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Engaging faith-based communities in pro-environmental behavior using soft regulations: The case of single-use plastics

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The consumption of single-use plastics, such as disposable tableware (DTW), conveys a high benefit-cost ratio for consumers while having large environmental externalities. To encourage consumers to reduce their use of DTWs, governments could use small and non-coercive changes in people's decision-making environments (nudges). This study focuses on the Israeli ultra-Orthodox communities a secluded population group that grows much faster- and consumes much more DTW than the rest of the Israeli population. Employing a quasi-representative sample (N = 450) of this population, this study conducted a discrete-choice experiment that presents the respondent with alternative options to reduce DTW. Two kinds of Nudges–framing and social norms–were utilized. The effectiveness of these Nudges in promoting PEB among faith-based communities has received little attention in previous studies. As another contribution to the literature, this paper also integrates latent constructs such as the respondents' environmental attitudes and level of conservativeness. 46% of the respondents chose to opt-out whereas 29%, 14%, and 11% chose '1-day', '2-days', and '3-days' per week avoiding DTW, respectively. Social norms, framings, and environmental attitudes had a significant mediating effect, with framing being associated with the highest effect on intentions to reduce DTW, i.e., a willingness to give up 0.31 USD per family member per month, compared to 0.07 USD for an increase in the description of the social norm. The results suggest that Nudges can enhance policies aimed at encouraging pro-environmental behavior among faith-based communities.

KEYWORDS

single-use plastics (SUP), disposable tableware, green nudge, discrete choice experiment (DCE), faith-based communities, pro-environmental behavior (PEB), ultra-orthodox

1 Introduction

The global disposable tableware (DTW) market is growing rapidly. In 2019, it was valued at 28.7 billion USD, and is predicted to reach 32.8 billion USD by the end of 2026 (MarketResearch.com, 2021). DTW are characterized by high functionality at low cost. They are intended to be used only once before they are thrown away. Because of their extremely low recyclability, DTW contaminate the natural environment (Wagner, 2017) and have become a significant source of damage, resulting in enormous environmental externalities (Cornago et al., 2021). In the North Pacific Ocean, the Great Pacific Garbage Patch, which is composed largely of plastic waste, exemplifies this problem; it has been estimated to be double the size of Texas (Lebreton et al., 2018). Various policies have been implemented to reduce the consumption of single-use plastic (SUP) in general and DTW in particular, ranging from soft policies (e.g., education) to command-and-control and market-based vehicles (e.g., taxation, fees, bans, and extended producer responsibility schemes). Thus far, these policies have yielded limited success, probably because of the lack of sufficient alternatives to DTW. This study focuses on the ultra-Orthodox Jewish population in Israel, a community whose SUP consumption is high, as compared to the broader society in Israel (Israel Central Bureau of Statistics, 2018), which, in turn, is the second biggest per capita consumer of SUP in the Mediterranean (World Wildlife Fund for Nature, 2020). Further, ultra-Orthodox Jews are the fastest-growing demographic in the developed world as well as in Israel (Cahaner and Malach, 2021). Ultra-Orthodox communities currently make up 12.9% of the population in Israel. Due to the high birth rate among ultra-Orthodox Jews (Freedman, 2020) their population is projected to grow at 4% per annum to two million by 2033, accounting for 16% of the Israeli population (Cahaner and Malach 2021). Even though they are not the current majority, projections indicate that when grouped with other Orthodox Jews, they are slated to become the largest Jewish demographic in Israel and the United States (Felman and Adkins, 2018; Cahaner and Malach 2021). Moreover, this population group has been known for its significant electoral power and gains, thus playing a large role in politics (Freedman, 2020). If ultra-Orthodox communities continue to consume single-use plastics at the current rate, this will have disastrous outcomes for the local environment, and put enormous strain on waste management systems.

Given the high consumption of DTW among the ultra-orthodox sector in Israel and their increased political power, legislation that bans or taxes disposable tableware may not be effective over the long term, which warrants the utilization of 'soft' regulatory measures. Indeed, various policies have been implemented to motivate faith-based communities to adopt PEB, such as education (e.g., Webb and Hayhoe, 2017), influencing their value frameworks (Smith and Pulver, 2009), and engaging faith leaders as role models to influence believers to adopt PEB (Yoreh, 2010; Tsimpo and Wodon, 2016). However, studies of the realized impact remain rare (Taylor et al., 2016). Given that consumption decisions are influenced by various factors, including perceptions of social norms (e.g., Steg and Vlek, 2009) and the high conformity to norms in faith-based communities, this study harnesses two nudges drawn from behavioral economics to explore their effect on the willingness to reduce consumption of DTW among ultra-Orthodox communities in Israel. The first nudge is a *descriptive* Social Norm (what other people in the community are doing in terms of using DTW). The second nudge is Framing (Defazio et al., 2021; Mertens et al., 2022) which in this study is the description of the hazards of DTW use in terms of health vs cleanliness and damage to the purity of sacred land.

This study provides the first evidence of the effectiveness of these nudges in promoting PEB among members of the ultra-Orthodox community. In addition, this study finds a mediating effect of latent variables such as pro-environmental attitudes and level of conservativeness.

The paper proceeds as follows: chapter 2 provides a Literature review and lay down the hypotheses. Chapter 3 describes the Methods including the study design, empirical model, data collection process, and analytical approach. Chapter 4 provides the statistical and econometric results. Chapter 5 provides policy implications and limitations.

2 Literature review and hypotheses

The following chapter provides the reader with a clear synthesis of the literature and the conceptual framework from which this study is drawn. The chapter starts with a review of PEB among faith-based communities and the challenges it conveys and continues with the utilization of Nudges to promote PEB in these communities, including emphasizing the contribution of this study. The chapter concludes with the research hypotheses.

2.1 Nudges

Nudges are small, non-coercive changes in people's decision-making environments that affect their decision-making without substantial monetary incentives (Thaler and Sunstein, 2008). For example, *defaulting* employees into saving for retirement (while providing them an easy and highly salient way to override this default) can considerably increase the savings rate (Madrian and Shea, 2001; Thaler and Benartzi, 2004). Similarly, nudging people by providing them with information about *a social* norm (either *descriptive* - what others do—*or injunctive* - what is the right thing to do; Lede and Meleady, 2019) increases their inclination to adhere to that norm (e.g., Shang and Croson, 2009). Also

prompting people with simple timely reminders can increase their uptake of services (e.g., Berliner Senderey et al., 2020). Another type of nudge is framing - namely, presenting information related to a decision (e.g., its potential outcomes) in a certain manner rather than another, so as to affect the decision-maker's preferences (Tversky and Kahneman, 1986). A good example of framing was provided by Wilson (2006), who partnered with evangelical Christian leaders, in discussing environmental protection in terms of morality and ethics. For an extensive review of these and other types of Nudges please refer to Münscher et al. (2016) and Szaszi et al. (2018). Because of the high benefit-cost ratio of nudges, as compared to other policy tools, e.g., material incentives that include vouchers and tokens, (Yoeli et al., 2013; Benartzi et al., 2017; Chetty et al., 2014; Rogers and Feller, 2018; Mertens et al., 2022), governments and public institutions have increasingly used nudges to promote various policy goals in domains such as health, tax compliance, consumer protection and retirement savings (e.g., Halpern, 2015; OECD, 2017; Carlsson et al., 2019; Ruggeri, 2021) as well in promoting PEB (e.g., Schubert, 2017; Akbulut-Yuksel and Boulatoff, 2021). For example, "green nudges" (i.e., nudges that aim at promoting environmentally benign behavior) can be used to promote energy and water conservation (e.g., Allcott, 2011; Yoeli et al., 2013; Bhanot, 2021), recycling behaviors (e.g., Zhang and Wang, 2020) or food waste reduction (e.g., Kallbekken and Sælen, 2013; Vidal-Mones et al., 2022).

2.2 Pro-environmental behavior among faith-based communities

The literature increasingly discusses the potential and need for religious communities to advance environmental action. In their article published in Science, Amel et al. (2017) addressed climate change activism. They argued that faith communities can drive change as they bring people together through shared values and rituals. Faith communities have considerable social capital that enables them to enact change broadly and swiftly (Veldman et al., 2013). Religious environmental organizations attempt to motivate change by influencing the value frameworks of religious communities (Smith and Pulver 2009). Religious environmental activists reference fundamental ideas and values within their faith as guiding their PEB (McKay et al., 2013; Bomberg and Hague 2018; Hancock, 2018; Nilan, 2020; Koehrsen, 2021). To encourage action, initiatives such as Interfaith Power and Light's Cool Congregation program[1] and Faith and the Common Good's Greening Sacred Spaces program[2] highlight the economic incentives of greening places of worship. Some scholars argue that motivating Pro-Environmental Behavior (PEB) in faith-based communities is challenging; while some faith-based groups have been active in the climate activism movement (Zemo and Nigus, 2021), others have received media attention for their outright denial of climate change (Haluza-DeLay, 2014).

Nevertheless, the engagement of faith-based communities in PEB is often overlooked, both in academia and practice (Taylor et al., 2016). There are very few studies that address PEB among faith-based groups. For example, Rice (2006) investigated the relationship between PEB and religiosity among Islamic citizens of Cairo. This study found that religious teachings and religiosity were associated with PEB, through the notions of health and cleanliness, thus supporting the presence of an Islamic environmental ethic. In South Africa it was found that respondents perceived environmental stewardship as a dimension of Christian stewardship (Le Roux, 2012). In Israel there has also been little study concerning the environmental behaviors of Israeli minorities including faith-based groups. Most of the research has been conducted by Yoreh (2010, 2011, 2019a, b), who explored attitudes toward the environment, wastefulness, and recycling patterns among ultra-Orthodox communities in Israel and Canada. He argues that the existence of a prohibition against wastefulness (*bal tashḥit*; Deuteronomy 20:19–20) in Judaism might lead one to assume that observant Jews minimize wastefulness to a great extent. However, there is a considerable gap between how the prohibition's parameters are generally interpreted by religious communities and how they are understood by environmentalists (Yoreh, 2019a). Nonetheless, Yoreh's studies revealed an interesting paradox: on the one hand, wastefulness is considered commensurate with idolatry, and on the other hand, many observant Jews associate environmentalism with nature worship, resulting in a disinterest in environmental issues that can yield wasteful behavior. Therefore, it is difficult to predict what type of intervention would be effective. This study contributes to the existing literature by providing rigorous, empirical-based evidence, regarding the willingness of faith-based, ultra-Orthodox communities, to engage in unwasteful behavior (reducing DTW consumption) employing soft regulation measures.

2.3 Employing nudges to promote PEB among faith-based communities

As mentioned in 2.1, motivating faith-based communities to adopt PEB is more challenging. For example, Hagman et al. (2015) showed that people were less inclined to approve of pro-social nudges that minimize externalities than pro-self nudges (that focus on private welfare). According to Pe'er et al. (2019) this gap is less clear in faith-based social minorities. While several soft measures, such as education, influencing the value orientation, and using role models (e.g., Feldman and Meseley, 2003; Haigh, 2010; Moyer, 2015; Webb and Hayhoe, 2017; Lakhan, 2018) have been implemented to influence faith-

1 https://www.coolcongregations.org/.

2 https://www.faithcommongood.org/greening_sacred_spaces.

based communities to adopt PEB, no nudges have been employed among these communities specifically to reduce consumption of DTW. Moreover, no studies have empirically studied the Nudges: social norms and framing in the context of faith-based communities PEB. We, therefore, focus on these Nudges. These nudges were proven to be effective, practical, and ethical in influencing people's intentions and behaviors, including pro-environmental ones combined with the practicality and the ethicality of using them (Schubert, 2017; Grecksch, 2021; Homar and Knezevic Cvelbar, 2021; Xu et al., 2022). In Hummel and Maedche's (2019) meta-analyses of the effectiveness of nudges, it was found that social norms interventions had an average effect size of 29%, while Mertens et al. (2022) in a similar meta-analysis, found that such nudges had an effect size (Cohen's d) of 0.36. In the latter meta-analysis, the nudge category of information translation (to which framing belongs) yielded an effect size (Cohen's d) of 0.28. In both meta-analyses, these kinds of nudges were found to be less effective than defaults - 87% and 0.62, respectively (Hummel and Maedche, 2019; Mertens et al., 2022). Yet, as noted by Perry et al. (2021) a stronger focus on the robust evaluation of the contribution of social norms to pro-environmental behaviors could lead to more effective pro-environmental initiatives.þ Also, social norms and framing are inexpensive to implement and do not necessitate the introduction of changes in the consumer's physical environment, or the use of technology (compare this to sending timely text messages, for example). Importantly, they are also less intrusive than nudges that are considered to be more effective, such as defaults.

2.4 Hypotheses

Based on prior evidence from the nudge literature (e.g., Schubert, 2017; Homar and Knežević Cvelbar, 2021; Pelletier and Sharp, 2008), the first hypothesis is as follows:

H1: The two kinds of nudges (social norms and framing) influence participants to express increased intentions to reduce their use of DTW.

In more individualistic cultures, personal attitudes play a more important role than in determining people's social behavior. In contrast, in collectivist cultures (such as the ultra-Orthodox Jewish culture) the opposite is true (Triandis and Gelfand, 1998). Thus, the second hypothesis is as follows:

H2: The social norms nudge is more effective on people who are more collectivist compared to those who are less so.

Studies have shown that, unlike liberals, conservatives are not swayed by moral framing of environmental issues. Instead, conservative-leaning communities gravitate towards language such as cleanliness and purity (Feinberg and Willer, 2012; Yoreh, 2020). This is consistent with findings in ultra-Orthodox communities where cleanliness is championed as a top priority (Hershkovitz and Uval, 1998; Yoreh, 2010). As such, it is expected that the most conservative a community is, the more they will be motivated towards PEB under the framing that emphasizes that DTW harms the holy land's purity and cleanliness, which leads to H3:

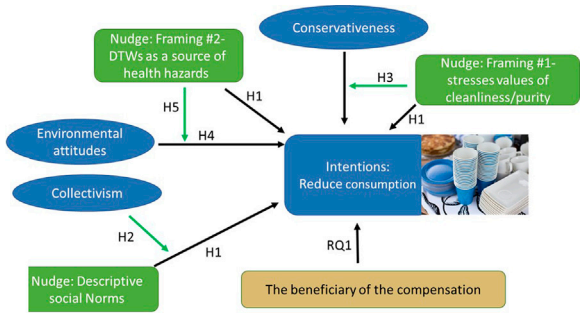

FIGURE 1
The hypothesized relationships between the Nudges and the moderating factors. The oval variables represent the latent constructs, dashed arrows represent mediating effect.

H3: Religious framing that stresses values of cleanliness/purity will be more effective in motivating PEB among non-modern, ultra-Orthodox, participants than in modern ultra-Orthodox participants.

The last Hypothesis is based on the considerable literature that suggests that environmental attitudes and knowledge can predict behavioral intention (e.g., Liu et al., 2020).

H4: Environmental attitudes can predict pro-environmental behaviors, and this effect can be moderated by knowledge.

Finally, given the altruistic nature of the ultra-orthodox community, the following research question is raised: Which of the following would be more effective in increasing intentions to reduce the use of DTW: receiving a small monetary reward for oneself, receiving the award for one's children, or donating the reward to one's religious community?

Figure 1 illustrates the hypothesized relationships between the nudges and the mediating factors.

3 Methods

3.1 Study design

Participants were presented with a survey questionnaire, beginning with a series of questions that asked them to estimate their DTW use patterns, including the drivers (barriers) underlying the use (minimizing the use) of DTW. The survey continued in the

following parts: 1) a labeled discrete choice experiment (DCE) in which the participants were presented with four menus, each consisting of four mutually exclusive, alternatives for DTW reduction. The alternatives used in menus were labeled and included: 1. Avoiding DTW use 1 day each week, 2. Avoiding DTW usage 2 days each week, 3. Avoiding DTW use 3 days each week, or 4. Refraining from decreasing the use of DTW (opt-out). The participants were asked to indicate their preferred alternatives in each menu. Based on H1 (the effect of the framing nudge, i.e., the description of the hazards related to DTW use), prior to receiving the choice tasks, the participants were randomly assigned to one of three conditions, i.e., two information framings regarding the damage caused by DTW and a no-information condition (see section b in 2.1.2 for details about the two information framings). Table 1 describes the attributes, and attributes' levels, that describe the alternatives in the DCE. In general, the design attributes are as follows: (1). Community participation: an attribute that provides information about a descriptive social norm (based on the literature review to formulate H1) (2). The expected decrease in environmental damage in terms of reduced risk of pollution of drinking water. This is the environmental reward for the effort embedded in letting go of DTW (once, twice, or three times per week). Environmental rewards or benefits have been used widely in studies applying choice models to understand preferences towards pro-environmental behavior (e.g., Loomis and Gascoigne, 2018; Shan et al., 2019; Niskanen et al., 2021). 3. Symbolic monetary compensation. Reducing DTW may incur extra costs above and beyond the time and effort required (water, detergents, and the purchase of a dishwasher), therefore this attribute is included. This financial attribute is also important to calculate participants' willingness to accept (WTA) for the effort embedded in their choices of alternatives, or for changes in the attributes of the alternatives. 4. Compensation beneficiary. This attribute was included given that ultra-Orthodox communities adhere to altruism in the form of charity or mutual aid (Berman, 2000; Malchi and Ben-Porat, 2018). The decisions about the attributes and their levels were also aided through in-depth interviews with marketing experts who specialize in the Israeli UO consumer segment and work with Askaria Ltd (Market Research Institute). After finalizing the first draft of the experimental design a pilot study was conducted among the staff of Askaria Market Research Institute. The pilot aimed at understanding the relevance of the attributes and their levels, and the cognitive burden associated with completing the choice tasks. The pilot was also required to obtain values for the efficient Bayesian design.

Prior to conducting the choice tasks, the participants received the following brief explanation: "Below are four programs aimed at reducing the use of DTW. Each program contains three alternatives, among which you can choose the one that best suits you. Please note: There is no connection between the programs: for each of them, separately, you will be asked to choose the best alternative in your opinion."

To generate the final experiment, a Bayesian D-error efficient design was employed using Ngene software. Twenty different choice tasks (i.e., scenarios) were generated and assigned *via* the algorithm into five blocks of four scenarios each. The choice tasks were designed to include implicit trade-offs between the attributes and their respective levels. An example of a choice scenario is provided in Figure 2.

The other parts of the survey included: 1) items aimed at unveiling the participants' main media sources of influence; 2) items aimed at measuring collectivism; 3) items that measured the participants' knowledge of the environmental harm caused by plastic pollution; 4) an abbreviated version of the revised New Ecological Paradigm Scale (NEP) (Dunlap et al., 2000). The NEP is a highly utilized known scale to measure Environmental Attitudes (EAs), it reflects beliefs about human-environment relationships and the perceived vulnerability of nature to human influences. Despite the emergence of other scales that measure EAs and despite problems associated with the NEP, such as unidimensional structure, (Bernstein and Szuster, 2018), no other measure has become the obvious heir to its throne and the NEP scale is still widely used (Mónus, 2021) as manifested in the numerous recent studies utilizing the NEP (e.g. Lou et al., 2022; Abedi Sarvestani and Shahraki, 2022; Hwang et al., 2020; Matsiori, 2020; Somerwill and Wehn, 2022; Tchetchik et al., 2021; Tchetchik et al., 2020). In the pilot conducted prior to the survey (detailed below in 2.2) the abbreviated NEP (10 of 15 items) was found to be less demanding while providing psychometric results equivalent to the conventional NEP scale (Cordano et al., 2003). Finally, items concerning socio-demographics and background were included.

3.1.2 Nudges

The effectiveness of two kinds of Nudges was tested:

a. The social norm nudge was operationalized by informing the participants that, based on prior research, a certain portion of families in their community were predicted to join the DTW use reduction plan. Three prospective participation rates were used 20%, 50%, or 80%.
b. The framing nudge concerned the damage associated with using DTW. One frame emphasized the fact that waste from DTW is harmful to the "Holy Land". The other frame focused on DTWs as a source of health hazards caused by the presence of plastic particles in drinking water and food. This type of framing - *emphasis framing* (Druckman, 2001) emphasizes a subset of considerations, in order to steer people to focus on these considerations when constructing their preferences

3.2 Empirical model

3.2.1 Discrete choice model

To elicit the participants' preferences towards reducing the use of DTW, a random utility-based, structural discrete-

TABLE 1 Attributes and their levels employed in the design.

Avoidance level program	**Three levels: 1 day per week, 2 days per week, 3 days per week**
Community participation	Three levels
The proportion of families in the community who agreed to participate in the reduction program	2 out of 10 families, 5 out of 10 families, 8 out of 10 families
The expected decrease in environmental damage	Three levels
In terms of the risk of pollution of drinking water	Low, medium, high
Compensation	Three levels
The amount of monetary compensation the participants would receive if they joined the program in USD/month, per household member[3]	0.28 USD
	0.85 USD
	1.42 USD
Compensation beneficiary	Three levels
	The compensation will be deposited monthly into: your bank account
	your children's savings accounts[2]
	the charity to which you regularly donate

Optional program	Avoid DTW 1 day per week	Avoid DTW 2 days per week	Avoid DTW 3 days per week
Community participation	8 of 10 families	2 of 10 families	5 of 10 families
Avoided environmental damage	The risk of drinking water contamination due to micro-particles will be moderately reduced.	The risk of drinking water contamination due to micro-particles will be moderately reduced.	The risk of drinking water contamination due to micro-particles will be moderately reduced.
Compensation per household member	1.42 USD per month	0.85 USD per month	0.28 USD per month
Compensation beneficiary	The compensation will be transferred to a charity to which you donate regularly.	The compensation will be transferred to your bank account.	The compensation will be transferred to a savings plan for your children.
Which program will you choose?			

FIGURE 2
An example of a choice scenario.

choice framework, was applied. This framework incorporates consumer heterogeneity and latent constructs. The inclusion of latent constructs leads to a more realistic representation of the choice process and better explanatory power (Ben-Akiva et al., 2002). Following the estimation procedure employed by Tchetchik et al. (2020), the choice data generated from the discrete-choice experiment were analyzed sequentially. First, confirmatory, and exploratory factor analyses, as well as latent class analysis were conducted for the latent variables. Second, the predicted values of the latent variables were internalized into the choice model. The choice model was then analyzed using the mixed-logit model with normal random distributed parameters.

3.3 Data collection

The generating process of the experimental design designated each of the five blocks to be assigned to a minimum of 35 participants, which resulted in a sample size of at least $35 \times 5 = 175$ participants. 450 ultra-Orthodox adults were sampled[4]. Since each participant was presented with four menus, each of which included four alternatives, the total number of choices was 7,200.

3.3.1 Sample characteristics

A list of the demographic variables of the 450 participants and their descriptive statistics are provided in Table 2.

4 The sample was representative in the following important dimensions: gender, belongingness to a sub-sector within the ultra-orthodox population, residence (in ultra-orthodox-dominant areas versus other areas), and region of residence.

TABLE 2 Sample's descriptive statistics.

Variable	Description	Mean
Age	Participant's age	30.19, S.D. = 8.73 (min 18–max 68)
Female	= 1 if the participant is a female	51%
Married	= 1 if the participant is married	82%
Education		
High school	*Academic education*	*Professional training*
32%	29%	39%
Orthodox strand		
Sephardi	*Lithuanian*	*Hassidic*
33%	33%	33%
Husband's occupation		
Yeshiva student	*Works in a non religious occupation*	*Religious occupation*
35%	37%	28%

TABLE 3 Notations and assumptions used in the econometric analyses.

Variables	Description
Compensation	The amount of the symbolic monetary compensation that the respondent receives if participating in a DTW reduction option ($/capita/month)
High risk reduction	Describes the extent to which the risk of drinking water contamination due to plastic micro-particles will be reduced. (An ordered categorical variable: 1 = low, 2 = medium, 3 = High)
Payment self, children	States who will be the beneficiary of the compensation: non-ordered categorical variable: respondent's bank account, his/her children's savings accounts, the charity to which the respondent's regularly donates)
Participation level	Describes how many community members have been committed to the presented DTW avoidance option (Continuous variable: percentage of community members)
Avoid DTW for 1 day	States the option to avoid the use of DTW 1 day per week (binary variable: 0,1)
Avoid DTW for 2 days	States the option to avoid the use of DTW 2 days per week (binary variable: 0,1)
Avoid DTW for 3 days	States the option to avoid the use of DTW 3 days per week (binary variable: 0,1)
Opt-out	States the option not to participate in any of the option to avoid the use of DTW (binary variable: 0,1)
Climate denials	A latent construct, derived from a CFA of the revised New Ecological Paradigm Scale. Representing the ecological crisis has been greatly exaggerated (transformed to a scale of 1–5)
Individualism	The answer to the item: I prefer to trust myself rather than trust others (on a 1–5 scale)
Plastic damage knowledge	A latent construct, derived from a PCA on a four-item scale refers to the respondent's own knowledge of the damage caused by DTW (transformed to a 1–5 scale)
Holy Land framing	States whether the respondent receives a framing that emphasizes the fact that waste from DTW is harmful to the Holy Land (a binary variable: 1/0)
Health damage framing	States whether the respondent receives a framing that emphasizes DTWs as a source of health hazards
Use printed media	A latent cluster, resulting from LCA, identifies respondents who use printed media as main knowledge source and use the Internet for emails only (a binary 1/0 variable)
Use social networks	A latent cluster, resulting from LCA, identifies respondents who use the Internet and Social networks as the main knowledge source (a binary 1/0 variable)
Do not use the Internet	A latent cluster, resulting from LCA, identifies respondents who do not use the Internet at all (a binary 1/0 variable)

3.4 Analytical approach

The behavioral model is tested and validated by using a mixed-logit model with latent variables. The mixed-logit model is designed to capture the unobserved heterogeneity in the preferences of participants. It accounts for random taste variations and can incorporate correlations in unobserved factors over choice alternatives (Colombo et al., 2009). Preference heterogeneity can be explained by observed variables (i.e., age and income) and latent variables,

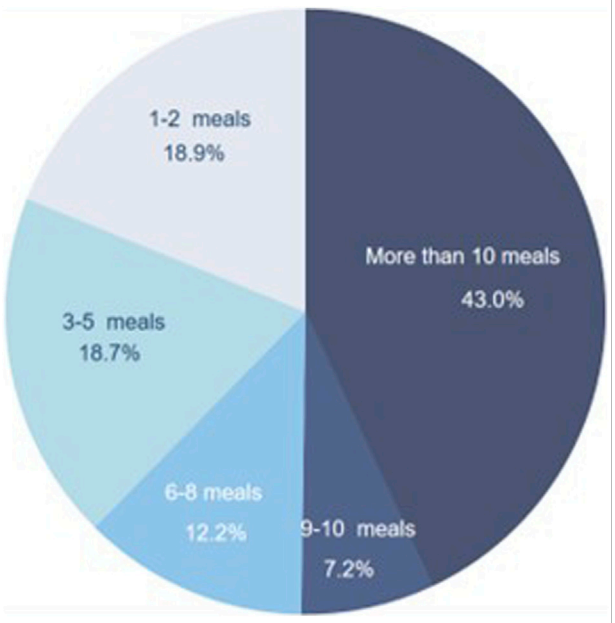

FIGURE 3
the distribution of the number of meals per week in which the respondents use DTW.

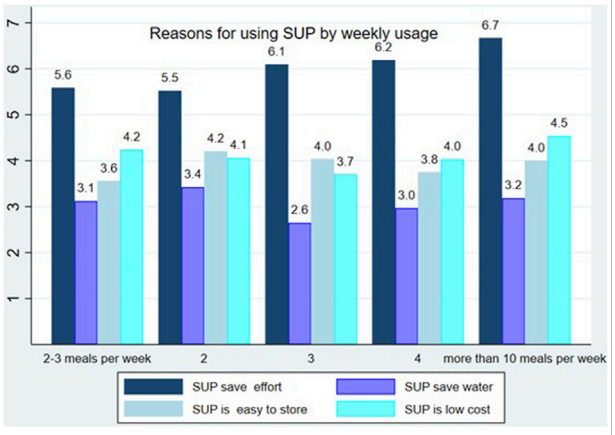

FIGURE 4
The importance of the different reasons to use DTW (on a 1-7 scale) by weekly usage.

such as latent psychological traits (i.e., environmental attitudes). According to Ben-Akiva et al. (2002, P1), "the incorporation of psychological factors leads to a more behaviorally realistic representation of the choice process, and consequently, better explanatory power". The likelihood function formulation is presented in Supplementary Figure S1B. The (latent) variable environmental attitudes were included in the choice model since it has been indicated as a predictor of pro-environmental behavior (Bamberg and Möser, 2007). Other potential moderating factors which were included, are respondents' own knowledge regarding the damage caused by DTW (operationalized *via* the items: plastic pollutes the air, plastic pollutes water sources, plastic pollutes the soil and harms agricultural produce, plastic waste creates damage to the appearance of the landscape), their level of conformism (*versus* individuality) and their level of conservativeness, the latter was operationalized *via* the extent to which they use the Internet and social media (Shahzalal and Hassan, 2019).

4 Results

The distribution of the answers to the question: how many meals per week do you use disposable tableware is described in Figure 3. Notably, 61% acknowledged that they used DTW between meals to a very large extent.

When respondents were asked how hard it would be to forgo the use of DTW, 35% of the participants answered that it would be difficult, and an additional 40% answered that it would be very difficult. High and significant correlations (0.61–0.80) were found between the variables of the number of meals with DTW, using DTW between meals, and how hard it would be to not use DTW.

When the participants were asked about reasons for using DTW, *saves effort* emerged as the most important reason, which increased as the extent of use increased (see Figure 4). The low cost and ease of storage of DTW were ranked second and third in importance, respectively. Saving water was the least important reason at all use levels. Other reasons mentioned for using DTW were that in comparison to non-disposable tableware, DTW save time (3%), are more aesthetical (2%), more hygienic (2%), save time (3%), and safer for children (1%).

Looking at the distribution of choices in the choice task, 46% chose the opt-out option (not interested in reducing DTW) whereas 29%, 14%, and 11% chose the 1-day, 2-day, and 3 days a week avoiding DTW, respectively.

Looking further at the differences in the choice distribution, it is found that respondents from the Lithuanian strand chose the opt-out option significantly more than the other two strands (Hasidic and Sephardi) i.e., 50% compared to 41% and 46%, respectively ($p < 0.005$). Also, 53% and 49% of the respondents with the highest income levels (above average and much above average) chose to opt-out which is significantly higher than the three lower income levels, 43%, 44% and 44%, respectively ($p < 0.005$). When comparing the choice distribution across the different, framing conditions, no significant differences are found (see Figure 5).

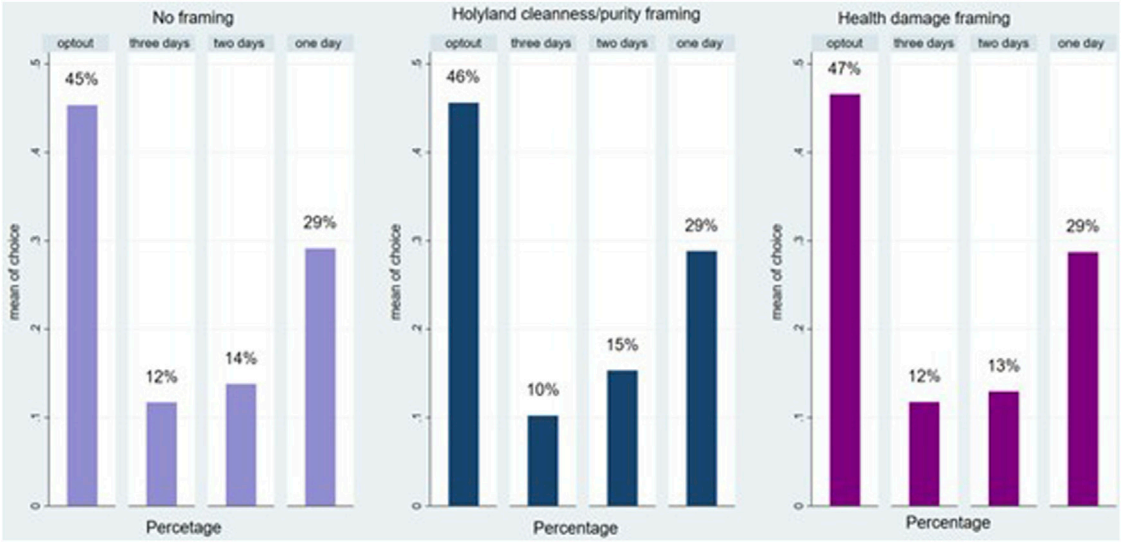

FIGURE 5
Choice distribution across the different framing conditions.

Next, a confirmatory factor analysis (CFA) was conducted for the NEP scale. The results revealed two factors: eco-crisis (i.e., believing that an ecological crisis was imminent) and climate denial (the belief that nature's balance was strong enough to cope with anthropogenic effects, and that the ecological crisis has been greatly exaggerated). Employing the -PNORM-command in Stata 17.0, the distribution of these two factors in the population follows a normal one (see Supplementary Figure S1A). However, the mean value of the factor climate denial (2.78 [0 0.045]) is significantly higher ($p < 0.001$ in a *t*-test) than the mean value of the Eco-crisis factor (2.55 [0.04]). These factors were tested in the econometric analysis, the mixed-logit model *via* interactions with the different alternative specific constants and the alternative attributes to examine whether, and in what way (i.e., *via* each attribute is it operationalized) and to what extent environmental attitudes affect the intention to consume less DTW.

Following the Latent Class Analysis (LCA) regarding sources of exposure to news and other content, the participants were assigned to three mutually exclusive clusters: participants who extensively used digital social media ("least conservative"); participants who extensively use printed media and use the Internet for email only ("moderately conservative") and participants who do not have access to the Internet at all ("most consecutive"). The results of the analysis are provided in Supplementary Figure S1A. A PCA on the conformism/individuality scale did not yield sufficient internal consistency (alpha Cronbach was low). Therefore, only one item from this four-item scale, was used. Finally, respondents who received no framing were presented with four items to elicit their own knowledge regarding the damage caused by DTW. A PCA resulted in one significant factor (alpha Cronbach = 0.9).

4.1 Econometric model results

4.1.1 Notation

To make this model more reader-friendly, Table 3 provides the notations and assumptions are presented in Table 3.

Table 4 reports the results of the five mixed-logit models. In these models, a binary dependent variable equaled one if an alternative was chosen and 0 otherwise. The main independent variables were the attributes of the alternatives to DTW avoidance, and the information framing conditions. Model 1) consisted of the main effects (i.e., the choice attributes), including the alternative-specific constants (ASC), which reveal *the ceteris paribus* preferences for avoiding DTW for 1 day, 2 days, and 3 days per week (the opt-out alternative was the reference). Models (2)–5) included variables that represented the participants' environmental attitudes, informational conditions, and sources of knowledge. In each model, the log-likelihood and McFadden's Pseudo R^2 is provided. The latter equals 27% in model (5), which was sufficiently high for a cross-sectional survey. The ASC parameters were assigned random parameters to determine their heterogeneity. The model was specified in a preference space rather than a willingness to pay (WTP) space.[5] Hence, the coefficient of the payment vehicle (i.e., compensation) was assigned as a fixed parameter. The right-hand column in Table 4 provides the WTP values based on the

5 In general, these approaches are equivalent. However, because convenient distributions Normal or log-normal) are usually specified, there are different implications when they are placed on WTPs rather than on coefficients (Train and Weeks, 2005).

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TABLE 4 Results of the mixed-logit model.

	(1)	(2)	(3)	(4)	(5)	WTP in USD per household member/month
Mean						
Compensation	0.585***	0.598***	0.592***	0.590***	0.613***	
	(7.20)	(7.88)	(7.76)	(7.44)	(7.88)	
High-risk reduction	0.687***	0.730***	0.745***	0.720***	0.729***	-0.33
	(3.43)	(4.05)	(4.08)	(3.94)	(3.99)	
Payment self	0.580***	0.651***	0.665***	0.628***	0.639***	-0.30
	(2.59)	(3.17)	(3.22)	(3.01)	(3.08)	
Payment children	0.793**	0.874***	0.888***	0.834***	0.852***	-0.39
	(2.39)	(3.08)	(3.01)	(2.78)	(2.93)	
Participation level	-0.233	-0.109	0.215	0.184	0.164*	-0.07
	(-1.25)	(-1.64)	(1.38)	(1.46)	(1.77)	
Avoid DTW for 1 day	-2.828***	-1.058	-0.795	-0.906	-1.283	
	(-3.01)	(-1.32)	(-0.89)	(-1.03)	(-1.43)	
Avoid DTW for 2 days	-4.128***	-2.479***	-2.350***	-2.545***	-2.711***	1.24
	(-4.04)	(-3.01)	(-2.86)	(-2.99)	(-3.16)	
Avoid DTW for 3 days	-6.199***	-4.451***	-4.146***	-3.934***	-4.384***	2.01
	(-5.94)	(-4.38)	(-3.97)	(-3.98)	(-4.17)	
Choose to opt-out*Climate denials		0.762***	0.799***	0.731***	0.684***	-0.31
		(3.99)	(3.86)	(3.28)	(3.36)	
Participation*Individualism			-0.062**	-0.058**	-0.047*	0.02
			(-2.28)	(-2.38)	(-1.93)	
No info* plastic damage knowledge* avoid DTW 3 days				0.400***	0.391***	-0.18
				(3.55)	(3.31)	
Holy Land framing*avoid DTW 3 days					-2.091*	0.94
					(-1.80)	
Holy Land framing* use printed media *avoid DTW 3 days					3.185**	-1.43
					(2.32)	
Holy Land framing* use social networks *avoid DTW 3 days						0.141
					(0.10)	
Health damage framing*avoid DTW 3 days					0.689***	-0.31
					(3.09)	
Health damage framing*use printed media *avoid DTW 3 days					-0.663**	0.30
					(-2.11)	
Health damage framing*do not use the Internet*avoid DTW 3 days					-0.623*	0.28
					(-1.78)	
S.D.						
Participation	0.717***	0.563***	0.609***	0.599***	0.598***	
	(3.92)	(7.39)	(7.45)	(8.51)	(8.37)	
Avoid DTW for 1 day	-3.737***	-3.793***	-3.643***	-3.684***	-3.892***	
	(-7.03)	(-9.71)	(-8.02)	(-8.33)	(-9.29)	
Avoid DTW for 2 days	2.767***	3.280***	3.342***	3.408***	3.345***	
	(3.21)	(6.85)	(8.55)	(8.06)	(9.10)	
Avoid DTW for 3 days	3.384***	3.960***	3.707***	2.826**	3.215***	
	(3.69)	(6.42)	(4.55)	(2.44)	(5.37)	
McFadden's Pseudo R^2	25.0%	25.8%	26.0%	26.1%	27.0%	
Log-likelihood	-1,194.9	-1,186.9	-1,184.1	-1,181.9	-1,176.8	

results of model (5). Following Hensher et al. (2005), WTP estimates were calculated by dividing the choice attribute coefficient by the compensation coefficient.[6] The interpretations of the results of model 5) and the corresponding WTP/A values are discussed below.

The compensation coefficient is positive, as expected by economic theory. Similarly, the coefficient of *risk reduction* is positive, i.e., DTW avoidance plans that offer higher risk reduction of plastic pollution, are more likely to be chosen. Participants are willing to give up 0.33 USD per household member per month to choose a plan that enables higher risk reduction. Both coefficients, *payment children* and *payment self*, are positive (the reference option is a donation to the participant's religious institution) with the coefficient of *payment children* being significantly larger than the *payment self*-coefficient (i.e., participants prioritized their children's welfare over their own; they are willing to forsake 0.39 USD if the compensation is directed to their children's saving accounts, and only 0.30 USD if the compensation is directed to their own accounts, compare to the reference option). The coefficient of community participation is positive. For each percentage increase in the share of community members that are expected to join a certain reduction plan, the participant is willing to give up 0.07 USD. However, the higher the participants are ranked on the *individualism* score, the less they will be influenced by social norms; their willingness to give-up compensation will decrease by 0.02 USD.

Regarding the information conditions, compared with participants who did not receive any information (i.e., the reference condition), those who received the Holy Land cleanliness framing and mostly relied on printed media ("moderately conservative"), were more likely to choose the 3 days avoidance program. Respondents who receive this framing and who do not use the Internet at all ("more conservative") are less likely to choose 3 days of DTW avoidance. They will require an additional compensation of 0.94 USD to participate in this plan. Respondents who are greatly exposed to social media ("least conservative") and who received health damage framing will be more likely to choose 3 days of DTW avoidance; that is, they will be willing to give up 0.31 USD. However, the participants who received the health damage framing and who are highly exposed to printed media ("moderately conservative") or do not use the Internet at all ("more conservative") will be less likely to choose this program and will require an additional compensation of 0.30 USD and 0.28 USD, respectively. Regarding the participants who did not receive any information, the effects of their perceptions of the damage caused by plastic pollution were assessed. These perceptions were positively associated with the choice of avoiding using DTW 3 days per week and the willingness to give up 0.18 USD per household member per month.

Finally, concerning the ASCs, the coefficient of 1-day DTW avoidance did not differ significantly from zero. However, its S.D. was significant, implying that the preferences are equally distributed around zero. The coefficients of two- and 3-day avoidance indicated that the participants required additional compensation of 1.23 USD and 1.99 USD, respectively (*ceteris paribus*). However, the results showed high heterogeneity around these preferences: 21% of the respondents had a positive preference for 2-day avoidance whereas nearly 9% of the respondents had a positive preference for 3-day avoidance (the distribution of the preferences appears in Figure in Supplementary Figure S1C).

5 Concluding remarks

Policymakers at all levels aim to mitigate anthropogenic pressure on the environment through various means, including regulations. However, the effectiveness and efficiency of many measures, such as command-and-control and market-based tools, are limited. Clearly, this goal will only be realized with the cooperation of businesses and consumers (Byerly et al., 2018; Ali et al., 2022). At the same time, there is an increasingly large number of consumers who are religiously affiliated. In fact, by 2050, the number of people affiliated with a religion is expected to grow from 5.8 billion in 2010 to 8.1 billion (Grim and Connor, 2015). Thus, it is essential to identify ways of motivating these populations to adopt PEB in general and to reduce the consumption of DTW in particular. This study advances the understanding of the relationships between soft intervention measures (nudges) and the desired environmental behavior concerning the consumption of single-use plastics among a population that heavily uses them. It is essential for enabling policymakers, government officials, NGOs, and others to design better policy initiatives.

The results of the current study provide evidence that simple and non-coercive changes in believers' decision-making architectures can decrease their intentions to use DTW without imposing drastic policy measures such as high taxation. Specifically, the findings showed that social norms and information framing that communicated health hazards promoted a shift toward reducing DTW use. Similarly, the findings indicated that a framing nudge that depicted the use of DTWs as harming the Holy Land increased the tendency to avoid DTW consumption. This effect was moderated by the participants' level of conservativeness, a factor that was measured by their exposure to external (digital) sources of knowledge.

The findings suggest that less conservative respondents who use the Internet and Social Networks as their main knowledge sources are more responsive to the health damage framing. In contrast, respondents who are moderately conservative (i.e., they use mainly printed media but use the Internet for emails) are more

6 The WTP/A values shown in Table 4 were originally in NIS but were converted to USD (USD 1 = NIS 3.521) in November 2019 when the survey was conducted.

responsive to the holy-land purity framing. These findings provide empirical evidence of the nuanced nature through which "green nudges" (in the form of framing) affect ultra-Orthodox Jews based on their level of conservativeness, as manifested by their use of the Internet and social media. From a policy perspective, this finding is important as it emphasizes the need to use different nudges to different types of communities or even to sub-communities (Soman and Hossain, 2021).

In addition, for respondents who received no framing (the reference condition), it was found that previous knowledge about the damage caused to the environment and health was associated with a higher probability of avoidance from DTW. This stresses the ongoing need to effectively communicate these risks *via* various media channels. Clearly, exploring alternative ways to deliver pro-environmental messages is crucial in faith-based communities, which ignore or are less exposed to the Internet. The results of this study emphasize that knowledge about the hazards of SUP to the environment can overcome the high convenience of using them even in very large families were washing the dishes after every meal is indeed an unpleasant task. The fact that respondents in the survey preferred to save the money they will receive from avoiding DTW for their children and not for themselves also expressed their concerns about the future generation which is in line with the motivation to limit their use of DTW.

The results of this study also help substantiate, in the context of DTW use, previous findings: First, participants who ranked high on the climate denial factor were less likely to engage in DTW reduction efforts. Second, the findings showed that social norms had a positive impact on intentions to reduce DTW use. As can be expected, for individualists, this impact is less pronounced.

According to the Israeli Household Expenditure Survey (Israel Central Bureau of Statistics, 2018), annual expenditure per family on disposable tableware is led by the National Religious (religiously observant but not rejecting modern practices) and ultra-Orthodox (a highly religious and very conservative population in terms of modern practices) sectors. The results of the current study may also serve as a reference to a massive command-and-control measure that was recently implemented in the same context of reducing the use of DTW, namely, a new tax on DTW that entered into force in November 2021. The taxation of DTW in Israel faced strong opposition from representatives of the ultra-Orthodox community who viewed this tax as political action while ignoring the argument that this taxation is motivated by the need to protect the environment. Therefore, any changes in the government structure will put this piece of legislation in danger. As shown, the use of DTW is strongly motivated by convenience factors. This study points that softer regulation may lead to similar and more stable results.

Finally, the contribution of this research goes beyond the boundaries of its specific context, as it provides an empirical framework to explore behavioral change when behavior is very persistent and where responsiveness to nudges has been acknowledged to be unclear.

5.1 Limitations

The results provide the first evidence of the effectiveness of soft regulations in changing religious believers' intentions to use DTW; however, additional research is needed in this area. First, a future study should investigate the effectiveness of nudges in influencing the actual consumption of DTW. Second, additional studies should be conducted on additional faith-based communities to increase the external validity of the findings of the current study. Because the main motivation for using DTW is to save time and effort, these efforts should be accompanied by presenting a viable alternative to environmentally harmful DTW, such as bio-degradable tableware at affordable prices.

Third, this study explores which "soft" regulatory measures will be more effective in achieving a substantial reduction in the consumption of single-use plastics. Nevertheless, the implications of the expected changes in the demand on the supply side, and therefore on the industry of single-use plastics, are not considered. This is a limitation of the study as the demand for the product always plays the most critical role in any industry (Dey et al., 2022a). Understanding expected variations in the demand for single-use plastics among these communities has crucial implications for manufacturers. It is essential for the SCM model to ensure the sustainable development of society (Sarkar and Bhuniya, 2022). For example, fluctuating market demand affects holding cost; in the case of low demand, the holding cost is reduced by limiting stock (Dey et al., 2022b). This is also the case when considering whether to invest in structural innovation of greener products (refers to products with improved design and functionality but without using new parts) or in improved innovation (which uses at least one new part) to produce the new innovative product (Sarkar et al., 2022) (Agrawal, 2008; Carlsson et al., 2019; Loomis and Gascoigne, 2018).

Data availability statement

The raw data supporting the conclusion of this article will be made available by the authors, without undue reservation.

Ethics statement

The patients/participants provided their written informed consent to participate in this study.

Author contributions

DK: conceptualization, data collection; ATik: trial design, trial execution, and writing; TY: trial design, writing, and review; ATch: methodology, trial design, data analysis, writing, and review.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Supplementary material

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fenvs.2022.1019904/full#supplementary-material

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