Religious Messaging and Adaptation to Water Scarcity: Evidence from Jordan

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Abstract

Can culture drive policy change? I study this question using a randomized evaluation in the context of water preservation in Jordan. Water preservation is crucial in the face of rising scarcity, yet it is challenging to change behaviors. In an experiment involving women attending religious classes, those in treated classes receive messaging on the sanctity of water in Islam, while the others attend classes on an unrelated religious topic. The treatment fosters prosocial attitudes and conservation efforts regarding water resources. Relative to the control, treated women were 28% more likely to donate to a water charity. More importantly, after three months, they reduced objectively measured water consumption by 17%. Exploring mechanisms, the messages work by instilling religious beliefs about water, especially those firmly rooted in the religious canon. In contrast, I observe a backlash against new practices, such as treated water adoption, that are not grounded in the tradition. Effective religious leaders emphasize concepts of moral responsibility over ritual practice and adopt an interactive teaching style. My findings provide new evidence on both the power and limits of harnessing culture to enhance policy effectiveness.

Keywords: culture, religion, water scarcity, Middle East

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1 Introduction

Development policy does not operate in a vacuum — it unfolds within specific cultural contexts. Economists are only beginning to explore how culture shapes the effectiveness of policy interventions. Nunn (2019) argues that accounting for local cultural contexts is essential for policy success in developing countries, as interventions that clash with deeply rooted cultural traits can backfire (Lowes and Montero, 2021). While this emerging agenda focuses on mitigating cultural frictions in policy design (Bau et al., 2024; Alsan et al., 2019), a different question arises: can cultural norms and traditions be actively harnessed to enhance, rather than hinder, policy effectiveness?

In the face of rising water scarcity in Jordan, I investigate whether religion, a core aspect of local culture, can foster prosocial attitudes and conservation efforts toward water. The Middle East and North Africa suffer from the world's most severe water scarcity, further exacerbated by climate change.[1] In response to this mounting crisis, individuals must adapt their behaviors and prioritize water conservation, yet shifting ingrained daily habits is challenging. At the same time, Islam, the dominant religion, grants water a sacred status and strongly emphasizes its conservation. This presents a unique opportunity to test, for the first time, whether culture can serve as a catalyst for spearheading change.

In this paper I test whether religious messaging, i.e. an argument based on religious grounds, motivates individuals to preserve water by highlighting its significance in Islam. Specifically, I conduct a field experiment with women attending religious classes led by female religious leaders in Jordan. Women are key to the design of effective water policies, as they are primarily responsible for household water management (Proctor, 2014). Despite this, social norms limit women's participation in public activities, resulting in limited research on women in the Middle East. I rely on the fact that in this context, practicing women often attend classes at the mosque with female preachers, known as waethats, who instruct them about Islam. By involving religious leaders who have privileged access to women, this study provides an opportunity to learn about an often-overlooked population in a gender-segregated society.

In my experiment, I select 19 religious leaders to convey to their classes messages rooted in religious beliefs with the aim to motivate women to value and conserve water. The intervention was designed in partnership with the German Agency for International Cooperation (GIZ) and the Jordanian Ministry of Islamic Affairs, which trained waethats

[1]The United Nations projects that by 2025, approximately two-thirds of the world's population will confront water-stressed conditions, mostly concentrated in the developing world.

to teach Islamic lessons about water. Each religious leader holds one treatment and one control class, chosen randomly. Women in treated classes receive messaging about the importance of water from an Islamic perspective. Control women attend a lesson on an unrelated religious topic. All women, regardless of treatment status, receive nonreligious content on water conservation from the waethats. The intervention consists of only one meeting per class.

The experiment is designed to control for several confounding channels. Stratification by religious leader allows me to take into account women's self-selection into religious leaders, as well as variation in leaders' identity that can affect women's behaviors (Bassi and Rasul, 2017; Dippel and Heblich, 2021; Cagé et al., 2021; Assouad, 2020). The provision of information to both treated and control women ensures that their baseline knowledge of secular aspects of water scarcity and conservation is the same. The active control holds fixed the religious setting across treatment status, mitigating unintended framing effects (Tversky and Kahneman, 1981). Consequently, effects are identified by experimentally varying the content of the religious message delivered in the class, conditional on leaders' identity, religious priming and nonreligious information.

I run surveys of women before the class (baseline), immediately after (midline), and three months later (endline), and I record water consumption from water bills and donations to existing charities involved in water preservation. Combined, these data allow me to measure effects of the treatment on women's prosocial attitudes toward water and water conservation. I also capture women's beliefs about what Islam teaches on water, using context-specific survey measures to detect subtle changes. Finally, I collect audio recordings of the classes, providing information on the leaders' teaching style and the content of the lessons, which is difficult to glean through survey data.

I find that exposure to religious messaging on water preservation fosters prosocial attitudes toward water resources and eventually increases water-conservation behaviors among participants.[2] At the end of the class, I observe that treated women become more prosocial toward water resources, proxied by their choice to donate to charities involved in water preservation: the treatment increases women's donations to a water charity (1.7 Jordanian Dinars (JOD), p-value = 0.00); treated women are also more likely to choose a water charity over other charities in order to donate 700 JOD on behalf of the class (11 p.p., p-value = 0.00). The treatment not only makes women more prosocial but affects their perceptions of their efficiency to manage water in the household: treated women

[2]Since water scarcity is a communal issue, donations provide a way to test whether the treatment increases women's willingness to sacrifice their own resources for the collective good.

adjust downward their perception of how water efficient they are by 0.39 points on a 7-point scale (p-value = 0.00).

These changes in prosocial attitudes and perceptions translate into a substantial reduction in water consumption three months after the intervention: treated women's households consume 4.6 cubic meters of water less on their water bill (p-value = 0.00), reflecting a 17% reduction in water consumption following the intervention. This substantial cutback is driven by high-usage households, and it is accomplished by reducing the frequency of and time spent on water-intensive household chores, such as laundry and house cleaning.

I then turn to explore the mechanisms behind the effects on behaviors, leveraging my data on religious beliefs. I argue that religious messaging affects women's behaviors by influencing their religious beliefs about water. Notably, treated women do not exhibit more knowledge about the water crisis or water-saving methods, nor do they show a heightened level of religiosity. Still, when asked about their primary motivation for saving water in the three months following the intervention, treated women are 43 s.d. (p-value = 0.00) more likely to cite religious concerns ("save water to be religiously pious") rather than environmental ("save water to be more water efficient") or moral ones ("save water for future generations").

However, the treatment does not uniformly influence all religious beliefs related to water. It is important to understand which religious beliefs the treatment is shifting, since these are likely to underlie the behavioral changes. The treatment is most effective in instilling religious views that are firmly rooted in the religious canon. Also, its delivery in a classroom setting increases social stigma around water waste, consistently with prior research indicating the influence of social norms on water-conservation behaviors (Ferraro and Price, 2013; Allcott, 2011). In contrast, the treatment fails to support new practices, such as treated water adoption, which have been recently accepted by religious scholars and are thus not grounded in the tradition. I observe a backlash against such new interpretations of long-held practices, especially among more conservative women. This last result highlights the complex interplay between messaging and personal convictions, adding evidence to research on the relation between new information and pre-existing entrenched beliefs (Baysan, 2022; Blumenstock et al., 2022). It also shows that when policies are not clearly linked to tradition —like new technologies— cultural interventions may backfire, by making people more aware of their cultural traditions and thus more resistant to adopting new practices.

Finally, I investigate whether religious leaders' communication differentially affects women's outcomes. Religious leaders are free to choose the content and teaching style for

their classes. Through Empirical Bayes methods, I discover large variance in treatment effects across religious leaders, indicating that some leaders are more effective than others. To understand the source of this heterogeneity, I perform human-based content analysis on the classes' recordings to classify the content and teaching style of each class. I find that leaders emphasizing concepts of moral responsibility, such as stewardship of nature or sinfulness of wasting water, correlate with larger treatment effects than those discussing more tangible aspects of religious practice, such as best methods for performing ablutions.[3] Also, classes are most effective when leaders adopt an engaging, participatory method rather than a top-down approach.

In sum, my findings provide new evidence on the potential of harnessing culture – specifically religion– to change behaviors. Religious interventions work by tapping into individuals' beliefs, provided messaging does not clash with entrenched previous beliefs and aims to motivate rather than lecture.

This paper relates to four strands of literature. Primarily, it contributes to a recent strand of literature, originating in the work of Nunn (2019) and Lowes (2022), highlighting the role of local culture in shaping development policy. While there is observational evidence on the interaction between development policy and culture (Le Rossignol et al., 2024; Ashraf et al., 2020; La Ferrara and Milazzo, 2017), its potential to drive change in field interventions remains underexplored. Some experimental work examines how cultural norms constrain policies and explores ways to alter the conditions that sustain them. For instance, building on Lowes and Montero (2021), which shows that colonial medical campaigns eroded trust in medicine, recent research in health policy emphasizes addressing these deep-seated trust deficits to improve health outcomes (Bau et al., 2024; Alsan et al., 2019). Gulesci et al. (2023) show that introducing in a given culture an intermediate action can facilitate the elimination of a harmful norm by replacing it. In contrast, my work shows that cultural norms can become the vehicle for spearheading change. My findings reveal that interventions can tap into the cultural roots of a society, transforming them into catalysts for the implementation of policies that benefit the environment. Thinking of culture as an instrument rather than a constraint is, to the best of my knowledge, new to the literature.

This paper also builds on a strand of literature, initiated by the work of Bénabou and Tirole (2016), arguing that noncognitive skills are important drivers of socio-economic outcomes and can be acted upon through interventions directly targeting beliefs and

[3]Furthermore, concepts highlighting women's role as homemakers, primarily responsible for water, show opposite effects, displaying a tension between water-conservation efforts and traditional gender roles.

values (Duckworth et al., 2007; Kautz et al., 2014; Blattman et al., 2017; Vicente et al., 2021). Bursztyn et al. (2019) is the only other study targeting religious beliefs, where they randomly vary religious appeals to affect debt repayment in a field experiment with an Indonesian Islamic bank. Unlike Bursztyn et al. (2019), I find that it is religious beliefs specifically —rather than broader moral appeals— that drive the effects, which may be due to the more comprehensive cultural intervention designed in this study compared to their light-touch approach. Thanks to this fully-fledged religious intervention, this study provides deeper insights into the mechanisms behind religious interventions and the role of religious actors—especially in low-state-capacity contexts—where support from non-governmental institutions is essential for the success of public policies (Acemoglu et al., 2020; Vyborny, 2021).

My results also contribute to research on the role of nonprice mechanisms to induce conservation of natural resources. While previous literature has focused on policies based on social norms, I prove for the first time that religion matters for conservation behaviors.[4] My religious intervention is particularly successful in curbing water consumption. Existing research points to reductions in water usage of around 3%–5% from interventions leveraging social pressure (Ferraro and Price, 2013; Bernedo et al., 2014; Brent et al., 2015), 26% from utility-sponsored conservation programs targeting social norm (Jessoe et al., 2021), up to 38% from automated enforcement of water restrictions (West et al., 2021). My estimates fall within this range, with religious interventions showcasing greater impact than conventional social-norm programs. Consistently with previous studies, high users are the most responsive to social norms and belief-based interventions (Allcott, 2011; Ferraro and Price, 2013). Moreover, while most evidence on adaptation to climate change is about the US and Europe, I study it in a developing country.

Finally, this study relates to the literature finding a strong association between religion and prosocial behaviors in cross-country observational studies.[5] By relying on novel microlevel data mapping the process of beliefs formation and capturing diverse religious content, I contribute by shedding light on which aspects of religious beliefs and practice determine prosocial preferences in a real-stake experiment, as well as pinpoint the change in religious beliefs responsible for the effects on prosociality.

The rest of the paper is organized as follows: Section 2 describes the Jordanian context

[4]See, for instance, for energy: Allcott (2011); Ayres et al. (2012); Allcott and Rogers (2014); Pellerano et al. (2017); Schultz et al. (2007). For water, see: Ferraro and Price (2013); Bernedo et al. (2014); Brent et al. (2015); Jessoe et al. (2021).

[5]See, for instance, Henrich et al. (2010); Norenzayan and Shariff (2008); Norenzayan (2013); Purzycki et al. (2016); Soler (2012); Soler (2012); Benjamin et al. (2016); Caicedo et al. (2023).

and the study population. Section 3 illustrates the experiment and the intervention in detail. The main results are shown in Section 4, and mechanisms are discussed in Section 5. Section 6 presents results of content analysis. Section 7 presents cost-benefit-analysis estimates. Section 8 concludes.

2 Context

The Middle East and North Africa (MENA) is the driest area on the planet, and, with climate change unfolding, it is anticipated to be among the first regions to completely run out of water. The World Bank projects that per capita water availability will fall by 50% by 2050.[6] Extreme water insecurity might have far-reaching negative socioeconomic and political consequences in an already-unstable geopolitical scenario, generating economic losses, social unrest, conflicts, and new waves of displacement.[7] Since water and its preservation have special standing in Islam, this paper studies if a water policy grounded in the tenets of Islam can foster individuals' adaptation to water scarcity. I conduct my experiment in Jordan, located in the Levantine area of the MENA, which is projected to be severely affected by droughts and reduced precipitation (Rajsekhar and Gorelick, 2017).

2.1 Water Scarcity in Jordan

Jordan is the second most water scarce country in the world (UNICEF, 2023). The population's water demand is met by over-pumping the groundwater, which is used twice as quickly as it can be replenished (USAID, 2023). Worryingly, climate change and population growth are accelerating the pace at which water supply is depleting.[8] Jordan's per person annual water share has been projected to fall from 145 to 90.5 cubic meters by

[6] See World Bank, 2007

[7] The climate-related water shortage in MENA will cause economic losses estimated at 6% to 14% of GDP by 2050, which is the world's largest (World Bank, 2017). Moreover, protests and tensions over water shortages have already arisen in Iran, Jordan, and Egypt (Reuters, 2019). Tensions over water availability might also heighten the likelihood of "water wars" in the near future (Mbaku, 2020). Finally, climate-induced compound events could generate new waves of refugees and displaced people, with up to 8% of North Africa's population expected to move internally by 2050 (Clement et al., 2021).

[8] Rajsekhar and Gorelick (2017) points to three major changes in climatic patterns in Jordan: an increased risk of droughts, from 23% in the period 1981–2010 to an estimated 94% in the period 2071–2100; a 4.5. degree Celsius rise in temperatures in 2071-2100; a 30% decrease in annual rainfall by the 22nd century. Moreover, following the onset of the Syrian conflict, the arrival of around 655,000 refugees, around 8% of Jordan current population, has further increased water pressure on this limited resource (Proctor, 2014).

2025. In comparison, an average American disposes of approximately 9,000 cubic meters of water per year (Proctor, 2014).[9]

Water scarcity is primarily a domestic, daily, issue. In Jordan, domestic uses make out for 45% of total water consumption (MWI, 2020). Water scarcity is binding: households get access to running water only once or twice per week. The days when water arrives are known as "water days", when water is expected to flow from pipes for twenty-four hours. During water days, households replenish rooftop tanks to store water for the rest of the week and do the most water-intensive chores, such as laundry and car washing, since running water is available then. Responsibility for these chores falls disproportionately on women, who are the main providers of fresh water in the household. However, rising water scarcity is challenging already-strained resources and lifelong habits of water management. Water cut-offs, delays, and intermittent service are increasingly common, especially in the dry summer months, and more and more people run out of water largely before the next water day (Proctor, 2014).

Although Jordanians are well aware of water scarcity, they are not prioritizing this issue and adapting behaviors fast enough to worsening water conditions. While studies report that 84% of respondents believes Jordan faces a critical water shortage and 72% are aware of cheap water-saving methods, there is still a gap in adoption and respondents rank actions toward water preservation lowest on the list of priorities for government spending and foreign aid preferences (Abufalgha, 2022; USAID, 2018).[10] Indeed, most water-saving behaviors stem from long-standing routines rather than adaptive responses to the escalating water crisis.[11] Also, while the region's water-service fees are extremely low and governments could in theory raise them to limit water demand, water reforms are extremely unpalatable for political and cultural reasons.[12]

[9] In the 1990s, the annual renewable freshwater available per person in Jordan stood at 540 cubic meters, a decrease of 73% over 30 years (Faruqui et al., 2001). When supply falls below 1,000 cubic meters per capita per year, a country is said to experience water scarcity, and below 500 cubic meters, absolute scarcity.

[10] Awareness of water scarcity is high, thanks to multiple efforts of the government and international NGOs to communicate knowledge on the impending crisis and foster collective action. For instance, in 2019, a large governmental awareness campaign was able to reach 3.5 million Jordanians through slogans on billboards, newspapers, television and social media (Dergham and Favazza, 2020).

[11] According to USAID (2018), the most popular conservation efforts take the form of small behavioral changes, such as closing water faucets during short washing (14%), adoption of indoor and outdoor cheap water-saving devices (9.5%), or taking shorter showers (9.5%). Adoption rates are lower for practicing some form of rainwater harvesting (2.1%), or installation of smart flush toilets (2.7%).

[12] On average, the price charged for water in the region is about 35% of the cost of production, making the implicit water subsidy the highest in the world (Kochhar et al., 2015). Islamic law principles treating water as a public good make market approaches to water management, such as increasing tariffs and privatizing utilities, frown-upon by the society at large (Faruqui et al., 2001). MENA citizens believe

2.2 Water in Islam

About 98% of the Jordanians practice Islam and manifest their practice in everyday life.[13] Water has special standing in Islam, and its conservation is prescribed by religion (Snarey, 1996).[14] My experimental classes delved around six main concepts on water in Islam:

Blessing, stressing the invaluable gift of water to humankind. Water is considered the foremost of God's blessings, as it makes life possible (*"We made from water every living thing"*; Quran, Surah Al-Anbiya, 21:30)).[15]

Stewardship, emphasizing humans' responsibility as caretakers of nature. Humans are considered vice-regents or stewards of the earth, who inherit it from older generations and are responsible to pass it on to posterity (*"The world is beautiful and verdant, and God has made you its stewards"*; Quran, Surah Al-A'raf, 7:31).[16]

Sin, considering misuse of water as sin, implying punishments. For instance, the Prophet stated that among the unforgiven people on the Day of Judgement are *"a man who possessed superfluous water on a way [who] withheld it from the travellers"* (Sahih al-Bukhari). Islamic sources discourage water waste (*"Eat and drink: but waste not by excess, for God love not the wasters"*; Quran, Surah Al-A'raf, 7:31).

Practice, covering water-related religious practices such as, especially, the daily ritual ablutions of *whudu* and *ghusl*. It is mandatory for an observant Muslim to reach a state of ritual purity through ablutions before prayers. *Wudu* is a short ablution preceding the five mandatory daily prayers (*salat*), which are among the five pillars of Islam.[17] *Ghusl*

that it is governments' responsibility to keep utility prices low, which makes governments reluctant to raise tariffs for fear of widespread protests (de Waal et al., 2023).

[13]For instance, according to Arab Barometer data from 2022, 88% of respondents reported to pray daily, and 73% to read Quran daily. Since religion influences how people think about societal issues, half of respondents declared to follow a religious role model over alternative, secular, ones, and stated that religion should guide decisions on important social choices.

[14]The link between religion and environment is in fact deep: Islam originated in desertic societies faced with the need to promote the prosocial use of water, a highly scarce resource. Islamic tenets, encompassing preservation and equitable sharing of water, reflect the central role of water scarcity (Snarey, 1996).

[15]Water symbolizes Allah's benevolence to humankind, which made life possible: "And Allah has sent down water from the sky, thereby giving life to the earth after its death" (Quran, Surah Al-Baqarah, 2:164). Water is a blessing even in the afterlife. The Quran depicts God's throne resting upon water and describes Paradise as a "Gardens beneath which rivers flow" (Quran, Surah Al-Baqarah, 2:25).

[16]Humans are appointed as stewards (*khalifah*) of God's creation.

[17]Mandatory (*Fard*) wudu consists in washing several parts of the body (namely, face, arms, wiping the head and the feet) three times.

is a longer ablution consisting in a full-body cleansening mandatory in some cases before the performance of various rituals, such as the Friday prayer. Failing to perform ablutions invalidates prayers, which is exemplified in the hadith that *"cleanliness is half of faith"* (Sahih Muslim). Though the ablutions require water, the centrality of water conservation calls for moderation even in such holy ritual task ("*Do not waste water even if performing ablution on the bank of a running river"*, Sahih al-Bukhari).[18] Charity is another aspect of practice intertwined with water. In Islamic doctrine, giving alms to the poor is an important act of worship, and the Prophet emphasized sharing water as the foremost act of charity (*"The best charity is giving water to drink"*; Sahih al-Bukhari).[19]

Ownership, addressing legals aspects of water rights from Islamic jurisprudence (*Sharia)*, primarily the ownership and sharing of water on religious grounds.[20] It recognizes water as a communal resource that should be equally accessible to all members of the community, and forbids private ownership of it (*"Muslims have common share in three things: pasture, water and fire"*; Musnad).[21] Although interpretations have evolved, economic measures like raising tariffs and privatizing utilities remain controversial in Muslim-majority nations because of these principles.

Women Role, highlighting women's pivotal role in water management. While there are no explicit teachings solely focused on women, in Islamic tradition they are the primary homemakers and caregivers, which includes responsibilities related to managing water and rising future generations.

[18]The quantity of water to be used in ablutions is suggested in the ablution habits of the Prophet, who "used to perform ablution with one mudd of water [2/3 of a liter] and used to take a bath with one sa' up to five mudds [2/3–1/2 liters]" (Sahih al-Bukhari).

[19]Zakat is a religious obligation to donate an amount depending on one's wealth, and it is one of the five pillars of Islam. Sadaqah, in contrast, is voluntary charity. In early Islamic desert societies, this mostly amounted to affluent believers' provision of public wells and fountains to their communities. For instance, the Prophet advised one of his companions to buy the well of Ruma (a settlement in Arabia) and make its water freely available to the whole community. Today, tsadaqah takes the form of donations to provide access to clean water to poorer communities (Faruqui et al., 2001)

[20]Sharia refers to the Islamic legal framework derived from the Quran and the Prophet Muhammad's tradition. It encompasses laws and ethical guidelines governing various aspects of Muslim life.

[21]The Prophet discouraged trading water, and even forbade to sell excess water ("What is forbidden is to sell the surplus water of a well and springs at their source")

2.3 Study Population: Women Attending Religious Classes

My sample consists of women attending classes led by female religious leaders. Women are key in the design of effective water policies. Indeed, they are in charge of day-to-day management of water in the household, as they conduct water-intensive household chores and are responsible of making sure water is available (Proctor, 2014). However, social norms limit women's mobility in Jordan, a gender-segregated society, making it challenging to reach them (World Bank, 2013). In my setting, practicing women often attend classes at the mosque with female preachers, known as waethats. Participation in these classes is voluntary and women usually attend classes for several years with the same waethat, with whom they form long-term connections.[22] Religious leaders thus have privileged access to women, compared to other actors, such as secular organizations or state actors (Underwood and Kamhawi, 2015). Leveraging this socially accepted activity, my intervention is designed to affect domestic water consumption, which consume 45% of total water supply in Jordan (MWI, 2020).

Religious Leaders. In cooperation with GIZ and the Ministry of Islamic Affairs, I select 19 female religious leaders in urban communities in the northern governorates of Amman, Irbid, and Mafraq.[23] Figure 1, Panel (a), shows in green the location of the major cities of these governorates.[24] The targeted waethats were conducting one class each week for two groups of women. Panel (b) represents the exact location of treatment and control mosques where the selected waethats operate.

Women. The final sample consists of 712 women who were already attending religious classes with the selected waethats. Table A1 in the Appendix reports women's baseline characteristics. The sample is relatively homogeneous in terms of socioeconomic background. Most of the women have some form of higher education, but 95% are housewives, reflecting women's limited participation in MENA economies despite their skills. Relevantly, 50% of women in my sample go to mosque more than once a week, giving them frequent opportunities to leave their homes. Religious leaders' influence is high: 81% of women seek their advice at least once a month, and 84% reports to frequently change mind on an issue after consulting with them.[25]

[22] Moreover, differently from men, women have a regular, usually weekly, interaction with their waethat, since waethats organize recurrent classes with the same group of women over a prolonged period of time. Therefore, the extent of interaction and built trust provides a better setting to deliver succesfull messages.

[23] As these are the most populated areas of Jordan, their water reservoirs exhibit the highest rates of depletion, necessitating timely conservation efforts (MWI, 2020).

[24] I relied on a 2022 survey conducted by GIZ in these areas to identify urban neighborhoods where at most 10% of interviewed women reported to have heard about water conservation in the mosque.

[25] The variable equals 1 if a woman answers "Always" or "Usually".

Women in my sample receive water in their houses less than twice per week on water days. Approximately 50% of respondents indicate that the weekly water supply barely meets their needs, and around 52% have faced issues of water access in the past month. On average, each woman in the sample owns approximately two water tanks, used to store water between water days.

3 Experimental Design

To study the effect of religious messaging on water conservation, I conducted a randomized control trial (RCT) with women attending religious classes with female religious leaders. In the treatment group, women attended a lesson on water preservation from an Islamic perspective, while those in the control group attended a class on a religious topic unrelated to water. Both groups additionally received nonreligious information on water conservation. With the assistance of my local partners, The German Agency for International Cooperation (GIZ) and the Ministry of Awqaf and Islamic Affairs, I randomized 712 women into the experiment.

3.1 Experiment Details

The intervention took place between July 24 and August 14, 2022 in the urban areas of Amman, Irbid and Mafraq. Figure 2 illustrates the timeline of the study and data collection activities.

I designed a pairwise randomized experiment, in which the treatment assignment was randomly determined at the class level stratifying by religious leader, so that each of them taught one treatment and one control class.[26] The randomization was private to the research team and performed after the classes were scheduled to ensure that the waethats could not selectively shift classes. To prevent self-selection into the treatment, women were not informed in advance about the topic of the class.

Stratification by religious leader takes into account self-selection of women into religious leaders, and any effect related to the identity of the person delivering the message.[27]

[26]Indeed, to stratify at the waethat level, I only considered waethats who regularly hold one class per week for each of two groups of women.

[27]Literature on leadership has shown that charismatic leaders can affect various outcomes, such as fertility (Bassi and Rasul, 2017), social movements (Dippel and Heblich, 2021), votes (Cagé et al., 2021) and nation building (Assouad, 2020). Regarding religious leaders, Wang (2021) shows that an American Catholic priest was able to sway voting and induce anti-Semitism through the radio in the 30s.

Before delivering the experimental class, and irrespective of being in treatment or control group, the waethat read, explained and distributed to women an informational leaflet on the water crisis in Jordan and several water-saving techniques to mitigate water wastage in the household. This exercise took around 20 minutes.

Providing information to both groups aimed to equalize baseline knowledge of secular aspects of water scarcity and conservation. Ideally, the intervention is meant to provide religious messaging on water, holding constant nonreligious information on the topic. However, religious messages can carry nonreligious information that may influence behavior.[28] For instance, a message about the religious suitability of treated water not only reassures believers but also informs them of the technology's existence. By delivering information, both groups receive information about the technology, but only treated women are further instructed on its religious suitability. As additional perk, the leaflet, by highlighting the research team's interest in water scarcity, could mitigate differences in social desirability bias between the two groups.

After the information session, the class was delivered according to treatment status. In treatment classes, women attended a class on water conservation from religious perspective, where religious leaders instructed believers on the importance in Islam of water and its preservation. The control group instead attended a class on a religious topic unrelated to water. By relying on an active control, I held constant the religious setting, mitigating unintended framing effects, such as emotional and attention responses (Tversky and Kahneman, 1981).[29] [30]

After the intervention, religious leaders returned to their regular class schedule. They were instructed not to teach topics related to water in Islam for the next three months and were informed that enumerators might conduct random visits to verify compliance. Five random visits were conducted, and no instances of waethats teaching water-related topics were observed.

[28] In the environmental economics literature, several papers explore the effects of providing information on conservation. For instance, Jessoe and Rapson (2014) show that providing families with real-time feedback on prevailing prices and quantity of energy consumed reduced their energy consumption.

[29] Indeed, framing and salience can increase conservation of energy and water. For instance, Allcott (2011), by providing "nudges" of peers' electricity usage and energy-saving recommendations, finds a decrease in energy consumption by 2%. In this case, the religious message may work because it was delivered by the waethat in the context of a mosque, inducing emotional and attention responses, rather than for its content. Moreover, women could associate information in the leaflet with right-doing, rather than latching onto the religious prescriptions. Haaland et al. (2023) suggest to include an active control receiving a similar priming on the treatment, but differing in terms of its content.

[30] Due to Jordanian social norms, women would be discouraged to attend a control session with unfamiliar individuals, such as state actors.

3.2 Data

I draw on data from (i) baseline, midline, and endline surveys conducted with women (ii) endline households' water bills, and (iii) detailed classroom observation data.

Women survey: On the day of the intervention, before the beginning of the class, I collected baseline information on women's socioeconomic characteristics, water access, and religiosity.

Midline data were collected right at the end of the class. I measured short-term effects on prosociality toward water using incentivized donation measures to water charities. I also measured women's beliefs on water-related religious norms. I relied on the expertise of my partners to design context-specific measures to detect changes in Islamic beliefs about water and accurately test for belief-driven mechanisms.

At endline, three months after the end of the intervention, I again measured women's beliefs about water-related religious norms. The survey also included measures of domestic water usage, recording the time spent on, and the frequency of, several water-intensive household chores.

Endline Water Bill: At the end of this three-month period, I directly inspected the water bills of the women's households, recording their water consumption and expenditure. This period aligns with the quarterly billing cycle for water.[31] Neither women nor religious leaders were informed about my intention to collect water bills until one week before the endline. At that time, I conducted brief sessions explaining how to interpret the information on water bills and to ensuring women presented the correct documents.[32]

Class Observation Data: To measure religious leaders' behavior in the class, all the experimental classes were recorded. Their content was then analyzed by human coders, who mainly noted the topics discussed and the leaders' teaching style.

3.3 Treatment Details

The treatment relied on a preexisting manual, produced by specialists in Islamic doctrine from the Ministry of Islamic Affairs, providing the basis to train religious leaders on the

[31] In Jordan, water bills are paid quarterly. Endline occurred in December 2022–January 2023 since this is the period in which the sample received the post-intervention water bill. I obtained the bills charged for the post-treatment period of September–December (mid).

[32] In Jordan, many people do not know how to interpret their water bills (USAID, 2018).

topics of water preservation in Islamic texts.[33] With their guidance, I identified the most relevant content in this manual for my treatment. The selected waethats then underwent one-day training on the manual.[34]

The training encompassed the six major concepts discussed above that relate to water from an Islamic perspective: *Blessing*; *Sin*; *Stewardship*; *Ownership*; *Practice*; and *Women Role*. Once trained, waethats had the freedom to structure the treatment class as they saw fit, choosing which topics to emphasize among those covered in the training. Moreover, leaders had the autonomy to choose their teaching styles, including whether to incorporate prayers, examples, anecdotes, and other elements.

I can use the audio recordings of the religious leaders' sessions to describe the content covered in the classes and characterize the intervention. First, I transcribed 38 audio recordings from all classes, tokenized the conversations of each class by sentence, and cleaned the sentences.[35] Using a narrative approach, I relied on three human coders to classify all tokenized sentences. To facilitate this process, I developed a codebook to train the coders in identifying and classifying sentences into categories of interest. The primary goal was to classify each sentence based on its religious content within the six major concepts covered in the training (see Appendix D for details on the procedure as well as for examples of classes' content and classified sentences).

Figure 3 provides an illustration of a data point, a class. Panel (a) presents the raw content discussed in the 19 treatment classes as computed using the coded text data, grouped by the six major concepts associated to water and Islam.[36] The vertical axis represents the share of sentences, weighted by number of words, belonging to each concept in a class. Most of the waethats discussed about *Blessing*, emphasizing that water is the foremost blessing of God and the primary source of life. *Practice* —the importance of giving water as form of charity and being prudent to avoid wasting water during ablutions—was also frequently discussed. *Stewardship* was also commonly discussed. Only

[33]The manual, in English and Arabic, is available upon request from its authors. Selected religious leaders were trained on the religious role of water and its preservation using *"The guide in water from an Islamic perspective"*, a training manual jointly developed by religious scholars from the Ministry of Religious Affairs, the Ministry of Water and Irrigation, and GIZ.

[34]The training sessions consisted of frontal lessons covering the contents of the manual, as well as practical lessons on how to preach on water using role plays, active engagement and examples.

[35]Data preparation involved removing interjections (e.g. "yeah", "ouch", "great", "yes", "ok", etc.), dropping filler sentences (e.g. "you know", "uhm", etc.), and removing greetings and religious exclamations (e.g. "good evening", "peace be upon you", "if God wills", etc.).

[36]I exclude the residual category of topics not related to water to ease visual representation. However, it is a marginal category in the treatment, as shown in Figure A1. Indeed, the average share of sentences related to water in Islam across treatment classes is 92%. Moreover, I excluded stop words, introductory and farewell sentences, and other greetings.

two waethats instead extensively talked about the *Women Role* concept. Figure 3, Panel (b), shows the distribution of the major class topics, identified by the concept presenting the largest share of weighted sentences in a class.

Control consists of a class on a religious topic unrelated to water. Thus, topics such as fasting, which may relate to drinking water, were considered off limits. As shown in Table A2 in the Appendix, most waethats preached about the migration of the Prophet Mohammad from Mecca to Medina since part of the intervention coincided with the anniversary of this event, celebrated as the Islamic New Year.

4 Results: Behaviors

4.1 Estimation

In this section, I document how religious messaging about water conservation affect prosocial behaviors on water and consumption of water. To estimate the effect of the treatment, I use the following specification:

$$y_{iwc} = \alpha_w + \beta T_c + X_i'\lambda + \epsilon_{iwc} \tag{1}$$

Here, y_{iwc} is the outcome of interest for woman i who attended class c taught by waethat w. T_c is an indicator equal to 1 if the woman attended the treatment class on water conservation from a religious perspective, and 0 for control women. X_i is a vector of balance variables and individual covariates measured at baseline to improve statistical power (McKenzie, 2012).[37] α_w indicates the strata fixed effects for waethats and ϵ_{iwc} is the error term.

Standard errors are clustered at the pair level—that is, the religious-leader level—, following de Chaisemartin and Ramirez-Cuellar (2020). I present p-values obtained by bootstrapping, resampling pairs over 2,000 replications, since the pair-clustered variance estimator becomes downward-biased with fewer than 20 pairs.

β measures the causal effect of participating in the class on water conservation from a religious perspective. As noted, the stratification by waethat allows me to take into account potential confounding factors from women's self-selection into religious leaders and to hold constant leaders' identity. Moreover, both treated and control women attended a religious session and received nonreligious information on water conservation from the re-

[37] These covariates were selected from the baseline data on the basis of their ability to predict the primary outcomes. They are age, household size, and number of water days.

ligious leader. Therefore, effects are identified from experimental variation in the content of religious messaging, conditional on nonreligious content, religious priming and leader identity.

The identification strategy for the RCT relies on the assumption that within each strata, treated and control women do not differ on average in all observable and unobservable characteristics. To support this hypothesis, Table 1, columns (1)–(3), show the general characteristics of the women included in my sample and verify the randomization balance in the baseline sample of 712 women. The first column of the table displays means and standard deviations of baseline characteristics in the control group, and column (2) displays means and standard deviations of baseline characteristics in the treatment group. Column (3) shows mean differences between treatment and control, within strata. There are no significant differences between treatment arms in any of the observed variables. Also, sample attrition is null since I consider as part of the sample only women who regularly showed up on the day of the class and no recruitment or announcements of the experiment were conducted.[38]

Women were asked to provide their telephone numbers if they consented to the research team calling them to follow up with the endline survey. Many women did not provide numbers or provided incorrect ones, so in order to generate an endline sample balanced between treatment and control, we randomized within treatment status to generate the list of endline women to call. Table 1, columns (4)–(6) show balance in observed characteristics of women included in the resulting endline sample by treatment status, as well as the difference between them. No difference in mean is significantly different from zero in the endline sample. In the endline sample only two women dropped out; therefore I do not correct for attrition in my main regression specification.

4.2 Effects on Prosociality

I start by presenting results on prosociality regarding water measured right at the end of the class by my midline survey. I measure prosociality by incentivized donations to water charities. These measures, by requiring the respondent to incur a cost when answering, should reduce concerns about demander effects in such short-term answers reported at the end of the class. The first measure, *Individual Donation*, records how much money a woman, upon receiving 15 JOD from the research team, was willing to give back for

[38] Women were not informed in advance about the topic of the class to avoid self-selection into treatment. 712 women eventually showed up on the days of the classes and constitute my study sample.

to donate to a charity operating in water resources preservation.[39] The 15 JODs was provided in-kind in the form of water filters distributed by the research team to the woman.[40] Consequently, this outcome provides a proxy for prosociality regarding water conservation.

My second measure of prosociality, *Collective Donation*, is a dummy indicating whether a woman chose a water charity over other charities to which to donate 700 JOD on behalf of the class. I provided the class with 700 JODs and committed to donating to the charity receiving the majority of votes as recorded in the survey. The answers were private, and women could choose among a charity working on water issues, another environmental charity working on energy conservation and a charity offering schooling opportunities. Therefore, this measure records preferences for different types of prosocial actions, conditional on acting prosocially.

Table 2 summarizes the estimation results. For each outcome in the table, the first column shows the treatment effect without controls and the second column shows the treatment effect in my preferred specification, which controls for age, household size, and number of water days. In all specifications, the treatment effects are sizable and significant: in the preferred specification, treated women donate 1.7 JODs more to charities working on water (p-value=.000, column 2), and are 11 p.p. more likely to choose to donate collective alms-giving to a charity working on water conservation (p-value=0.000, column (4)). Compared to baseline mean, the treatment increased the likelihood that women chose water charities for the class donation by 29%, and increased individual donations by 22%. Figure 4 presents the results visually. The horizontal axis presents the donation outcomes, and the vertical axis reports the effect of the treatment in standard deviations for ease of comparison.

The effect on *Individual Donation* suggests that treated women became more prosocial, but it does not allow us to disentangle whether women were becoming more prosocial with respect to water conservation, given that the receiving charity was fixed. Moreover, the measure could be prone to demander effects, as it was measured out of an interaction between the woman and the enumerator to assess the amount of money to donate. The *Collective Donation* measure helps address the first concern while being less susceptible to the second concern. The results for that measure show that treated women indeed

[39] One Jordanian dollar is equal to 1.41 US dollars. The charity works in the water sector. It has operations in natural resources conservation, such as spring cleaning and groundwater monitoring. It also disseminate knowledge of water-saving methodologies to households and farmers, such as rainwater harvesting and grey water reuse. Last, it provides safe access to clean water to poor households.

[40] We did not inform women upfront about which goods would be distributed in-kind, but we did mention that 15 JOD would be given in-kind in some form.

came to care more about water conservation. The choice between donating to a water charity or energy charity allows me to infer increasing sensitivity to water scarcity rather than just an enhanced general pro-environment attitude. And *Collective Donation* was recorded in private, reducing concerns about demander effects.[41]

4.3 Effects on Water Usage

Next, I investigate the effects of the treatment on water consumption and expenditure from households' water bills after three months from the end of the intervention in my endline sample. *Water Consumption* is real quarterly water consumption, in cubic meters, as measured by the water meter. *Water Expenditure* is real water expenditure, in JOD, charged on the water bill. To measure whether reduction in water use translates into welfare gains, *Days Without Water* records the number of days the household's tank ran out of water in the last month. Furthermore, I collected self-reported behaviors on water use for several domestic chores in terms of frequency and time spent.

Table 3 shows that the treatment decreases the amount of water used in the household (see Figure 5 for graphical visualization). In my preferred specification, treated women's households consumed 4.6 cubic meters of water less over a three-month period (p-value=0.01, column (2)), corresponding to 3.1 JOD less spent on their water bill (p-value=0.000, column (4)). To put this magnitude in perspective, a full-load washing machine consumes around 0.17 cubic meters of water, and a full dishwasher uses 0.05 cubic meters. For the average household of five members, this drop corresponds to 0.7% of their annual water consumption. Since the water sector is highly subsidized, the corresponding 25% reduction in water expenditure accounts for a small saving—0.045% of the average Jordanian's annual income in 2022.

The estimated reduction in water consumption is large: the treatment lowered water consumption by 17%. Compared to the relevant literature on environmental preservation, this coefficient is larger in magnitude than conservation effects induced by social pressure interventions, which the literature finds in the order of 3% - 5% (Ferraro and Price, 2013; Bernedo et al., 2014; Brent et al., 2015), while smaller than effects induced by regulation in the order of 38% (West et al., 2021).

Who is championing water conservation? Figure 6, Panel (a) presents the cumulative distribution function of water consumption by treatment status, suggesting that the effect might be driven by high-users at the tail. This is in line with previous literature in envi-

[41] Women's preferences were recorded at the end of the study through anonymous surveys, increasing the incentives for them to answer truthfully.

ronmental economics finding larger treatment effects for high-usage households, who can reduce consumption at lower cost or exhibit differential effects from such behavioral interventions in different parts of the usage distribution.[42] To investigate this more rigorously, I examine quantile treatment effects (QTEs) of the treatment on water consumption. Figure 6, Panel (b) depicts the set of QTEs and confirms that the substantial cutback in water consumption is driven by high-usage households above the 75th percentile.

Finally, treated women report a decrease of 0.35 days they were out of water in the month prior to the endline (p-value=0.07, column (6)). This suggests that the reduction in water usage allowed women to store more water and be less water constrained. Overall, the findings consistently reflect a reduction in household water consumption following the intervention.

The data on domestic water use provide valuable insights into how treated women managed to reduce household water consumption. Table 4 presents the treatment's impact on the frequency of and time spent on several domestic activities involving water: showering, performing religious ablutions (*wudu*), house cleaning, and making laundry. Treated women reduced the frequency and time spent on most of these household chores, while time dedicated to laundry increased given that ecological washing requires more time. I do not find any effect on ablutions, and Section 5 provides insights into why this is so. Last, column (9) shows that treated women were also 15 p.p. more likely to report adopting some water saving methods, and Figure A6 suggests that this might be driven by treated women adopting more water-saving devices and reusing water across chores.

4.4 Effects on Perceptions of Personal Water Efficiency

Since treated women significantly changed their water-related behaviors within the household, I now want to understand whether these changes were mediated by an increased self-awareness of their water management.[43] Following the treatment, I recorded a measure of women's belief correction regarding their efficiency in managing water in the household, *Updated Belief*.

Specifically, I recorder prior perceptions at baseline and posteriors at midline and endline regarding how much a woman believed herself to be water efficient in the house on a scale from 1 to 7. I can then compute the change in beliefs about own water efficiency

[42]For instance, Allcott (2011)finds that, after a social-norm information campaign targeted at reducing energy consumption, households in the highest decile of pre-treatment consumption decrease usage by 6.3%, while consumption by the lowest decile decreases by only 0.3%.

[43]In Section 5, I investigate whether the main effects are induced by beliefs about water efficiency or deeper, moral beliefs about water conservation rooted in Islam.

between baseline and midline (that is, immediately after the intervention) and between midline and endline (that is, after three months from the intervention).[44]

Using midline posteriors, Table A4, column (1) shows that treated women updated downward, by 0.39 points on a scale from 1 to 7, their overall belief on how water efficient they are. These findings suggest that women became more self-aware of areas in improvement for their water-saving behaviors right at the end of the religious treatment.

Overall, in Section 4.3. I observe that treated women became more water efficient in the months after the intervention. I can then check whether they re-updated their assessment of own water efficiency accordingly at endline. Figure 7 shows that while the intervention made women update downward their belief of own water efficiency at midline, three months after the intervention they re-update this belief upward relative to midline. Indeed, treated women did modify their water use (Table 4) and became more water efficient (Table 3). Therefore, women reverted back to their baseline self-evaluation: the difference in beliefs between endline and baseline is null.

4.5 Robustness and Heterogeneity

I perform the following empirical checks to validate my findings. In Appendix C, Table C2, I present my main results with clustering at the class level (the unit of randomization), pair level without bootstrapping, and randomization inference estimates with class-level standard errors; I show that they are largely unaffected. I also perform Westfall-Young multiple testing for joint significance and reject the null of complete irrelevance of the treatment. Then, given that I observe differential levels of non-response across midline outcomes, I perform a careful attrition analysis composed of three exercises. First, I show in Table B1 that there is no differential attrition by treatment status. Second, I show in Table B2 that baseline characteristics are not systematically different across treatment and controls in each estimation sample. Third, in Table B3, I show that Lee bounds to the treatment effect do not affect the sign and significance of the results. Also, in Table A7, I show that my results are not driven by the recurrency an external event overlapping with the experiment, namely the Islamic New Year which occurred during part of it and may have affected religiosity and donations to charities.

Finally, I study whether the treatment exhibits heterogeneous effects according to a measure of water scarcity, namely the distance between the day of the class and the last

[44] Also, eliciting posteriors allows me to disentangle the effects of religious priming from genuine belief updating following the religious treatment, given that both treated and control receive non-religious information on water in a religious setting.

day a woman received water (that is, the water day). This distance measure can be interpreted as a proxy of water stress in the household; the longer it has been since the last water day, the more likely it is for households to experience water constraints because the water stored in their tanks decreases over time. Figure A5 shows heterogeneous effects by distance from the last water day, where I interact treatment with a set of dummies for the number of days elapsed between the day in which a woman attended the class and her last water day. I observe attenuation in the treatment effects: the more days have passed, the less effective the treatment becomes. The heterogeneity may be due to limited room for adjusting water-related behaviors among women who are already water constrained, or it could indicate that water-stressed women undergo a negative emotional response to the treatment when exhorted to save water. This suggests that delivery of policy interventions based on messaging has to take into account the timing and salience of the issue as well as unintended emotional responses.

5 Mechanisms: Religious Beliefs

Having demonstrated that religion can provide a powerful tool to promote pro-environmental behaviors, I move to investigate the mechanisms through which religious messaging operates. My hypothesis is that deep-seated beliefs, in this case religious ones, motivate individuals to change behaviors and my treatment affects behaviors by influencing such beliefs. Bénabou and Tirole (2016) show that motivated beliefs, such as values and political ideologies, fulfill important functional needs of individuals and influence their actions. Among them, religion is a "number one form of valued beliefs," typically providing comfort and self-discipline. For instance, beliefs in an afterlife directly influence anticipatory utility of engaging in prosocial actions, and just-world beliefs offer motivation for taking action (Bénabou and Tirole, 2016). In my experiment, I consider both people's beliefs about the acceptability of certain Islamic tenets and practices on water, and their willingness to engage in water-related actions deemed religiously right or wrong.[45]

A competing explanation is that the treatment works through beliefs other than religious ones—for example, increased sensitivity toward the environment, or heightened morality. To test for this, I asked women at endline to choose their primary reason for saving water during the last three months: religious ("save water to be religiously pious"), environmental ("save water to be more water efficient"), or moral ("save water for future

[45]I then do not delve into more fundamental beliefs, such as concepts of God or foundational pillars of Islam, given that the treatment targeted more applied aspects of the faith.

generations"). Table A8, column (7) reveals that treated women are 21% more likely than control women to cite religious concerns over environmental or moral ones. And Figure A2 visually suggests that treated women are less likely than control women to rank environmental concerns over religious ones.

Relatedly, the treatment might have affected other aspects of religiosity (e.g. conservativeness), skills (e.g. knowledge about water-saving methods), or salience (e.g. women more aware of water crisis), and those changes, rather than changes in religious beliefs about water are the driver of the results. While it is difficult to fully rule this out, two sets of results point to religious beliefs as driving the results. First, I rule out that the treatment increased the salience and knowledge of key nonreligious information on water conservation.[46] In Table A5, the treatment does not significantly affect the number of known water-saving practices (column (1)) and devices (column (2)); also, it does not affect the share of correct answers in a quiz on the secular content provided (column (3)), suggesting that the treatment did not increase its salience. Then, Table A5 does not support the hypothesis that the treatment made women more religious or conservative. Treated women were not more likely to perform an optional night-time prayer (column (4)), nor did they exhibit greater distrust of people from other religious faiths (column (5)).

5.1 Religious Intervention at Work

My results provide evidence that the observed behavioral changes stem from changes in religious beliefs about water rather than alternative explanations. Cultural interventions –in this case religious ones– are effective because they can affect deep beliefs and motivate individuals to change. This section moves a step forward and sheds light on which of such beliefs are most influenced by the treatment and thus most pivotal in designing successful religious interventions. I distinguish between individual and social beliefs. First, I explore which religious beliefs held by the women changed in response to the treatment.[47] Second, I look at social beliefs, which are collective norms that shape social interactions and behaviors; my religious treatment can affect social beliefs, as it occurs in a classroom setting.[48]

[46] Religious leaders provided the same information on water-saving practices, and explained and distributed my informational leaflet at the beginning of both treatment and control classes.

[47] The treatment can affect those by showing the moral implications of water use. Existing work shows that some prosocial behaviors, such as charitable giving, are motivated by feelings of self-satisfaction (Andreoni, 1998).

[48] For instance, the literature shows how social pressure and social comparison affect prosocial behaviors. Rao (2019) shows how exposure to poor students in India makes wealthy students more charitable by

Individual Beliefs. I want to understand how the treatment successfully changed women's religious views on water and pinpoint which beliefs were the most affected. Some religious beliefs may be more or less affected by the religious information provided in the treatment, and prior beliefs could interact with the process of belief formation. To get at it, I measure several types of beliefs about water that were covered in the classes, which vary in the extent to which they can be justified on religious grounds. First, I measure religious beliefs explicitly prescribed in Islamic sources. I asked women if they believed that: Muslims should moderate water use in religious ablutions; she would speak up against water waste when at the mosques; Muslims are not free to be wasteful with water even if they pay for it. All these principles are directly supported by Islamic sources and anecdotes about the Prophet.

Other religious beliefs are instead supported through more complex religious arguments. This is the case for recommendations to perform alternative types of ablutions on dry days to preserve water. On the one hand, traditional prescriptions require Muslims to perform standard purification rituals. On the other hand, Islamic sources offer alternatives, such as engaging in dry or shorter ablution rituals or even skipping long ablutions in extremely water-scarce scenarios. The prevalent belief depends on whether more emphasis is given to ritual cleanliness or water preservation in interpreting the religious sources. To measure this, I asked women whether, in the event of water scarcity, they would perform short ablutions (*fard*) or skip long ablutions (*ghusl*).

Finally, some religious beliefs come from new interpretations of religious texts. I focus on the case of treated water. Given the importance of cleanliness in Islam, treated water was considered undesirable and sometimes unlawful (*haram*).[49] However, as technological advancements now enable the provision of clean and safe treated water, many leading Islamic doctrinal centers have issued religious legal rulings (*fatwas*) declaring that treated water is permissible, not only for everyday purposes but also for religious ablutions.[50] I

affecting deeply held notions of fairness and generosity. DellaVigna et al. (2012) find that social pressure is an important determinant of giving. In the environmental literature, several papers show that peer effects influence conservation behaviors (Allcott and Rogers, 2014).

[49]In light of this long-held norm, Bolton (2021) finds that 81% of Jordanians to consider treated water to be bad in a 2016 survey about attitudes to alternative water sources, although the Jordanian Council of Fatwa, Research, and Islamic Studies declared treated water halal in 2014.

[50]In Saudi Arabia, the case study by Farooq and Ansari (1983) shows that reusing wastewater is not seen as haram, as long as it does not cause harm. The Council of Leading Islamic Scholars in Saudi Arabia issued a fatwa in 1978 stating that treated wastewater can be used for ablution and drinking as long as it's safe (CLIS 1978). This fatwa led to a significant increase in wastewater reuse in Saudi Arabia. By 1995, about 15% of treated wastewater was used for irrigation.

thus asked the women if they believe treated water is allowed (*halal*) for all uses.

In Figure 8, I investigate which types of religious beliefs were affected by the treatment. The x-axis reports treatment effects (in standard deviations) from a regression of each of the outcomes on the y-axis on the treatment indicator as in equation 1. Each outcome measures how much the woman adheres to or would practice a specific religious belief. The outcomes on the y-axis have been ordered based on a 1-5 ranking of "How much the norm is supported in the religious canon and sources" from a sample of 20 women outside of my sample, where 1 represents "no support" and 5 represents "highly supported".[51]

Treated women are more likely to hold religious beliefs that are clearly stated in their religious texts, shown as the three first outcomes the y-axis, from top to bottom. First, treated women are more likely to believe that moderation in ablution is preferable to abundance during ablution.[52] Treated women are also more likely to agree with the statement that "when a person pays for his/her water is not free to use it freely," consistently with the Islamic principle that water is a community good rather than a private commodity, regardless of the price paid. Finally, treated women are more likely to recognize water waste as a sin.[53]

The treatment did not affect religious beliefs that are not clearly stated in the religious texts but can be supported by religious arguments, as shown in the fourth and fifth outcomes on the y-axis in Figure 8. Indeed, treated women are not more willing to reduce some types of ablutions in dry days. This result also sheds light on what observed in Table 4: no effects on water use for religious purposes. This finding might suggest that treated women are not updating their religious beliefs on ablutions enough to affect its water usage.

Treated women are *less* likely than control women to hold religious beliefs coming from a reinterpretation of long-held prescriptions, suggesting a backlash effect. This is measured by the bottom outcome on the y-axis. Recently, several Islamic centers unanimously expressed approval for the use of treated water for all purposes, including religious ones, which was historically forbidden (Farooq and Ansari, 1983). The coefficient

[51] Ranking takes the following values: *Moderation in ablution* (5), *Paying does not allow free use of water* (5), *Would speak up* (4.4), *Would perform short ablution* (3.2), *Would skip ghusl* (2), *Treated water allowed* (1.2). All of the outcomes are recorded at midline.

[52] Indeed, while Islamic sources consistently report that moderation in ablution is always to be preferred, sometimes people mistakenly prefer abundant use as a sing of piousness.

[53] I measure this as women reporting "waste of free drinking water" or "leaving tap running during ablutions" as the most likely reason they would speak-up in the mosque among a list of generally recognized bad habits to exhibit in the mosque. Women could chose only one among the following habits: not taking off shoes, dirtying carpets, leaving tap running during ablutions, speaking loudly, and wasting free drinking water.

in the figure shows that, once informed, treated women are less likely than before to agree that treated water is acceptable. Appendix Table A8 reports related coefficients.

Are these mixed results about religious beliefs influenced by baseline religious conservatism? I consider a woman to be conservative if she reported at baseline that she visits the mosque more than once a week, which in Islam is a strong measure of religiosity because women do not have religious obligations to visit the mosque. In Table A9, for each of the outcomes on religious beliefs, I augment the standard specification with an interaction term between a woman's baseline conservatism and the treatment indicator. Although I find mixed results across outcomes, I observe that the most conservative women are driving the backlash effect regarding treated water.

Social Beliefs. The religious messaging, conveyed in a classroom setting, could reshape beliefs about prevailing norms within the women's reference group. To gauge this, I presented women with a vignette about a certain water-waste norm. In this vignette, a neighbor, when cleaning their house, makes immoderate use of running water. Water abundance is usually associated with wealth in the MENA, and copious use is a way to show off cleanliness and wealth (Bolton (2021); USAID (2018)). I then ask if the neighbor should be considered wealthy, wasteful or clean. In Table 5, column (1), I asked the woman what she believes about this neighbor, where the outcome is 1 if she believes the neighbor to be wasteful. In column 2, I instead asked the woman what she thinks another neighbour would believe about the neighbor in the vignette, where the outcome is 1 if she believes the other neighbor would consider the vignette one to be wasteful. Interestingly, the treatment does not affect personal views in column (1); the dependent variable's mean is also high (more than 80%), showing that women individually recognize such behavior as wasteful. However, treated women are 12 p.p more likely to believe that another neighbor would consider this as wasteful. This suggests that the treatment effectively increased treated women's social stigma surrounding this behavior. Moreover, column (3) reveals that the treatment enhanced the likelihood that women discussed water in social conversations. Last, column (4) checks for spillovers. While small in numbers, control participants who were exposed to the religious message exhibited similar effects to treated participants on the main variable of water consumption.

Taken together, these results show that religious interventions work by changing religious beliefs, but not all beliefs are uniformly affected. The treatment successfully alters religious views aligned with religious tradition. The class setting further influences norms of

social reputation and stigma, which cannot be targeted by other forms of interventions such as religious text messages (Bursztyn et al., 2019). In contrast, the treatment fails to support new practices, such as treated water adoption, which have been recently accepted by religious scholars and are thus not supported by tradition. Women do not passively believe in everything it is told them, and push back on some deeply entrenched beliefs. Prior beliefs, such as conservative views, matter and influence the process of belief formation, through confirmation bias, emotional responses (Bénabou and Tirole, 2016), or ideology (Blumenstock et al., 2022).

6 Religious Leaders' Heterogeneity

In this section, I explore whether religious leaders play a role in influencing the outcomes of interest. As shown in the previous sections, women do not passively embrace every doctrine presented to them in their system of beliefs. This prompts an important question: to what extent do religious leaders, who are integral to religious interventions, influence women's behaviors and beliefs?

Empirical Bayes (EB) methods reveal substantial variations in leaders' effectiveness by detecting the existence of religious-leader-level heterogeneity. I estimate the extent of heterogeneity in religious leaders by running the following reduced-form regression:

$$y_{iwc} = \sum_{w} \delta_w L_w * Treatment_c + X_i'\lambda + \epsilon_{iwc} \tag{2}$$

Here, y_{iwc} is the outcome of interest for woman i, and δ_w are religious-leader fixed effects. L_w are the 19 religious leader's treatment indicators. A standard F-test rejects the null of no leader heterogeneity (p-value=0.0045 for an index of main outcomes). I then estimate a bias-corrected variance of δ to account for excess variance of the estimates due to sampling error, following Kline et al. (2020).[54] Figure 10, Panel (a) reports the distribution of the religious leaders' fixed effects, where the coefficients have been shrunken under assumption of a normal model. Figure A7, in Appendix, reports the original estimates and the shrunken posteriors. I obtain large bias-corrected variance estimates in the order of .28, which are sizable given that the teacher value added literature consider values above .2 to be highly dispersed (Angrist et al., 2017). According to my estimates, moving up

[54]Indeed, the sample observations are small within each leader, leading to finite-sample bias. This may lead to some chance of getting an overdispersed δ from equation 2, even if there is no actual dispersion in leaders effect.

one standard deviation in the religious leaders' distribution increases the index by 0.28 standard deviations: some leaders are significantly more effective than others. I also find a strong signal-to-noise ratio of around 0.97, showing that most of the variation I observe in leaders' effectiveness is actual signal rather than noise.

Which factors explain the observed heterogeneity in religious leaders' effectiveness? While my experiment is designed to leverage causal variation in the religious message delivered, it cannot causally identify for the effect of the messenger—the waethat. However, I can provide some suggestive evidence into the inner workings of religious leaders' communication thanks to my data on class recording. Specifically, I posit that religious leaders' class content and teaching methods are key determinants of their success, and I rely on content analysis of class recordings to provide evidence in this direction.

Message Content. Regarding the content of the messages, I am interested in understanding how the six major concepts of water in Islam explained in the training, namely *Blessing*, *Sin*, *Stewardship* , *Ownership*, *Practice*, and *Women Role*, relate to the treatment effects.[55] What I am after is:

$$\begin{aligned} y_{iwc} = \eta_w + \eta_1 Blessing_c + \eta_2 Sin_c + \eta_3 Stewardship_c + \\ \eta_4 Ownrship_c + \eta_5 Practice_c + \eta_6 RoleWomen_c + X_i'\lambda + \epsilon_{iwc} \end{aligned} \tag{3}$$

Here, y_{iwc} is the outcome of interest for woman i. The main independent variables are six mutually exclusive indicator variables for the main concept discussed by the religious leader, identified as the concept with the largest share of weighted sentences in the class. Alternatively, I estimate the same specification with six continuous variables for the share of weighted sentences in the class belonging to each of the six concepts. Notably, I make no causality claim since since the religious leaders' choice of class content was not guided.

Figure 9 shows results from equation 3. Panel (a) presents coefficients on the six indicator variables, and Panel (b) presents coefficients on the six continuous variables. The dependent variables are my main objective outcome measures, namely (*Individual Donation*, *Collective Donation*, and *Water Consumption*) and an index of all outcomes (*Index*). All the outcomes have been standardized on the same scale. Therefore, a positive coefficient indicates successful results of the treatment. To build the index, I follow Anderson (2008) and account for the covariance structure in the components, demean and normalize

[55] Each class was in fact classified based on the content discussed and the way the religious leader structured the class, as explained in Section 3.3.

by the standard deviation of the index in the control group to ease interpretation.

Overall, most of the concepts seem to affect the outcomes. *Stewardship* and *Sin* present large treatment effects, suggesting that both concepts of agency to take care of the environment and fear to incur in punishments were effective. Results on *Practice* and *Ownership* are mixed. *Practice* includes discussion of religious acceptability of treated water, which caused backlash as shown in Section 6. Also, *Ownership*, the idea that water in Islam should not bear a price, correlates with increased water consumption. Conversely, concepts on the role of women as main homemakers, thus the ones primarily responsible for water, show opposite effects, revealing a tension between water-conservation efforts and traditional gender roles. Indeed, women may have found a contradiction between their responsibility to take care of the house and children, tasks requiring abundant water, and their responsibility to take care of such a scarce but domestically needed resource.

Religious leaders are most effective when discussing about moral responsibility and agency (*Stewardship* and *Sin*), rather than applied aspects of the religious practice (*Practice*, *Ownership* and *Women Role*). Consistent with my analysis of mechanisms, Figure A8 in Appendix shows that religious beliefs are most affected by the same concepts of *Stewardship* and *Sin*, reinforcing the hypothesis of changes in behaviors mediated by changes in religious beliefs.[56]

Teaching Style. I study whether there are heterogeneous treatment effects by leaders' teaching style. Considering as the unit of analysis a religious leader's class, coders were asked to assess the following aspects of a leader's teaching style: *Positive* if she had an encouraging style, instead of relying on admonitions and warnings; *Quran* if she relied extensively on Quranic sources, instead of other religious ones; *Religious Models* if she referred to religious role models, such as the Prophet and renowned Islamic scholars, instead of secular ones, such as early Islamic communities, pious historical figures, and tribal ancestors; *Participatory* if she engaged the class with a bottom-up, dialogic approach rather than a top-down, frontal approach. Therefore, I estimate:

$$y_{iwc} = \gamma_w + \gamma_1 Treatment_c + \gamma_s TeachingStyle^s_w * Treatment_c + X_i'\lambda + \epsilon_{iwc} \qquad (4)$$

Here, y_{iwc} is the outcome of interest for woman i. $TeachingStyle^s_w$ is an indicator variable for a given teaching style s among the ones described above.

[56] Also, I observe the strongest backlash in religious beliefs for concepts of *Practice*, that discussed extensively the issue of treated water.

Table 6 shows the results. The dependent variable is the above index of my main real outcomes, namely *Individual Donation*, *Collective Donation*, and *Water Consumption*, where all the outcomes have been standardized on the same scale following Anderson (2008). Therefore, a positive coefficient indicates effective results of the treatment. Most successful waethats relied on religious role models and adopted a participatory approach to engage women.

Does the content analysis explains the large religious leaders' heterogeneity documented above? To answer this, I create an index of the strongest predictors of water-saving behaviors indicated by the content analysis, namely *Blessing*, *Stewardship*, and *Sin* for message content, and *Religious Models* and *Participatory* for teaching style. Figure 10, Panel (b) shows a scatterplot with the shrunken estimates of the religious leaders' treatment effects on the y-axis and the source of heterogeneity predicted by the index on the x-axis with a line fit to the cloud. Almost 40% of the observed variation in religious leaders' efficacy is explained by which messages they chose to deliver and their style of conducting the class—with the largest effects coming from religious leaders who chose concepts of stewardship, sin and blessing for their messages and engaged more with their class.[57]

EB analysis reveals that religious leaders vary in effectiveness. Content analysis suggests that they are most effective when emphasizing concepts of moral responsibility over ritual practice and adopting an interactive teaching style. Therefore, selection, engagement, and training of religious leader may play a key role in the design of successful religious interventions.

7 Replicability and Cost-Effectiveness

Since my intervention closely resembles real-life circumstances in several aspects, it is relatively easy to replicate. First, waethats' classes are regularly attended by Jordanian women, so this infrastructure is ready to be activated for policy purposes. Indeed, in this study the selected waethats were already conducting their weekly classes with groups of women; classes were not created for the purpose of the experiment. Moreover, in Jordan, waethats get periodic training on religious topics from the Ministry of Islamic Affairs and

[57]Including in the index also a baseline measure of trust in the religious leader, I am able to explain 50% of the observed heterogeneity in religious leaders' effectiveness. This suggests that other aspects of leaders' identity, that I am not able to measure, may also play a relevant role in influencing behaviors.

Awqaf.[58] In this case, the waethats were trained on the relationship between water and Islam.

I estimate an administrative cost of $ 0.35: each religious leader received $ 10 for a one-day training session and transportation compensation, and each one taught two classes (treatment and control) comprising 40 women each on average.[59] The per-woman cost is relatively low, considering a waethat's monthly stipend ($ 423 - $ 564). I consider the opportunity cost for the waethats to be null, since they delivered the experimental classes within their regular workday on request of their employer, the Ministry of Islamic Affairs. To calculate the opportunity costs for women, I use average monthly income of households from Arab Barometer 2022 ($ 585 per month; $ 2.44 per hour, assuming eight hours of work per day) and weight it by the share of employed women in my sample (6%) since female labor force participation is very low in Jordan. I overestimate the amount of time dedicated to the class as 3 hours, when on average participants spent 1.7 hours in the program. The opportunity cost for women computed in this way amounts to $ 0.44, and the total costs per woman amounts to $ 0.79. My treatment estimates indicate that treated households saved $ 4.8 on their water bill in a three-month period. Based on the above back-of-the-envelope calculations, I estimate a benefit-cost ratio of 7.79.

What would the aggregate benefit be if we expanded the intervention at the country level? In the absence of official data on attendance to waethats' classes, I use as a proxy the share of Jordanian women trusting religious leaders (54%), using data from Arab Barometer 2022. This leads to 13,510,359 cubic meters of water saved over a three-month period following the intervention. Such saving would suffice to cover the yearly basic water needs of 370,000 individuals according to World Health Organization estimates of those needs.[60]

Therefore, my intervention generates large effects in a scalable fashion since such mosque-based programs rely on a preexisting infrastructure, teach a well-understood and well-developed set of values, and rely on religious agents that are trusted and respected by the local community.

[58] Indeed, waethats are not religious experts like their male counterparts but pious women who educate themselves on religious matters and rely on Awqaf for comprehensive training and materials. Awqaf provides training on specific topics to advance its policy agenda.

[59] For conversion, I use the exchange rate as of August 2022.

[60] The World Health Organization estimates that 50–100 liters of water per day is needed to ensure that most basic needs are met and few health concerns arise.

8 Conclusions

In this paper, I investigated whether explicit cultural systems, in particular religion, can induce social change. I showed that religious beliefs can be harnessed to promote pro-environmental behaviors regarding adaptation to water scarcity in MENA, a region particularly exposed to rising water scarcity. I conducted an RCT with women attending religious classes led by religious leaders in Jordan. Treated women received religious messaging on water preservation in Islam, while control women received messaging on another religious topic. The treatment increased donations to a water charity, and eventually decreased women's water consumption from water bills. The cutback in water consumption was driven by high-usage households, and it was accomplished by a reduction in water-intensive household chores.

The treatment worked by affecting religious beliefs about water. However, the treatment did not modify all these beliefs in the same way. It affected religious views on water that are clearly rooted in religious sources, while it triggered backlash against new interpretation of long-established norms. This suggests a complex interplay between new information and individuals' pre-existing beliefs. Finally, content analysis of class recordings revealed that religious leaders were most effective when emphasizing concepts of personal responsibility over ritualistic practice and when adopting an interactive teaching style.

This paper contributes to research on the role of culture in shaping development policy. My results underscore the power of religion as a catalyst for shaping behaviors through religious interventions that target deep-seated beliefs. This also highlights the key role of beliefs in adapting to climate change, a global priority. Finally, this analysis sheds light on an important region, MENA, and a sample, women in MENA, that has not been widely studied. Future research could delve deeper into the role of religious leaders in the design of successful religious interventions. Also, more evidence is needed on the impact of motivated beliefs in adaptation to climate change.

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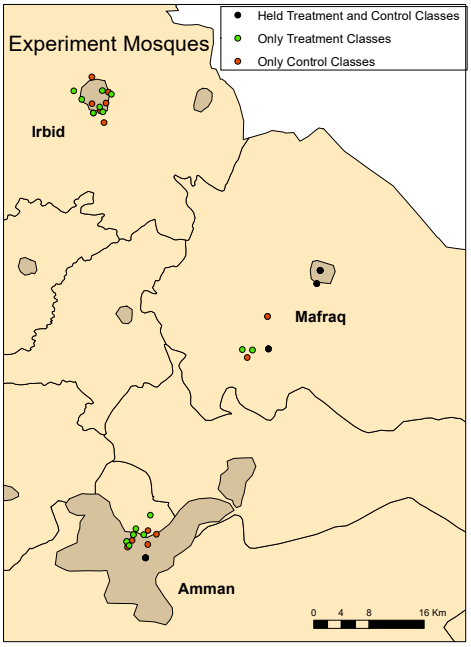
Figures and Tables

Figure 1. Experiment Location

(a) Selected Areas

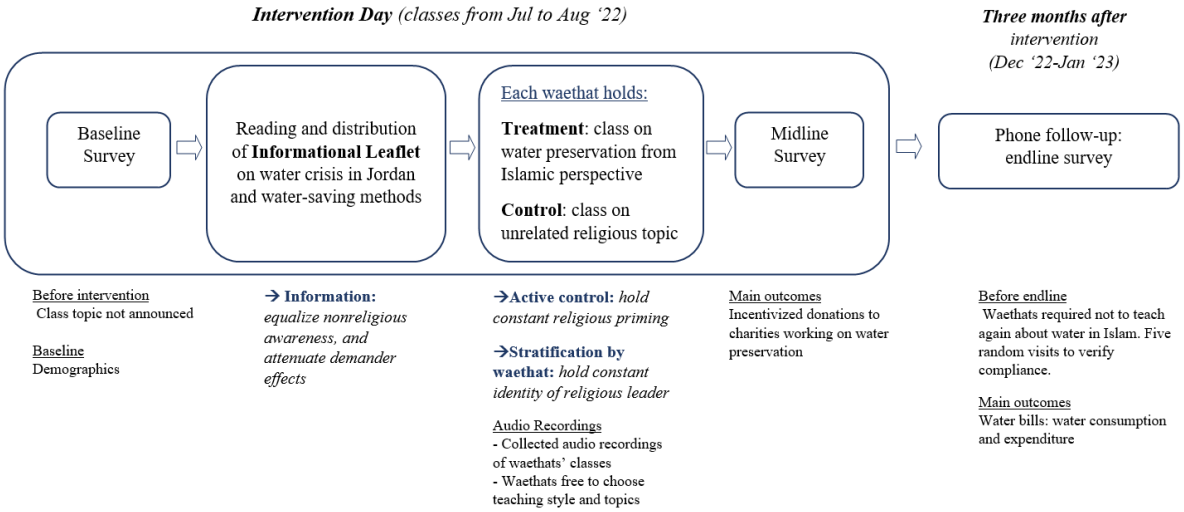


(b) Selected Mosques



Note: These maps display the geographical locations of the sampled communities and mosques. The left panel shows Jordan, highlighting the cities of Amman, Mafraq, and Irbid in green, where the study took place, while other cities are shown in grey. The right panel zooms into the areas of Amman, Mafraq, and Irbid (in gray), with points marking the locations of the mosques where the classes took place.

Figure 2. Experiment Timeline

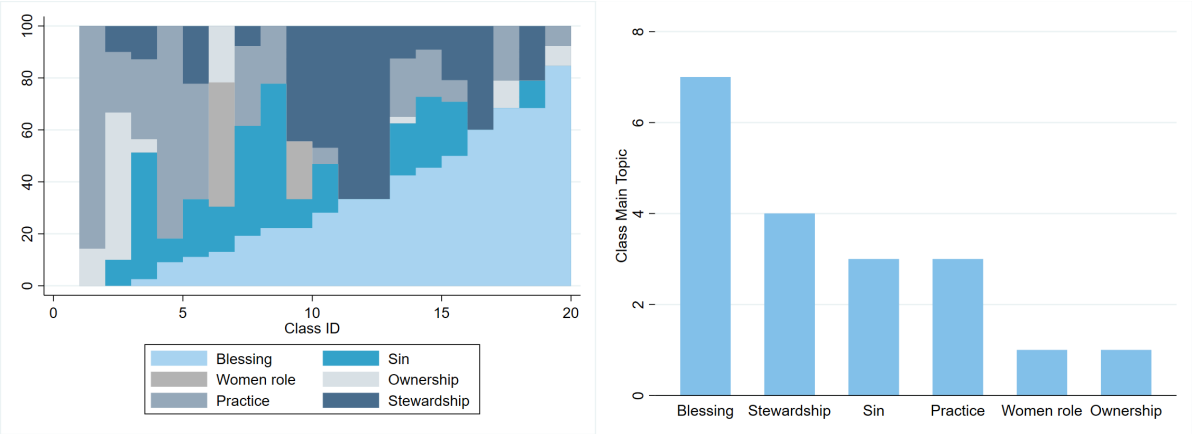


Note: This figure visualizes the timeline of the study and its sequential steps. The bullets beneath each box note either the key variables measured in that step (underlined), or its underlying foundations (arrows).

Figure 3. Class Content from Audio Recordings

(a) Coded Class Content

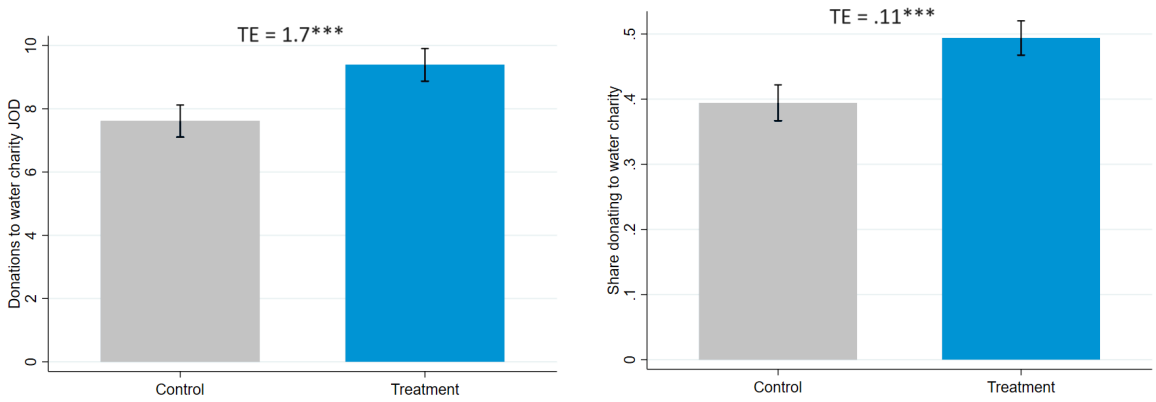
(b) Main Concept Discussed in Class



Note: These figures provide a graphical description of the main concept discussed in the treatment class on water from an Islamic perspective. Panel (a) represents the raw content discussed in the 19 treatment classes computed using the scripts data from class recordings, grouped into the six major concepts associated with water and Islam: *Blessing*, *Stewardship*, *Sin*, *Ownership*, *Practice*, *Women Role*. Each unit on the x-axis represents a class. The vertical axis represents the share of sentences, weighted by number of words, belonging to each concept discussed in a class. Panel (b) shows the distribution of the main concepts discussed in each class, identified as the concept presenting the largest share of weighted sentences in the class.

Figure 4. Effect of the Treatment on Donations to a Water Charity

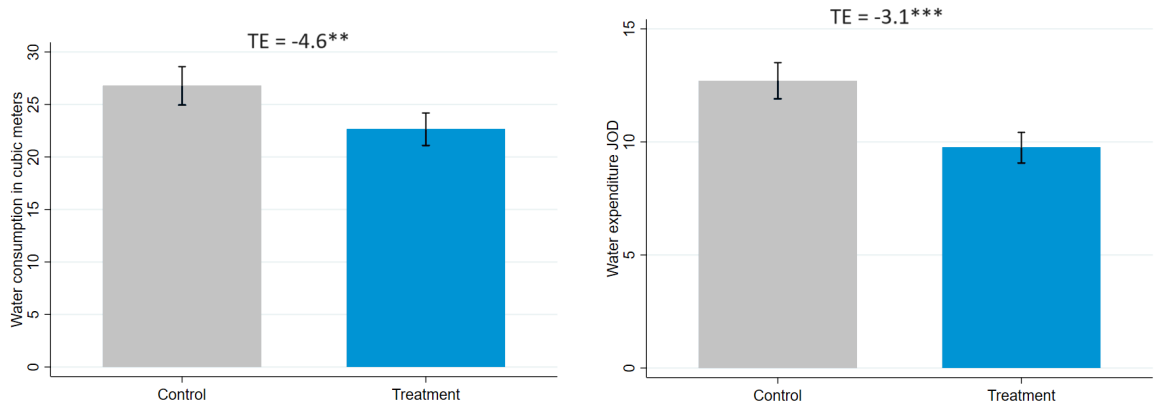
(a) *Individual Donation* (b) *Collective Donation*



Note: The figure plots the main experiment results on prosociality regarding water, proxied by donations to a charity operating in water resources' conservation. It plots the raw outcome data, by treatment status, residualizing on waethat fixed effects. In panel (a), *Individual Donation* records how much money a woman, upon receiving 15 JOD from the research team, was willing to give back for a donation to a water charity. In panel (b), *Collective Donation* is a dummy for whether the woman choses a water charity, over other charities, to donate 700 Jordanian Dinars (JOD) for almsgiving on behalf of the class. The bars are 95% confidence intervals. Standard errors are clustered at the pair level following de Chaisemartin and Ramirez-Cuellar (2023). Bootstrapped clustered standard errors are obtained by resampling pairs over 2,000 replications.

Figure 5. Effect of the Treatment on Water Usage

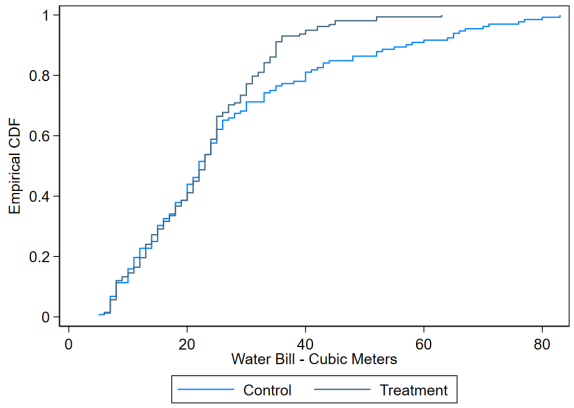
(a) *Water Consumption* (b) *Water Expenditure*



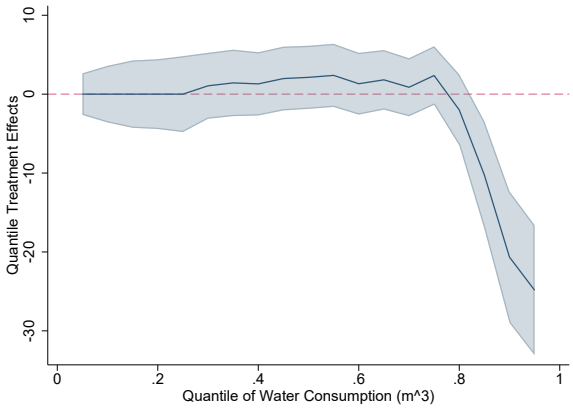
Note: The figure plots the main experiment results on water consumption and expenditure, as shown in households' quarterly water bills. It plots the raw outcome data, by treatment status, residualizing on waethat fixed effects. In panel (a), *Water Consumption* refers to the amount of water, in cubic meters, consumed by the household in the last quarter. In panel (b), *Water Expenditure* is the water bill amount due in Jordanian Dinars. The bars are 95% confidence intervals. Standard errors are clustered at the pair level following de Chaisemartin and Ramirez-Cuellar (2023). Bootstrapped clustered standard errors are obtained by resampling pairs over 2,000 replications.

Figure 6. Quantile Treatment Effects of the Treatment on Water Consumption

(a) CDF of Water Consumption



(b) QTE on Water Consumption



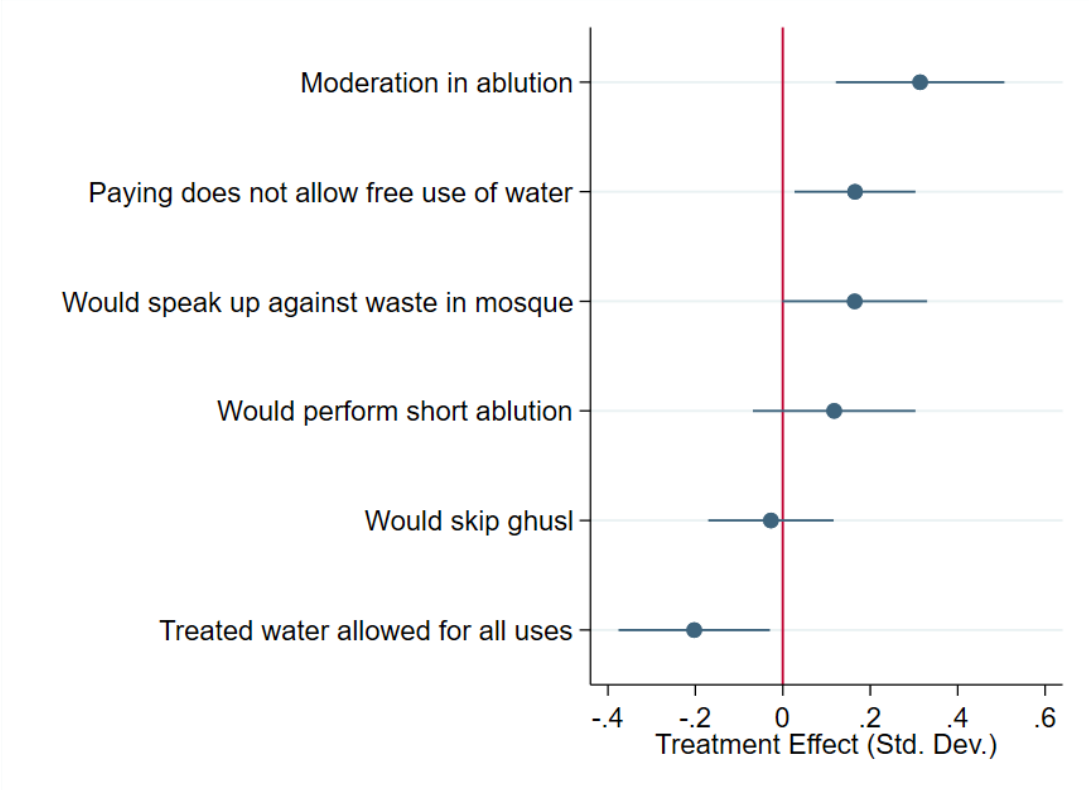
Note: Panel (a) shows the empirical cumulative distribution functions of water consumption at the household level by treatment status. Exact Kolmogorov-Smirnov tests reject the null that the two samples come from the same distribution at the 5% level. Panel (b) shows the quantile treatment effects (QTEs) of the treatment on water consumption, with 95% confidence intervals estimated and covariates and stratum fixed effects controlled for.

Figure 7. Change in Perceptions about Own Water Efficiency between Survey Rounds



Note: This figure shows estimated treatment effects on perceptions of own water efficiency from equation 1, which includes waethat fixed effects and age, household size, and number of water days as controls. Both coefficients report a change in perceptions between priors and posterios, on how much the woman perceives herself to be water efficient in her house on a scale of 1 to 7. The coefficient on the left shows the estimated change in perceptions of own water efficiency between baseline (that is, right before the class) and midline (that is, right after the class). The one on the right shows the change between midline and endline (that is, three months after the intervention). Vertical lines represent 95% confidence intervals, with errors are clustered at the pair level following de Chaisemartin and Ramirez-Cuellar (2023). Bootstrapped clustered standard errors are obtained by resampling pairs over 2,000 replications.

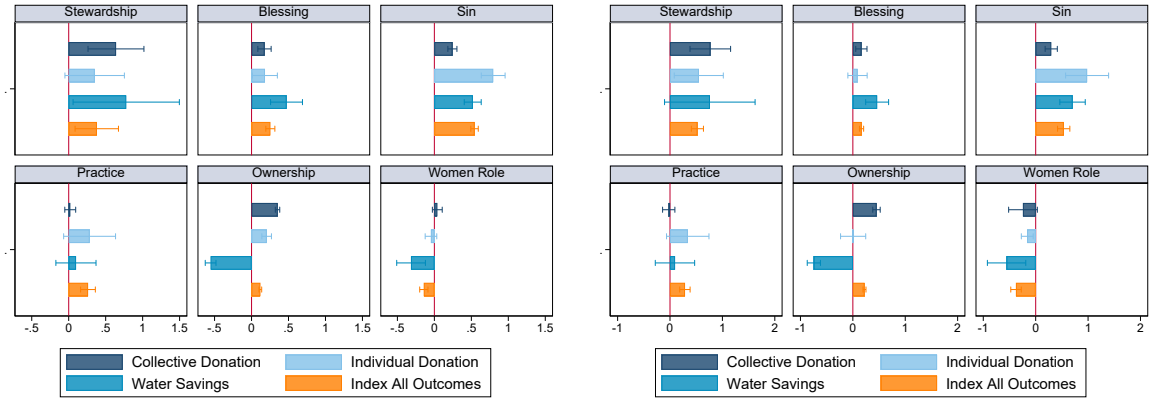
Figure 8. Effect of Treatment on Religious Beliefs



Note: This figure shows estimated treatment effects on water-related religious beliefs in equation 1, which includes waethat fixed effects and age, household size, and number of water days as controls. Outcomes are measured as z-scores, so effects are expressed as standard deviations of each outcome. Outcomes represent agreement with the following statements. *Moderation in ablution*: Individuals should moderate water use when cleansing themselves before prayers. *Water speak up*: Woman would speak up if she sees someone wasting water at the mosque. *Paying does not allow waste*: Individuals are not free to be wasteful with water even if they paid for it. *Reduce daily ablutions*: When water is scarce, it is acceptable to perform a shorter ablution. *Skip Ghusl*: When water is scarce, woman would skip the long ablution before the Friday prayer. *Treated water is halal*: Water that has been treated for reuse is acceptable in most uses. The outcomes on the y-axis have been ordered based on a 1-5 ranking of "How much the norm is supported in the religious canon and sources" from a sample of 20 women outside of my sample, where 1 represents "no support" and 5 represents "highly supported". Horizontal lines represent 90% confidence intervals, with errors clustered at the pair level following de Chaisemartin and Ramirez-Cuellar (2023). Bootstrapped clustered standard errors are obtained by resampling pairs over 2,000 replications.

Figure 9. Differential Effect of Class Content on Main Outcomes

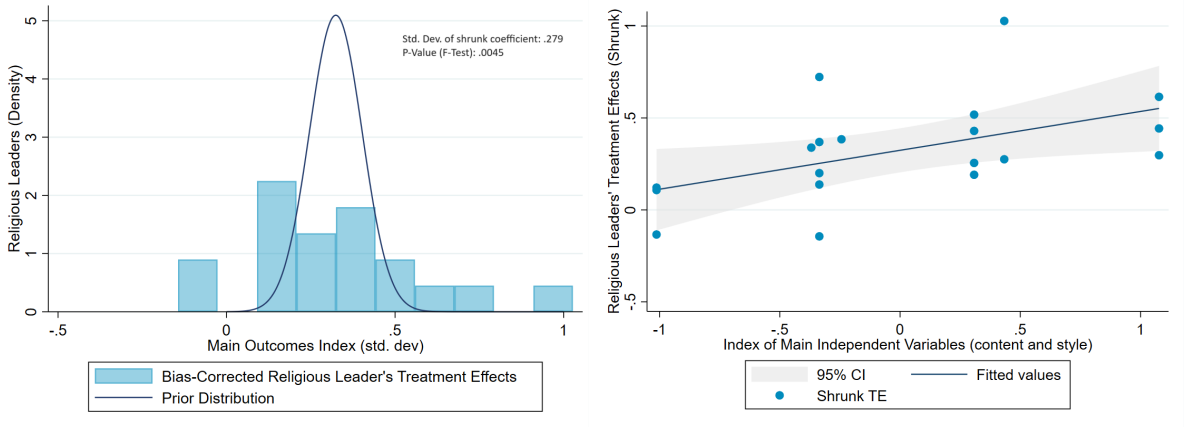
(a) Indicator Vars: Main Concept Discussed (b) Continuous Vars: All Concepts Discussed



Note: These figures show differential effects of the concepts discussed in the treatment class on my main objective outcome measures (*Individual Donation*, *Collective Donation*, and *Water Consumption*) in equation 3, which includes waethat fixed effects and age, household size, and number of water days as controls. All the outcomes are standardized on the same scale. Moreover, I include an index of all the outcomes constructed following Anderson (2008). The concepts are: *Blessing*, *Sin*, *Stewardship* , *Ownership*, *Practice*, and *Women Role*. Panel (a) shows effects from a regression of the outcomes over six mutually exclusive dummies for the main content discussed in each class, identified as the concept with the largest share of weighted sentences discussed. Panel (b) shows effects from a regression of the outcomes over six continuous variables for the weighted share of sentences belonging to each concept discussed in the class. Horizontal lines represent 90% confidence intervals, with errors clustered at the pair level following de Chaisemartin and Ramirez-Cuellar (2023). Bootstrapped clustered standard errors are obtained by resampling pairs over 2,000 replications.

Figure 10. Religious Leaders' Heterogeneity and its Predictors

(a) Unbiased Religious Leaders' Fixed-Effects (b) Predictors of Religious Leaders' Heterogeneity



Note: These figures exhibit religious-leader level heterogeneity and its sources. Panel (a) reports unbiased (shrunken posteriors) distributions of the religious leaders' fixed effects. I overlay the prior normal distribution with the bias-corrected standard deviation. Panel (b) depicts a scatterplot between the shrunken estimates of the religious leaders' fixed-effects on the y-axis and an index summarizing the source of heterogeneity on the x-axis with a line fit to the cloud, where the index has been constructed following Anderson (2008). The index groups the main predictors of treatment effects from the content analysis, namely *Blessing*, *Sin*, and *Stewardship* for content and *Religious Models* and *Participatory* for leaders' teaching style.

Table 1. Baseline Balance on Women Characteristics

	Baseline Sample			Endline Sample		
	Control	Treatment	Difference	Control	Treatment	Difference
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Socio-Economic Characteristics						
Age	45.861	45.727	0.306	46.970	46.018	0.200
	(14.136)	(12.868)	(0.820)	(13.235)	(12.202)	(0.905)
Ever married	0.866	0.897	0.044	0.902	0.920	0.018
	(0.342)	(0.304)	(0.305)	(0.298)	(0.273)	(0.527)
Five children more	0.263	0.293	0.035	0.250	0.310	0.054
	(0.441)	(0.456)	(0.332)	(0.435)	(0.464)	(0.308)
Primary	0.178	0.178	-0.013	0.194	0.170	-0.047
	(0.383)	(0.383)	(0.696)	(0.397)	(0.377)	(0.256)
High school	0.490	0.484	0.005	0.537	0.485	-0.048
	(0.501)	(0.500)	(0.929)	(0.500)	(0.501)	(0.545)
University	0.217	0.192	-0.018	0.179	0.200	0.040
	(0.413)	(0.394)	(0.673)	(0.385)	(0.401)	(0.500)
Refugee	0.208	0.216	-0.018	0.202	0.232	-0.003
	(0.406)	(0.412)	(0.643)	(0.403)	(0.423)	(0.942)
Urban	0.748	0.756	-0.018	0.789	0.837	0.004
	(0.435)	(0.430)	(0.661)	(0.410)	(0.371)	(0.915)
HH. size	4.950	5.204	0.231	5.148	4.945	-0.231
	(2.191)	(2.300)	(0.293)	(2.228)	(2.361)	(0.533)
PCA wealth	0.060	-0.091	-0.090	-0.219	-0.371	-0.065
	(1.682)	(1.683)	(0.598)	(1.682)	(1.583)	(0.760)
Employed	0.060	0.062	0.005	0.063	0.057	-0.001
	(0.237)	(0.242)	(0.855)	(0.243)	(0.232)	(0.974)
Panel B: Water Availability						
Number of waterdays	1.375	1.316	-0.054	1.504	1.382	-0.104
	(0.776)	(0.619)	(0.301)	(0.905)	(0.557)	(0.243)
Weekly water just enough	0.480	0.488	0.016	0.523	0.491	-0.033
	(0.500)	(0.501)	(0.693)	(0.501)	(0.501)	(0.650)
Water bill	26.587	29.230	2.128	26.947	29.371	1.178
	(15.994)	(17.992)	(0.214)	(16.757)	(17.086)	(0.691)
Panel C: Values and Religiosity						
Trust others	0.184	0.169	-0.014	0.163	0.163	0.020
	(0.388)	(0.375)	(0.709)	(0.371)	(0.371)	(0.687)
Advise monthly with rel. leader	0.177	0.197	0.018	0.168	0.159	-0.009
	(0.382)	(0.398)	(0.623)	(0.375)	(0.367)	(0.844)
Attend mosque more than weekly	0.512	0.544	0.021	0.577	0.565	0.074
	(0.501)	(0.499)	(0.726)	(0.496)	(0.497)	(0.309)
Observations	339	373	712	135	165	300

Note: The table reports means and clustered standard errors from OLS regressions in parentheses with religious-leader fixed effects. Column (3) and (6) report the T-test of equality of means and stars correspond to the test of whether control and treatment groups have the same population mean. Columns (1)–(3) consider the baseline sample of women. Columns (4)–(6) consider the endline sample of women, randomly selected from the baseline sample of women who agreed to participate in the endline phone call. Data in Panel A are from the baseline survey of women. The household index of wealth is calculated based on 11 dummy variables regarding the ownership of 11 household assets (washing machine, fridge, computer, television, internet, heating, A/C, carpets, garden, Arab salon). Data in Panel B are from the baseline surveys of women, which I use to build measures of water availability in the household. Number of water days indicates the number of days that the household receive running water from pipes in a week. Weekly water is considered just enough if the woman declared herself barely able to meet household water needs in a standard week. Data in Panel C are from the baseline surveys of women, which I use to build measures of women's religious life. *p<0.10,**p<0.05,***p<0.01

Table 2. Treatment Effects on Donations to a Water Charity

	Donations - Short Run			
	Individual Donation *JOD*		Collective Donation *p.p.*	
	(1)	(2)	(3)	(4)
Treatment	1.7***	1.7***	.12***	.11***
	(.59)	(.6)	(.03)	(.031)
Obs	431	431	583	583
Clusters	19	19	19	19
Mean	7.8	7.8	.38	.38
Waethat FE	Yes	Yes	Yes	Yes
Controls	No	Yes	No	Yes

Notes: The table shows estimated treatment effects for the main midline outcomes in equation 1. All regressions include waethat fixed effects. In columns (2), and (4), regressions additionally include age, household size, and number of water days as controls, selected following the post-double-selection LASSO procedure set forth in Belloni et al. (2014). Below each coefficient estimate, I report bootstrapped clustered standard errors in parentheses, obtained by resampling pairs over 2,000 replications. For each outcome, I report the mean outcome for the control group. All outcomes are measured at midline— that is, right at the end of the intervention class. In columns (1)–(2), *Individual Donation* measures how much money a woman, upon receiving 15 JOD from the research team, is willing to give back for a donation to a water charity. In columns (3)–(4), *Collective Donation* is a dummy for whether the woman chooses a water charity over other charities to donate 700 Jordanian Dinars (JOD) to on behalf of the class. Errors are clustered at the pair level following de Chaisemartin and Ramirez-Cuellar (2023). *p<0.10,**p<0.05,***p<0.01

Table 3. Treatment Effects on Water Usage

Water Usage - Medium Run

	Water Bill				Days Without Water	
	Consumption (m^3)		Expenditure (JOD)			
	(1)	(2)	(3)	(4)	(5)	(6)
Treatment	-4.8**	-4.6**	-3.2***	-3.1***	-.34*	-.35*
	(2)	(1.8)	(.9)	(.79)	(.21)	(.2)
Obs	290	290	290	290	298	298
Clusters	19	19	19	19	19	19
Mean	27	27	13	13	.62	.62
Waethat FE	Yes	Yes	Yes	Yes	Yes	Yes
Controls	No	Yes	No	Yes	No	Yes

Note: The table shows estimated treatment effects for the three endline outcomes in equation 1. All regressions include waethat fixed effects. In columns (2), (4), and (6), regressions additionally include age, household size, and number of water days as controls, selected following the post-double-selection LASSO procedure set forth in Belloni et al. (2014). Below each coefficient estimate, I report the bootstrapped clustered standard errors in parentheses, obtained by resampling pairs over 2,000 replications. For each outcome, I report the mean outcome for the control group. All outcomes are measured at endline— that is, three months after the end of the intervention. In columns (1)–(2), *Water Consumption* refers to the amount of water consumed by the household in a quarter, in cubic meters, as indicated on the water bill. In columns (3)–(4), *Water Expenditure* is the water bill amount due in Jordanian Dinars (JOD). In columns (5)–(6), *Days Without Water* is the number of days the household was without water in the last month. Errors are clustered at the pair level following de Chaisemartin and Ramirez-Cuellar (2023). *p<0.10,**p<0.05,***p<0.01

Table 4. Treatment Effects on Water-Related Behaviors in the House

	Water-Related Behaviors								
	Shower		Wudu		House cleaning		Laundry		Adoption
	times	*minutes*	*times*	*minutes*	*times*	*minutes*	*times*	*minutes*	*saving methods*
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Treatment	-.28*	-.2	.51	.0015	-.2	-5.5**	-.18	7.5***	.15**
	(.14)	(.99)	(1.1)	(.11)	(.33)	(2.2)	(.18)	(2.8)	(.07)
Obs	296	295	298	298	298	298	298	298	298
Clusters	19	19	19	19	19	19	19	19	19
Mean	2.9	13	30	1.6	3.1	21	2.6	43	.65
Waethat FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: The table shows estimated treatment effects on endline water-related behaviors in equation 1. All regressions include waethat fixed effects and age, household size, and number of water days as controls, selected following the post-double-selection LASSO procedure set forth in Belloni et al. (2014). Below each coefficient estimate, I report the bootstrapped clustered standard errors in parentheses, obtained by resampling pairs over 2,000 replications. For each outcome, I report the mean outcome for the control group. All outcomes are measured at endline— that is, three months after the end of the intervention. In columns (3)–(4), *Wudu* refers to the short ritual cleansing before a prayer. For each behavior, *times* is the number of times the woman performed the activity in the last seven days, while *minutes* is the time, in minutes, she spent in the most recent occurrence of the activity. In column (9), *Adoption* is a dummy equal to 1 if the woman reported to had used any water-saving method in the last three months. Errors are clustered at the pair level following de Chaisemartin and Ramirez-Cuellar. *p<0.10,**p<0.05,***p<0.01

Table 5. Treatment Effects on Social Beliefs on Water and Spillovers

Mechanisms - Social Beliefs

	Water waste		Sharing	Water
	Individual norm	*Social norm*	Water Info	Consumption
	(1)	(2)	(3)	(4)
Treatment	.0045	.12*	.11*	-4.29
	(.031)	(.062)	(.061)	(6.895)
Obs	277	277	298	129
Clusters	19	19	19	19
Mean	.83	.59	.4	27
Waethat FE	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes

Note: The table shows estimated treatment effects on water-related social beliefs in equation 1, which includes waethat fixed effects and age, household size, and number of water days as controls, selected following the post-double-selection LASSO procedure set forth in Belloni et al. (2014). Below each coefficient estimate, I report the bootstrapped clustered standard errors in parentheses, obtained by resampling pairs over 2,000 replications. For each outcome, I report the mean outcome for the control group. All variables in columns (1) to (3) are dummy variables equal to 1 if a woman agrees with the following statement. *Individual Norm*: the woman consider her neighbor (in a vignette) to be wasteful, instead of clean or wealthy, when using a copious amount of water to clean her house. *Social Norm*: the woman believes that one of her neighbors (in a vignette) would consider another neighbor to be wasteful, instead of clean or wealthy, when using a copious amount of water to clean her house. *Sharing Water Info*: water management is a frequent topic in the woman's social network. *Water Consumption* refers to the amount of water consumed by the household in a quarter, in cubic meters, according to the water bill. Column (4) relies on the sample of control women to perform spillover analysis—where treated women reported having heard about water and Islam. Errors are clustered at the pair level following de Chaisemartin and Ramirez-Cuellar. *p<0.10,**p<0.05,***p<0.01

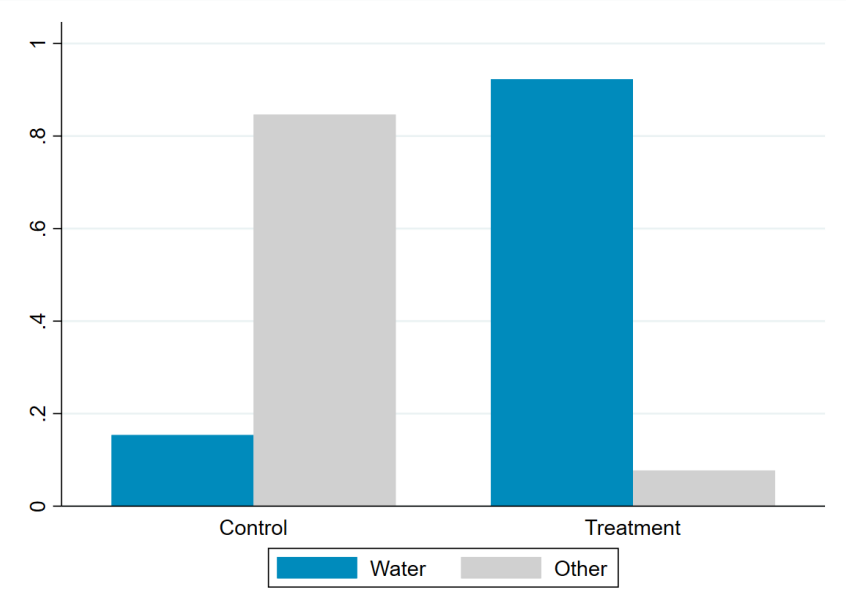
Table 6. Heterogeneous Effects by Religious Leaders' Teaching Style

	Heterogeneous Effects *Teaching Style*			
	Index of Main Outcomes			
	(1)	(2)	(3)	(4)
Treatment	.46***	.31***	.2***	.22***
	(.14)	(.078)	(.074)	(.062)
Treatment× Positive	-.22			
	(.16)			
Treatment × Quran		-.051		
		(.1)		
Treatment × Religious Models			.2**	
			(.098)	
Treatment × Participatory				.22**
				(.11)
Obs	650	650	650	650
Clusters	19	19	19	19
Mean	-.16	-.16	-.16	-.16
Waethat FE	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes

Note: The table shows heterogeneous treatment effects by teaching style of the religious leader in equation 4, which includes waethat fixed effects and age, household size, and number of water days as controls, selected following the post-double-selection LASSO procedure set forth in Belloni et al. (2014). Below each coefficient estimate, I report the bootstrapped clustered standard errors in parentheses, obtained by resampling pairs over 2,000 replications. *Index of Main Outcomes* is a standardized index of my main objective outcome measures (*Individual Donation*, *Collective Donation*, *Water Consumption*), standardized on the same scale. I report the mean outcome for the control group. I follow Anderson (2008) in accounting for the covariance structure in the components and demeaning and normalizing by the standard deviation of the index in the control group to ease interpretation. All interacted variables in columns (1) to (4) are dummy variables equal to 1 if the teaching style of the waethat is as follows: *Positive* if she has an encouraging and positive tone, instead of relying on admonitions and warnings; *Quran* if she relies extensively on Quranic sources, instead of other religious ones; *Religious Models* if she mainly refers to religious role models instead of secular ones; *Participatory* if she engages the class with a bottom-up, dialogic approach rather than a top-down, frontal, approach. Errors are clustered at the pair level following de Chaisemartin and Ramirez-Cuellar. *p<0.10,**p<0.05,***p<0.01

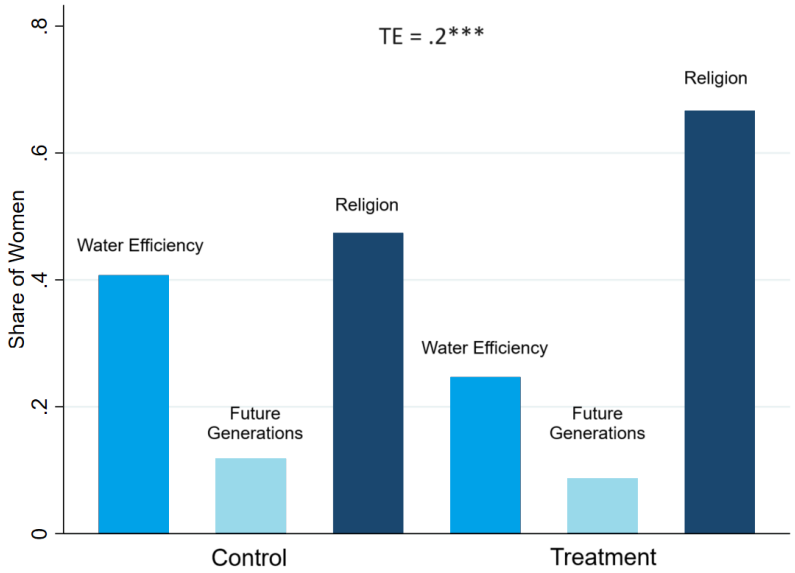
Appendix A Additional Figures and Tables

Figure A1. Share of Sentences about Water vs. Any Other Topic



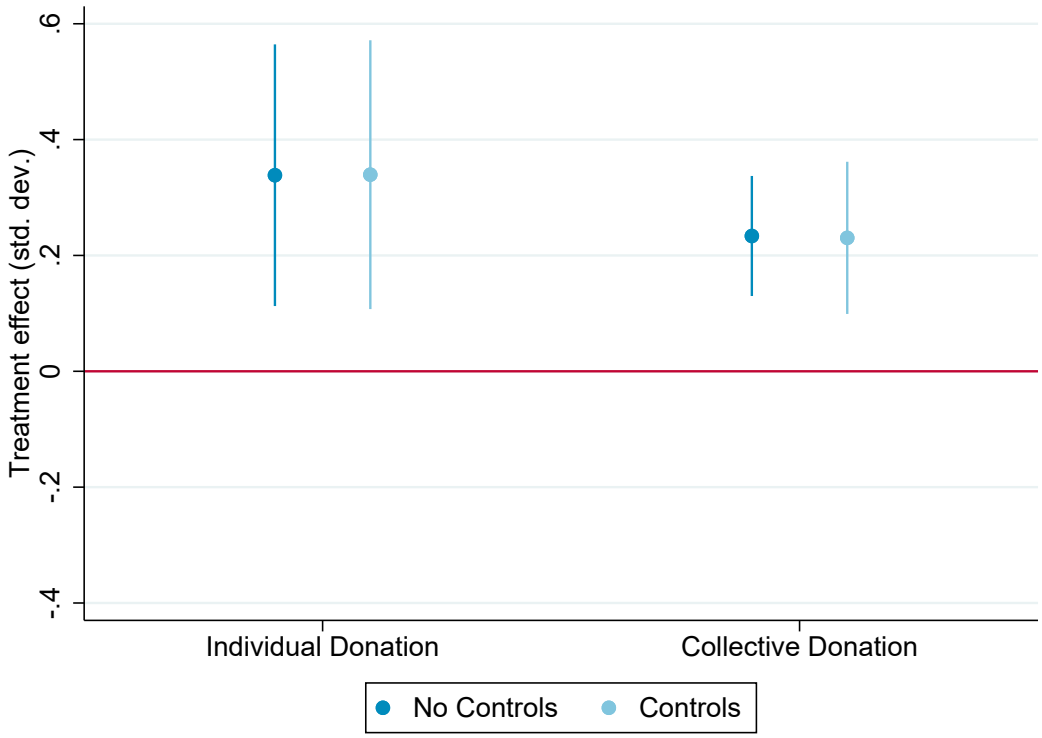
Note: The vertical axis represents the share of sentences, weighted by number of words, about water and any other topic (residual category) in treatment and control classes.

Figure A2. Main Reason to Save Water



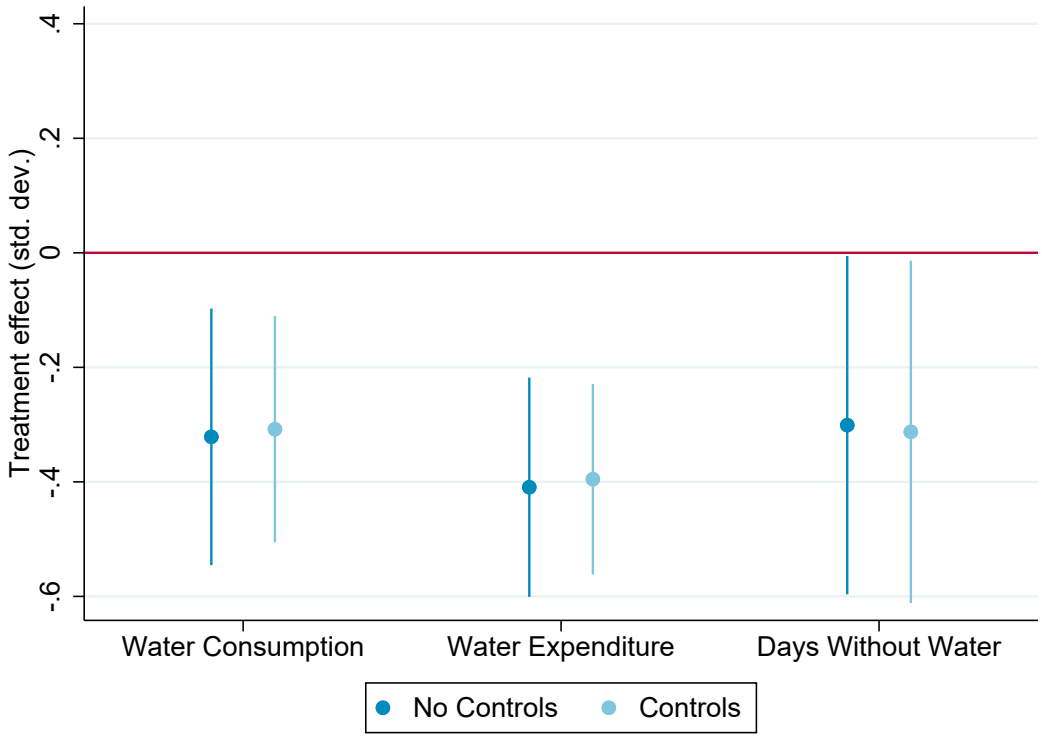
Note: This figure shows the share of women reporting the following primary reason for saving water: religion ("save water to be religiously pious"), environment ("save water to be more water efficient"), or morality ("save water for future generations"). Above, it shows estimated treatment effects in equation 1, including waethat fixed effects and age, household size, and number of water days as controls; the dependent variable is a dummy equal to 1 if the woman chose the religious concern, and 0 otherwise. I report significance levels from bootstrapped clustered standard errors at the pair level following de Chaisemartin and Ramirez-Cuellar. *p<0.10,**p<0.05,***p<0.01

Figure A3. Effect of the Treatment on Donations to Water Charities



Note: This figure shows estimated treatment effects for the three midline outcomes in equation 1, which includes waethat fixed effects and age, household size, and number of water days as controls. *Individual Donation*, records how much money a woman, upon receiving 15 JOD from the research team, is willing to give back for a donation to a water charity. *Collective Donation*, is a dummy for whether the woman chooses a water charity, over other charities, to donate 700 Jordanian Dinars (JOD) for almsgiving on behalf of the class. Outcomes are measured as z-scores, so effects are expressed as standard deviations of each outcome. Vertical lines represent confidence intervals at 90%, with errors clustered at the pair level following de Chaisemartin and Ramirez-Cuellar (2023). Bootstrapped clustered standard errors, obtained by resampling pairs over 2000 replications.

Figure A4. Effects of the Treatment on Water Usage

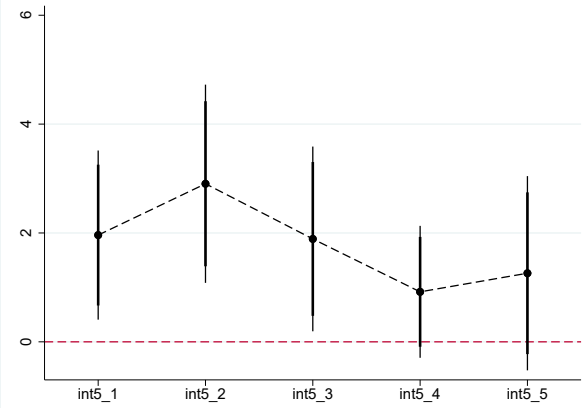


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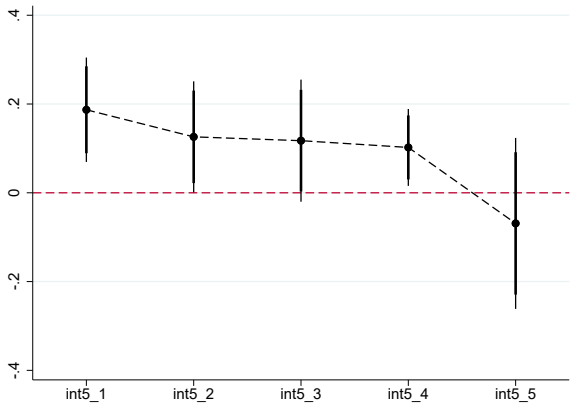
Note: This figure shows estimated treatment effects for the three endline outcomes in equation 1, which includes waethat fixed effects and age, household size, and number of water days as controls. *Water Consumption* refers to the amount of water consumed by the household in a quarter, in m^3. *Water Expenditure* is the water bill amount due in Jordanian Dinars (JOD). *Days Without Water* is the number of days the household was without water in the last month. Outcomes are measured as z-scores, so effects are expressed as standard deviations of each outcome. Vertical lines represent confidence intervals at 90%, with errors clustered at the pair level following de Chaisemartin and Ramirez-Cuellar (2023). Bootstrapped clustered standard errors, obtained by resampling pairs over 2000 replications.

Figure A5. Heterogeneous Treatment Effect by Distance from Water Day

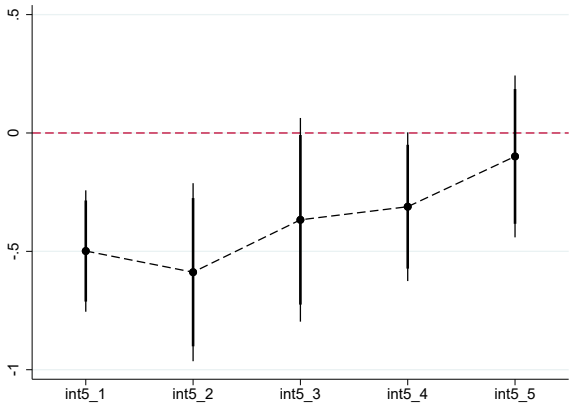
(a) Individual Donation (JOD)



(b) Collective Donation (p.p)

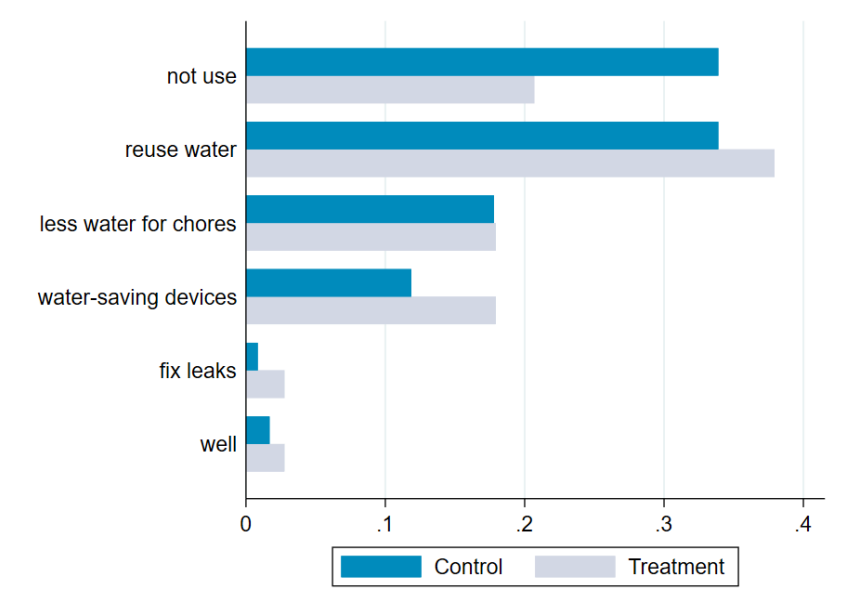


(c) Updated Beliefs (Δ)



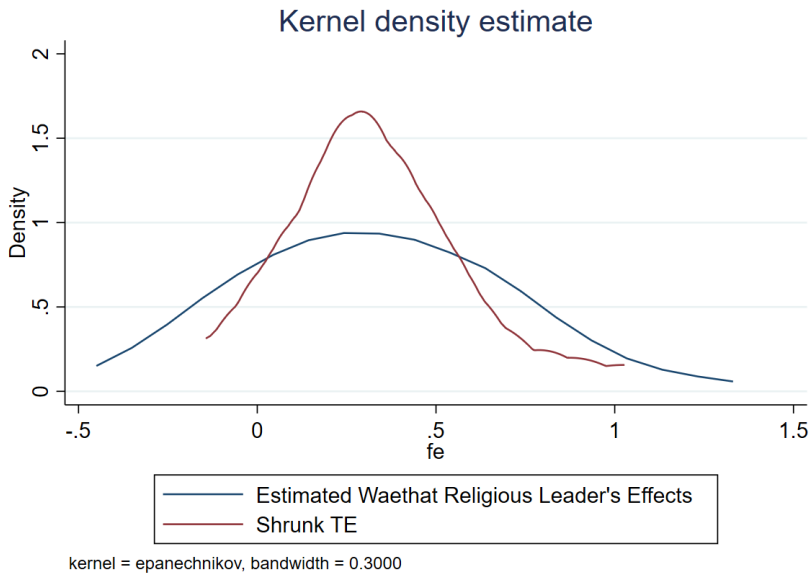
Note: This figure shows heterogeneity in estimated treatment effects on the midline outcomes, by number of days the woman reports elapsing between the day of midline survey and the next water day. The estimated equation is as Equation 1 but substituting the treatment with all the shown interactions. The specification includes waethat fixed effects and age, household size, and number of water days as controls. *Individual Donation*, records how much money a woman, upon receiving 15 JOD from the research team, is willing to give back for a donation to a water charity. *Collective Donation*, is a dummy for whether the woman chooses a water charity, over other charities, to donate 700 Jordanian Dinars (JOD) for almsgiving on behalf of the class. *Updated Belief* reports change in perceptions between baseline priors and midline posterios, on how much the woman believes to be water efficient in the house on a scale from 1 to 7. The coefficient on the left shows the estimated change in own water efficiency belief between baseline, i.e. right before the class, and midline, i.e. right after the class. 95% confidence intervals are shown as thick lines and 90% confidence intervals with thinner ones, computed by resampling pairs over 2000 replications. Errors are clustered at the pair level following de Chaisemartin and Ramirez-Cuellar (2023).

Figure A6. Share of Women Using Water-Saving Methods



Note: This figure shows the share of women reporting to have used a specific water-saving method in the last three months.

Figure A7. Biased and Unbiased Religious Leaders' Fixed Effects

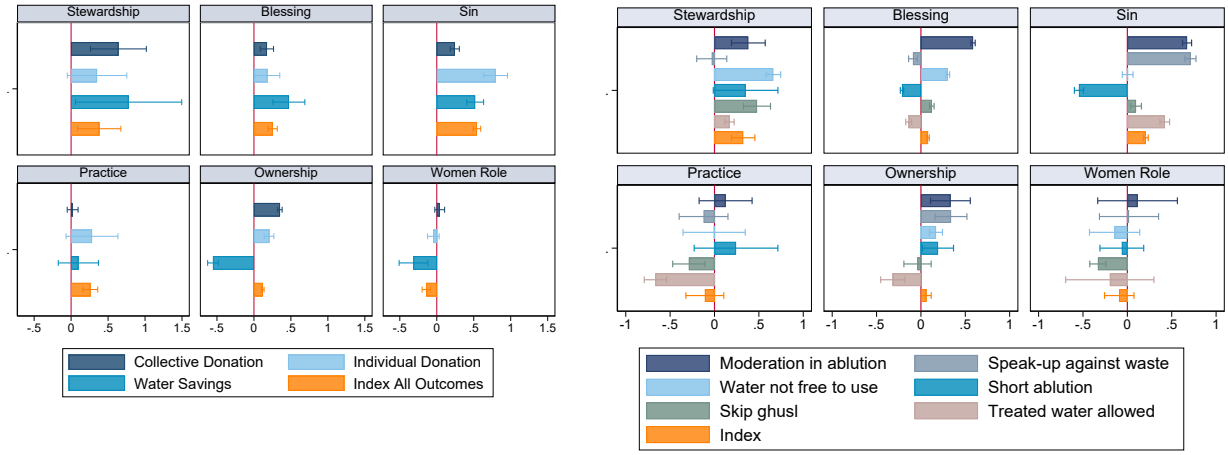


Note: This figure shows the biased (observed estimates) and unbiased (shrunked posteriors) distributions of the religous leaders' fixed-effects.

Figure A8. Differential Effect of Class Content on Main Outcomes and Beliefs

(a) Main Outcomes: Behaviors

(b) Mechanisms: Beliefs



Note: These figures show differential effects of the concepts discussed in the treatment class on behaviors (*Individual Donation*, *Collective Donation*, and *Water Consumption*) and religious beliefs measures in equation 3, which includes waethat fixed effects and age, household size, and number of water days as controls. All the outcomes are standardized on the same scale. Moreover, I include an index of all the outcomes constructed following Anderson (2008). The concepts are: *Blessing*, *Sin*, *Stewardship* , *Ownership*, *Practice*, and *Women Role*. Panels show effects from a regression of the outcomes, behaviors (panel (a)) and beliefs (panel (b)) over six mutually exclusive dummies for the main content discussed in each class, identified as the concept with the largest share of weighted sentences discussed. Horizontal lines represent 90% confidence intervals, with errors clustered at the pair level following de Chaisemartin and Ramirez-Cuellar (2023). Bootstrapped clustered standard errors are obtained by resampling pairs over 2,000 replications.

Table A1. Descriptives Statistics

	Mean	Std. Dev.	Minimum	Maximum
Age	42.69	13.48	16	95
Ever married	.87	.33	0	1
Five children more	.24	.43	0	1
Primary	.18	.39	0	1
High school	.48	.5	0	1
University	.22	.41	0	1
Refugee	.22	.42	0	1
Urban	.73	.44	0	1
HH. size	5.21	2.11	0	12
Pca wealth	.14	1.67	-5.05	2.64
Employed	.05	.23	0	1
N. waterdays	1.34	.72	0	7
Weekly water just enough	.5	.51	0	1
N. tanks	1.83	.84	1	6
Water bad last month	.53	.5	0	1
Trust others	.17	.38	0	1
Advises monthly	.82	.39	0	1
Change mind usually	.84	.36	0	1
Attend mosque weekly	.49	.5	0	1
Observations	712			

Notes: The table reports descriptive statistics for main sample.

Table A2. Topics Covered in Control Class

Topic	Times covered
Prophet migration	11
Obedience to God	1
Love of goodness	1
Night prayer	1
Social temptation	1
Lying	1
Danger of extremism	1
Children education	1
Names of Allah	1
Tot.	19

Notes: This table shows the topics covered in the control classes.

Table A3. Heterogeneous Effects on Water Consumption and Expenditure by Baseline Water Bill

	Heterogeneous Effects *Baseline water bill*			
	Water Consumption		Water Expenditure	
	(1)	(2)	(3)	(4)
Treatment	-4.6**	2.6	-3.1***	.09
	(1.8)	(2.8)	(.79)	(0.95)
Treatment×Water bill		-.21**		-.096*
		(.099)		(.057)
Obs	290	290	290	290
Clusters	19	19	19	19
Mean	27	27	13	13
Waithat FE	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes

Notes: The table shows heterogeneity in estimated treatment effects on endline water consumption and expenditure, by baseline values. The estimated equation is as Equation 1 but augmenting the specification with an interaction term between the treatment indicator and baseline water bill measures of consumption (2) and expenditure (4), as well as disinteracted. All regressions include waethat fixed effects and controls, namely age, household size, and number of water days as controls, selected following the post-double-selection LASSO procedure set forth in Belloni et al. (2014). Below each coeffcient estimate, I report the bootrapped clustered standard errors in parentheses, obtained by resampling pairs over 2000 replications. For each outcome, I report the mean outcome for the control group. Errors are clustered at the pair level following de Chaisemartin and Ramirez-Cuellar (2023). *p<0.10,**p<0.05,***p<0.01.

Table A4. Treatment Effects on Water Efficiency's Perceptions

	Updated Beliefs			
	Δ Baseline vs. Midline		Δ Midline vs. Endline	Δ Baseline vs. Endline
	(1)	(2)	(3)	(4)
Treatment	-.39***	-.57***	.38*	-.2
	(.1)	(.21)	(.21)	(.24)
Obs	602	258	258	258
Clusters	19	19	19	19
Mean	.17	.17	-.45	-.27
Waethat FE	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes

Notes: The table shows estimated treatment effects for beliefs updating in equation 1. All regressions include waethat fixed effects and controls, namely age, household size, and number of water days as controls, selected following the post-double-selection LASSO procedure set forth in Belloni et al. (2014). Below each coeffcient estimate, I report the bootrapped clustered standard errors in parentheses, obtained by resampling pairs over 2000 replications. For each outcome, I report the mean outcome for the control group. All columns report a change in beliefs between priors and posterios, on how much the woman believes to be water efficient in the house on a scale from 1 to 7. In columns (1)-(2), I record the change in beliefs of own water efficiency between baseline, i.e. right before the class, and midline, i.e. right after the class. Column (2) restrict to the endline sample. In columns (3), I record the change in beliefs of own water efficiency between midline and endline, i.e. three months after the intervention. Errors are clustered at the pair level following de Chaisemartin and Ramirez-Cuellar (2023). *p<0.10,**p<0.05,***p<0.01.

Table A5. Alternative Mechanisms: Information, Salience and Religiosity

Non-Belief Mechanisms

	Known Practices (1)	Known Devices (2)	Correct Anwers (3)	Night Prayer (4)	Mistrust Other Rel (5)
Treatment	-.17	-.17	.023	-.034	.02
	(.22)	(.22)	(.025)	(.05)	(.047)
Obs	653	653	694	285	294
Clusters	19	19	19	19	19
Mean	4.6	4.6	.61	.32	.27
Waethat FE	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes

Notes: The table shows estimated treatment effects on alternative mechanisms, other than beliefs, in equation 1. All regressions include waethat fixed effects and age, household size, and number of water days as controls, selected following the post-double-selection LASSO procedure set forth in Belloni et al. (2014). Below each coefficient estimate, I report the bootstrapped clustered standard errors in parentheses, obtained by resampling pairs over 2,000 replications. For each outcome, I report the mean outcome for the control group. In column (1), *Known Practices* reports the number of water-saving practices known by the woman at midline. In column (2), *Known Devices* reports the number of water-saving devices known by the woman at midline. In column (3), *Correct Answers* reports the share of correct answers in a quiz on water-saving methods and the water crisis in Jordan conducted at the end of the class. In column (4), *Night Prayer* is equal to 1 if the woman reported to have engaged in a voluntary late-night prayer in the last three months. In column (5), *Mistrust Other Rel.* is equal to 1 if the woman distrusts individuals from other faiths at endline. Errors are clustered at the pair level following de Chaisemartin and Ramirez-Cuellar. *p<0.10,**p<0.05,***p<0.01

Table A6. Overlapping Events: Islamic New Year

	Heterogeneity - Islamic Year					
	Collective Donation *dummy* (1)	Individual Donation *JOD* (2)	Updated Belief *scale* (3)	Water Consumption m^3 (4)	Water Expenditure *JOD* (5)	Days Without Water *days* (6)
Treatment	.14***	1.4	-.46***	-5.7*	-3.4**	-.13
	(.038)	(.97)	(.11)	(3)	(1.3)	(.21)
Treatment × Islamic New Year	-.11	.89	.23	5	1.2	-.83
	(.14)	(1.6)	(.35)	(5.4)	(2.8)	(.68)
Obs	583	431	602	290	290	298
Clusters	19	19	19	19	19	19
Mean	.38	7.8	.17	27	13	.62
Waethat FE	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes

Notes: The table shows heterogeneity in estimated treatment effects on main outcomes, by overlapping of class day with the Islamic New Year celebration. The estimated equation is as Equation 1 but augmenting the specification with an interaction term between the treatment indicator and a dummy equal to 1 if the class occurs on a celebration day, as well as disinteracted. All regressions include waethat fixed effects and controls, namely age, household size, and number of water days as controls, selected following the post-double-selection LASSO procedure set forth in Belloni et al. (2014). Below each coefficient estimate, I report the bootsrapped clustered standard errors in parentheses, obtained by resampling pairs over 2000 replications. For each outcome, I report the mean outcome for the control group. Errors are clustered at the pair level following de Chaisemartin and Ramirez-Cuellar (2023). *p<0.10,**p<0.05,***p<0.01.

Table A7. Quantile Treatment Effects

	Quarterly Water Consumption (m^3)			
	Q(20) (1)	Q(40) (2)	Q(60) (3)	Q(80) (4)
Treatment	1.82	.000	.000	-7.91**
	(2.132)	(2.309)	(2.477)	(3.606)
Mean	27	27	27	27
Obs	290	290	290	290
Waethat FE	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes

Notes: This table shows the quantile effects of the treatment. The dependent variable is the quarterly water consumption, in cubic meters, as indicated in the water bill. *p<0.10,**p<0.05,***p<0.01

Table A8. Mechanisms: Religious Beliefs

	Moderation in Ablution	Speak-up for Water Waste	Paid Water Not Free To Use	Shorten Ablutions	Skip Ghusl	Treated Water Halal	Water Saving Pious
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Treatment	.3***	.17*	.16**	.12	-.026	-.21*	.43***
	(.12)	(.087)	(.078)	(.11)	(.087)	(.11)	(.14)
Obs	667	629	533	657	644	551	297
Clusters	19	19	19	19	19	19	19
Mean	-.15	-.075	-.07	-.078	.013	.099	-.21
Waithat FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: The table shows estimated treatment effects on water-related social beliefs in equation 1, which includes waethat fixed effects and age, household size, and number of water days as controls, selected following the post-double-selection LASSO procedure set forth in Belloni et al. (2014). Below each coefficient estimate, I report the bootstrapped clustered standard errors in parentheses, obtained by resampling pairs over 2,000 replications. For each outcome, I report the mean outcome for the control group. Outcomes are measured as z-scores, so effects are expressed as standard deviations of each outcome. Outcomes represent agreement with the following statements. *Moderation in ablution*: Individuals should moderate water use when cleansing themselves before prayers. *Water speak up*: Woman would speak up if she sees someone wasting water at the mosque. *Paying does not allow waste*: Individuals are not free to be wasteful with water even if they paid for it. *Reduce daily ablutions*: When water is scarce, it is acceptable to perform a shorter ablution. *Skip Ghusl*: When water is scarce, woman would skip the long ablution before the Friday prayer. *Treated water is halal*: Water that has been treated for reuse is acceptable in most uses. *Water Saving Pious*: Woman saved water in the last three months to be religiously pious. Errors are clustered at the pair level following de Chaisemartin and Ramirez-Cuellar. *p<0.10,**p<0.05,***p<0.01

Table A9. Heterogeneity of Effects on Religious Beliefs by Conservativeness

	Moderation in Ablution	Speak-up for Water Waste	Paid Water Not Free To Use	Shorten Ablutions	Skip Ghusl	Treated Water Halal	Water Saving Pious
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Treatment	.35*	.16	.38**	-.035	-.16	.00059	.39
	(.2)	(.12)	(.16)	(.13)	(.12)	(.13)	(.28)
Treatment × Conservative	-.15	-.011	-.43	.32**	.23	-.48***	.0081
	(.25)	(.15)	(.3)	(.14)	(.17)	(.17)	(.35)
Obs	638	603	511	628	619	527	281
Clusters	19	19	19	19	19	19	19
Mean	-.15	-.075	-.07	-.078	.013	.099	-.21
Waethat FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: The table shows heterogeneity in estimated treatment effects on religious beliefs, by women's baseline religious conservativeness. The estimated equation is as Equation 1 but augmenting the specification with an interaction term between the treatment indicator and a dummy equal to 1 if the woman reported attending the mosque more than once per week at baseline, as well as disinteracted. All regressions include waethat fixed effects and controls, namely age, household size, and number of water days as controls, selected following the post-double-selection LASSO procedure set forth in Belloni et al. (2014). Below each coefficient estimate, I report the bootstrapped clustered standard errors in parentheses, obtained by resampling pairs over 2000 replications. For each outcome, I report the mean outcome for the control group. Errors are clustered at the pair level following de Chaisemartin and Ramirez-Cuellar (2023).

Table A10. Content Analysis - All

	Individual Donation (1)	Collective Donation (2)	Water Savings (3)	Index All (4)
A Dummy Variables				
Stewardship	.64***	.35	.78*	.38**
	(.22)	(.24)	(.43)	(.17)
Blessing	.18***	.18*	.47***	.25***
	(.053)	(.1)	(.13)	(.036)
Sin	.24***	.8***	.52***	.54***
	(.036)	(.096)	(.068)	(.03)
Practice	.021	.28	.098	.26***
	(.044)	(.21)	(.16)	(.059)
Ownership	.35***	.2***	-.55***	.12***
	(.018)	(.038)	(.043)	(.011)
Role Women	.04	-.046	-.32***	-.14***
	(.04)	(.046)	(.12)	(.033)
B Continous Variables				
Stewardship	.77***	.55*	.76	.52***
	(.23)	(.28)	(.51)	(.069)
Blessing	.16**	.089	.46***	.17***
	(.064)	(.11)	(.13)	(.024)
Sin	.3***	.98***	.7***	.53***
	(.069)	(.24)	(.14)	(.07)
Practice	-.024	.34	.095	.28***
	(.07)	(.24)	(.22)	(.059)
Ownership	.45***	.0055	-.74***	.22***
	(.042)	(.14)	(.075)	(.017)
Role Women	-.24	-.16**	-.56**	-.37***
	(.16)	(.067)	(.22)	(.059)
Obs	583	431	290	650
Clusters	19	19	19	19
R2	.16	.24	.07	.092
Waithat FE	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes

Notes: These table show differential effects of the concepts discussed in the treatment class on my main objective outcome measures (*Individual Donation*, *Collective Donation*, and *Water Consumption*) in equation 3, which includes waethat fixed effects and age, household size, and number of water days as controls. All the outcomes are standardized on the same scale. Moreover, I include an index of all the outcomes constructed following Anderson (2008). The concepts are: *Blessing*, *Sin*, *Stewardship* , *Ownership*, *Practice*, and *Women Role*. Panel (a) shows effects from a regression of the outcomes over six mutually exclusive dummies for the main content discussed in each class, identified as the concept with the largest share of weighted sentences discussed. Panel (b) shows effects from a regression of the outcomes over six continuous variables for the weighted share of sentences belonging to each concept discussed in the class. Bootstrapped clustered standard errors are obtained by resampling pairs over 2,000 replications.

Table A11. Heterogeneous Effects - All

	Individual Donation (1)	Collective Donation (2)	Water Savings (3)
Treatment	2.7***	.13	4.1
	(.65)	(.13)	(3.3)
Treatment×Positive	-1.3	-.015	.62
	(1)	(.13)	(4)
Treatment	2.7***	.081*	1.7
	(.69)	(.041)	(2.2)
Treatment×Quran	-2.4***	.089	7.3*
	(.9)	(.068)	(3.7)
Treatment	.34	.11***	2.3
	(.52)	(.042)	(2.9)
Treatment×Religious Models	2.8***	.004	4.7
	(.91)	(.067)	(3.6)
Treatment	1.6***	.074**	1.4
	(.57)	(.033)	(1.9)
Treatmen×Participatory	36	.12	11***
	(1.4)	(.074)	(3.4)
Obs	431	583	290
Clusters	19	19	19
Mean	7.8	.38	27
Waithat FE	Yes	Yes	Yes
Controls	Yes	Yes	Yes

Notes: The table shows heterogeneous treatment effects by teaching style of the religious leader on my main objective outcome measures (*Individual Donation*, *Collective Donation*, and *Water Consumption*) in equation 4, which includes waethat fixed effects and age, household size, and number of water days as controls. All the outcomes are standardized on the same scale. Below each coefficient estimate, I report the bootstrapped clustered standard errors in parentheses, obtained by resampling pairs over 2,000 replications. All interacted variables in columns (1) to (3) are dummy variables equal to 1 if the teaching style of the waethat is as follows: *Positive* if she has an encouraging and positive tone, instead of relying on admonitions and warnings; *Quran* if she relies extensively on Quranic sources, instead of other religious ones; *Religious Models* if she mainly refers to religious role models instead of secular ones; *Participatory* if she engages the class with a bottom-up, dialogic approach rather than a top-down, frontal, approach. Errors are clustered at the pair level following de Chaisemartin and Ramirez-Cuellar. *p<0.10,**p<0.05,***p<0.01

Appendix B Attrition

Table B1. Attrition by Treatment Status

	Didn't answer Collective Donation		Didn't answer Individual Donation		Didn't answer Updated Belief	
	(1)	(2)	(3)	(4)	(5)	(6)
Treatment	-.015	-.017	.059	.058	.003	.0012
	(.027)	(.024)	(.051)	(.05)	(.047)	(.042)
Age		.0015		.0017		.0019*
		(.00093)		(.0015)		(.0011)
HH. size		.0021		.0022		-.0045
		(.0071)		(.0065)		(.0051)
N. water days		.019		.013		.024
		(.031)		(.035)		(.023)
PCA wealth		-.011		-.015*		-.031***
		(.012)		(.008)		(.0094)
Obs	712	712	712	712	712	712
Clusters	19	19	19	19	19	19
Mean	.18	.18	.37	.37	.16	.16
Waethat FE	Yes	Yes	Yes	Yes	Yes	Yes
Controls	No	Yes	No	Yes	No	Yes
F-stat		.59		.4		.002

Notes: This table presents tests for selective attrition by treatment status in answering outcome measures. In each column, the dummy is equal to 1 if the woman did not answer to the question. I report the bootstrapped clustered standard errors in parentheses, obtained by resampling pairs over 2,000 replications. Errors are clustered at the pair level following de Chaisemartin and Ramirez-Cuellar (2023). *p<0.10,**p<0.05,***p<0.01.

Table B2. Attrition Analysis - Baseline Characteristics for Estimation Sample

	Difference		
	Collective Donation	Individual Donation	Updated Belief
	(1)	(2)	(3)
Age	0.643	0.192	0.359
	(0.560)	(0.877)	(0.737)
Ever married	0.043	0.056	0.057*
	(0.191)	(0.120)	(0.091)
Five children more	0.038	0.043	0.039
	(0.185)	(0.192)	(0.190)
Education	0.029	0.027	0.088
	(0.658)	(0.751)	(0.162)
Refugee	-0.011	0.008	-0.012
	(0.719)	(0.815)	(0.705)
Urban	-0.012	0.020	-0.023
	(0.655)	(0.235)	(0.510)
HH. size	0.138	0.167	0.198
	(0.478)	(0.344)	(0.207)
Pca wealth	-0.075	0.060	-0.067
	(0.533)	(0.682)	(0.508)
Employed	-0.007	0.002	-0.007
	(0.736)	(0.912)	(0.729)
N. water days	-0.027	-0.028	-0.054
	(0.469)	(0.614)	(0.215)
Trust	-0.041	-0.024	-0.013
	(0.148)	(0.513)	(0.614)
Advise monthly rel. leader.	-0.007	-0.000	-0.006
	(0.788)	(0.997)	(0.794)
Weekly water just enough	-0.008	0.036	-0.006
	(0.805)	(0.164)	(0.850)
Obs.	583	431	602

Notes: Standard deviations in parentheses. Stars correspond to the test that control and treatment groups have the same population mean. *p<0.10,**p<0.05,***p<0.01

Table B3. Attrition Analysis - Lee Bounds

	Individual Donation		Collective Donation		Updated Belief	
Bounds	Upper	Lower	Upper	Lower	Upper	Lower
	(1)	(2)	(3)	(4)	(5)	(6)
Treatment	2.2***	1.2*	.11***	.12***	-.42***	-.37***
	(.58)	(.58)	(.032)	(.031)	(.1)	(.1)
Obs	413	413	581	582	600	601
Clusters	19	19	19	19	19	19
Waethat FE	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Errors are clustered at the pair level following de Chaisemartin and Ramirez-Cuellar (2023). *p<0.10,**p<0.05,***p<0.01.

Appendix C Robustness

Table C1. Robustness Exercises on Main Outcomes

	Robustness - Main Outcomes				
	Individual Donation	Collective Donation	Water Bill Consumption	Water Bill Expenditure	Days Without Water
	(1)	(2)	(3)	(4)	(5)
A Cluster: Class					
Treatment	1.7***	.11***	-4.6***	-3.1***	-.35**
	(.45)	(.023)	(1.4)	(.62)	(.16)
B Cluster: Waethat					
Treatment	1.7**	.11***	-4.6**	-3.1***	-.35
	(.62)	(.032)	(1.8)	(.81)	(.21)
C Randomization Inference					
Treatment	1.7***	.11***	-4.6**	-3.1***	-.35**
	(.45)	(.039)	(1.8)	(.96)	(.14)
Obs	431	583	290	290	298
Mean	7.8	.38	27	13	.62
Waethat FE	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes

Notes: The table shows estimated treatment effects for the main outcomes in equation 1. Panel (a) reports standard errors clustered at the class level; panel (b) reports standard errors clustered at the waethat level; panel (b) reports standard errors clustered at the waethat level; panel (c) reports standard errors calculated using randomization inference following Athey and Imbens (2017). P-vale for *Young Westfall-Young joint test* is 0.001. *p<0.10,**p<0.05,***p<0.01.

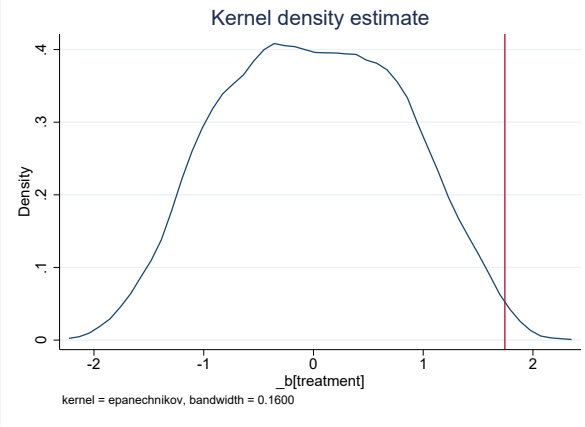
Table C2. Robustness Exercises on Mechanisms

	Robustness - Mechanisms						
	Moderation in Ablution (1)	Speak-up for Water Waste (2)	Paid Water Not Free to Use (3)	Shorten Ablutions (4)	Skip Ghusl (5)	Treated Water Halal (6)	Water Saving Pious (7)
A Cluster: Class							
Treatment	-.13***	-.071**	.081**	.057	-.01	-.1**	.21***
	(.037)	(.027)	(.039)	(.039)	(.025)	(.039)	(.053)
B Cluster: Waethat							
Treatment	-.13**	-.071*	.081	.057	-.01	-.1*	.21***
	(.051)	(.037)	(.054)	(.054)	(.034)	(.054)	(.07)
C Randomization Inference							
Treatment	-.13***	-.071**	.081*	.057	-.01	-.1**	.21***
	(.033)	(.035)	(.044)	(.037)	(.031)	(.041)	(.058)
Obs	667	629	533	657	644	551	297
Clusters	38	38	38	38	38	38	37
R2	.051	.029	.037	.079	.028	.063	.1
Mean	.31	.27	.49	.32	.19	.67	.47
Waithat FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes

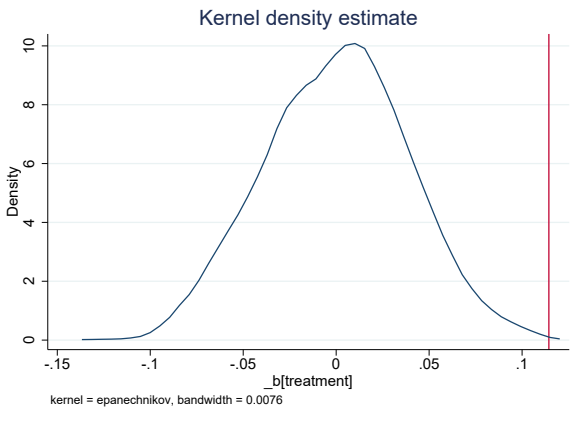
Notes: The table shows estimated treatment effects for the main mechanisms in equation 1. Panel (a) reports standard errors clustered at the class level; panel (b) reports standard errors clustered at the waethat level; panel (b) reports standard errors clustered at the waethat level; panel (c) reports standard errors calculated using randomization inference following Athey and Imbens (2017). P-vale for *Young Westfall-Young joint test* is .0008. *p<0.10,**p<0.05,***p<0.01.

Figure C1. Density - Randomization Inference

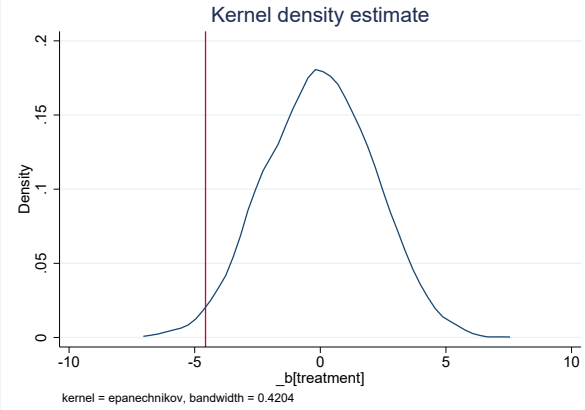
(a) Individual Donation



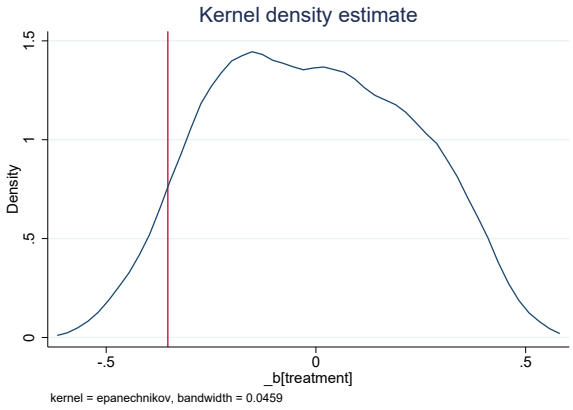
(b) Collective Donation



(c) Water Consumption



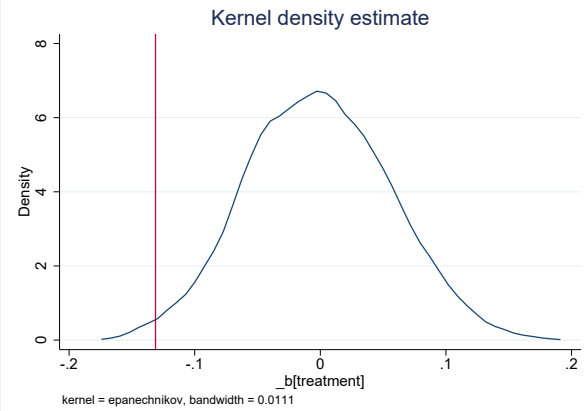
(d) Days Without Water



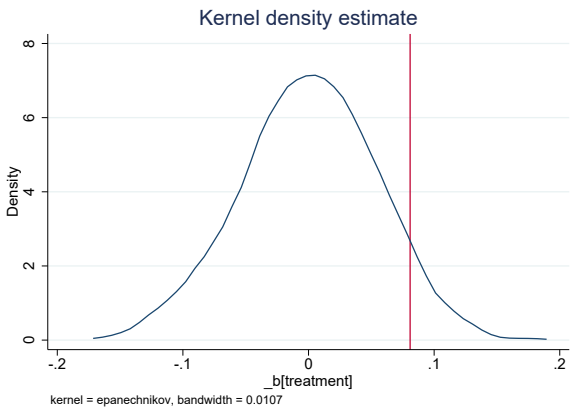
Note: The figure shows a simulation exercise following Athey and Imbens (2017). Each simulated treatment effect comes from randomly assigning classes, within pairs, to the religious treatment using the same randomization algorithm used for the true assignment and then running a regression of the outcome on the treatment status, including religious leader fixed effects. The red line is the estimated effect. The reported p-value is calculated as the number of simulated effects greater in absolute value than the estimated effect.

Figure C2. Density - Randomization Inference

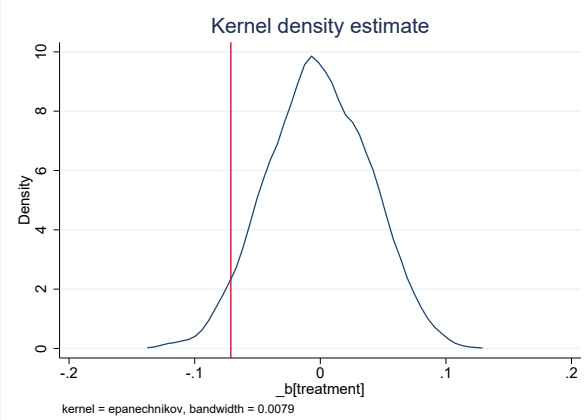
(a) Moderation in Ablution



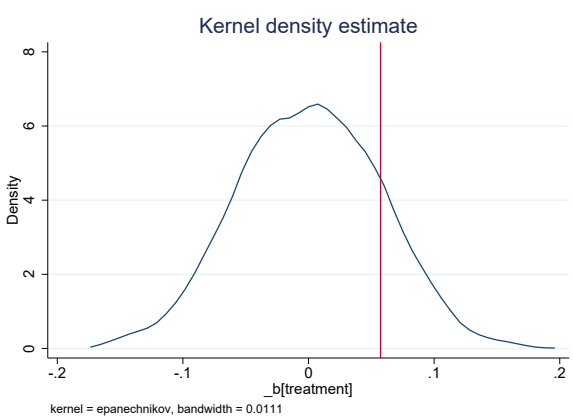
(b) Speak-up for Water Waste



(c) Paid Water not Free



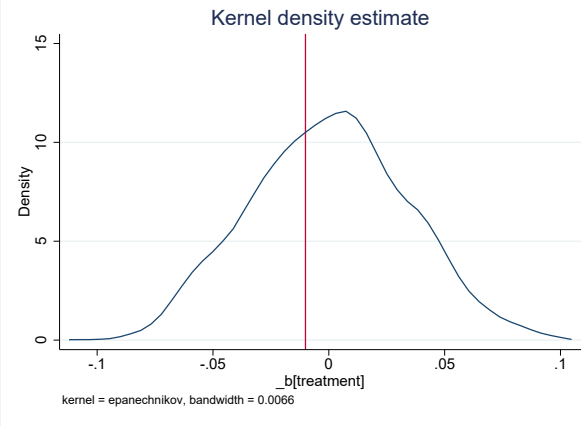
(d) Shorten Ablutions



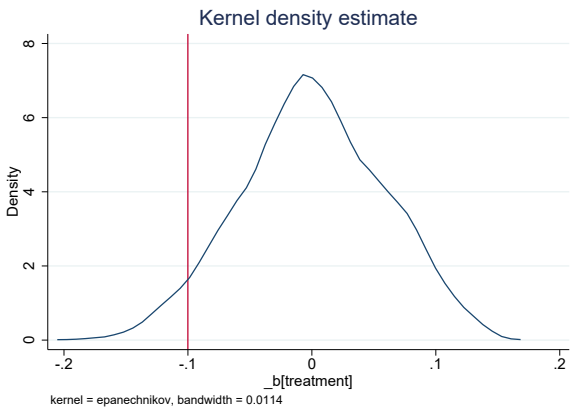
Note: The figure shows a simulation exercise following Athey and Imbens (2017). Each simulated treatment effect comes from randomly assigning classes, within pairs, to the religious treatment using the same randomization algorithm used for the true assignment and then running a regression of the outcome on the treatment status, including religious leader fixed effects. The red line is the estimated effect. The reported p-value is calculated as the number of simulated effects greater in absolute value than the estimated effect.

Figure C3. Density - Randomization Inference

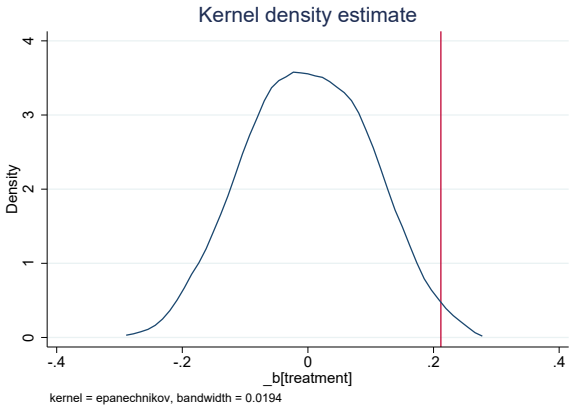
(a) Skip Ghusl



(b) Treated Water Halal



(c) Water Saving Pious



Note: The figure shows a simulation exercise following Athey and Imbens (2017). Each simulated treatment effect comes from randomly assigning classes, within pairs, to the religious treatment using the same randomization algorithm used for the true assignment and then running a regression of the outcome on the treatment status, including religious leader fixed effects. The red line is the estimated effect. The reported p-value is calculated as the number of simulated effects greater in absolute value than the estimated effect.

Appendix D Text Analysis

To classify the recordings of the religious classes, I rely on a narrative approach to content analysis (Grimmer and Stewart (2013); Neuendorf (2017)). This technique is particularly effective for texts with specialized content that is difficult to automate, as in my case of Islamic precepts on water (Grimmer and Stewart (2013)). I select three human coders from Jordan, that do not have previous experience with the experiment and have similar characteristics to the women in my sample in terms of socio-economic and religious background. Coders classify scripts transcribed from classes' recordings. After removing interjections and greetings, the unit of analysis is a class' sentence. I create a codebook to train the coders to identify the categories of interest, and classify sentences accordingly. I ask coders to classify each sentence according to its religious content. Also, coders classify each class according to the teaching style adopted by the religious leader. Following Neuendorf (2017), the coders are first trained on a script sample, when they perform the exercise together and can provide feedback to incorporate missing categories. The training and debriefing was repeated twice. After the training, the codebook was finalized, the coders had to classify the data independently without any contact between them, or with resources outside of the codebook. To validate the procedure, I find an average inter-coder agreement rate of 96%, using Cohen's kappa metrics (Landis and Koch (1977)). This is in line with other papers using the human approach. For instance, Gillion (2016) reports an inter-coder agreement rate between his two annotators at 97%. In cases where no agreement was reached, I attributed the final classification of the sentence using GPT-4.

To validate the text analysis further, I re-classified the content of the recordings using GPT-4. I use the same codebook instructions followed by the human coders. Since the automated language cannot perfectly classify such an highly specialized and context-specific content, GPT-4 fails to classify 18% of the sentences. Among the sentences that are instead classified, I find an inter-coder agreement of 91% with respect to the human coding.

Regarding classification by religious content, coders classified sentences into six major concepts of water in Islam explained in the waethats' training, breaking down each concepts into smaller micro-topics, as show below:

- *Blessing*: water as a gift to humankind; water as origin of life; sign of God omnipotence; concept of free gift that God can take away at any moment.
- *Stewardship*: humans as stewards of God's perfect creation; responsibility of humans to preserve God's creation for future generations.

- *Sin*: concepts of sin and/or punishments following bad use of water (e.g. wasting, polluting, etc.) and rewards for good use of water; mentions of forbidden water behaviors.

- *Ownership*: Islamic law (Sharia) to use and share water sources among communities; Islamic law (Sharia) on rights and responsibilities regarding water ownership among communities; Islamic law (Sharia) to address disputes related to water rights and usage.

- *Practice*: any mention to religious ablutions, both wudu and ghusl, which may include type of water to use, method (e.g. short, sunna, dry, etc.), religious prescriptions, etc.; religious suitability of adoption of new water technologies, which may include discussions of treated waste water, and water saving devices; water as best form of charity, both in zakat and saddaqa jariya.

- *Women Role*: role of women as main ambassadors to spread water conservation principles in society; women as main care-giver responsible of water in the household; women main responsible to educate future generations to environmental preservation; women as main role models in the household.

Regarding classification by teaching style, coders classified classes into some teaching characteristics, as show below:

- *Positive*: waethat is positive and cheerful in engaging with women and promoting water conservation. Opposite case if waethat use admonitions to preach.

- *Quran*: the waethat uses Quran as main source to prepare the class.

- *Religious Models*: waethat uses as main role models the Prophet and other pious Muslims (e.g. wives of Prophet, sheiks, etc.)

- *Participatory*: waethats is engagin, talks openly with women, tries different bottom-up approaches (e.g. games, examples, demonstrations) and there are many dialogues and questions, and answers.

Examples of Sentences Classification
Blessing Concepts

- The most beautiful grace Allah gives to a human being is water, because water is the main reason for living.

- Allah told us in the Quran that water is the most important resource on the earth, Allah said in Quran Kareem "And We made from water every living thing. Will they not believe?".

- Water is more valuable than possessions and jewels. Harun al-Rashid, the Abbasid caliph, once approached Ibn Samak and requested water. When he began drinking the water hastily, Ibn Sammak remarked, "Amir al-Mu'min, if this water were hidden from you, how much would you be willing to pay for it?" Harun al-Rashid replied, "I would give half of all I possess for it." Ibn Sammak then asked, "And if, by God's grace, the water remains in our bodies, how much would you pay to remove it from your body?" Harun al-Rashid answered, "I would give everything I have." Ibn Sammak concluded, "Possessions are of no worth if they can't equal a glass of water," which moved Harun al-Rashid to tears.

- Allah said "one is fresh, sweet, and pleasant to taste, while the other is salty and bitter". This did not happen by chance, but there is a very accurate reason. If all water was salty, life would be impossible on the earth. But Allah, in wisdom, made water sweet: "and have given you to drink sweet water". Although most of the earth is covered by salty oceans and rivers, the rainwater is sweet and here we can find the gift and balance from Allah.

Stewardship Concepts

- Saving water is a public responsibility at home, hospitals, public gardens, and government organizations, because you are stewards on this earth and for your community.

- Each of you is a shepherd and each of you is responsible for his flock. 'Abdallah b. 'Umar reported God's Messenger as saying, "Each of you is a shepherd and each of you is responsible for his flock. The imam who is over the people is a shepherd and is responsible for his flock; a man is a shepherd in charge of the inhabitants of his household and he is responsible for his flock; a woman is a shepherdess in charge of her husband's house and children and she is responsible for them. So each of you is a shepherd and each of you is responsible for his flock." Foremost, you are responsible for your brothers' survival on this planet taking care of its resources.

- God gave you the world, beautiful, perfect and verdant and you are its stewards.

- Allah orders us to protect the grace he gives to us, and be viceregents of his perfect creation. Islam came to guide us to protect these graces, and Islam requires us to protect water and make individuals, families, and community life easier.

- Older Islamic communities and our ancestors, parents, and grandparents, lived with less water and a hard life, but their rule was to spare and protect water for all the community.

Sin Concepts

- The person who wastes water, Allah will punish her. A lot of Islamic texts banned wasting water even in activities related to prayers.

- Islam is a religion of moderation. It is against excess and negligence. Islam has fought extravagance in everything. Among the manifestations of fighting this waste and extravagance, there is the Prophet's supplication of not misusing water. The prohibition of extravagance in water use applies even if a person is next to a flowing river in which there is a lot of water.

- Allah prohibited extravagance even in food and drinking. Allah Almighty said: "Eat and drink but do not be extravagant as he does not love the extravagant". And said: "Do not be spendthrifts. Verily spendthrifts are brothers of evil ones, and he the evil one is to his Lord ungrateful".

- The Prophet prohibits extravagance in the use of water even in one of the most revered acts of worship, ablutions, which is essential for prayer.

Ownership Concepts

- Who owns the water in Islam? The water is owned by everyone and is managed by the state. No one can monopolize the water for him/herself. Prophet Mohammad said, "Muslim are partners in three things: grazing, pasture, water, and fire."

- Remember the story of the Ruma well. The Prophet had come to Medina, and there was only one well of sweet water, the Well of Rumah. To give access to water to all the community, the Prophet asked the owner to sell him the well in exchange for a garden in Paradise. So no one can monopolize water for him/herself, and the state's responsibility is to distribute the water to citizens equally.

Practice Concepts

- The Prophet teaches us that moderation has to be used in ablutions. The Prophet once saw Saad doing ablution with abundant water. He said: "What is this extravagance?" and Saad said: "O Messenger of Allah, is there extravagance in ablution?" He said: "Yes, even if you are on a flowing river." Here it becomes clear that the Prophet did not base his prohibition of extravagance in water usage only on water scarcity or security. He forbids extravagance even when water is abundant as revealed in "even if you are on a flowing river."

- A Bedouin came to the Prophet and asked him about his ablution. He showed him how to perform it washing each part of the body three times. Then he said: "This is ablution, and whoever does more than this, has done evil, transgressed the limits and wronged himself". The Prophet considers excess of the third wash in ablution not good, even though this excess is related to a pious act of worship.

- The Prophet used to perform ablution and wash with a small amount of water, ablutions with a Mudd and wash with a Sa' to five Mudds.

- It was narrated by Sa'd bin 'Ubadah that his mother died. He said: "O Messenger of Allah, my mother has died; can I give charity on her behalf?" He said: "Yes." He said: "What kind of charity is best?" He said: "Providing drinking water." And that is the drinking fountain of Sa'd in Al-Madinah.

- We are required to adopt optimal behaviors in the use of water and use technologies that contribute to the rationalization of water consumption, such as treated water. The Awqaf and Al-Ahzar gave it the green light. Now treated water has been recognized halal since modern technologies allow us to obtain treated water that is as pure as water from a spring. The reason that such water was haram was to protect us from diseases. Since the treated water by modern technology is perfectly pure, we are now allowed to use it even for the most important ritual ablutions.

Women Role Concepts

- Woman is the main core to establishing strong bonded societies, that's why woman is honored in Islam. Islam gave her rights and duties and gave her the most important task which is raising generations. In the current difficult water situation that the citizens suffer, the main role of the woman is to deliver the message of using water wisely to her family and society.

- A woman is capable of changing many wrong behaviors inside and outside the house, that's why Allah ordered us to obey mothers, and made obeying parents linked with obeying Allah. Women have the responsibility of using water wisely and share this awareness among their family members.
- Women's role is to bring attention to saving water, first within the family, then in the community through their children and future generations.