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Evidence on the nature of sectarian animosity from a geographically representative survey of Iraqi and Iranian Shia pilgrims

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Sectarian tensions underlie conflicts across the Middle East, but little is known about their roots and associated beliefs. We conducted a large-scale empirical analysis, drawing on an original, geographically representative survey of over 4,000 devout Shiites across Iran and Iraq. We find that sectarian animosity is linked to economic deprivation, political disillusionment, lack of out-group contact and a sect-based view of domestic politics—paralleling patterns seen in ethno-nationalism elsewhere. In contrast, two alternative accounts are largely unsupported: sectarian animosity is not consistently associated with solidarity with a transnational sect-based community, nor does it seem to stem from disputes over religious doctrine. Nonetheless, this identity's religious roots manifest in differences from typical ethno-nationalism; practising men are less sectarian, consistent with official doctrine encouraging unity, whereas practising women are more sectarian. These gendered patterns suggest an understudied mechanism: religiously mediated socialization, or the transmission of non-religious norms through religious practice.

The past 50 years have seen a resurgence in sectarian tensions within Islam, in the Middle East and worldwide. Inter-sectarian suspicion and animosity have manifested in violent conflicts in Syria, Iraq, Yemen, Lebanon and South Asia, as well as in post-Arab Spring government clampdowns in Gulf states[1,2]. Some argue that the Sunni-Shia religious divide will be the defining conflict of this century[3,4]. Yet despite the evident importance of sectarian animosity—that is, antipathy to co-religionists based on membership in another sect—researchers know little about how individuals come to hold this animosity or what other social, religious or political attitudes are associated with it. Existing work has focused almost exclusively on societal factors that spur sectarian tensions, be they institutional or transnational[5–7]. Research is particularly sparse compared with existing social-scientific work on ethnicity, nationalism and religion, even though in the Middle East and North Africa, sectarian identity arguably plays a more important role. This research deficit is even more severe for Shiites, who comprise at least 20% of Muslims worldwide and hold considerable sway in contentious parts of the Middle East. Due to the extreme difficulty of operating in these regions—including political instability, regime restrictions and social norms—research has focused disproportionately on Sunni Muslims and relies overwhelmingly on male respondents.

To gain a richer understanding of sectarian attitudes, we conducted in-person surveys of over 4,000 Shia pilgrims who travelled to the Iraqi city of Karbala for the holy day of Arba'een. The concept of pilgrimage is enshrined in Islam as one of the religion's five pillars. While the hajj is the most important pilgrimage for Sunni and Shiites alike, Shia scholars also emphasize travels (*ziyara*) to shrines of imams or Mohammed's companions. Arba'een, the religious occasion that serves as the backdrop for our survey, is a collective mourning ritual involving a pilgrimage on foot to the shrine of Imam Hussein

in Karbala. While not obligatory, the spiritual rewards of *ziyara* to Imam Hussein's shrine are often compared to the hajj. Individuals depart days or weeks in advance on foot from as far as Basra (500 kilometres away) or Baghdad (100 kilometres), engaging in recitations and lamentations during the journey. Banned for decades during Saddam Hussein's reign, the pilgrimage has since steadily grown in numbers, with Iraqis being the most frequent visitors, followed by Iranians. In 2015, when we conducted this survey, 22 million pilgrims reportedly visited the shrine, according to Iraqi state media official counts[8]. (We note that attendance is difficult to confirm. However, even with uncertainty over exact participation, the Arba'een pilgrimage is consistently regarded as among the largest human gatherings in existence.) In Supplementary Section 1.2, we detail the particular sectarian context and history in which this takes place.

Attendees are a regionally and socio-economically diverse subpopulation united by the pilgrimage. While often understood to be central to politics and conflict in the region, these devout individuals are normally difficult to identify, let alone study. Our survey collects a geographically representative sample of them, including an unusually large number of women and individuals from inaccessible areas across Iraq and Iran. This geographic diversity allows us to assess the generality of our findings across local and national contexts. We then characterize this sample using self-reported religious practice, prior pilgrimage participation and anonymous smartphone location tracking of attendees. We examine variation along these dimensions, providing some indication of how they might generalize to less devout Shiites—though we emphasize that a key limitation of a pilgrimage-based study is that it cannot directly examine non-pilgrims.

Using the resulting data, this paper lays the groundwork for the systematic study of sectarian animosity in Islam in three ways. First, given the lack of standardized measures in this nascent research

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area, we develop a latent-variable measurement strategy for sectarian animosity and demonstrate its validity using alternative self-reported, experimental and behavioural measures. Second, we take stock of a literature that has theorized numerous underlying causes or risk factors that drive sectarian animosity, often on the basis of qualitative or case-specific evidence. We conduct a systematic, empirical evaluation of these claims. Third, we unpack the contents of the 'sectarian worldview'—the bundle of social, religious and political beliefs that are assumed to correlate with sectarianism, often without evidence. Throughout, we use our sample's breadth to examine how findings generalize. We begin by examining animosity among Iraqi Shiites, where sectarian diversity means that inter-sect relations are highly salient; the culturally similar Iranian Shia sample helps show which results are country-specific and which may be more generally applicable. And our large sample of women, often excluded from the public sphere in the Middle East, offers the rare opportunity to understand gender differences and how patterns of beliefs vary across genders.

Using these results, we empirically assess three widely espoused, non-exclusive theories about the nature of sectarian animosity by testing their observable implications. We emphasize that our analyses can only evaluate whether observational data are consistent with theorized mechanisms; they cannot test those mechanisms directly. Broadly speaking, our findings suggest that sectarian animosity is best conceived in terms of a national politicization of sectarian identities and the desire for sectarian control of national-level symbols and resources. Despite key differences, sectarianism presents many functional similarities to ethno-nationalism[9–11]. These similarities include how economic deprivation, democratic disillusionment and lack of out-group contact correlate with out-group animosity across diverse contexts, and how individuals with high animus evaluate domestic politics, politicians and political parties through a sect-based lens. In contrast, we find little support for the prominent narrative of transnationalism—the notion that individuals' sectarian animosity is tied to engagement with and allegiance to a global Shia community that is seen as persecuted in Sunni-dominated areas. Nor does sectarian animosity seem to be tied to religiosity—that is, grounded in piety, practice or doctrinal conflict with other sects. While these alternative perspectives are not necessarily mutually exclusive—and while failure to detect an observable implication does not falsify a theory—we find little empirical support for their predictions.

But the analogy to ethno-nationalism has its limits. We observe substantial gender heterogeneity in the correlates of sectarian animosity that existing models fail to explain. While women hold significantly less animosity than men, this does not seem to be inherent to gender. Rather, gender differences are closely linked to variation in women's (typically limited) social exposure. Those participating regularly in public life—for example, working outside the home or engaging with the news—hold significantly higher levels of animosity, highlighting the social origins of sectarian norms. We find that religious practice—one of the most important channels for social interactions—is even more strongly associated with women's beliefs, potentially because these channels help diffuse norms.

Using variation in the level and nature of religious practice, we show that the relationship between religion and sectarian animosity differs substantially between Iraqi men and women. Among women who do not work outside the home, those regularly participating in communal practice have levels of animosity that rival those of their male counterparts. In contrast, women who are similarly religious but lack this social contact (for example, consuming religious media at home) are far less sectarian. For men, who already have regular extra-familial interactions, this does not hold. We do not find evidence of these patterns in Iran, where women are far more integrated into the public sphere[12,13] (our baseline results rule out correlations larger in magnitude than ±0.1). We argue that these differences are consistent with religiously mediated socialization—the transmission of non-religious norms acquired through religious practice among individuals who would otherwise be excluded from the broader social sphere. This is an important but often-overlooked correlate of sectarian animosity and a notable form of gendered variation in the broader role of religion[14,15].

The remainder of this paper proceeds as follows. The Results section presents the empirical results, beginning with commonly hypothesized drivers of sectarian animosity and then proceeding to other worldviews held by individuals with sectarian attitudes. In the Discussion section, we conclude with the implications of these results for common theoretical accounts of sectarian animosity. The technical details are reserved for the Methods section. These include (1) our sampling procedure, with specific mechanics of the pilgrimage and detailed tests of representativeness; (2) measurement based on Bayesian principal components analysis (BPCA), with numerous validity tests of the animosity measure; (3) regression analysis incorporating uncertainty from missingness, measurement and finite samples; and (4) multiple-testing corrections.
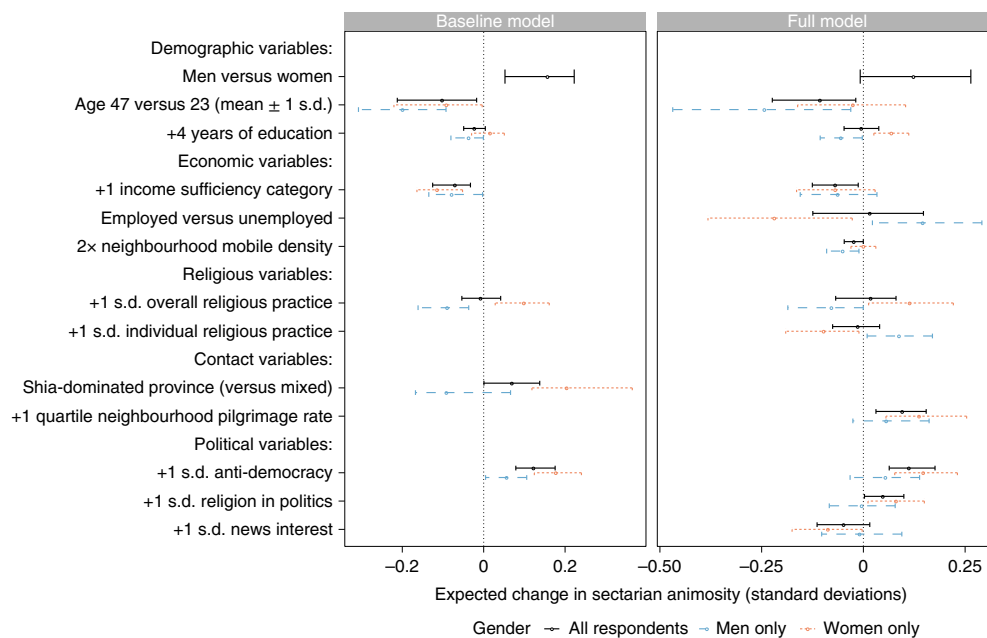
Results

What are the factors that might plausibly push individuals towards sectarian animosity, and are there discernible commonalities in how they operate across cultures? In this section, we conduct our primary confirmatory analyses to evaluate the numerous potential causes that prior work has proposed. To do so, we examine whether each theory's observable implications—the correlations between a hypothesized driver and sectarian animosity—are in fact present in our data. We emphasize that when testing previously theorized causal effects with observational data, unobserved confounders can reinforce causal effects, leading to inflated estimates; alternatively, confounders can be countervailing, producing estimates that are attenuated or even entirely inverted in sign. Thus, these observational tests are informative to the extent that countervailing confounders are weak relative to theorized effects, and they can produce false positives if the theorized effect is non-existent. It is important to note that these conditions cannot be evaluated empirically.

We first assess these theories in the context of the Iraqi case, where sect plays an inescapable role not only in national politics but also in daily life. The regression results are reported in Fig. 1 and Supplementary Table 9; 95% credible intervals and additional details on multiple-testing-corrected P values (denoted P_{adj}) are given in Supplementary Tables 17 and 19.

Potential drivers of animosity. *Religious practice.* We first consider whether religious devotion might push individuals towards sectarian animosity. Our operationalization of devotion focuses on religious practice rather than making value judgements about particular beliefs. We extract the principal components of questions about the frequency of various acts (Supplementary Section 3.3) using a BPCA procedure described in the Methods section under 'Measurement'. The first dimension captures overall religious practice; the second distinguishes respondents who practise more individually from those engaged in communal practice.

We find that religious practice is associated with attitudes towards religious out-groups, but the patterns are more context-dependent than existing theory predicts. Among Iraqi women, our baseline model indicates that those who are one s.d. more religiously practising are on average 0.10 s.d. more sectarian. Yet among Iraqi men, we observe a similarly strong but diametrically opposed association with tolerance (Supplementary Tables 9, 17 and 19; both $P_{adj} < 0.001$).

Closer examination suggests that these shifts are related to religiously mediated socialization, or transmission of non-religious norms through religious practice. Religious practice can influence individuals on two dimensions—doctrine and socialization. In the

Fig. 1 | Testing theorized drivers of sectarian animosity among Iraqi respondents. The left (right) coefficient plot summarizes the regression results from a specification in which single (multiple) measures correspond to each hypothesized cause. The complete results are given in Supplementary Tables 9, 17 and 19. The points and error bars are posterior means and 95% credible intervals after accounting for uncertainty from missingness, measurement and finite samples. $N = 2,231$ ($N = 1,888$) for the baseline (full) results. The full specification includes province-fixed effects. A corresponding coefficient plot for Iranian pilgrims is given in Fig. 2.

case of sectarian animosity, these two dimensions pull in opposite directions: official Shia religious doctrines discourage sectarian animosity, while socialization encourages it, influenced by the relatively high levels of sectarianism in the public sphere. Individuals already socialized through other avenues—for example, through work outside the home or through news—will be minimally affected by further socialization in religious venues and more substantively influenced by moderating doctrines. Those whose primary socialization is religious practice, however, will be more impacted by the amplifying effect of religiously mediated socialization on sectarian animosity.

In Iraq, this phenomenon seems to break down largely on gender lines. The tolerance observed among practising Iraqi men (replicated in the Iranian case) is more consistent with the hypothesized effect of religious doctrine. However, our data also suggest a parallel process at work among Iraqi women, who have historically been excluded from public discourse. For these individuals, religious practice—particularly the communal variety—is the primary channel through which they interact with the public sphere. Because of this, women have baseline lower average levels of sectarian animosity. But when they participate in religious events, they seem to be socialized towards the male mean, overwhelming the moderating effect of doctrine. Men, however, are already socialized to this higher level of sectarianism through regular public interactions, so they receive only the doctrinal impact of religious practice, which encourages moderation.

These hypotheses are reinforced by further analysis. In our full specification, which probes different types of religious practice, we find that the apparent effects of religion are stronger when individuals participate in communal religious activities. Women who take part in collective worship are decidedly more anti-Sunni (Supplementary Tables 9, 17 and 19; $P_{adj} = 0.033$), whereas communally practising men are perhaps more inclined towards coexistence ($P_{adj} = 0.069$). Conversely, women (men) who are more devout but individually practising tend to respond in line with the

average woman (man). We ran additional models in which religiosity was interacted with individual or communal practice, although we view the interactive models as exploratory. The results were consistent with the religiously mediated socialization hypothesis. Men (women) who were 1 s.d. more religious and 1 s.d. more communally practising differed significantly ($P \leq 0.02$ for both): they were 0.25 s.d. less sectarian (0.30 s.d. more sectarian). We found no significant differences between average respondents and (1) highly devout, individually practising individuals of the same gender, or (2) less devout individuals who are communally oriented.

Together, these findings support an understanding of sectarian animosity as distinct from religiosity. But they strongly indicate that religious practice plays an important role in influencing sectarian animosity through moderating doctrines and religiously mediated socialization, which have important gender dimensions.

Economic deprivation. Next, we examine a potential driver of sectarian animosity that suggests similarities to ethno-nationalism[9]. We examine the relationship between economic well-being and sectarian animosity, using a four-point scale of household income sufficiency to measure overall economic well-being. Our findings are consistent with impoverishment making individuals susceptible to out-group resentment: a one-point increase on this scale (roughly 1 s.d.) is associated with a 0.07-s.d. decline in sectarian animosity ($P_{adj} < 0.001$).

We unpack this result using a richer specification that incorporates additional variables, including other economic measures. The results are virtually identical even after controlling for mobile phone density in the ten-kilometre radius around a respondent's home—a proxy for local urbanization and wealth that we compute from our location-tracking dataset, given the lack of fine-grained census statistics. This suggests that poverty operates individually, not on a community level. Employment, though, is more nuanced. Employed men are more sectarian than the unemployed, despite being better off (Supplementary Tables 9, 17 and 19; $P_{adj} = 0.048$). Prior work has

found that government bureaucracies, a major employer of Iraqi men, assign jobs through sect-based patronage networks that exacerbate sect-based competition for scarce resources[16-18]. In contrast, employed women are more moderate in their out-group views, as economic deprivation theory expects, although there is strong selection in the types of Iraqi women who work.

Taken together, the relationship between economic hardship and sectarian animosity forms one parallel between sectarian animosity and ethno-nationalism.

Democratic disillusionment. A third potential cause of animosity, democratic disillusionment, is often considered a core driver of modern ethno-nationalist movements. Research suggests that failures within a political system can encourage individuals to identify more strongly with other non-national identity cleavages[10,19,20]. To test the micro-foundations of these arguments, we measure political disillusionment through a BPCA-based index that summarizes a battery of questions about the stability, economic performance and morality of democracy (Supplementary Section 3.3).

Our results lend credence to these arguments. We find that dissatisfaction with democratic governance is strongly associated with sectarian animosity, although this is primarily driven by women (Supplementary Tables 9, 17 and 19; 0.18 s.d. increase per s.d. increase in disillusionment, $P_{adj} < 0.001$). We speculate that attitudes towards the out-group are more malleable among Iraqi women who, having less exposure to the public arena, form beliefs from their own life experiences rather than by absorbing societal consensus[21]. The connection is markedly weaker among men (correlated at +0.06, $P_{adj} = 0.039$; heterogeneity $P_{diff} < 0.001$) and loses significance with additional controls—countering the widespread narrative of young, disillusioned men being the key actors in sectarian conflict.

One potential objection to our disillusionment proxy is that respondents may be opposed to democracy on moral principles rather than perceived disenfranchisement. To better understand how political factors may affect intergroup tensions, we construct two additional control variables with indices that capture each respondent's (1) views on the 'proper' role of religion in government, on the basis of questions about political fatwas and related issues, and (2) news interest, using self-reported consumption frequencies across six news types. Incorporating these and other controls into our full specification, we continue to find that women dissatisfied with Iraq's current mode of governance are significantly more anti-Sunni. Finally, we note that women who support greater religious involvement in government tend to be more sectarian (+0.08, $P_{adj} = 0.025$). One explanation is that anti-Sunni individuals want Shia religious leaders to have greater influence in order to reduce Sunni political power, but it is also plausible that individuals desiring a Shia religious state resent Sunnis because Iraq's consociational system of power-sharing impedes this goal.

The strong relationship between democratic disillusionment and sectarian animosity marks another parallel between sectarian animosity and ethno-nationalistic animosity.

Intergroup contact. A commonly cited driver of inter-ethnic animus is a lack of intergroup contact[22,23]. It has long been argued that intergroup contact can soften prejudices, but rigorous tests are notoriously difficult because of measurement error and the self-selected nature of interpersonal interaction. Our study is no exception. We operationalize contact in three ways, each making trade-offs between specificity and susceptibility to bias. At the crudest level, we use a binary indicator for whether a respondent lives in a homogeneously Shia province or a mixed Sunni-Shia province, as measured by the proportions from each group on the Iraqi Council of Representatives. While individuals can and do migrate, the cost of migration makes it less likely that this explanatory variable is causally affected by sectarian animosity. We find that women in Shia-dominant provinces are 0.2 s.d. more sectarian than those in mixed provinces (Supplementary Tables 9, 17 and 19; $P_{adj} < 0.001$), but we see no such relationship among men.

However, merely living in a mixed province does not indicate direct or even indirect exposure to the out-group, particularly in areas with hyperlocal neighbourhood segregation, such as Baghdad. Therefore, we next use respondents' self-reports of whether they had Sunni friends. We find a strong negative correlation between Sunni friendships and sectarian animosity. But while self-reported relationships are a more accurate measure of contact, obvious self-selection issues make it impossible to interpret unreported results.

We therefore construct a third contact proxy based on our mobile location dataset. For each respondent reporting a geocodable home city or neighbourhood, we identify tracked mobile devices based in the surrounding area and monitor whether they appear at the Imam Hussein shrine during Arba'een week. These proportions are ranked to reduce leverage and rescaled to [0, 1]. Neighbourhood attendance rates are then used to proxy for the proportion of Shia residents. (Supplementary Section 2.2 examines this proxy in detail; the results indicate that it is high in areas known to be homogenously Shia and appropriately lower in known mixed and Sunni-dominated areas.) While this measure is imperfect—because it might also capture unmodelled neighbourhood devoutness—we believe it strikes a balance between granularity and self-selection. This measure is included in our preferred model specification. We find that among Iraqi women, a ten-percentile increase in this proxy—indicating lower Sunni presence and fewer opportunities for contact—is associated with a 0.06 s.d. increase in sectarian animosity ($P_{adj} < 0.001$).

While no individual test is definitive, the results among women consistently support the contact hypothesis—that exposure can decrease intergroup tensions. For Iraqi men, however, we find no evidence that contact matters. In the Discussion, we consider the possibility that the structure of Iraqi society leads male attitudes towards the out-group to crystallize earlier, leaving less room for influence by the life experiences described here.

These findings again highlight the importance of gender in understanding sectarian animosity, while also offering another parallel to the role of intergroup contact in ethno-nationalism. We also examine associations with violence exposure and find evidence that complicates straightforward narratives about violence causing intergroup hatred[11] (Supplementary Section 5.1).

Generalizing to Iran. To evaluate the generality of our results, we next assess the extent to which these patterns hold in our Iranian sample. In the context of the Arba'een pilgrimage, we can reduce typical concerns about cross-national comparability. Both Iraqi and Iranian respondents belong to the same sect, are more devout than their respective countries as a whole and often follow the same religious authorities. Through comparing the two countries, we gain a better understanding of which phenomena are salient only in the Iraqi context and which might generalize to the broader Shia world. However, we note that the Shia homogeneity of Iran complicates this assessment of generalizability; here, sectarian animosity is largely an abstract concept rather than a lived experience. To address this, rather than attempting to explain raw differences in sectarian animosity, we focus on whether hypothesized drivers (to the extent feasible) correlate with anti-Sunni sentiment similarly in each country. Such shared patterns are an observable implication of broader theories that claim to operate across contexts.

We find that economic deprivation seems to operate similarly. Better-off Iranians are generally less susceptible to sectarian prejudice (Supplementary Tables 10, 18 and 20; $P_{adj} < 0.001$)—a result that is primarily driven by employment. However, the general importance of economic factors mirrors our finding in Iraq, despite potential differences in mechanisms, lending credence to the view
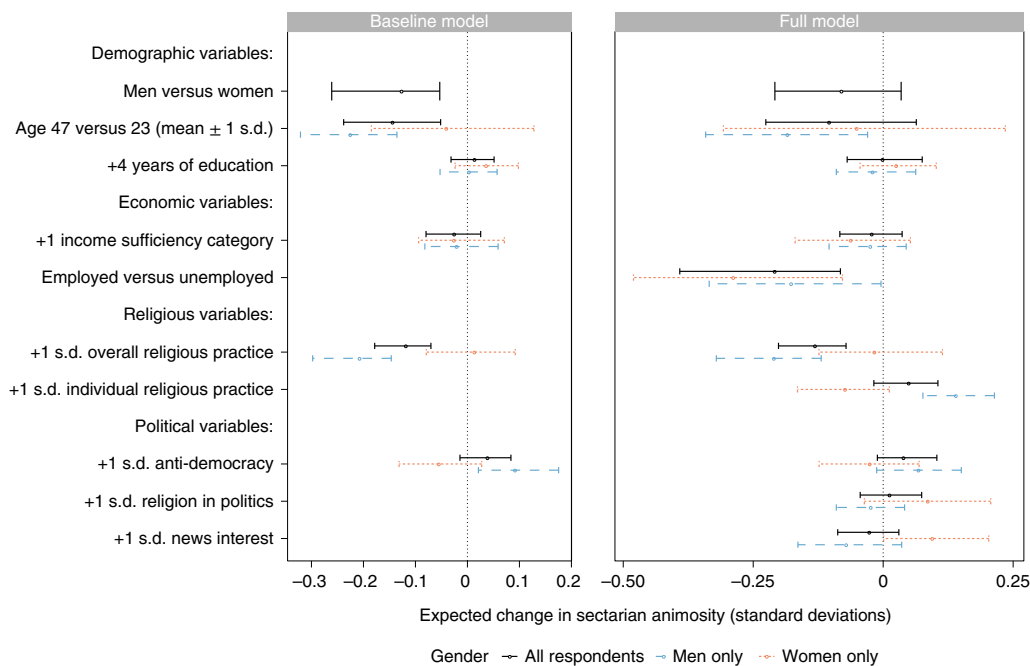
Fig. 2 | Testing theorized drivers of sectarian animosity among Iranian respondents. The left (right) coefficient plot summarizes the regression results from a specification in which single (multiple) measures correspond to each hypothesized cause. The complete results are given in Supplementary Tables 10, 18 and 20. The points and error bars are posterior means and 95% credible intervals after accounting for uncertainty from missingness, measurement and finite samples. N = 1,362 (N = 1,325) for the baseline (full) results. The full specification includes province-fixed effects. A corresponding coefficient plot for Iraqi pilgrims is given in Fig. 1.

that sectarian animosity represents a form of ethno-nationalism. At the same time, other implications of this theory cannot be evaluated in the Iranian context due to a lack of variation in the explanatory variable (for intergroup contact) or political sensitivity (for anti-regime attitudes, the Iranian analogue of anti-democratic attitudes in the Iraqi context). These limitations suggest caution in conclusions about generality, and they highlight the fact that even fully general theories will inevitably manifest differently in different settings.

In the religious realm, the results among Iranian men support our previous arguments about the moderating influence of mainstream religion. Men who are more religiously practising by one s.d. are significantly less sectarian by 0.21 s.d. ($P_{adj} < 0.001$). This correlation with tolerance is amplified among men who practise communally, as in Iraq. Among Iranian women, religious devotion has no discernible association with out-group attitudes (our baseline results rule out associations larger in magnitude than ±0.1). We interpret this as a result of Iranian women's greater political integration compared with their Iraqi counterparts, highlighting that this might be a potential long-term equilibrium that Iraqi women are moving towards, as political integration and exposure to public discourse increase.

The complete regression results are reported in Fig. 2 and Supplementary Table 10; 95% credible intervals and additional details on multiple-testing corrections are given in Supplementary Tables 18 and 20.

Worldviews associated with sectarian animosity. The rise in sectarian conflict in the Middle East has been accompanied by numerous societal shifts, including a backlash in some quarters against liberalizing gender roles, blurring between political and religious domains, and the emergence of religious organizations that recruit members and solicit financial assistance across national borders. Scholars often theorize links between these phenomena, yet no evidence exists to test whether these correlations indeed exist.

To address this gap, we examine four worldviews commonly associated with sectarian animosity. These include (1) a desire for more religious involvement in political decision-making, (2) support for Iranian involvement in the domestic politics of other countries in the region, (3) support for foreign Shia groups and (4) a sect-based political outlook that emphasizes the importance of Shia representation. Though these exploratory analyses do not necessarily test theories of sectarianism directly, associated worldviews provide insight into the plausibility of different conceptualizations that are common in the literature, targeting the link between sectarian animosity and (1) religiosity, (2) and (3) transnationalism, and (4) the political implications of ethno-nationalism.

We construct BPCA-based measures of each worldview following Supplementary Section 3.1. The component questions, loading plots and diagnostics are in Supplementary Section 3.3. The regression results are reported in Supplementary Tables 13–16 and summarized in Fig. 3; 95% credible intervals and multiple-testing-adjusted P values are presented in Supplementary Table 21.

In Iraq, we find that individuals with sectarian views tend to also hold a somewhat more sect-oriented view of politics, including the belief that out-group politicians cannot represent one's interests. (We do not examine this association in Iran, where sectarian politics are non-existent.) This is consistent with the ethno-nationalist view[10], where disempowerment leads individuals to blame the out-group. The result is intuitive, but it shows that sect is more than just a cognitive shortcut for whether a party will deliver material benefits. Rather, citizens that see national politics as a sectarian competition for resources also hold direct animosity for out-group members at the individual level. The relationship is highly significant among both Iraqi men and women (Supplementary Tables 13 and 21; $P_{adj} \leq 0.002$ for both), corresponding to a roughly 0.10-s.d. increase per s.d. increase in sectarian animosity, on average. The relationship was roughly twice as large in male respondents, but gender heterogeneity is not statistically significant.
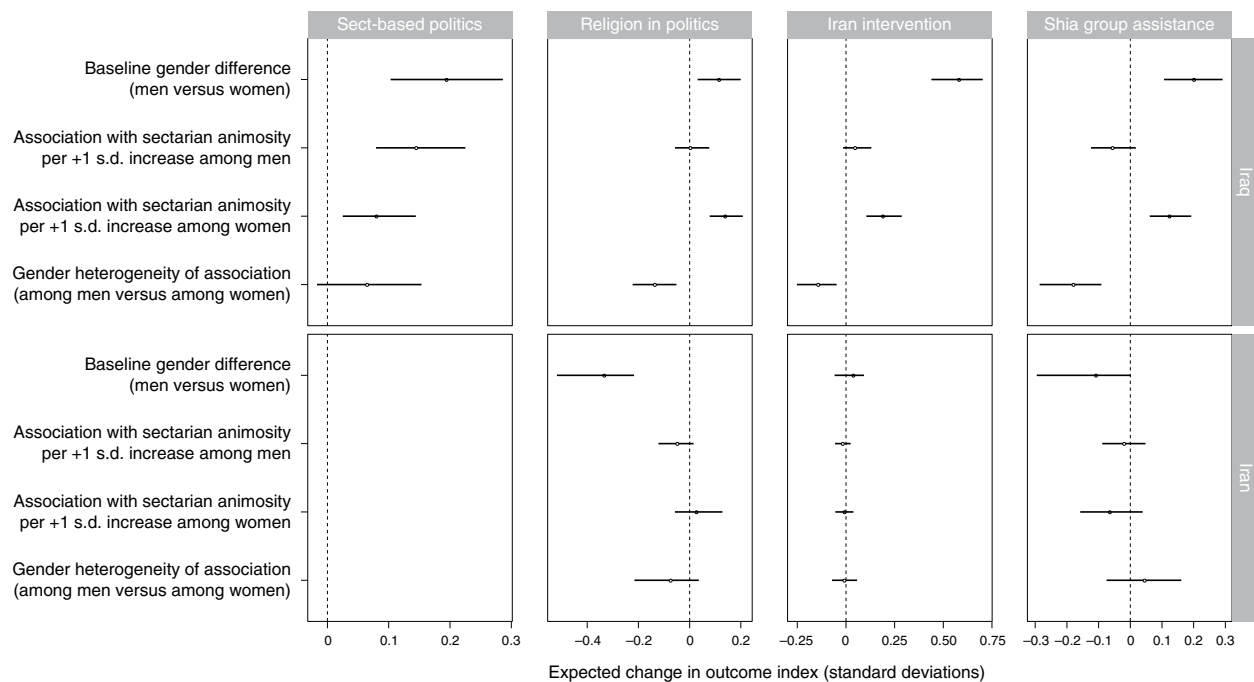
Fig. 3 | Worldviews associated with sectarian animosity, by gender. This plot summarizes regressions of each worldview on sectarian animosity, interacted with gender, along with demographic controls and province-fixed effects (not depicted). The points and error bars are posterior means and 95% credible intervals after accounting for uncertainty from BPCA-based indices. The complete results are reported in Supplementary Tables 13–16 and 21.

Surprisingly, all other attitudes that we examine follow a consistent but distinct pattern. We note three stylized facts that we suggest, in the Discussion, are consistent with ongoing belief transmission as Iraqi women increasingly enter a male-dominated public sphere. First, on every worldview, we observe that Iraqi men and women hold differing average attitudes: men desire deeper involvement by religious leaders in political decision-making, look more favourably on Iranian foreign policy interventions and support external Shia groups. Second, on every dimension, sectarian Iraqi women gravitate significantly towards the typical male position. Lastly, shifts in the beliefs of Iraqi women cannot be explained by sectarian animosity alone, because there is no apparent relationship between out-group animosity and these attitudes in any other subgroup.

Discussion
These findings provide a framework for understanding theorized origins of sectarianism among a central but understudied population. Despite the clear importance of the Saudi-Iranian conflict to geopolitics[4,24], we find no support for an individual-level understanding of sectarian animosity as a transnational movement, either with or without Iran as its leader. On a personal level, individuals with sectarian views did not show more affinity for fellow Shiites who were not co-nationals or co-ethnics. Similarly, individuals with sectarian views were not generally more aware of sectarian conflicts, nor were they generally more supportive of Shia groups within these conflicts. We do not observe the expected widespread support for the foreign policy objectives of Iran, suggesting that it is not seen as a flagbearer for Shia regional interests. Nor do we see evidence of a singular sectarian perspective in Iran and Iraq, either within our sample as a whole or among more sectarian respondents, highlighting the lack of a unified 'sectarian mindset' across the two countries.

We do, however, find that individuals with sectarian views tended to also hold attitudes resembling those of ethno-nationalists. They preferred sectarian political parties and were more critical of (non-sectarian) democratic institutions, a marker of disillusionment that often underlies ethno-national movements[10]. Similarly, various

drivers often associated with ethnicity and ethno-nationalism seem to hold within this sectarian context. In our survey, increased intergroup contact is associated with lower levels of sectarian animosity[25,26]. Real economic concerns are closely tied to sectarian animosity, much like ethnic attitudes[27,28]. Exposure to violence may also be associated with greater sectarian animosity, as with ethnic polarization[11].

The relationship between religion and sectarian animosity is less straightforward. Sectarian animosity is clearly not a manifestation of dogmatism; in fact, greater religiosity is strongly associated with less hatred among men. We propose two mechanisms, doctrine and socialization, through which religion might influence sectarian animosity. This moderating effect is consistent with a doctrinal effect, as the ayatollahs emulated by the majority of our sample explicitly promote sectarian unity. (For details on changes in emulation over time, see Supplementary Section 2.7.)

Among women, we see a highly significant correlation in the opposite direction, with more religious practice being associated with greater sectarian animosity. We suggest that this difference may be due to the second mechanism, which we term religiously mediated socialization—the transmission of (potentially non-religious) norms through religious practice—which is most salient among individuals who would otherwise be excluded from the broader social sphere. For many Iraqi women, religious practice represents one of the few opportunities to interact with society more broadly, whether through attending Friday prayers, participating in pilgrimages such as Arba'een or listening to religious teachings on political or social topics.

Four pieces of evidence point to the importance of religiously mediated socialization in explaining gender differences. First, women who engage with the public sphere through other channels—such as news consumption or work—also diverge in their sectarian animosity, suggesting that the differences are not the result of gender itself but rather of the different socialization experiences of men and women in Iraqi society. Second, the role of religious practice is magnified among women who participate in communal

events, where socialization is most likely to occur, whereas it diminishes for those who practise alone. Third, religiously practising women tend to lie much closer to the male average in terms of sectarian animosity, consistent with acceptance of mainstream social norms, rather than being spurred towards extreme levels of sectarian animosity by religious teachings. Fourth, as seen in the Results section under 'Generalizing to Iran', we do not see similar patterns in Iran, where, since 1979, women have held a larger place in the public sphere. Because Iranian women are already more involved in mainstream social and political discourses, it stands to reason that religiously mediated socialization will play a weaker role.

The parallels and contrasts between the Iranian and Iraqi samples demonstrate both the importance of broad examination and the perils of overgeneralization. In both contexts, however, sectarianism takes a decidedly nationalist bent, with its closest parallel being ethno-national movements in other contexts. Yet the inextricably religious nature of sect adds an additional layer of complexity, with official doctrine moderating anti-Sunni hatred and religiously mediated socialization seeming to aggravate it. These results highlight the unquestionably complex nature of religiously affiliated identities.

We emphasize that while this study tests the implications of various causal theories, the observational nature of the data—as well as the self-selected nature of the pilgrim respondent pool—limits the conclusions that can be drawn. Future research must examine the causal mechanisms behind these relationships in more detail, both to develop a clearer understanding of the interactions between religion, ethnicity and nationalism and to create more effective policies at the national and international levels.

Methods

Statistics. *Sampling design.* Our study aims for a geographically representative, gender-balanced sample of devout individuals across Iran and Iraq. The logistics and rituals of the pilgrimage offer a rare opportunity to access this difficult-to-reach group. We recruited across Karbala and the 80-kilometre road from Najaf, the most frequented portion of the pilgrimage route. Clusters of service tents (*mawakib*) with distinct regional identities dot this road, offering food and shelter to pilgrims from different governorates and provinces in Iraq and Iran. Travellers stop here for long periods to dine, drink water and tea, recharge mobile phones, repair shoes or take shelter for the night.

By identifying *mawakib* serving each locality, we cleanly recruited a diverse and geographically representative sample (see Supplementary Section 2.1 for details). The survey was administered to 2,410 Iraqi and 1,668 Iranian pilgrims of mixed gender; we sought roughly equal numbers of male and female respondents between the ages of 18 and 60. We provide detailed descriptive statistics on our sample in Supplementary Section 2.3. The survey research and data analysis were conducted under MIT COUHES no. 1508154225, with additional data analysis conducted under Princeton IRB no. 10942. Informed consent was obtained from all participants. About 15% of men and 20% of women declined to participate, primarily due to lack of time before their group had to depart the tent. We attribute the high response rate primarily to the structure of the pilgrimage (though the participants were also compensated with a small religious gift and a charitable donation made on their collective behalf). Individuals were resting inside tents when approached, and this natural pause made interviewees open to taking time to respond to the survey, as the pilgrimage is a highly social event conducive to interactions.

We validate our sampling strategy using a mobile-location dataset of individuals in Iraq who voluntarily share their device location with installed mobile applications. Safegraph, a location data clearinghouse, aggregated these data in an anonymized form spanning September to December 2017. In Supplementary Section 2.2, we describe how we computed the home districts of over 300,000 individuals across Iraq. For each district, we then calculated the proportion of tracked residents visiting the shrine during Arba'een week.

Supplementary Fig. 3 shows that average participation rates in Shia-dominated provinces hover around 6%; there is no evidence that geographic distance reduces attendance, with the sole exception of Karbala locals, for whom proximity leads to far higher participation. This suggests that despite variation in the cost of attendance—both economic and otherwise—these costs do not substantially influence Iraqi pilgrimage participation (or, by extension, survey sampling).

Rather, extrapolating from analyses of repeat pilgrimage participation in Supplementary Section 2.6 and Supplementary Table 5, we conclude (perhaps unsurprisingly) that religious devotion is the main dimension on which survey respondents differ from the broader Shia population. Repeat pilgrims also tend to

be wealthier in Iran, suggesting that financial considerations are more important for this group than for domestic Iraqi pilgrims. We find that religious practice is significantly associated with repeat pilgrimaging in both Iraq and Iran. Moving from the 2.5th to the 97.5th percentile in religious practice is associated with roughly a 12-percentage-point increase in the proportion of respondents who are repeat pilgrims. While this difference is substantial, it also leaves considerable room for other factors influencing participation. Moreover, the large overlap in religious practice between first-time and repeat pilgrims suggests that pilgrims in general also overlap the general population on this attribute (assuming that the factors driving repeat pilgrimage also drive first-time pilgrimage).

Using a similar strategy, we show that our sampling strategy is unlikely to produce overestimates of sectarian animosity. Repeat attendees are not more polarized, even after adjusting for a range of respondent characteristics, implying that the pilgrimage does not preferentially attract individuals with high animosity.

Finally, additional results presented in Supplementary Section 2.8 and Supplementary Table 2 show that the pilgrim sample is broadly comparable to nationwide and Shia-specific Iraqi samples obtained by the World Bank Living Standards Measurement Survey[29] and the Arab Barometer[30,31] in terms of distributions of age, education and income sufficiency. In light of these results—on the geographic representativeness of the pilgrim sample, the demographic representativeness of the pilgrim sample and the likely substantial overlap in religious practice between pilgrims and the broader Shia population—we posit that the results will generalize to a substantial portion of non-pilgrimaging Iraqi Shiites, though as noted above, a key limitation of our sampling approach is that we cannot directly examine this group. The scope of these conclusions is examined in the Results under 'Generalizing to Iran'.

Measurement. To aggregate various measures of sectarian animosity, we develop a latent-dimension measurement strategy based on self-reported attitudes towards Sunnis. We then conduct numerous tests to assess its quality, including vignette experiments, conjoint experiments and a behavioural measure based on donations to sectarian organizations. We find that the proposed measure strongly and consistently explains anti-Sunni behaviour across five scenarios of varying realism (detailed in Supplementary Section 4), alleviating concerns that our metric captures salience or social desirability rather than sectarian animosity.

Our measure of sectarian animosity uses BPCA[32] to aggregate multiple questions, each imperfectly proxying the same unobservable construct, into a weighted index. Principal component analysis is a widely used technique (including in the study of Islam[33]) and reduces reliance on individual questions. However, in using the resulting proxies to test causal theories, we follow ref. [34] by ensuring that subsequent analyses—regressions using the resulting index—accurately reflect uncertainty from dimension reduction and missing data.

We apply this procedure to a battery of questions relating to out-group perceptions and stereotypes. For simplicity, a uniform prior is used in all analyses; due to the size of the data, the results are not sensitive to this choice. Survey question wordings, loadings and diagnostics for the BPCA measures are reported in Supplementary Section 3.3; the measures are robust to dropping component questions, minimizing concerns that a flaw in any individual question leads to incorrect results. BPCA measurement is similarly applied to question groups about attitudes towards democracy, self-reported religious practice, desire for religious involvement in government, news consumption, support for Iranian interventions in other countries, support for foreign Shia movements and sect-based views on politics (see Supplementary Section 3.3 for details).

Regression analysis. Our analysis of each potential driver progresses in three parts. First, we regress sectarian animosity on demographic controls (ancillary covariates including gender, income sufficiency, a quadratic term for age and years of education) and an overall summary indicator for each hypothesized driver using the Bayesian regression procedure below. We refer to this as the 'baseline specification'. The analyses are conducted one country at a time to avoid partial pooling. Next, we examine important gender heterogeneity by further disaggregating to female and male respondents in each country; the model specifications remain unchanged except for the omission of gender indicators. Finally, we conduct a more robust analysis that further incorporates multiple measures relating to each theorized driver—for example, to understand the role of economic deprivation, we use household income sufficiency, employment status and local mobile-phone density (a proxy for wealth and urbanization). This 'full model' represents our preferred specification, as it best captures the richness of existing theories (p. 7). Like the baseline model, this full model is applied to Iraq and Iran separately, both pooling and disaggregating respondent genders. (We note that the tests of drivers are limited to those implied by the religiosity and ethno-nationalism theories. The key driver implied by the transnationalism theory, exposure to information about in-group persecution, is difficult to disentangle from the factors examined in the Results under 'Worldviews associated with sectarian animosity'.)

All regressions that utilize BPCA variables, whether individually or in combination, incorporate their uncertainty by taking repeated draws from the BPCA posterior—where a draw is a vector representing each of the N respondents' positions on the latent dimension of interest—and, for each draw, conducting a

Bayesian linear regression. The reported results account for uncertainty from both the dimension reduction procedure and the regression analysis by numerically integrating over the BPCA and regression posteriors. The technical details are given in Supplementary Section 3.2.

Multiple testing. The reported analyses include a wide range of outcomes and alternative specifications. To control the false-discovery rate in the face of multiple testing, we compute Bayesian *P* values based on two-sided tail probabilities and then apply an adjustment (P_{adj}) according to the hierarchical testing procedure of ref. [35]. To deal with a nested testing structure in which several tests belong to a 'family' bearing on one overarching hypothesis, this approach computes and adjusts both overall family *P* values (for example, whether any economic factors matter) and within-family *P* values for individual hypotheses (which specific economic indicators matter). Briefly, this procedure relies on a combination of (1) the Simes method[36] for testing the intersection null for all hypotheses within a family and (2) the Benjamini-Hochberg procedure[37] for controlling the false-discovery rate when examining multiple families or unpacking constituent hypotheses within a family. See Supplementary Section 6 for details and Supplementary Tables 17–21 for the results.

Reporting summary. Further information on research design is available in the Nature Research Reporting Summary linked to this article.

Data availability

The replication data are available via CodeOcean at https://doi.org/10.24433/CO.1650288.v1.

Code availability

Reproducible code and third-party verified results are available via CodeOcean at https://doi.org/10.24433/CO.1650288.v1.

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Author contributions

F.C. collected the data. E.D. and D.K. analysed the data. F.C., E.D. and D.K. wrote the paper.

Competing interests

The authors declare no competing interests.

Additional information

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Data collection	Qualtrics was used to record responses
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Behavioural & social sciences study design

All studies must disclose on these points even when the disclosure is negative.

Study description	Quantitative, experimental
Research sample	Arbaeen pilgrims selected to be geographically representative of Iranian and Iraqi Shia.
Sampling strategy	Geographically stratified sampling of pilgrimage participants. A large scale survey (4078 respondents) was conducted to ensure statistical power.
Data collection	Survey instrument. Responses were elicited in a semi-public space, isolated to the maximum extent feasible in the study context. Enumerators were blind to conditions.
Timing	Late 2015
Data exclusions	No data was excluded.
Non-participation	About 15% of men and 20% of women declined to participate, primarily due to lack of time before their group had to depart.
Randomization	Participants were randomly allocated to groups.

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Human research participants

Policy information about studies involving human research participants

Population characteristics	We sought roughly equal numbers of male and female respondents between the ages of 18 and 60. See also above and detailed descriptives in SI.
Recruitment	Survey respondents were approached at rest areas in pilgrimage; self-selection here is unlikely to be a threat here due to high response rates and the fact that nonresponse was primarily driven by logistical factors (sufficient time) rather than attitudinal factors. Selection into pilgrimage participation (a factor in our study's generalizability) is examined in analyses of (1) mobile location tracking and (2) repeat pilgrimage and found to be unrelated to the key explanatory variable of interest.
Ethics oversight	MIT COUHES #1508154225, Princeton IRB #10942

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Field strength	*Specify in Tesla*
Sequence & imaging parameters	*Specify the pulse sequence type (gradient echo, spin echo, etc.), imaging type (EPI, spiral, etc.), field of view, matrix size, slice thickness, orientation and TE/TR/flip angle.*
Area of acquisition	*State whether a whole brain scan was used OR define the area of acquisition, describing how the region was determined.*

Diffusion MRI   ☐ Used   ☐ Not used

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Preprocessing software	*Provide detail on software version and revision number and on specific parameters (model/functions, brain extraction, segmentation, smoothing kernel size, etc.).*
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