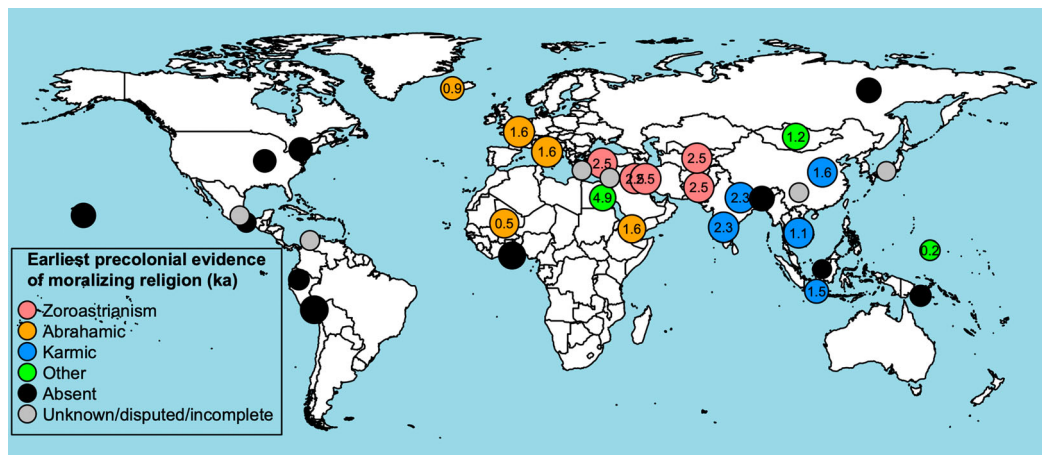


Figure 2. (Corrected and improved version of Figure 1.) Locations of the 35 sampled regions on the world map, showing the earliest precolonial evidence of religions where moralizing supernatural concern is primary (MSCP). Circle area is proportional to sociopolitical complexity of the earliest polity in which moralizing religion was present, or for the latest precolonial polity for regions without precolonial moralizing religion. For regions in which moralizing religion was present prior to colonization, the date of earliest evidence of such beliefs is displayed in thousands of years ago (ka), colored by religion. The three transnational religious systems that represent the first appearance of moralizing religion in more than one region—Zoroastrianism, Abrahamic religions (Judaism, Christianity, and Islam) and Karmic religions (Buddhism, Hinduism, Jainism)—are colored red, orange and blue, respectively, whereas other local religious systems with beliefs in MSCP are colored green (Egyptian Maat, Mongolian Manichaeism, and Chuuk Animism). Regions where precolonial moralizing religion was absent are colored black. Regions where the earliest evidence of moralizing religion is unknown, disputed, or incompletely coded are colored in grey. See Table S2 for further details.

regression analysis, in which the response variable (in this case, the primary measure of sociopolitical complexity, SPC1) is regressed on the lagged values of potential predictors (in this case MSCP). Our analysis also controls for potential temporal, geographical, and cultural dependencies in the data (see Methods). Contrary to the Big Gods hypothesis, we find no evidence for the causal effect of moralizing religion on SPC1 (Table 1a). We also tested for the opposite possibility – that high levels of sociopolitical complexity facilitated the rise of moralizing religion. Our regression provides support for the effect of SPC1 on moralizing religion (Table 1b), although we caution that these results are incomplete, because here we focus only on the (potential) reciprocal causality between the two variables (SPC1 and MSCP). The observed correlation between these two variables could also arise as a result of other shared evolutionary drivers – variables affecting both SPC1 and MSCP that drive their parallel evolution, resulting in strong correlation without direct causal effects

Table 1. Regression results.

Parameter	Coefficient estimate (± SE)	t-value	Pr(> t)
(a) Dynamic regression with SPC1 as the response variable. SPC (Sociopolitical complexity) and SPC.sq are autocorrelation terms (the values of the response variable lagged by 1 time step and its square, time step = 1 century, see Methods).			
(Intercept)	$2.3 \times 10^{-16} \pm 0.01$	0.0	1.00
SPC (100-year lag)	1.13 ± 0.05	21.6	$<2 \times 10^{-16}$
SPC.sq (100-year lag)	-0.20 ± 0.05	-3.8	.0002
MSCP (Moralizing supernatural concern is primary)	0.023 ± 0.018	1.3	.21
(b) Dynamic regression with moralizing supernatural concern is primary (MSCP) as the response variable. MSCP is the autocorrelation term, and Phylogeny is the term accounting for cultural dependencies in the data.			
Parameter	Coefficient estimate (± SE)	z-value	Pr(> z)
(Intercept)	-4.8 ± 0.6	-7.9	2.5×10^{-15}
MSCP (100-year lag)	6.4 ± 0.8	8.1	4.12×10^{-16}
SPC	3.2 ± 1.2	2.7	.007
Phylogeny	21.9 ± 6.0	3.6	.0003

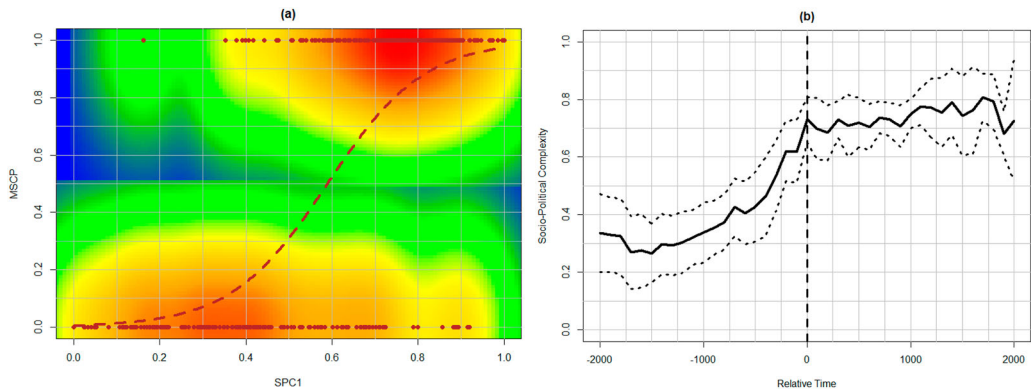


Figure 3. (a) Correlation between Seshat measure of sociopolitical complexity (SPC1) and presence or absence of Moralizing Supernatural Concern as Primary (MSCP). Points indicate individual data points. Colours indicate density of points shading from red (high density) to blue (low density). Dashed curve is logistic regression of MSCP on SPC1. (b) Average (thick curve) and 95 % confidence interval (dotted curves) of SPC1 trajectories in 17 NGAs for which at least two centuries of SPC1 data are available both before and after the appearance of MSCP.

between them. This possibility is explored further elsewhere (Turchin et al., 2022) (see below for a summary).

According to the Big Gods hypothesis, “Big Gods spread because they contributed to the expansion of cooperative groups. Historically, they coevolved gradually with larger and increasingly more complex societies” (Norenzayan et al., 2016, p. 6). Thus, a key prediction of the Big Gods Hypothesis is that, on average, sociopolitical complexity should increase more rapidly following the appearance of Big Gods. To test this prediction, we compared increases in SPC1 with the dates of first appearance of MSCP. For this analysis we examined trajectories of SPC1 in Natural Geographic Areas (NGAs) for which relevant data are available before and after the appearance of MSCP. On average, we found that SPC1 tends to increase more rapidly in all NGAs before the arrival of MSCP than after. The visualization presented in Figure 3b is consistent with the formal analysis using time-lagged regressions that found no predictive effect of MSCP on SPC1.

In summary, although our analyses are consistent with earlier studies that show an association between Big Gods and big societies (Botero et al., 2014; Gray & Watts, 2017; Johnson, 2005; Murdock, 1967; Peoples & Marlowe, 2012; Raffield et al., 2019; Roes & Raymond, 2003; Watts et al., 2015), here we find that beliefs in moralizing religion usually follow, rather than precede, the rise of sociopolitical complexity. More formally put, analysis designed to probe for causal relationships between variables failed to detect a statistically significant effect of moralizing religion on the rise of sociopolitical complexity.

2.3. Second wave of analyses using improved data and analytic techniques

As detailed above, many previous attempts to test the Big Gods hypothesis have serious limitations. In the light of much critical debate on these issues, some of it stimulated by the publication of the *Nature* paper, the Seshat team concluded that any single binary measure of moralizing religion can only capture part of the puzzle and therefore devoted substantial effort to developing a multidimensional measure of the role of beliefs in Big Gods in the evolution of social complexity which we refer to as our MSP (Moralizing Supernatural Punishment) measures. These developments are the subject of a separate Target Article (Turchin et al., 2022) aimed at stimulating wider discussion via published commentaries. Here we briefly summarize some key features of these conceptual and methodological innovations.

One dimension, whether or not MSCP is present, has been discussed and subjected to analysis in see Section 2.2. We have also coded data for other dimensions, allowing a more nuanced approach

to measuring the rise of Big Gods in world history. First, we sought to capture features that could plausibly facilitate cooperation as increasingly anonymous social interactions become harder to monitor and as cross-cutting structural tensions in society grow more intense. These features are:

- Moralizing supernatural punishments and/or rewards are certain and predictable (rather than arbitrary or capricious)
- Moralizing supernatural punishments and/or rewards enforce norms across a broad range of moral domains (instead of just a few domains)
- Moralizing supernatural punishments and/or rewards are targeted specifically at culpable individuals (instead of the whole group)

We also attempted to capture the degree of penetration of a particular religion into the region under consideration, comprising the following features:

- Moralizing supernatural forces or agents punish and/or reward rulers
- The elites of the polity subscribe to moralizing supernatural punishments and/or rewards
- The commoners of the polity subscribe to moralizing supernatural punishments and/or rewards

Finally, we coded additional characteristics that could influence the efficacy of MSP, comprising:

- Moralizing enforcement in afterlife, reflecting whether punishment is delayed until after the death of the transgressor
- Moralizing enforcement in this life. Reflects whether punishment occurs during transgressor's lifetime. It is possible to code both this variable and AfterLife as present, if punishment can occur both in this life and in afterlife
- Moralizing enforcement is agentic. Reflects whether punishment/reward is administered by a supernatural agent, such as a deity or spirit (as opposed to being administered by an impersonal supernatural force, such as karma)

In our analyses we investigated a variety of ways of combining these ten binary variables into a single quantitative MSP measure (Turchin et al., 2022). Because the Seshat project has always adopted the practice of publishing raw data together with analysis articles, other analysts can propose alternative quantifications and investigate their effect on the results of analysis.

At the analysis level, the most important advance was the addition of potential predictor variables. As indicated above, when we fit dynamic regression models with SPC as the response variable, we find that MSP has no detectable effect on the evolution of complexity. Thus, we can reject the hypothesis $MSP \rightarrow SPC$ (where the arrow indicates the direction of causality). Testing for reciprocal causality, $SPC \rightarrow MSP$, we found that SPC has a significant predictive effect on MSP, seemingly supporting this reverse effect. However, this conclusion is tentative because it can also arise as a result of SPC not being a true cause for MSP, but because it is correlated with such a cause, or causes. This is known as the “omitted variable bias” (Eff & Routon, 2012). To check for this possibility, we need to bring other potential predictor variables into the analysis. Thus, the second wave of analyses (Turchin et al., 2022), considered the role of other processes that have been suggested by previous theories: warfare, animal husbandry, and agricultural productivity in the rise of moralizing religions, in addition to the Big Gods hypothesis.

Turchin et al.'s analysis found that both MSP and SPC were strongly influenced by the evolutionary demands of intense inter-state competition, particularly cavalry warfare. The analysis also supported the hypothesis that the productivity of agriculture and pastoralism have a positive effect on the evolution of MSP. However, once warfare, agriculture, and pastoralism were included in the regression model for MSP, the effect of SPC disappeared. This result indicates that the significant effect of SPC on MSP we found above (Section 2.2) is potentially spurious. The overall correlation

between SPC and MSP arises not because there are any direct causal influences between processes proxied by these variables, but because both variables evolve under the effect of the same set of causes – specifically, warfare and agriculture. (Of course, as above, there remains the possibility that correlations with warfare and agriculture are themselves spurious and driven instead by some other, yet-to-be-measured omitted variable.) Thus, utilizing the large dynamic dataset gathered by Seshat: Global History Databank, we were able to trace how all of these factors relate to each other in our global sample and make inferences about temporal causality. This inference is strengthened because the Seshat Sample, unlike the ethnographic databases, was deliberately structured to include regions where large-scale societies organized as states formed early, as well as regions with smaller-scale ones (and everything in between).

Because the correlation between sociopolitical complexity and moralizing religion appears to result from shared evolutionary drivers, rather than from direct causal relationships between these two variables, our results amount to a rejection of the Big Gods hypothesis.

3. Response to critics

We now compare the results reported in the previous section with those presented by Beheim et al. (2021) based on their analysis of the mislabeled dataset from the retracted *Nature* paper and their efforts to correct for what they claim to be a problem of future bias, which they argue warrants redating of the first appearance of Big Gods by an arbitrary period of time, in a way that favours their preferred hypothesis. We point out the limitations of their critique and instead advocate an approach that is grounded as rigorously as possible in the available data.

The stated intention of our *Nature* paper was to treat beliefs in Big Gods as present after the first appearance and absent before. Following this logic, once first appearance dates had been settled, the variables used to detect the presence of Big Gods should have been labeled as “absent” or “inferred absent” prior to first appearance and “present” or “inferred present” afterward. The computer program that generates the dataset file translates empty or “unknown” codings to “NA”, which when used in datasets analyzed in R means an entry for which there is no information (i.e., missing data in a dataset curation sense). Thus, the data file that was posted on GitHub at the time of publication did not reflect the original coding intentions and contained a large number of data points that were mislabeled as NA. One of the reasons this issue was not picked up was that one of the analysis scripts inappropriately converted “NA” values to “0”, indicating absence (line 17 at <https://github.com/pesavage/moralizing-gods/blob/master/RegrDat.R>), which broadly had the effect of reversing the earlier oversight (although it inappropriately treated some cases that should have been coded “inferred present” as if they had been coded “inferred absent”). The analyses based on the corrected dataset reported in the preceding section utilized an analysis script with “unknown” values relabeled and without conversion of “NA” values to “0”s (they are instead excluded from analysis).

Beheim et al.’s critique assumed that the original labeling of the data was appropriate and that therefore approximately 61% of our data points on moralizing gods were truly missing values. They then attempted to impute those missing values using various approaches designed for data that are truly unknown (Beheim et al., 2021). Given the assumption that most of the data on the absence of Big Gods are effectively missing, Beheim et al. claimed that the dates of first appearance of Big Gods can be pushed back in time based on the argument that the first evidence for almost anything in history is later than its real date of first appearance. This date-changing procedure, described as correcting for future bias, works in favor of the Big Gods hypothesis. We argue that it would be better to test hypotheses even-handedly based on the available evidence.

Testing the Big Gods hypothesis, like any other in science, requires careful attention to evidence, but the standards of scholarship in this field have often been poor and the general attitude to empirical data bordering on cavalier. Consider the following highly cited claim, published in the renowned journal *Science*:

“Although in many societies supernatural agents are not directly concerned with human morality, in many others, morally concerned agents use their supernatural powers to observe and, in some cases, to punish and reward human social interactions. Examples include the God of Abrahamic religions and Viracocha, the Incan supreme God, but also many morally concerned deities found in traditional societies, such as the adalo, ancestral spirits of the Kwaio Solomon islanders” (Norenzayan & Shariff, 2008, p. 58).

These claims are not buttressed by expert sources on either Viracocha or Kwaio religion. The source cited in support of these claims is Boyer (2001), but there is no mention of experts on either Viracocha or Kwaio religion. As the Seshat analytic narrative on Peru makes clear, any association of Viracocha with the God of Abraham was likely the invention of early missionaries. Viracocha was one of several creators recognized by Andean peoples (Cieza de León, 1985 [c. 1553 Ch. 5]). The first Spanish chronicle to discuss Viracocha in any detail (Betanzos, 1996 [1551–1557 Pt. I Chs. 1–2]) describes Contiti Viracocha as a being who made the world, fashioned the first people and sent them to their origin places. Having given order to the world, Viracocha then traveled the Inca road from Tiwanaku to Cuzco, and on to Puerto Viejo, where the Spaniards were to appear in the 1520s, declaring, through Andean translators, that they were sent by the God who created the world. The principal coastal creator, Pachacamac, was a superhuman agent who, when summoned by the Inca to help him in battle, declared itself to be a power beyond the Inca’s reckoning, one that would shake the world to bits if stirred to action (Salomon & Urioste, 1991 [17th c. Ch. 23]). Andean creators set the world in motion and shook it into oblivion before repeating the act of creation, but most chronicles describe them as absent or dormant in the intervening period. Although pro-indigenous writers like Bartolomé de Las Casas (1550s–1560s) claimed that the Incas glimpsed elements of Catholic religious truth in their recognition of a creator, seventeenth century writers like the Jesuit Bernabé Cobo argued that they only worshiped “secondary causes” like the sun and moon. Some writers even associated Viracocha’s wanderings with the legendary ministries of Christian saints. *No chronicler claimed that the Incas worshiped a high god who was active in human affairs, let alone for enforcing moral behavior among humans.*

The use of Kwaio religion as an example of morally concerned agents using their powers to monitor human cooperation and punish transgressions is equally problematic. Foremost experts on Kwaio ethnography have repeatedly emphasized (Keesing, 1970, 1977; Akin, 1996), that Kwaio traditional religious beliefs and practices revolve around efforts to maintain harmonious relations with the ancestors through the correct observation of rituals and taboos, the breach of which is said to cause offence. This is not a system of beliefs designed to police cooperative principles in human interactions relevant to building increasingly large-scale sociopolitical formations. Keesing summarizes the key features of Kwaio religion in the following way:

Kwaio propitiate adalo, the “shades” of the dead, both immediate forebears and ancient ancestors, to sustain a protective mantle of mana, and thus to maintain stability, good living, and prosperity ... Maintaining ancestrally defined boundaries between the polluted and the pure, the sacred and the profane, male and female, the ancestors and the living, is an everyday preoccupation. Focal concerns in ritual are with restoring proper boundaries when they have been breached by pollution, by death, or by procedural error; and in doing so, restoring mana ... Kwaio ritualize their encounters with their adalo, particularly their collective encounters. These encounters are precipitated by illness, death, or misfortunes, which are attributed to ancestral displeasure because of desecration, defilement, or other human errors; or they are initiated to maintain a protective mantle of mana ... These collective encounters bring a kin group into intimate, immediate contact with ancient ancestors and their awesome powers and dangers. The procedures for engaging in transactions with adalo, for enlisting their powers, and for then progressively removing the dangerous sacredness of these encounters are elaborate and complicated. (Keesing, 2012, pp. 408–10).

A wealth of research by experts on the non-literate polities covered in the Seshat databank demonstrates how it is possible to make inferences about beliefs in Big Gods prior to evidence of their presence, even in societies that lacked writing (Table S2).

The case of the Americas, used above by advocates of the Big Gods hypothesis cited above, is highly instructive. Contact-era documents affirm the absence of Big Gods in the endogenous

evolution of religious systems in both continents, including those observed in well-established complex societies. Agriculture developed independently in the Andes, Amazonia, Mesoamerica, and the Eastern Woodlands of North America, contributing to millennia-long trajectories of increased sociopolitical complexity in those regions. Early contact documents from the circum-Caribbean chiefdoms noted the belief in supernatural beings who created and sustained the universe, but these beings were not thought to monitor human morality actively or to punish lapses (e.g., Arrom, 1980 [Taíno]; Helms, 1979 [Panama]; Stone, 1966 [Lower Central America]; cf. Londoño, 1996 [Muisca]). In the chiefdoms of the Eastern Woodlands, creators might be credited with establishing a moral code, but it was ancestral culture heroes who “bestowed religious institutions and sacred knowledge and gifts to humankind,” and these were maintained by elite priests (Dye, 2012, p. 145; cf. Rountree, 1992). Likewise, the surviving religious codices from Postclassic Mesoamerican states do not indicate that the supernatural entities revered by the Maya, Zapotec, Mixtec, and Nahua involved themselves in human morality as a primary concern (e.g., Marcus, 1978). These city-states and regional confederacies represented almost two millennia of statecraft, possessing costly and elaborate religious hierarchies that sustained political ideologies, without reliance on Big Gods (e.g., Brumfiel, 2001).

The most extensive and populous state in the pre-colonial Americas was the Inca Empire, which recognized beings that set the universe into motion (Viracocha, Pachacamac) and had the power to shake it into oblivion, but who were absent or unmoved by human affairs (Betanzos, 1996 [1550s Part I, Chapters 1–2]; Salomon & Urioste, 1991 [1600s Chapter 23]). The Inca state religion emphasized the worship of the sun and the royal ancestors, as well as the propitiation of sacred places that influenced weather and could cause earthquakes, volcanic eruptions, and tsunamis (Covey, 2019). Ordinary Andean people gave reverence to the female forces that made the earth and the sea fertile (Pachamama and Mamaqocha), as well as to mountains, caves, and other local landmarks that connected the living and their ancestors to entities responsible for controlling precipitation. Early colonial writers did not describe supernatural agents as being concerned with monitoring human moral actions—rather, they belonged to the political domain. The Inca emperor claimed the authority to watch over and punish those living in his capital city, and he appointed inspectors (*tukuyrikhuq*, “the one who sees all”) and ritual “confessors” (*huchukamayuyq*) to discover and punish what were considered to be crimes against his provincial properties and officials (Betanzos, 1996 [1880] Part I, Chapter 21). A generation after the European invasion, Catholic friars refashioned this Andean version of *lèse-majesté* to teach Quechua speakers about sin.

In sum, defenders of the Big Gods hypothesis have adopted a highly problematic strategy with regard to empirical evidence, at turns misusing ethnographic and archaeological evidence as examples, then claiming that examples are irrelevant because only statistical patterns matter, and then claiming that in any case statistical patterns are impossible to discern because the empirical evidence is too flimsy to establish presence or absence of Big Gods in societies without literacy. These claims are not only contradictory but we strongly dispute each of them. Empirical evidence here and elsewhere refutes the Big Gods hypothesis; statistical patterns in the data can indeed be established; and much more than nothing is known about the presence or absence of Big Gods in nonliterate societies.

One of the most challenging aspects of testing the Big Gods hypothesis using data on world history is that the evidence base is complex, requires extensive consultation with experts to navigate adequately, and in consequence is difficult to convey in a highly condensed form. This same problem also makes it very difficult to respond to blanket criticisms that the data on Big Gods in societies without writing should be classified as unknown. To defend our efforts to show that much is indeed known about this topic requires consideration of the detailed evidence base, something that is extremely difficult to accomplish within the space constraints of scientific journal articles. To address the problem, we have developed analytic narratives on key variables for all the regions covered by Seshat, taking the form of full-length academic books detailing the evidence

on topics like moralizing religion in the format used by humanities scholars and capable of incorporating the appropriate nuance (Hoyer & Reddish, 2019; Turchin et al. (2022); Larson et al, [In Prep.](#)). In order to bridge the gap between such substantial bodies of text and minimalistic codings of present, absent, inferred present/absent etc., the Seshat project now produces tables such as the one included here in the SI ([Table S2](#)), summarizing the rationales for coding decisions made by the project's Data Review Board.

4. Conclusions

The above findings have important implications for the Big Gods hypothesis. As already noted, broadly two versions of the hypothesis should be disambiguated: one in which “Big Gods were one critical causal factor that contributed to the rise of large groups unleashed by agriculture” (Norenzayan, 2013, pp. 120–1), and one in which Big Gods formed part of a package of religious innovations that “coevolved gradually with larger and increasingly more complex societies” (Norenzayan et al., 2016, p. 6). The latter adaptive complex approach arguably has greater *prima facie* plausibility and is probably more widely accepted in the field than the stronger version originally advanced. Nevertheless, if the Big Gods hypothesis is to be testable, it must predict that some precisely specifiable version of the Big Gods construct produces prosocial behavior that in turn causes sociopolitical complexity either to emerge in the first place (Norenzayan's, 2013 version) or, once established, to spread and increase as part of a suite of other religious adaptations (the later version in Norenzayan et al., 2016). If we mean by Big Gods a belief in a pervasive system of moralizing supernatural punishment (dubbed moralizing religion in this article), then the evidence produced by a decade of continuous work on the Seshat database suggests that *Big Gods did not play a causal role in the evolution of sociopolitical complexity in world history*. While we find a strong positive correlation between our quantitative measures of moralizing religion and sociopolitical complexity, this relationship arises as a result of shared causes, most importantly intensity of interpolity competition, rather than direct causation.

The retracted *Nature* paper constituted a first attempt to test the Big Gods hypothesis based on statistical analysis of data on global history. Our efforts to test the Big Gods hypothesis with data on past human societies in the *Nature* Letter constituted a first significant step in what was always intended to be a much longer journey. The decision to force its retraction was unfortunate.

First, the retraction threatens the quantitative analysis of world history. Since this is a new field and relies on extensive collaboration with experts in longer-established fields, it is highly vulnerable to reputational damage in its early stages (Whitehouse & François, 2019). While retraction can and should be used without shame for honest mistakes that invalidate conclusions, they unfortunately often prompt suspicions of misconduct, which can hinder efforts to recruit expert collaborators willing to take a risk on methodologies that seem controversial. In parallel to the statistical critique, allegations of scientific misconduct about the involvement of One of Seshat's experts were published by a group of authors affiliated with the Database of Religious History (Slingerland, Monroe, et al., 2020). We replied in print to these allegations (Whitehouse et al., 2020) explaining why they are unfounded but it is equally important to explain that such misplaced allegations were made despite our long standing commitment to open science practices. Open science practices have undergone monumental changes in the last five years and scholarly communitywide accepted practices are still being finetuned. Our original *Nature* Letter from 2019 was already at the forefront of these developments by making both the code and dataset open, by linking our data to scholarly sources so others could engage productively with our coding decisions (and if they want rerun the analyses based on different coding decisions), and by listing all experts who had contributed and informed our data. This already constituted a very high level of openness and commitment to replication. As the Methods sections of both Retake and Target article and the very extensive supplementary material make clear we are continuously refining our approach and strive to remain at the forefront of the open science movement.

Second, the retraction obstructs opportunities for learning how to manage methodological or theoretical disagreement in science in a constructive way (cf. Ellemers et al., 2020). As Bulbulia et al. (2021) put it, in cases of “*retraction* ... the scientific community is politely asked to forget the retracted work ever existed. Every page of the on-line versions of the retracted study is stamped with ‘RETRACTED’ in bold letters. The retraction is the academic equivalent of the annulment; the stamp might just as well read ‘NEVER HAPPENED.’” With the results of the *Nature* paper struck from the record in this way, this could encourage further retraction campaigns and also contribute to the creation of a culture of fear around hegemonic theories or dominant research groups. It is of obvious relevance to this particular case that many coauthors of the Matters Arising critique requesting retraction were advocates of the Big Gods hypothesis and/or affiliated with a rival database of religious history (though we should emphasize that some coauthors have been critical of the Big Gods hypothesis [e.g., Watts et al., 2015; Purzycki & Sosis, 2021]). There is a danger that it becomes a tactic for advocates of a favored hypothesis to seek to nullify disconfirming evidence in cases with legitimate methodological disagreement rather than by using mechanisms of correction and/or post-publication review to update the scientific record. If such a tactic were to become normalised, it could have the overall effect of discouraging the publication of disconfirming evidence and contrary viewpoints.

Since in our case the errors we made were correctable and did not invalidate our conclusions, rather than expunging the *Nature* paper from consideration, we would have preferred to recognize it as a first step towards testing a widely cited and highly regarded hypothesis concerning the role of Big Gods in world history, a step that could be cited and improved upon by other researchers with alternative and perhaps competing approaches. It is better for science if correctable errors are recognized and dealt with, and disputes over research methods debated, than if entire bodies of evidence, analysis, and critical discussion are rendered uncitable and thus excluded from further consideration. We therefore welcome this Retake format as a method of rescuing our work from such a fate and helping to keep up the momentum on scientific research tackling this challenging topic.

Arguably, it would have served the scientific community better to have allowed the original paper to stand, with a published Correction, and to facilitate a productive discussion about the research methods adopted in the original paper by publishing a reply to the Matters Arising critique. Since this did not happen, the present Retake setup provides a crucially important alternative avenue. Together, this publication and a parallel target article by Turchin et al. (2022) using additional moralizing religion variables confirm the original conclusions from the retracted *Nature* paper and provide strong quantitative support for the qualitative conclusions of historians that the Big Gods hypothesis “does not live up to the historical evidence” (Stausberg, 2014).

Data availability

The Seshat team makes our data and analysis scripts publicly available in several ways. First, we periodically publish “snapshots” of the Seshat Databank for well-curated variables and polities. The current such data release is Equinox-2020 (<http://seshatdatabank.info/databrowser/>), which presents data in both browsable format and through a spreadsheet. Whereas the spreadsheet contains data in computer-readable form suitable for statistical analyses, Seshat Data Browser also includes narrative paragraphs, explaining the codes, as well as references. Second, we deposit in open access all data on which analyses are based at the time of publication of the article that reports these analyses. These “replication datasets” are published as downloadable spreadsheets (see Seshat Datasets (<http://seshatdatabank.info/datasets/>)).

In addition to the Supplementary Results and code for analysis (<https://osf.io/b3fsg/>), we have made available Analytic Narratives describing moralizing supernatural punishment and reward in the polities for each region, which have guided our coding decisions (<http://seshatdatabank.info/databrowser/moralizing-supernatural-punishment-narratives.html>). Finally, a list of domain

experts consulted is available at (<http://seshatdatabank.info/databrowser/moralizing-supernatural-punishment-acknowledgements.html>).

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ORCID

Harvey Whitehouse  <http://orcid.org/0000-0001-6935-6724>

John Baines  <http://orcid.org/0000-0003-4543-9909>

Alan Covey  <http://orcid.org/0000-0002-1271-230X>

Peter Turchin  <http://orcid.org/0000-0002-1292-8100>

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Appendix

Supplementary methods for the retake

Here we detail the updated coding scheme and improved data management methods used for the analyses presented in this Retake piece referred to above. These same Methods also form the basis of the broader analyses presented in a parallel target article (Turchin et al., 2022). Accordingly, following the best practices for text recycling (Hall, 2021) and for greater transparency, we acknowledge that much of the text in this section reuses paragraphs that have been published previously or that are included in Turchin et al., (2022).

Brief introduction to seshat: Global History Databank

Seshat (<http://seshatdatabank.info/>) is a large database of information about global history from the Neolithic Revolution up to the Industrial Revolution (François et al., 2016; Turchin et al., 2015; Turchin et al., 2018). During the early stages of the project, we created an initial stratified sample of past societies by identifying 10 world regions distributed as widely as possible across the Earth's surface and within each of those regions designated three Natural Geographical Areas (NGAs) with discrete ecological boundaries, on average about 10,000 km² in size, thus creating a sampling scheme of 30 such areas around the world (<http://seshatdatabank.info/methods/world-sample-30/>). The 30 regions and their selection rationale were published previously (Turchin et al., 2015) before the start of data collection. Our aim was to maximize variability in our global sample while minimizing historical relationships between cultures. We are in the process of adding further NGAs to the initial sample of 30 and at the time of writing Seshat contains 35 NGAs comprising 372 unique polities (see <http://seshatdatabank.info/databrowser/>).

Data on political systems (polities) that emerged and persisted in each of the NGAs are organized into a continuous time series, going back as far into the history of that area as scholarly literature would allow (up to a maximum of roughly 10,000 years before present). In the case of NGAs containing clusters of very small-scale polities that share a similar culture but are not under a single system of jurisdictional control, we refer to these as quasi-polities and code information on all of them generically, unless information is available that would allow us to differentiate between these polities.

All variables for which data have been gathered and entered into Seshat are derived from a Seshat Codebook that can be accessed and downloaded (<http://seshatdatabank.info/methods/code-book>). The Codebook was designed by, and is continually updated and extended in consultation with, a large network of professional historians, archaeologists, anthropologists and other specialists whom we refer to as Seshat experts. Especially during the early phases of data entry, variables in the codebook were revised and improved through continuous discussions among Seshat research assistants, experts, and the Board. Most variables in Seshat require the data to take the form of a number or numerical range or they specify a feature that can be coded as absent, present or unknown (additionally coding items as inferred present or inferred absent, where the evidence permits). All data are linked to scholarly sources, including peer-reviewed publications and personal communications from established authorities. A large subset of our dataset – the Equinox2020 Dataset – including all variables used for this paper, can already be accessed at the project website <http://seshatdatabank.info/databrowser/downloads.html> (Turchin, Hoyer, et al., 2020).

Coding historical information into the Seshat Databank

Within each polity, data is gathered for a growing number of variables, including the moralizing religion variable (MSCP) as described below. Our Seshat Codebook specifies the full list of variables, including the specific variables used in our analyses for this paper. Variables are selected and data are gathered as part of a process in which experts (professional historians, archaeologists, and social scientists) and research assistants (RAs) play vital and complementary roles. First, for each paper an initial list of variables is put together which reflects the different hypotheses under review. This initial variable list, or initial Coding Scheme, is based upon an extensive review of the literature by the authorial team, including input from a range of experts. This input is typically solicited via workshops or email communications. Experts remain involved in ongoing dialogues with RAs as the latter begin collecting data for the variables on a first diverse pilot set of polities. This back-and-forth between experts and RAs leads to a continual refinement of the coding scheme.

Once the variables in the Coding Scheme have stabilized, full scale data collection occurs in a stepwise process, which begins with RAs populating the database for all polities with relatively easy-to-acquire information extracted from scholarly publications. While doing so, the RAs list variables where information is lacking or ambiguous and periodically consult with the Seshat experts on these matters. Seshat experts are thus involved

in reviewing the data, addressing questions of interpretation, filling gaps or confirming that data are unavailable. The names of both Seshat experts and RAs are linked to the data. This information on expert provenance and keeping a log of the dates of their interventions help us to assess the state of maturity of the data curation process for any given variable. Disagreement in the literature or among Seshat experts, as well as uncertainty, are recorded as much as possible so that data analysis can take into account alternative interpretations (Turchin, 2018).

For each variable we store three types of information. First, we gather machine-readable values. Rather than using an arbitrary scale to code features that vary in magnitude, we prefer to quantify variables (e.g., estimated population size) or fractionate them into multiple features that can be coded as either absent or present (allowing also for coding as inferred present or inferred absent). Second, if applicable, we gather as much as possible information on levels of uncertainty and disagreement as expressed within the literature or amongst experts. As we capture this information in machine readable format, we can include this information in our analyses. Third, Seshat also contains narrative paragraphs explaining the rationale for coding each variable a certain way. This text is typically drafted by a research assistant, often quoting from authoritative sources, and is later checked, edited, and augmented by Seshat experts. Wherever possible, information in Seshat is linked to fully cited sources which, in addition to scholarly publications, may include personal communications from one or more Seshat experts.

Defining the variables

Moralizing Supernatural Concern is Primary (MSCP). MSCP is coded as present when the principal concerns of supernatural agents or forces pertain to cooperation in human affairs. It is coded as absent when the primary concern is the behavior of humans towards the supernatural realm, e.g., by discharging ritual obligations. We refer to belief systems in which MSCP is present as moralizing religions. Importantly, codings of MSCP as present were applied not only when moralizing religion took the form of a morally concerned agent but also when beliefs in non-agentic forms of supernatural moral concern were present, including karmic principles emphasizing incentives to behave morally as well as punishments for transgressions.

Socio-Political Complexity (SPC1). Following previously established procedures, including data gathering procedures suitable for the social complexity variables, (Turchin et al., 2018), we measure socio-political complexity by a composite of 51 separate variables (Turchin et al., 2018 provides further details on each of the 51 variables, also defined in the Seshat Codebook). These variables were first aggregated into eight composite categories (“Complexity Characteristics”) capturing different dimensions of complexity:

1. polity population size
2. population size of the largest settlement
3. polity territory size
4. levels of administrative, military, settlement, and religious hierarchy
5. polity-produced infrastructure
6. sophistication of government institutions
7. information systems
8. sophistication of economic exchange.

Statistical analysis of the Complexity Characteristics found that they all closely correlated and that the first Principal Component captures more than three-quarters of variance in the data (Turchin et al., 2018). We use this principal component, SPC1, as our measure of socio-political complexity here. In order to make SPC1 easily interpretable, we scale it in such a way that it corresponds to $\log_{10}(\text{Polity Population})$. In other words, polities with $\text{SPC1} = 3$ have, on average, populations of 1000, and $\text{SPC1} = 6$ corresponds to polities with populations of 1,000,000.

Supplementary Results for the retake

Regression results

In this section we explore how different decisions on the treatment of expert disagreement and missing data affect our main result, lack of causal effect of moralizing religion on SPC1.

The result reported in the main article was based on including only data that were checked by experts. We duplicate it here for comparison with what is to come below:

Table 1. Regression results. (a) Dynamic regression with SPC1 as the response variable. SPC (Sociopolitical complexity) and SPC.sq are autocorrelation terms (the values of the response variable lagged by 1 time step and its square, time step = 1 century, see *Methods*).

Parameter	Coefficient estimate (\pm SE)	t-value	Pr(> t)
(Intercept)	$2.3 \times 10^{-16} \pm 0.01$	0.0	1.00
SPC (100-year lag)	1.13 ± 0.05	21.6	$<2 \times 10^{-16}$
SPC.sq (100-year lag)	-0.20 ± 0.05	-3.8	.0002
MSCP (Moralizing supernatural concern is primary)	0.023 ± 0.018	1.3	.21

If we include data for two NGAs that were not fully buttressed by experts, the number of data points increases, but the overall result is unchanged:
Including expert unchecked data

Parameter	Coefficient estimate (\pm SE)	t-value	Pr(> t)
(Intercept)	$1.3 \times 10^{-16} \pm 0.01$	0.0	1.00
SPC (100-year lag)	1.13 ± 0.05	21.8	$<2 \times 10^{-16}$
SPC.sq (100-year lag)	-0.20 ± 0.05	-3.8	.0001
MSCP (Moralizing supernatural concern is primary)	0.024 ± 0.018	1.3	.20

Next we have two types of codes that could be interpreted as either absent (A) or present (P), transitionalary (A~P) code and expert disagreement (A;P) code. We check how the results are affected by making either choice. Converting transitionalary (A~P) and expert disagreement (A;P) codes to absent (A)

Parameter	Coefficient estimate (\pm SE)	t-value	Pr(> t)
(Intercept)	$2.5 \times 10^{-16} \pm 0.01$	0.0	1.00
SPC (100-year lag)	1.13 ± 0.05	21.7	$<2 \times 10^{-16}$
SPC.sq (100-year lag)	-0.20 ± 0.05	-3.6	.0001
MSCP (Moralizing supernatural concern is primary)	0.013 ± 0.017	0.8	.45

Converting transitionalary (A~P) and expert disagreement (A;P) codes to present (P)

Parameter	Coefficient estimate (\pm SE)	t-value	Pr(> t)
(Intercept)	$2.3 \times 10^{-16} \pm 0.01$	0.0	1.00
SPC (100-year lag)	1.13 ± 0.05	21.6	$<2 \times 10^{-16}$
SPC.sq (100-year lag)	-0.20 ± 0.05	-3.8	.0002
MSCP (Moralizing supernatural concern is primary)	0.026 ± 0.017	1.5	.13

Finally, we explore how elimination of disputed values affects the results:
Drop disputed (A;P) codes

Parameter	Coefficient estimate (\pm SE)	t-value	Pr(> t)
(Intercept)	$3.5 \times 10^{-16} \pm 0.01$	0.0	1.00
SPC (100-year lag)	1.14 ± 0.05	21.2	$<2 \times 10^{-16}$
SPC.sq (100-year lag)	-0.21 ± 0.06	-3.8	.0002
MSCP (Moralizing supernatural concern is primary)	0.026 ± 0.019	1.4	.17

Our overall conclusion is that, although specific numbers change, the overall result that moralizing religion has no causal effect on SPC1 is sustained under all decisions about the treatment of uncertainty and disagreement.

Timing of SPC1 increases relative to moralizing religion

On average, we found that SPC1 tends to increase more rapidly in all NGAs before the arrival of moralizing religion, than after (see [Figure 2b](#) in the main article). We also investigated how our results are affected by increasing the threshold required for inclusion from two to more centuries. The effect of increasing the threshold is to reduce the number of NGAs that fit this criterion, but it does not materially affect the results. For example, using the threshold of five centuries gives us 14 NGAs and the following average trajectory (compare with [Figure 2a](#) in the main article):

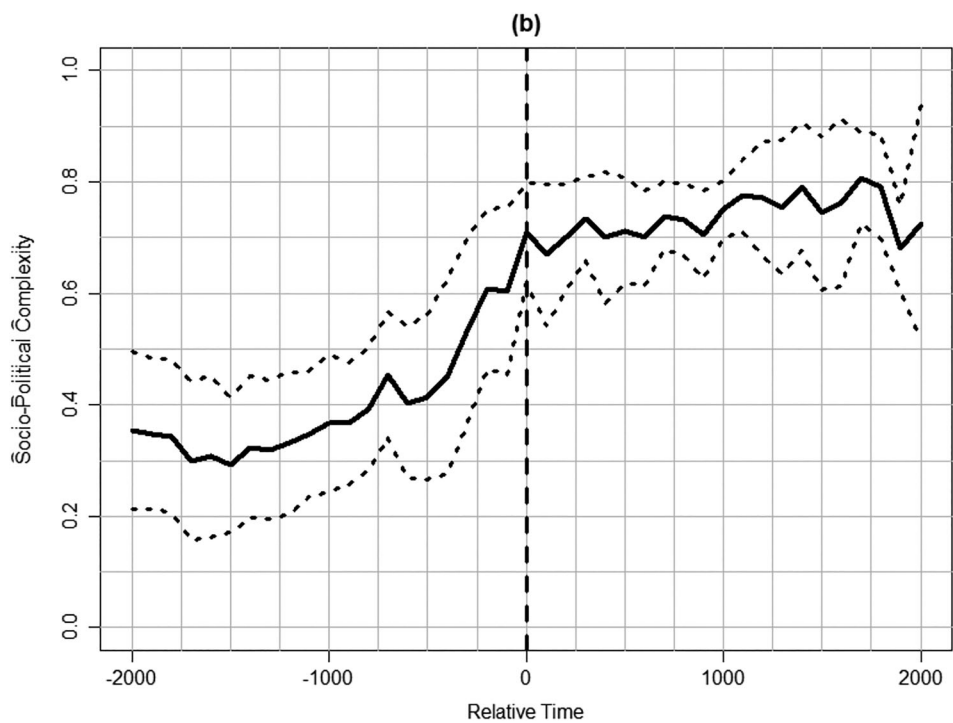


Figure S1. Alternative Figure 2b with inclusion threshold increased to 500 years.

Table S2. | Summary of MSCP codes for the 33 NGAs in Extended Data Table 1 (see Methods section for further details of the codes used in this table)

Natural Geographic Area	Date range	Coding and summary of buttressing data	Scholarly sources
Upper Egypt	4400 BCE-2901 BCE	[TRANSITION FROM ABSENT TO PRESENT] Predynastic iconography (e.g., depicting the subjugation of enemies and wild animals) emphasizes order triumphing over chaos but not ethical dimensions. Order in a moralizing sense gradually emerges with the concept of <i>ma'at</i> .	On Predynastic iconography, see Kemp (2018, 89-97) and (Hendrickx, 2011).
	2900BCE-1838CE	PRESENT King seen as appointed by the gods as earthly guarantor of <i>ma'at</i> (order, including in a moral sense). Earliest written attestation of both <i>ma'at</i> and its connection to the kingship dates to the Second Dynasty. Religious practice and theology remained mostly unchanged under Persian rule between the 6th and 4th centuries BCE, although there is a general dearth of sources for this period (J. Baines, personal communication, June 3, 2019). During the period of Greek rule, traditional Egyptian notions of MSCP likely coexisted with Greek beliefs, and indeed social identities and boundaries between Greeks and Egyptians grew increasingly blurred from the 2nd century BCE on. Egyptian and Greek culture persisted under Roman rule, until Christianity spread across the empire. Christianity features MSCP. From the 7th century CE on, the region was ruled by a succession of Islamic polities. Islam features MSCP as well.	On tie between king and <i>ma'at</i> , see Assmann (2006), Lichtheim (1992), Morris (2010, 216), and Silverman (1995). On earliest attestation of <i>ma'at</i> , see Goebis (2007, 276). On Persian rule, see Dunand and Zivie-Coche (2006). On Hellenistic period, see Vanderpe (2010: 171-173). On Roman rule, see Frankfurter (1998, 7). On spread of Christianity, see Fox (1986) and Odahl (2013). On MSCP in Christianity, see: Angenendt and Riches (2014). On early Islam in Egypt, see Bowman (1986, 52-53) and Bosworth (1996). On MSCP in Islam, see Yaran (2007).
Susiana	7800 BCE-5101 BCE	UNKNOWN No data.	
	5100 BCE-2676 BCE	INFERRED ABSENT Iconographic and archaeological data in neighbouring South Mesopotamia—in particular, the existence of temples—from the Ubaid period (c. 6500 BCE-4000 BCE, with regional variation) strongly suggests belief that gods primarily rewarded those who provided them with correct ritual worship and suitable offerings. The same can be said for the Uruk period (4000 BCE-3100 BCE), which has also left behind written evidence for this belief. In the Early Dynastic Period (2900 BCE-2350 BCE), praising the gods became a new way to gain their favour.	On Ubaid period, see Hole (2010, 228-238) and Peasnell (2002, 381). On Ubaid, Uruk and Mesopotamian beliefs generally, see Cunningham (2013, 41-48). On moralizing concerns of Mesopotamian gods, see Lambert (1996/1963). On judgement of the dead in Elamite beliefs, see Carter (2011, 46), Potts (2004, 172-73) and Vallat (1998).
	2675 BCE-540 BCE	ABSENT Overall, religious developments in Susiana at this time mostly paralleled ones in South Mesopotamia (M. Altaweel, personal communication, December 21, 2020). Written sources demonstrate that though Mesopotamian gods were thought to monitor certain aspects of morality, they were equally interested in correct ritual performance. Some Mesopotamian thinkers grappled with the question of the “righteous sufferer”, i.e., the person who experiences misfortune despite morally upstanding conduct. There is evidence for belief in judgement after death among the Elamites, but the criteria by which the dead were thought to be judged remain unclear.	
	539 BCE-331 BCE	INFERRED PRESENT Region annexed to the Achaemenid empire. The Achaemenids followed a form of Zoroastrianism. In Zoroastrianism, the god Ahura Mazda monitored moral behavior and punished and rewarded people accordingly. Additionally, Zoroastrian teachings posited a dualistic cosmology with a struggle between good and evil. However, early Zoroastrianism remains difficult to reconstruct, e.g., because much of what is known about MSCP in Zoroastrianism derives from much later	On forms of Zoroastrianism possibly practiced by the Achaemenids, see Herzfeld (1936, 20) and Gershevitch (1959, 8-22). On MSCP in Zoroastrianism, see Stausberg (2000, 231-241). On Zoroastrianism more broadly see Nigosian (1993).

Table S2. Continued.

Natural Geographic Area	Date range	Coding and summary of buttressing data	Scholarly sources
Konya Plain	312 BCE-144 BCE	sources. We are inferring that MSCP was present based on these sources. [TRANSITION FROM ABSENT TO PRESENT] Though Alexander persecuted Zoroastrianism following his conquest of the region, his successors, the Seleucids demonstrated greater tolerance toward local faiths, and did not impose Greek beliefs on their subjects. We are therefore coding this as a period of transition from a time when the main moralizing religion in the region was almost stamped out, to its re-establishment.	On Alexander's persecution of Zoroastrianism, see Nigosian (1993, 30-31). On Seleucid rule, see Kosmin (2013).
	143 BCE-1925 CE	PRESENT Zoroastrianism flourished under the Parthians since its first appearance in the region. The region was conquered by an Islamic polity in the 7th century CE, which led to gradual Islamization of the population. Islam features MSCP.	On Zoroastrianism under the Parthians, see Nigosian (1993, 31-33). On Islamic conquest of the region, see Zarrinkub (1975). On MSCP in Islam, see Yaran (2007).
	9600 BCE-1700 BCE	UNKNOWN No data.	
	1650 BCE-1181 BCE	ABSENT Among the Hittites, transgressions such as theft, murder (particularly the murder of family members), certain sexual practices, and oath violation were all thought to result in punishment from the gods but MSCP was not present because many ritual transgressions were also punished, the gods could be persuaded through ritual not to punish transgressions, and morally upstanding behavior was not automatically rewarded. Moreover, everyone was expected to experience the same fate in the afterlife.	On Hittite beliefs, see Collins (2007, 91, 178-179) and Bryce (2002, 139-140, 181-184).
	1180 BCE- 547 BCE	INFERRED ABSENT Although information about MSCP is sparse, continuity with preceding period is likely, especially among the Neo-Hittites (c. 12 th -10 th centuries BCE), who held similar religious beliefs to the Hittites. Urartian iconography and epigraphy portrays a religion that bolstered royal legitimacy rather than promoting moral conduct. Haldi, the supreme god, was a warlike deity who supported the king's conquests; both he and the lesser gods required regular animal sacrifices and festivities in their honor.	On Neo-Hittites, see Bryce and Birkett-Rees (2016, 160-162). On Urartian religion, see Smith (2000). On Haldi, see Taffet and Yakar (1998) and Zimansky (1995).
	546 BCE-334 BCE	INFERRED PRESENT Region annexed to the Achaemenid empire. The Achaemenids followed a form of Zoroastrianism. In Zoroastrianism, the god Ahura Mazda monitored moral behavior and punished and rewarded people accordingly. Additionally, Zoroastrian teachings posited a dualistic cosmology with a struggle between good and evil. However, early Zoroastrianism remains difficult to reconstruct, e.g., because much of what is known about MSCP in Zoroastrianism derives from much later sources. We are inferring that MSCP was present based on these sources.	On forms of Zoroastrianism possibly practiced by the Achaemenids, see Herzfeld (1936, 20) and Gershevitch (1959, 8-22). On MSCP in Zoroastrianism, see Stausberg (2000, 231-241). On Zoroastrianism more broadly, see Nigosian (1993).
	300 BCE-283 BCE	ABSENT Hellenistic rule, followed by Roman rule. Hellenistic-era texts such as the "Confessions Inscriptions" of Lydia and Phrygia suggest that the gods mostly punished ritual transgressions. As for the Romans, offenses they thought were punished by the gods include: (1) direct affront to a deity such as thieving from the sanctuary or omitting a required rite; (2) violations of <i>fides</i> , such as breaking oaths or a wide range of less formal agreements; (3) incest; (4) kin murder, at least from 200 BCE on; and (5) unjust war. This suggests that the Roman gods were interested in only certain types of moral transgressions, and that they did not distinguish these from transgressions against the gods themselves. Such beliefs persisted up until the spread of Christianity.	On Confessions Inscriptions, see Petzl (1994), Versnel (2002, 63-72), Chaniotis (2004) and Gordon (2004). On MSCP in Roman religion, see Liebeschuetz (1979, 39-54) and Tatum (1993).



Middle Yellow River Valley	284 CE-394 CE	[TRANSITION FROM ABSENT TO PRESENT]	On spread and establishment of Christianity through Roman Empire, see Fox (1986), Galvao-Sobrinho (1995) and Odahl (2013). On MSCP in Christianity, see Angenendt and Riches (2014). On Seljuk conquest see Aktas (2017). On MSCP in Islam, see Yaran (2007). On ritual in early China, see Demattè (1999, 126), Underhill and Habu (2008, 13), Underhill (2001, 159), Liu (2005, 70), and Reinhardt (2015, 86). See Eno (2009, 100). On traditional Chinese cosmology, see Poo (2009, 312) Poo (2014) and Poo (2021). See Cook (2009, 239). On the Mandate in the Book of Documents, see Cheng (2010: 41). On Xunzi, see Kim (2011, 375). On Mengzi, see Lewis (1990, 236). On the early evolution of the Mandate as concept, see Goldin (2011). On Buddhist ideas on the afterlife in China, see Zhang (2014, 119). On Buddhism's spread in this period, see Knechtges (2010, 183). On establishment of Buddhism, see Xiong (2009, 68). On MSCP in Buddhism, see Keown (2013).
	395 CE-1838 CE	PRESENT Establishment of Christianity, which features MSCP. Later, in the eleventh century, conversion to Islam, following Seljuk conquest. Islam also features MSCP.	
	5000 BCE-1251 BCE	INFERRED ABSENT Inferred absence code is partly based on assumed continuity with the ensuing period (1250–1046). Also, archaeological evidence from the Neolithic and Early Bronze Age period (5000-1251 BCE) suggests the presence of sacrifice and ritual practices, likely accompanied by music and feasting. While archaeological finds and early script (from the Erligang period on) cannot tell us about the specific tenets of religious practices in this period, it seems reasonable to conclude that moral concern was not primary because of the primary emphasis on ritual sacrifices.	
	1250 BCE–489 BCE	ABSENT In the Late Bronze Age, kings acted as an intermediary to appease or influence high god Di through the correct ritual sacrifice. Eno concludes there is no evidence in the oracle bone records for Di as a moralizing force. Moreover, traditional Chinese cosmology, including ancestor and deity worship, is described as amoral and based on ritual knowledge rather than moral behavior. We conclude that appeasement of Di, Tian, and spirits and deities through ritual were the primary concerns this period.	
	488 BCE-317 CE	[TRANSITION FROM ABSENT TO PRESENT] Tian worship was replaced by worship of Tai Yi (Great One) by the end of the Warring States period. Cook describes Tai Yi as, “an abstract astral power”. It is unclear if there is any connection with Tai Yi and individual behavior. The Mandate is portrayed in the <i>Book of Documents</i> (Shang Shu), however, (written at least in the Warring States) as a natural impersonal force. Xunzi believed that Heaven was not involved in human affairs, and promoted ritual and rule of law over the cult of Tian. To Mengzi Tian becomes less of a mystical, all-knowing force and more of a metaphor for responsible and fair governance. It seems that there was no one clear interpretation of Tian among the intellectual elite, and it is unclear how much impact these philosophies had on different Warring States rulers. This period is therefore coded as transitional because the concept of the Mandate likely evolved over time and was influenced by Spring and Autumn and Warring States texts compiled and categorized in the Han. In addition, Buddhism was not an official ideology in the Han period, but Buddhist ideas regarding hell gradually became influential during the Eastern Han Buddhism had a “significant presence” in North China by the Western Jin.	
	386 CE-1912 CE	PRESENT Fully developed MSCP arrived in China with Buddhism, which started making inroads during the first century CE, and became dominant during the Six Dynasties Period (220–589 CE). Buddhism features MSCP.	

Table S2. Continued.

Natural Geographic Area	Date range	Coding and summary of buttressing data	Scholarly sources
Kachi Plain	7500 BCE-1301 BCE	UNKNOWN Though some scholars have argued, on the basis of archaeological data, for cultural continuity between the Harappans and later inhabitants of this region, these arguments have been persuasively critiqued. Though there has been some speculation regarding possible moralizing aspects of MSCP among the Harappans, the data ultimately appears to be insufficiently conclusive to confidently adjudicate.	On theories regarding Harappan culture, see e.g., Kenoyer (1989) and McIntosh (2008, 285–290). On critiques of some of these theories, see Lowe, 2004.
	1300 BCE-551 BCE	ABSENT Sacred Vedic texts suggest that only some transgressions were punished, and most of these were ritual rather than moral, e.g., cutting wood or killing animals without performing the correct sacrifices.	On punishable transgressions in early Vedic texts, see Obeyesekere (1980, 156–158).
	550 BCE-329 BCE	INFERRED PRESENT Region annexed to the Achaemenid empire. The Achaemenids followed a form of Zoroastrianism. In Zoroastrianism, the god Ahura Mazda monitored moral behavior and punished and rewarded people accordingly. Additionally, Zoroastrian teachings posited a dualistic cosmology with a struggle between good and evil. However, early Zoroastrianism remains difficult to reconstruct, e.g., because much of what is known about MSCP in Zoroastrianism derives from much later sources. We are inferring that MSCP was present based on these sources.	On forms of Zoroastrianism possibly practiced by the Achaemenids, see Herzfeld (1936, 20) and Gershevitch (1959, 8–22). On MSCP in Zoroastrianism, see Stausberg (2000, 231–241). On Zoroastrianism more broadly, see Nigosian (1993).
	303 BCE-1826 CE	PRESENT Establishment of belief in karma, an impersonal force by which people who perform more good actions will be rewarded after death, and people who perform more bad actions will be punished. Moreover, from the 6th century BCE on, the region is ruled by a succession of polities based outside South Asia, whose official cults (Buddhism, Zoroastrianism, eventually Islam) feature MSCP.	On karma, see Shattuck (2002), Dwivedi (2012) and Keown (2013). On history of region after 6th century BCE, see Harmatta et al. (1994). On MSCP in Zoroastrianism, see Stausberg (2000, 231–241). On Islamic conquest of the region, see MacLean (1989) On MSCP in Islam, see Yaran (2007).
Sogdiana	3500 BCE-2001 BCE	UNKNOWN Not enough data.	
	2000 BCE-751 BCE	INFERRED ABSENT Although there is no direct evidence of belief in MSCP being absent in Sogdiana until the emergence of Zoroastrianism, it is more likely that it was absent in all preceding polities because comparison between two well-documented religious traditions that likely derived from it (Vedic Hinduism and Zoroastrianism) allows for partial reconstruction of the Indo-Iranian religion, which was thought to be prevalent in this region during this period. Although the god Mithra (one of many in the pantheon) may have enforced honesty and reciprocity to some extent, other gods were not thought to have monitored human morality and Mithra's monitoring powers were limited. It is also likely that the Indo-Iranians believed that one's fate in the afterlife depended on one's social status in life.	On Mithra, see Thieme (1960, 307–309). On Indo-Iranian beliefs, see Gnoli (2004) and Gnoli (2005).
	750 BCE-600 BCE	[TRANSITION FROM ABSENT TO PRESENT] Based on most recent theories regarding the origins of Zoroastrianism (i.e., that it may have first emerged in the latter half of the second millennium BCE, and that they gradually spread from either Central Asia or Eastern Iran and gradually spread from there), it seems reasonable to infer that MSCP appeared in Sogdiana during this period. In Zoroastrianism, the god Ahura Mazda	On early Zoroastrianism, see Malandra (2005) and Grenet (2015). On MSCP in Zoroastrianism, see Stausberg (2000, 231–241). On challenges involved in reconstructing early Zoroastrianism, see Nigosian (1993, 10–25).

		monitored moral behavior and punished and rewarded people accordingly. However, it is difficult to reconstruct MSCP belief in early Zoroastrianism, e.g., much of what is known derives from much later sources. This means that it is not clear when exactly Zoroastrianism became a moralizing religion. We are therefore treating this as a transition period from a time when Zoroastrianism may not have featured MSCP, to one where it did.	
	550 BCE-330 BCE	<p>INFERRED PRESENT</p> <p>Region annexed to the Achaemenid empire. The Achaemenids followed a form of Zoroastrianism. Again, early Zoroastrianism remains difficult to reconstruct, e.g., because much of what is known about MSCP in Zoroastrianism derives from much later sources. We are inferring that MSCP was present based on these sources.</p>	On forms of Zoroastrianism possibly practiced by the Achaemenids, see Herzfeld (1936, 20) and Gershevitch (1959, 8–22).
	300 BCE-249 BCE	<p>[TRANSITION FROM ABSENT TO PRESENT]</p> <p>Though Alexander persecuted Zoroastrianism following his conquest of the region, his successors, the Seleucids demonstrated greater tolerance toward local faiths, and did not impose Greek beliefs on their subjects. We are therefore coding this as a period of transition from a time when the main moralizing religion in the region was almost stamped out, to its re-establishment.</p>	On Alexander's persecution of Zoroastrianism, see Nigosian (1993, 30–31). On Seleucid rule, see Kosmin (2013).
	248 BCE-1747 CE	<p>PRESENT</p> <p>Zoroastrianism and Buddhism co-existed as dominant religions in the region for several centuries, but Zoroastrianism flourished under Sasanian rule. In the 8th century CE, the region was conquered by the Umayyads, which led to the establishment of Islam. Zoroastrianism, Buddhism and Islam all feature belief in MSCP.</p>	<p>On religions in the region in the late centuries BCE and early centuries CE, see Harmatta et al. (1994). On Sasanian rule, see Nigosian (1993, 33–41). On MSCP in Zoroastrianism, see Stausberg (2000, 231–241). On MSCP in Buddhism, see Keown (2013).</p> <p>On the advent of Islam, see Bosworth and Bolshakov (1998). On MSCP in Islam, see Yaran (2007).</p> <p>On MSCP in Roman religion, see Liebeschuetz (1979, 39–54) and Tatum (1993).</p>
Latium	3600 BCE-510 BCE	<p>INFERRED ABSENT</p> <p>Written sources from the Early Republic (e.g., the Twelve Tables) as well as sources from neighboring cultures and from subsequent Roman culture suggest that the gods were at no period primarily concerned with morality. We are inferring similar beliefs backwards until the Copper Age.</p>	
	509 BCE-283 CE	<p>ABSENT</p> <p>Offenses the Romans thought were punished by the gods include: (1) direct affront to a deity such as thieving from the sanctuary or omitting a required rite; (2) violations of <i>fides</i>, such as breaking oaths or a wide range of less formal agreements; (3) incest; (4) kin murder, at least from 200 BCE on; and (5) unjust war. This suggests that the Roman gods were interested in only certain types of moral transgressions, and that they did not distinguish these from transgressions against the gods themselves. Such beliefs persisted up until the spread of Christianity.</p>	
	284 CE-394 CE	<p>[TRANSITION FROM ABSENT TO PRESENT]</p> <p>Transition to Christianity.</p>	On spread and establishment of Christianity through Roman Empire, see Fox (1986), Galvão-Sobrinho (1995) and Odahl (2013). On MSCP in Christianity, see Angenendt and Riches (2014).
	395 CE-1800 CE	<p>PRESENT</p> <p>Christianity as dominant ideology. Christianity features MSCP.</p>	

Table S2. Continued.

Natural Geographic Area	Date range	Coding and summary of buttressing data	Scholarly sources
Deccan Plateau	2700 BCE-301 BCE	UNKNOWN Not enough data.	On Mauryan conquest of South India, see Thapar (2003, 176). On spread of karmic religions to South India, see Johansen (2014). On rise of Hinduism from 500 CE on, see Shattuck (2002: 38–51) and Sanderson (2009). On karma, see Shattuck (2002), Dwivedi (2012) and Keown (2013). On the Mughal empire and its collapse, see Richards (1995). On MSCP in Islam, see Yaran (2007). On MSCP in Christianity, see Angenendt and Riches (2014).
	300 BCE-1946 CE	PRESENT Through Mauryan conquest, introduction of Buddhism and therefore belief in karma, an impersonal force by which people who perform more good actions will be rewarded after death, and people who perform more bad actions will be punished. Buddhism remained the dominant religion until about 500 CE, and was replaced by Vedic Hinduism from 500 CE on. Though there are philosophical differences between Buddhist and Vedic concepts of karma, these do not affect our codes. With Mughal conquest in the seventeenth century CE, Islam becomes the official cult, at the state level. The Mughals were followed by the British, who were Christian. Both Islam and Christianity feature MSCP.	
Paris Basin	3200 BCE-27 BCE	INFERRED ABSENT No known polytheistic religion of the pre-Christian era in continental Europe displays primary concern with interpersonal morality. We infer similar beliefs backwards as far back as the Bell Beaker period.	For a synoptic survey of ancient polytheisms see Johnston (2004) and Watts (2013).
	26 BCE-283 CE	ABSENT The observations about ancient polytheism generally lacking primary concern for interpersonal morality also apply here. Roman ideological influence extended across Gaul during this period (particularly the South, but also in the Paris Basin). Offenses the Romans thought were punished by the gods include: (1) direct affront to a deity such as thieving from the sanctuary or omitting a required rite; (2) violations of <i>fides</i> , such as breaking oaths or a wide range of less formal agreements; (3) incest; (4) kin murder, at least from 200 BCE on; and (5) unjust war. This suggests that the Roman gods were interested in only certain types of moral transgressions, and that they did not distinguish these from transgressions against the gods themselves.	On MSCP in Roman religion, see Liebeschuetz (1979, 39–54) and Tatum (1993).
	284 CE-394 CE	[TRANSITION FROM ABSENT TO PRESENT] Transition to Christianity.	On spread and establishment of Christianity through Roman Empire, see Fox (1986), Galvao-Sobrinho (1995) and Odahl (2013). On MSCP in Christianity, see Angenendt and Riches (2014).
	395 CE-1788 CE	PRESENT Christianity as dominant ideology. Christianity features MSCP.	
Cambodian Basin	225 CE-539 CE	UNKNOWN Insufficient data.	On early Hinduism and Buddhism in Cambodia, see Harris (2005, 8–11).
	540 CE-639 CE	INFERRED ABSENT Before the 7th century it seems likely that MSCP was not present (W. Noseworthy 2021, personal communication, February 18, 2021).	
	640 CE-801 CE	[TRANSITION FROM ABSENT TO PRESENT] From the 7th century onward there is mounting archaeological and textual evidence for the establishment of Saivist Hinduism and Mahayana Buddhism in the region. Given the relative uncertainty regarding this period, however, coding it as one of transition reflects best the current scholarship.	

		PRESENT	
	802 CE-1873 CE	Jayavarman II (r. c. 802–850 CE) was the first known ruler to claim the Indic royal title of cakravartin, through a Hindu ritual. This suggests that, by this point, Hinduism (and therefore the the doctrine of karmic retribution, which features belief in MSCP) was firmly established among the region's ruling class. In the postclassical period (1431–1860 CE), Theravada Buddhism replaced Hinduism as the dominant ideology, but its version of the doctrine of karmic retribution still features belief in MSCP.	On Jayavarman II, see Harris (2005, 12). On rise of Theravada Buddhism, see Harris (2005, 26–48). On MSCP in Buddhism, see Keown (2013).
Orkhon Valley	1400 BCE-744 CE	INFERRED ABSENT Scholarly reconstructions of ancient and medieval Mongolian religion indicate that the Xiongnu worshipped Tengri (Heaven), along with the Sun and the Moon, and performed annual sacrifices to the ancestors, heaven and earth, and spirits. In the fourth century CE, Chinese historical sources reported that the Rouran Khaganate used “witchcraft ... to make sacrifices to Heaven and to cause wind with snow.” Ethnographic reconstructions and studies of later religious beliefs suggest that MSCP was not present in ancient to early modern Mongolian shamanism. Note, though, that Zoroastrianism and Buddhism both made some inroads into the region between the sixth and eighth centuries. Turkic polities were established in the region between the sixth and the eighth centuries BCE and they had a similar belief system to the Xiongnu.	On Xiongnu religion, see Atwood (2004, 595) and Baldick (2000, 23–3). Quote on the Rouran from Taskin (1984, 240). On Buddhism and Zoroastrianism at this time, see Golden (1992, 150) and Moses (1973, 47). On the Turks, see Malov (1951, 36–37) and Bichurin (1851/1950, 230–231).
	745 CE-840 CE	PRESENT The Uighur Khagnate elite adopted Manichaeism from roughly 762–982 CE. Manichaeism doctrine centered on the belief in a powerful and moralizing high god and on keeping the ten commandments that demanded a renunciation of “idolatry, lying, greed, killing, fornication, theft, teaching of pretenses and sorcery, of standing in two opinions (concerning the religion) and of slackness and negligence of work”.	On Uighurs and Manichaeism, see (Golden, 1992, 174). Quote on MSCP in Manichaeism from Colditz (2009, 76–80).
	841 CE-907 CE	INFERRED ABSENT The religious beliefs of the Shiwei remain largely unknown. However, they were likely shamanists (N. Kradin, personal communication, December 15, 2020), suggesting that MSCP was not a significant element of their beliefs.	On the Shiwei, see Taskin (1984).
	960 CE-1125 CE	PRESENT The Khitan combined Buddhism with shamanic beliefs and practices. Buddhism features belief in karma, which acts as a moralizing force, promoting charity, human reciprocity, and respect for life, abstinence from killing, stealing, lying, adultery, intoxicants, etc.	On religion among the Khitan, see Atwood (2004, 318). On MSCP in Buddhism, see Keown (2013).
	1126 CE-1270 CE	INFERRED ABSENT The elite and commoners of the Mongol Empire practiced traditional shamanism until around 1575. MSCP would seem to be lacking in ancient to early modern Mongolian shamanism based on ethnographic evidence and other studies of later religion.	On religion among the Mongols, see Atwood (2004, 465).
	1271 CE-1367 CE	PRESENT Adoption and promotion of Buddhism during the Yuan Dynasty.	On Buddhism in the Yuan Dynasty, see Brook (2010).
	1368 CE-1580 CE	INFERRED ABSENT The elite and commoners of the Mongol Empire practiced traditional shamanism until around 1575. MSCP would seem to be lacking in ancient to early modern shamanic Tengrism based on ethnographic evidence and other studies of later religion.	On Buddhism in Mongolia from 1580 CE on, see Atwood (2004, 491).
	1581 CE-1912 CE	PRESENT Buddhism popularized after 1580, with Altan Khan's persecution of the shamans. Buddhism, Daoism, and Confucianism practiced in the Qing.	

Table S2. Continued.

Natural Geographic Area	Date range	Coding and summary of buttressing data	Scholarly sources
Yemeni Coastal Plain	3500 BCE-801 BCE	UNKNOWN No data.	
	800 BCE-340 CE	INFERRED ABSENT The majority of inscriptions suggest that the gods were thought to punish people because of failure to fulfil ritual obligations with respect to a deity, or because of their infringement of the code of ritual purity. Only a single known inscription (MB 2002 I-28) describes an instance of divine punishment that may be interpreted as moralistic, as it targeted the sale of food to neighboring communities during bad harvest years, and of enslaved people from one's own community to other communities.	On MB 2000 I-28, see Beeston (1948), Jamme (1962), Maraqtan (2006) and Multhoff and Stein (2008).
	378 CE-1805 CE	PRESENT Conversion to Judaism, eventually followed by Christianity. The region was subsequently ruled by the Sasanids, who practiced Zoroastrianism. Finally, Islam became the dominant religion in the region. All these religions feature MSCP.	On Judaism and Christianity in Yemen, see Hoyland (2001; 146–147) and Segovia, 2015 (6–9). On Sasanian rule, see Nigosian (1993, 33–41). On the advent of Islam, see Al-Mad'aj (1988). On MSCP in Zoroastrianism, see Stausberg (2000, 231–241). On MSCP in Judaism, see Rosen (2003). On MSCP in Islam, see Yaran (2007). On MPS in Christianity, see Angenendt and Riches (2014).
Kansai	N/A	N/A <i>Excluded from analysis because buttressing process incomplete at time of submission.</i>	
Central Java	400 BCE-499 CE	INFERRED ABSENT Based on ethnographic observation of indigenous beliefs, we infer that, before the arrival of any of these religions, Javanese religion revolved around the relationship between the living and the dead, often portrayed as vengeful or unhappy, and had to be correctly propitiated to avoid misfortune. MSCP therefore appears not to have been a feature of pre-karmic religions in Java.	On early Java, see Miksic and Goh (2017, 173).
	500 CE-1703 CE	PRESENT Archaeological data (e.g., an early Buddhist temple in northwest Java) suggests that both Buddhism and Hinduism began to establish themselves on the island as early as the 4th century CE. Both feature belief in karma, an impersonal force by which people who perform more good actions will be rewarded after death, and people who perform more bad actions will be punished. Islam, which became established on the island in the fifteenth century CE, also includes belief in MSCP.	On karma, see Shattuck (2002), Dwivedi (2012) and Keown (2013). On advent of Islam, see Tjandrasasmita (2004, 409–410). On MSCP in Islam, see Yaran (2007).
Iceland	930 CE-1000 CE	ABSENT Though the gods endorsed some prosocial behaviors, literary sources depict them as fickle and amoral; e.g., in the poem <i>Hávamál</i> , Odin provides advice as to the most efficient ways to kill an enemy, seduce a woman, or steal property, and cautions people not to be overly trusting of their friends, also revealing that he himself broke an oath he had sworn to the giant Suttungur.	On Nordic beliefs, see Raffield et al. (2019).
	1001 CE-1380 CE	PRESENT Conversion to Christianity. Christianity features MSCP.	On advent of Christianity, see Durrenberger (1988, 239). On MSCP in Christianity, see Angenendt and Riches (2014).

Inland Niger Delta	250 BCE-1077 CE	UNKNOWN Extrapolating from historical Mande contexts, in pre-Islamic times, human communities in the Niger Inland Delta likely followed norms that demanded moral reciprocity both between human individuals and between human communities and the landscape. It is also worth noting that prominent sites such as Jenné-jeno have not yielded evidence of a vertical social stratification, suggesting perhaps an ideology that promotes cooperation, and therefore perhaps prosociality more generally. Overall, however, the present evidence, both archaeological and ethnographic, does not seem sufficient to infer the presence or absence of belief, at this time, in supernatural entities who monitored intra-human interactions, punishing antisocial behaviors and rewarding prosocial ones.	On theories regarding belief in pre-Islamic era, see McIntosh (2000). On Mande beliefs, see e.g., McNaughton (1988: 15–21). On Jenné-jeno, see McIntosh (2005), MacDonald (2013).
	1100–1410	[TRANSITION FROM ABSENT TO PRESENT] The rulers of the Wagadu officially converted to Islam in 1075–77 CE to foster commercial ties with Almoravid newcomers. Islam features MSCP.	On spread of Islam across West Africa, see Levzion and Spaulding (2003, 24–25).
	1411 CE-1818 CE	PRESENT By the fifteenth century, Timbuktu had emerged as an important center of Islamic scholarship.	On Timbuktu, see Saad (1983). On MSCP in Islam, see Yaran (2007).
Ghanaian Coast	1501 CE-1894 CE	INFERRED ABSENT The Akan believe that both their supreme god (Nyame) and lesser deities (abosom) monitor the moral quality of human behavior. However, the Akan also acknowledge that both Nyame and the abosom are often slow to address injustices, even when these are particularly egregious, operating on an entirely different time scale than humans. Even the most “hot-headed” deity, Densu, whose reaction to injustices is thought to be swiftest, may only address wrongs after repeated prompting. Moreover, wrong-doers and transgressors may successfully bribe or appease the abosom through offerings and sacrifices.	On Akan beliefs, see e.g., Ephirim-Donkor (2010, 8, 57–58).
	1895 CE-1914 CE	PRESENT The British Empire came to occupy this region between the end of the nineteenth century and the beginning of the 20th. The dominant ideology in this polity was Christianity, which features MSCP. Note that Christianity had already begun spreading through region in the late eighteenth century, however, and that the region had not been entirely immune from the influence of Islam, another moralizing religion.	On British invasion, see Hallett (1974, 281). On MSCP in Christianity, see Angenendt and Riches (2014). On Islam in Ghana in this period, see Silverman and Owusu-Ansah (1989). On MSCP in Islam, see Yaran (2007).
Kapuas Basin	1650 CE-1987 CE	ABSENT Based on descriptions from ethnographic studies, in traditional Iban religion, people’s interactions with their main creator gods centers on appeasement through ritual sacrifice.	On traditional Iban beliefs, see Gomes (1911/1995/1911, 202) and Sutlive and Beierle (1995).
Big Island Hawaii	1000 CE-1819 CE	INFERRED ABSENT Great gods (<i>akua</i>) worshipped as part of official government-sponsored religion not primarily concerned with supernatural enforcement. Ancestral spirits known as ‘aumākua were believed to punish certain moral transgressions or reward morally upstanding behavior, these beliefs did not constitute part of the official state-sponsored religion.	On traditional Hawaiian beliefs, see Malo (1951, 29, 56–57, 189), Kamakau (1964, 28–32, 60, 87, 95), Pukui and Handy (1972, 24, 37–40), Kirch (2010, 69) and Hommon (2013, 56, 134, 243).
Chuuk	1775 CE-1948 CE	INFERRED PRESENT Sky gods and benevolent spirits punished behavior that angered them including in afterlife.	On traditional Chuukese beliefs, see Goodenough (2002), Bollig (1927/1999/1927) and Krämer (1932).
Lena River Valley	1400 CE-1900 CE	ABSENT Morality was not a primary concern for Sakha spirits, who were only concerned with issues of purity, some kinship obligations, the breaking of oaths and whether or not people had fulfilled their ritual obligations toward them; at other times the spirits could also be indifferent to people.	On traditional Sakha beliefs, see Popov (1946/1997/1946, 22–23), Sauer (1802/1995/1802) and Jochelson (1933/1997/1933).

Table S2. Continued.

Natural Geographic Area	Date range	Coding and summary of buttressing data	Scholarly sources
Garo Hills	1775 CE-1956 CE	INFERRED ABSENT Moralizing concern likely not primary in official cult for entire period considered for analysis. The A'chik do abide by a code of conduct intended to regulate interpersonal behavior, but this code is not enforced by either gods or spirits. Supernatural punishment and reward focuses mainly on ritual obligations.	On traditional A'chik beliefs, see Marak (2005, 58, 69–70).
South China Hills	N/A	N/A <i>Excluded from analysis because buttressing process incomplete at time of submission.</i>	
Oro PNG	1783 CE-1883 CE	ABSENT In reviewing ethnographic descriptions of Orokaiva religion, it seems reasonable to conclude that MSCP was not present. The Orokaiva interacted with demigods and ancestor spirits through ritual exchanges and an elaborate system of initiation. Indigenous explanations for misfortune in Melanesia typically invoke sorcery or unintended offences against the supernatural agents themselves. Moreover, Orokaiva spirits traditionally endorsed ritualized acts that would be regarded as highly immoral in everyday life.	On traditional Orokaiva beliefs, see Schwimmer (1973), Iteanu (1990), and on Melanesian spirit beliefs, see Whitehouse (1996).
	1884 CE-1942 CE	PRESENT Ethnographic sources show that Christianity and Christian-influenced cults spread during the colonial period. Christianity features MSCP.	On Christianity on Oro, see Chinnery and Haddon (1917), Williams (1928), Bashkow (2006). On MSCP in Christianity, see Angenendt and Riches (2014).
Finger Lakes	1566 CE-1848 CE	INFERRED ABSENT Ethnographic sources describe a cosmology wherein states of order and disorder derive from harmonious or inharmonious relations with nature.	On traditional Iroquois beliefs, see Foley (1975/1996/1975, 46) and St. St. John (1981/1994/1981, 50).
Cahokia	600 BCE-1639 CE	INFERRED ABSENT There is little data on MSCP in the Woodland or Emergent Mississippian (P. Peregrine, February 2, 2017). We infer the absence of belief in MSCP in the Woodland and Emergent Mississippian periods, as well as in Cahokia, because of evidence for lack of MSCP in later Mississippian religion.	
	1640 CE-1717 CE	ABSENT The few surviving Peoria oral traditions, as well early French ethnographies, suggest that Illinois cosmology centered on holistic connectivity and natural cause and effect rather than supernatural moralizing concern.	On traditional Illinois beliefs, see Illinois State Museum (2000) and Marquette (1959/1674, 139–141).
Valley of Oaxaca	1400 BCE-1520 CE	INFERRED ABSENT Although there is no direct evidence of belief in MSCP being absent in the Valley of Oaxaca until its first appearance with the arrival of Christianity, it is more likely that this belief was absent in all preceding polities in the region because analysis of archaeological data (including elaborate iconography and inscriptions), parallels with other world regions, and ethnohistoric accounts by early colonial sources allow reconstruction of the pre-contact religious system. Archaeological evidence from the Late Formative period (beginning around 500 BCE) at the central site of Monté Alban suggests that supernatural agents were thought to be motivated not so much by the moral quality of their worshippers' behavior towards other humans, but by the quality of their offerings to their gods. Likewise, Spanish sources describe Zapotec and later Maya beliefs that supernatural agents were responsible for misfortunes, and that when these occurred they had to be placated through ritual, but these misfortunes were not used to punish moral transgressions.	On prehistoric religion in Oaxaca, see Marcus (1983) and Joyce (2009). On protohistoric accounts of Zapotec religion, see Lind (2015, 346–347).

North Colombia	1521 CE-1700 CE	PRESENT	On advent of Christianity, see Cline (1993). On MSCP in Christianity, see Angenendt and Riches (2014).
	250 CE-1049 CE	UNKNOWN	
	1050 CE-1524 CE	No data. DISPUTED (“{INFERRED PRESENT; UNKNOWN}”) According to scholars such as Reichel-Dolmatoff and Witte, there are significant cultural continuities between the Tairona and the modern-day Kogi, which suggests MSCP. However, many scholars disagree, suggesting that, due to significant historical change, the Kogi cannot be used as directly analogous with the Tairona. Available data insufficient to adjudicate.	On Kogi beliefs, see Reichel-Dolmatoff (1990, 12), Witte (2017). On arguments against use of Kogi beliefs as analogues, see Uribe (1992), Bocarejo (2002) and Giraldo (2020).
Lowland Andes	1534 CE-1931 CE	ABSENT Moralizing concern not primary in official cult for entire period considered for analysis (1534–1931 CE). Twentieth-century ethnography describes the presence of avenging spirits that may punish those who do not fulfill their ritual obligations and elders with the power to curse others. Overall, Chicham cosmology is characterized by holistic interconnectedness. Christian missionaries only began to establish a significant presence among the Chicham in the 1890s. In the 1970s, many Chicham still resisted conversion to Christianity.	On traditional Shuar beliefs, see Karsten (1935/2000/1935, 252), Harner (1973), Descola (1996, 375). On attempted Christianization, see Meiser (2011, 496) and Descola (1996: 357).
Cuzco	1 CE-1531 CE	INFERRED ABSENT Iconographic and archaeological data, interpreted at least in part through the use of ethnohistoric descriptions of sixteenth-century beliefs and practices, as well as more recent ethnographic accounts of Andean culture, suggest that indigenous Andean religion has long revolved around complementarity and reciprocity, sacrifice and supplication. Moreover, among the Inca, moral transgressions were mainly policed by human agents. In other words, belief in MSCP likely only came to the region with the advent of Christianity following Spanish conquest.	On prehistoric religion in Cuzco, see Quilter (2014, 151), Weismantel (2014/2015, 48), Lau (2002, 281), Mannheim and Salas Carreño (2015, 60–64), Bourget (2016). On Inca religion, see Betanzos (1996), Yaya (2012, 148) and D’Altroy (2014).
	1532 CE-1700 CE	PRESENT Conversion to Catholicism with Spanish conquest. Christianity features MSCP.	On advent of Christianity, see MacCormack (1985). On MSCP in Christianity, see Angenendt and Riches (2014).
Basin of Mexico	6000 BCE-401 BCE	UNKNOWN Insufficient data.	On prehistoric religion in the Basin of Mexico, see Carballo (2016), Carballo (2018), Helmke and Nielsen (2017) and Favrot Peterson (2019).
	400 BCE-1519 CE	DISPUTED (“{PRESENT; ABSENT}”) Scholarly opinion differs on the extent to which supernatural powers from the Formative Period through Aztec times were concerned with monitoring and enforcing moral behavior among humans, which leads to our code expressing this disagreement. Further, there is evidence that certain core principles of later Aztec religion had their origins in the pre-Teotihuacan cultures of the Formative period, which is why we code this disagreement for this entire period.	
Middle Ganga	7000 BCE-1501 BCE	UNKNOWN No data.	
	1500 BCE-325 BCE	ABSENT Sacred Vedic texts suggest that only some transgressions were punished, and most of these were ritual rather than moral, e.g., cutting wood or killing animals without performing the correct sacrifices.	On punishable transgressions in early Vedic texts, see Obeyesekere (1980, 156–158).
	324 BCE-1803 CE	PRESENT With rise of Mauryan empire, establishment of Buddhism and therefore belief in karma, an impersonal force by which people who perform more good actions will be rewarded after death, and people who perform more bad actions will be punished. Buddhism remained the	On the Mauryan empire, see Thapar (2003). On rise of Hinduism from 500 CE on, see Shattuck (2002: 38–51) and Sanderson (2009). On karma, see Shattuck (2002), Dwivedi (2012) and Keown

Table S2. Continued.

Natural Geographic Area	Date range	Coding and summary of buttressing data	Scholarly sources
		dominant religion until about 500 CE, and was replaced by Vedic Hinduism from 500 CE on. Though there are philosophical differences between Buddhist and Vedic concepts of karma, these do not affect our codes. When this region was conquered by the Delhi Sultanate in the thirteenth century CE, Islam becomes the official cult, at the state level. The Delhi Sultanate was followed by the Mughals, for whom Islam remained the official cult. In turn, the Mughals were followed by the British, who were Christian. Both Islam and Christianity feature MSCP.	(2013). On the Delhi Sultanate, see Habib (2005). On the Mughal empire and its collapse, see Richards (1993). On MSCP in Islam, see Yaran (2007). On MSCP in Christianity, see Angenendt and Riches (2014). On karma, see Shattuck, (2002), Dwivedi (2012) and Keown (2013). On MSCP in Islam, see Yaran (2007). On MSCP in Christianity, see Angenendt and Riches (2014).
Southern Mesopotamia	9000 BCE-5501 BCE	UNKNOWN No data.	
	5500 BCE-2351 BCE	INFERRED ABSENT Iconographic and archaeological data—in particular, the existence of temples—from the Ubaid period (c. 6500 BCE-4000 BCE, with regional variation) strongly suggests belief that gods primarily rewarded those who provided them with correct ritual worship and suitable offerings. The same can be said for the Uruk period (4000 BCE-3100 BCE), which has also left behind written evidence for this belief. In the Early Dynastic Period (2900 BCE-2350 BCE), praising the gods became a new way to gain their favor.	On Ubaid period, see Hole (2010, 228–238) and Peasnell (2002, 381). On Ubaid, Uruk and Mesopotamian beliefs generally, see Cunningham (2013, 41–48). On moralizing concerns of Mesopotamian gods, see Lambert (1996/1963).
	2350 BCE-540 BCE	ABSENT Written sources demonstrate that though Mesopotamian gods were thought to monitor certain aspects of morality, they were equally interested in correct ritual performance. Some Mesopotamian thinkers grappled with the question of the “righteous sufferer”, i.e., the person who experiences misfortune despite morally upstanding conduct.	
	539 BCE-331 BCE	INFERRED PRESENT Region annexed to the Achaemenid empire. The Achaemenids followed a form of Zoroastrianism. In Zoroastrianism, the god Ahura Mazda monitored moral behavior and punished and rewarded people accordingly. Additionally, Zoroastrian teachings posited a dualistic cosmology with a struggle between good and evil. However, early Zoroastrianism remains difficult to reconstruct, e.g., because much of what is known about MSCP in Zoroastrianism derives from much later sources. We are inferring that MSCP was present based on these sources.	On forms of Zoroastrianism possibly practiced by the Achaemenids, see Herzfeld (1936, 20) and Gershevitch (1959, 8–22). On MSCP in Zoroastrianism, see Stausberg (2000, 231–241). On Zoroastrianism more broadly, see Nigosian (1993).
	312 BCE-144 BCE	[TRANSITION FROM ABSENT TO PRESENT] Though Alexander persecuted Zoroastrianism following his conquest of the region, his successors, the Seleucids demonstrated greater tolerance toward local faiths, and did not impose Greek beliefs on their subjects. We are therefore coding this as a period of transition from a time when the main moralizing religion in the region was almost stamped out, to its re-establishment.	On Alexander’s persecution of Zoroastrianism, see Nigosian (1993, 30–31). On Seleucid rule, see Kosmin (2013).
	143 BCE-1838 CE	PRESENT Zoroastrianism likely firmly established, given the passing of several century since its first appearance in the region. The region was conquered by an Islamic polity in the 7th century CE, which led to gradual Islamization of the population. Islam features MSCP.	On Zoroastrianism under the Parthians, see Nigosian (1993, 31–33). On Islamic conquest of the region, see Zarrinkub (1975). On MSCP in Islam, see Yaran (2007).