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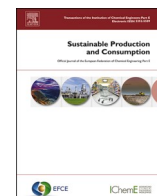
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Morals over money: The relationship between moral motivations and Consumers' food waste[☆]

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1. Introduction

People generally dislike wasting food (Graham-Rowe et al., 2014; van Geffen et al., 2020b; Watson and Meah, 2012) and often try to avoid this (Bolton and Alba, 2012). There are several different reasons why someone may engage in food waste avoidance behaviors. Some people feel guilty towards the hungry (Aydin and Yildirim, 2021; Mondéjar-Jiménez et al., 2016; Setti et al., 2018), while others worry about the financial costs (Graham-Rowe et al., 2014; Neff et al., 2015), environmental impact (Diaz-Ruiz et al., 2018; Schanes et al., 2018) and/or the potential social disapproval from significant others (Ribbers et al., 2023) when wasting food. Considering the plethora of reasons to avoid food waste, it is surprising that consumers are responsible for over 50% of total food wastage (Eurostat, 2022; Stenmarck et al., 2016). In fact, households waste approximately 11% of total global food production (UNEP, 2021). The aim of this study is to identify which motivations actually translate into reduced food waste behavior, guiding consumers towards reducing their waste.

Motivations play a crucial role in shaping human behavior (Ryan, 2012). This key role for motivation is highlighted in established theoretical frameworks, such as the Theory of Planned Behavior (Ajzen, 1991), Theory of Reasoned Goal Pursuit (Ajzen and Kruglanski, 2019), the Elaboration Likelihood Model (Petty and Cacioppo, 1986), and the Motivation, Ability, and Opportunity model (MOA; Ölander and Thøgersen, 1995). Previous research has investigated the impact of general negative attitudes towards food waste (Barone et al., 2019; Stancu et al., 2016; Stefan et al., 2013; Visschers et al., 2016) and food waste aversion (Raghunathan and Chandrasekaran, 2021) on

consumers' food waste behaviors, providing valuable insights into the significance of avoiding food waste for consumers. However, these studies have overlooked the underlying reasons behind consumers' aversion to food waste. Delving into these distinct reasons is essential, as they can uniquely impact consumer behavior and, subsequently, food waste.

Due to its personal implications, financial motivations may exert a particularly strong influence on food waste (Neff et al., 2015; van der Werf et al., 2021). In addition, extrinsic motivations such as social norms seem to play a smaller role in reducing food waste than more internal, altruistic motivations (Cecere et al., 2014). Although concerns about the environmental consequences of food waste are often mentioned in qualitative research (van Geffen et al., 2020a), whether environmental motivations really affect consumers' waste is firmly debated, possibly due to many misperceptions about the environmental consequences (Brennan et al., 2021). Some consensus seems to have been reached about the predictive power of self-conscious emotions such as guilt (Attiq et al., 2021; Brennan et al., 2021; Parizeau et al., 2015; Qi and Roe, 2016; Russell et al., 2017; Stefan et al., 2013), which are closely related to moral motivations. Yet, all these studies document either intentions to reduce waste or self-reported food waste. This is an important shortcoming, as there is a well-known gap between intentions and actual behavior (Vermeir and Verbeke, 2006), and self-reported food waste has been argued and shown to have issues related to drastic underreporting (Quested et al., 2020; van Herpen et al., 2019), at least in part due to socially desirable answering tendencies and general unawareness of the amount of food that is wasted. There is an urgent need for a more comprehensive assessment of the impact of various motivations to

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reduce food waste on observed levels of food waste, ideally using data from a waste audit.

Understanding the effectiveness of different motivations in reducing the amount of food waste is especially relevant in the context of intervention development. At the moment, contemporary campaigns aiming to reduce food waste leverage a diverse range of motivations. The Waste & Resource Action Program (WRAP), through their Food Waste Action Week initiative, prominently highlights the economic advantages (WRAP, 2023), a shift from their previous emphasis on environmental benefits (WRAP, 2021). The UN World Food Program (WFP) takes a different approach by shedding light on the alarming statistic that one in nine individuals suffers from nightly hunger (WFP, 2019), thereby invoking moral concerns in their Stop The Waste campaign. However, their campaign website strategically combines both moral and financial incentives (WFP, 2021), revealing a multifaceted approach. The United States Environmental Protection Agency (EPA) equips local authorities and organizations with a comprehensive toolkit for their Food: Too Good to Waste campaign. Communication materials underscore a dual impact of food wastage—both on finances and the environment (EPA, 2023). On the International Day of Awareness of Food Loss and Waste, the Food and Agriculture Organization of the United Nations (FAO) and the United Nations Environment Programme (UNEP) integrate moral, financial, and environmental rationales (European Commission, 2023). Collectively, these instances demonstrate that various organizations address diverse motivations, underscoring the complexity and uncertainty practitioners face in determining the most effective motive. This ambiguity potentially undermines the effectiveness of these campaigns. This study aims to disentangle the effects of four distinct motivations to avoid food waste (financial, social, environmental, and moral motivations; cf. Ribbers et al., 2023) on the amount of household food waste. In doing so, we can offer policy makers and stakeholders insight into which motivation(s) are impactful and thus how to increase the impact of their campaigns.

2. Theoretical background

2.1. Financial motivation

Financial motivations, aggravated by consumers' concerns about inflation and recession, play a pivotal role in consumer decision-making processes. For example, price continues to reign as the most influential factor preventing consumers from embracing environmentally friendly products (Ketelsen et al., 2020). Recent research in the food waste domain stresses the positive effects of highlighting the financial implications of food waste as a strategic approach for curtailing households' food waste. Notably, people frequently mention the monetary losses incurred from discarding food in qualitative research (Blichfeldt et al., 2015; Graham-Rowe et al., 2015; Grandhi and Appaiah Singh, 2016), and it was even identified as the most important reason for consumers to minimize waste (van der Werf et al., 2021). Some scholars argue that the desire to save money tends to create a stronger incentive for individuals to reduce food waste than concerns related to the environment and society (Graham-Rowe et al., 2014; Neff et al., 2015; Stancu et al., 2016). Encouragingly, implementing a campaign specifically focusing on the financial benefits for households has yielded tangible reductions in household food wastage (van der Werf et al., 2021), although this intervention also contained several reduction tools and tips. This implies that the effectiveness of the intervention cannot be ascribed uniquely to its focus on financial motivations. Still, the promising results of situationally triggering financial motivation indicate that overall, financial motivation should be a key motivator in reducing food waste.

2.2. Social motivation

Like financial motivation, concern for social approval is a self-centered reason to behave in the interest of the common good. People

behave pro-socially because of various motives, including intrinsic, extrinsic, and image motives. Image motives refer to the goal of obtaining or maintaining social status by behaving in the most socially desirable way (Anderson et al., 2015; Crocker and Canevello, 2008). The promise of social benefits has been shown oftentimes to motivate people to engage in pro-social (Alpizar et al., 2008; Flynn et al., 2006; Grant and Gino, 2010) and pro-environmental behaviors (Wang and Griskevicius, 2014; Zhang et al., 2019). For example, studies have found that consumers are more likely to engage in green consumption when they have strong impression management motivations (Zhang et al., 2019) or desire to signal status (Griskevicius et al., 2010). Given that social status is contingent upon one's pro-environmental behaviors (Braun Kohlová and Urban, 2020; Devos et al., 2023), it is not unfounded for consumers to fear being negatively judged by others when they act non-sustainably. Public recognition is, however, crucial to promoting such behavior (Hardy and Van Vugt, 2006; Wang and Griskevicius, 2014; Willer et al., 2009), as impression management cannot be exercised when no one is watching. Because household food waste predominantly occurs within the household, which is rather private and typically not visible to people other than immediate household members, social motivations may be relatively less important within this particular context (Ribbers et al., 2023).

2.3. Environmental motivation

Globally, there is a growing trend of recognizing climate change as a primary concern (Capstick et al., 2015; Leiserowitz et al., 2021; Steg, 2018). Despite this increased awareness, a lack of understanding of the connection between a product and its environmental impact still exists. Consumers are, for example, limited in their ability to assess a product's environmental footprint (Steenis et al., 2017). Consumers' understanding of food waste specifically and its contribution to climate change is even more limited (Graham-Rowe et al., 2014; Neff et al., 2015; Principato et al., 2015). Clear communication about the environmental consequences of food waste is lacking. The complexity of comprehending the impact of food waste is likely the reason for the lack of clear communication, as its consequences occur at various stages of the food supply chain and are often distant in time, such as food rotting in landfills. This knowledge gap, in turn, may explain the ambivalent findings in the food waste literature. While some studies argue that environmental concern can reduce food waste (Bretter et al., 2023b; Diaz-Ruiz et al., 2018; Roodhuyzen et al., 2017; van der Werf et al., 2021), other research concludes that environmental concerns have minimal or no influence on reducing waste (Graham-Rowe et al., 2014; Prelez et al., 2023; van Geffen et al., 2020a; Visschers et al., 2016; Watson and Meah, 2012). Despite increased awareness of climate change, the complexity of this “wicked problem” may hinder full comprehension, personal concern, and food waste behaviors.

2.4. Moral motivation

Morality is a powerful force that consistently and reliably shapes human behavior. Morality is basically the set of attitudes that people perceive as grounded in a fundamental distinction between right and wrong (Skitka et al., 2021). A range of studies have demonstrated the influence of moral values on actions and decisions, including pro-social behavior, avoidance of anti-social behavior, ethical behavior in an organizational context, and political engagement (Hertz and Krettenauer, 2016; Skitka et al., 2021). Overall, these examples illustrate that morality can play a crucial role in shaping human behavior, guiding individuals towards actions that align with their ethical beliefs and values.

However, research also points out that morality yields mixed results regarding consumers' behavior (Philipp-Muller et al., 2022). Ethical consumption is often against one's self-interest as it incurs costs on the individual (Campbell and Winterich, 2018; Weinberger and Wallendorf,

2012), and pursuing self-interest in the marketplace is generally more accepted (Philipp-Muller et al., 2022). Moreover, various factors within the marketplace may limit the impact of morality on consumer behavior. Peers or admired others may disregard morality in their purchases (Carrington et al., 2016; Szmigin et al., 2009), making it challenging for individuals to maintain their moral standards. Financial limitations may also prevent consumers from making morally responsible choices (Szmigin et al., 2009), such as investing in solar panels or a high-quality fridge and freezer. As a result, consumers may feel less in control of their behavior, which can affect their actions. Additionally, individuals' self-views may not always align with their actual behavior, as they may be mistaken about what truly matters to them (Hertz and Krettenauer, 2016). These factors highlight the complex relationship between morality and consumer behavior and suggest that morality may have weaker effects in consumer decisions than in other domains.

Prior research thus indicates that ethical considerations may not always be of great relevance in purchasing decisions (Setti et al., 2018). Still, it is important to note that many food management behaviors occur beyond this context, such as storage, cooking, and disposal. In fact, guilt, which is commonly associated with food waste (Attig et al., 2021; Parizeau et al., 2015; Qi and Roe, 2016; Russell et al., 2017; Stefan et al., 2013), has been recognized as a powerful self-conscious emotion and motivator of moral behaviors in other contexts (Adams et al., 2020; Antonetti and Maklan, 2014; Basil et al., 2006; Chang, 2014; Duhachek et al., 2012; Haidt, 2001; Kandaurova and Lee, 2019; Onwezen et al., 2014; Polman and Ruttan, 2012; Shipley and van Riper, 2022). The existing literature on food waste presents a lack of consensus regarding the influence of morality-related factors, such as moral attitudes, norms, and values, on the issue. While some researchers assert a positive correlation between morality and food waste (Bretter et al., 2023a; Talwar et al., 2022; Visschers et al., 2016), others argue against such a connection (Aschemann-Witzel et al., 2018; Stancu et al., 2016). This discrepancy in findings, however, may stem from potential variations in measurement methodologies (Ribbers et al., 2023). Consequently, it is reasonable to propose that individuals' moral beliefs and their consideration of the moral consequences associated with food wastage may play a notably pivotal role within the context of households.

2.5. Relative importance of the motivations

Unraveling the relative importance of different motivations to reduce food waste requires a nuanced understanding of the dynamic tension between personal self-interest and broader altruistic motivations in consumer waste behaviors. Consumers constantly face trade-offs between self-interest and environmental interest (Berger and Wyss, 2021). For instance, the desire for fresh, aesthetically pleasing produce results in the rejection of imperfect fruits and vegetables, contributing to unnecessary food waste (Aschemann-Witzel et al., 2018; Bolos et al., 2019; de Hooge et al., 2017; Jaeger et al., 2018). In addition, the preference for buying in bulk to save money can lead to over-purchasing and eventual food spoilage (Graham-Rowe et al., 2014). It seems that self-interest often has the upper hand, driving consumers towards food waste increasing behavior.

Studies in food waste literature seem to suggest that financial and moral motivations both play an important role (Graham-Rowe et al., 2014, 2015; Nabi et al., 2021; Nguyen et al., 2023; Secer et al., 2023; Visschers et al., 2016). Specifically, Nabi et al. (2021) found that among five motivational factors (saving money, saving the planet, easing guilt, doing the right thing, and educating children), only saving money and doing the right thing are negatively related to food waste for certain food types. Saving money is associated with reduced waste of fresh vegetables and fruits, whereas doing the right thing is linked to reduced waste of fresh vegetables, bread and bakery products. Nguyen et al. (2023) suggest that normative motivations, encompassing environmental and moral concerns, have the strongest effect on reducing self-reported food waste through behaviors such as planning, adjusting portions during

food preparation, and consuming leftovers. Additionally, gain motivations, closely related to financial motivations, significantly influence food waste reduction across all food management stages, whereas hedonic motivations (i.e., immediate feelings) are less impactful unless combined with gain or normative motivations (Nguyen et al., 2023). However, the claim that normative motivation is the strongest lacks statistical support as no direct comparison of the strength of the effects is reported. In fact, another study showed that economic consciousness has a strong positive impact, environmental and ethical consciousness also positively influence the motivation to reduce food waste, albeit to a lesser extent than economic motivation (Secer et al., 2023). In a qualitative study, van Geffen et al., 2020a noted that during daily routines the guilt associated with food waste diminishes. This finding suggests that moral motivations, although significant, often fade amid the demands of daily life.

While sustainability is gaining importance in consumers' decision-making, it often takes a backseat to other product characteristics, particularly price (see Ketelsen et al., 2020 for a review). As consumers value the financial costs of products, it is reasonable to assume that the cost of food wasted is a primary concern for them as well. Therefore, immediate financial benefits may more strongly predict consumption decisions than more abstract long-term motivations like the moral and the environmental motivation. Overall, financial motivations are more immediately impactful as they directly address tangible savings, whereas moral motivations, although important, often diminish amid the demands of daily life.

In summary, we expect that financial motivations have a significant and relatively large influence on food waste, due to their direct personal implications. While social motivations may also have an effect, we expect that their impact is relatively low, given the private nature of household food waste behaviors. While global awareness of climate change is increasing, a specific lack of understanding about the environmental impact of food waste among consumers leads to inconsistent behaviors in reducing food waste. Therefore, we remain agnostic regarding whether environmental motivation significantly influences consumer behavior in reducing food waste, indicating a potential disconnect between motivation and behavior. Finally, we anticipate that moral motivations will exhibit robust influence, given that morality strongly shapes various behaviors. Notably, a comparative analysis of the distinct individual impacts of these motivations has not been conducted previously, which is the aim of the present study.

3. Methodology

The aim of this study was to determine whether motivations—financial, environmental, moral, or social—to avoid food waste predict actual household food waste. The data was collected as part of a larger intervention study. This larger study comprised an initial survey assessing demographics and household characteristics, a baseline waste collection measure, different interventions (control group versus two intervention groups involving a tool package for food management and information) provided to participating households, a second waste collection phase to assess the effectiveness of these interventions, and a concluding survey. Only the initial survey, the baseline waste measurement in this study, as it could not be not impacted by the interventions, and the concluding survey were used to investigate the current research question. The second waste measurement was deliberately not included here as it could be affected by the interventions. The concluding survey included several additional measures designed to address various research questions posed by other authors (Werkman et al., working paper, see web appendix A for full disclosure of all measures and items included: https://osf.io/729t4/?view_only=abc b92cbbdf4017affe1622fa455c18).

3.1. Participants

The sample for our study was drawn from three adjacent neighborhoods in the Netherlands, all serviced by the same waste collector. All households in these neighborhoods were approached door-to-door. Initially, 338 households completed the first survey, and of these, 275 participated in the initial waste collection phase. Several factors contributed to participant dropout. Key reasons for participant dropout included unexpected events such as holidays, which led to participants being away from home. There were also instances of collection mishaps and a few cases where we received no response from the participants. The final sample consisted of 230 participants (145 females, $M_{\text{age}} = 54.2$, $SD = 14.5$).

Demographics of our sample generally aligned with the national averages, with only slight variations (see Table 1). The age distribution in our sample showed that the majority of respondents fell within the 40–65 age range, accounting for 55.7%, mirroring the national average, which also had the highest representation in this age group at 33% (Centraal Bureau voor de Statistiek (CBS), 2022a). Conversely, individuals under the age of 20 were less represented in our sample. In terms of gender, our sample had a slightly higher proportion of females at 63.0%, compared to the national average of 50.3% (CBS, 2022b). The fact that we primarily targeted the person responsible for food management within the household explains why individuals under 20 are underrepresented and females are overrepresented in our sample. Household size in our sample was slightly larger than in the population, with an average of 2.7 people per household, while the national average stood at 2.1 (CBS, 2023). When examining household type, we observed some minor differences in living arrangements, with a slightly lower percentage of respondents in our sample living together without children (39.1% vs. 48.9% in the national average; CBS, 2023) and a slightly higher percentage living with children at home (41.7% vs. 26.3%). These subtle variations in our sample demographics compared to national averages highlight the general alignment between our study participants and the broader population in the Netherlands.

3.2. Procedure

Households were engaged through door-to-door recruitment during the day and early evening. Individuals willing to consider participating received study information on paper and were given the opportunity to sign up either immediately or later, using a QR code. When inhabitants of a house were not at home, a recruitment letter with study information was placed in the mailbox. The participants were informed that the subject of the study was waste, but the type of waste was not specified.

Table 1
Comparison of sample and population demographics.

		Study sample	The Netherlands
Age	<i>M</i>	54.2	42.4
	< 20	0%	21%
	20–40	19.1%	26%
	40–65	55.7%	33%
	65–85	23.9%	15%
	80 >	1.3%	5%
Gender	Females	63.0%	50.3%
Household size	Number of people	2.7	2.1
Household type	Living together	39.1%	48.9%
	Living together with children	41.7%	26.3%
	Single	12.6%	18.3%
	Single parent	3.9%	3.4%
	Other	2.2%	1.5%
	In institution	N.A.	1.6%

Note: statistics with regard to the demographics of the Dutch population are retrieved from the national bureau of statistics (CBS).

The first questionnaire included, among others, questions regarding the participants' responsibility for grocery shopping, responsibility for cooking, ownership of a compost heap, pets and finally basic demographics (gender, age, household type, number of adults, and number of children). As mentioned, some measures included in the questionnaires were not relevant to the research question at hand and are therefore not elaborated upon here (see web appendix A for an overview).

Four weeks later, in May 2021, the participating households collected their waste for seven days ($N = 275$). Each household was given two garbage bags and instructions on what (not) to put in the bags. Additional garbage bags were available upon request. Each garbage bag had a unique number that was used to match the survey data to the waste collection data. Households were instructed to put all kitchen waste, plastic packaging, vegetable and fruit waste, food scraps, metal cans, drink cartons, and general household waste into the bags. Items such as garden waste, batteries, oil, glass, paper, diapers for diaper services, and large household items (e.g., electrical appliances, renovation materials) were not to be included. At the end of the collection week, the garbage bags were collected by a waste collector and brought to a professional waste sorting company that both sorted and measured the edible food waste. Food waste was further subdivided into five categories, namely: bread, vegetables and fruit, meat, meal scraps and other food waste. This categorization is consistent with categories used in previous waste sorting studies (Elimelech et al., 2018; Hanssen et al., 2016; Parizeau et al., 2021), while also considering its practical feasibility for the waste collector. Direct measurement and waste sorting, such as used in this study, are widely acknowledged to be the most trustworthy method of collecting food waste data (Amicarelli and Bux, 2020; van der Werf et al., 2018; van Herpen et al., 2019), as it does not suffer from underreporting (van Herpen et al., 2019). As part of the bigger project, a subset of the households was subsequently exposed to a three-week intervention and another weeklong measurement of their food waste, results of which are beyond the scope of this study.

Five weeks after the baseline waste collection phase (i.e., the measurement used in this study), participants were asked to fill out a concluding survey ($N = 230$) containing the motivation to avoid food waste scale (Ribbers et al., 2023). The scale consists of 21-items and was administered on a seven-point Likert Scale (1 = not at all, 7 = very much). The overall question posed to participants was: "To what extent do you personally avoid wasting food because of the following reasons?" For each motivation, several items were included. The financial motivation ($\alpha = 0.91$) and moral motivation ($\alpha = 0.79$) subscales each contained four items including "Wasting food is a shame because I could have saved the money" and "Wasting food is disrespectful to poor people in this country," respectively. To assess environmental motivation, seven items were administered ($\alpha = 0.90$; e.g., "Food waste leads to excess pollution caused by the production, distribution, and disposal of food"). Lastly, six items formed the social motivation subscale, with a sample item being "I avoid food waste because I don't want other people to think I'm greedy" ($\alpha = 0.95$; see web appendix B for the Dutch translation and see web appendix C for its psychometric properties). Measuring the MAFW-scale five weeks after the dependent variable (i.e., food waste collection) ensured participants remained unaware of the hypothesis, allowing for more natural observation of waste-motivation patterns and less biased results.

The second survey also contained questions on other disposal methods (home-composting, animal-feeding, and drain), waste patterns of other household members, and a suspicion probe. Again, other measures were included but not discussed further here because they mainly concern anomalies with regard to the second waste collection week data which is not used in this paper. All participants received a package of tools to reduce food waste after their waste levels were measured. Additionally, upon completing both surveys, they entered a raffle where they could win one of five €50 vouchers as an incentive. Data has been analyzed with SPSS statistic 27 unless otherwise noted.

3.3. Data analysis

To analyze the data, we utilized repeated measures ANOVA to compare the means of the four different motivations for avoiding food waste, correcting for sphericity violations using the Greenhouse-Geisser correction. Post-hoc analyses with Bonferroni correction were conducted to determine the significance of differences between motivations. Furthermore, *t*-tests were employed to assess if the motivations significantly differed from the mid-point of the scale.

We further examined the correlations among motivations to assess their interrelationships, following Cohen's (1988) guidelines that recommend $r = 0.10$, $r = 0.30$, and $r = 0.50$ to be considered small, medium, and large in magnitude, respectively. As high correlation between motivations can be expected, we performed a discriminant validity test using the Fornell-Larcker criterion (Fornell and Larcker, 1981), where validity can be assumed when the extracted variances exceed the squared bivariate correlations. To evaluate multicollinearity, we assessed the Variance Inflation Factor (VIF) values against conventional thresholds of 5–10 (Thompson et al., 2017) and the more stringent cut-off of 2.5 (Johnston et al., 2018).

To examine the effects of the different motivations on household food waste we employed a Tobit model (Tobin, 1958). The Tobit model was chosen, as the dependent variable revealed a significant proportion of zero-values among the observations ($N = 55$) and the Tobit model is a censored regression model, designed specifically for such cases. This model is used for estimating equations with dependent variables that are continuous over some range, but censored at the lower (or higher) end. Tobit models are often employed in the food waste literature to cope with zero-inflated data, as many households report no waste during the collection period (Ananda et al., 2022; Chalak et al., 2019; Visschers et al., 2016). As the non-zero observations are non-normally distributed, we also performed an additional analysis using a log-transformed variable (as a robustness check). We log-transformed the non-zero observations and kept the observations of no waste at zero. For the results of the regression of the log-transformed food waste variable, see web appendix D. Here, we report the results of the regression taking the original food waste variable as dependent variable because (1) the results of the regression of the original and log-transformed food waste variable on motivations are equivalent, and (2) the regression coefficients (*b*'s) of the regression on the original food waste variable are easier to interpret (i.e., one point increase in motivation results in a decrease of *b* grams of food waste). Additionally, household size and age were added to the Tobit regression to account for their known influence on food waste (Schanes et al., 2018). Finally, we examined the potential impact of alternative disposal methods, such as using a compost bin or feeding food scraps to animals, on the regression results.

4. Results

4.1. Motivations to avoid food waste

Using a repeated measures ANOVA, we compared the means on each of the four motivations to assess which is most strongly held (see Table 2). We used the Greenhouse-Geisser correction as Mauchly's test indicated a violation of the assumption of sphericity. Results showed that the means were significantly different ($F(2.48, 2254.75) = 657.04$, $p < .001$, $\eta_p^2 = 0.742$). Post-hoc analysis with Bonferroni correction

revealed that moral considerations ($M = 5.63$, $SD = 1.11$) were rated as more important than environmental motivations ($M = 5.47$, $SD = 1.21$, $p = .009$). Financial motivations ($M = 4.10$, $SD = 1.60$) were rated as less important than moral and environmental motivations (both $ps < 0.001$) and did not differ from the mid-point of the scale ($t = 0.98$, $p = .329$). Finally, social motivations were considered least important ($M = 1.72$, $SD = 1.14$, $ps < 0.001$ compared to all other motivations).

Upon examining the correlations among motivations to avoid food waste, a robust positive relationship was observed between moral and environmental motivations ($r = 0.683$, $p < .001$; see Table 3), suggesting that individuals who were morally driven to reduce food waste were also likely to be motivated by environmental concerns. Financial motivations demonstrated moderate positive correlations with both moral ($r = 0.371$, $p < .001$) and environmental motivations ($r = 0.330$, $p < .001$). Furthermore, financial motivation was found to correlate with social motivation ($r = 0.313$, $p < .001$), which aligns with theoretical expectations, as both dimensions are rooted in self-interest. However, social motivation did not significantly correlate with either moral or environmental motivations ($ps > .283$). Given that all variables measured different aspects of consumers' motivation to reduce food waste, a certain degree of intercorrelation was to be expected.

Despite the notable correlations observed between the variables, the variance extracted for each of the four dimensions was measured at 0.57 for environmental, 0.49 for moral, 0.71 for financial, and 0.78 for social factors, while the squares of the correlations between these dimensions ranged from 0.00 to 0.47. Given that none of the extracted variances fell below the squared bivariate correlations, we can infer discriminant validity (Fornell and Larcker, 1981). Furthermore, to evaluate multicollinearity, we examined the Variance Inflation Factor (VIF) values. The VIF values for moral, environmental, financial, and social factors were 1.97, 1.90, 1.30, and 1.11 respectively, which remained well below the preferred thresholds (Johnston et al., 2018; Thompson et al., 2017).

4.2. Food waste descriptives

Table 4 provides general descriptive statistics of the amount of edible food waste generated by households in our sample during one week. On average, households wasted 515 g of food (i.e., 191 g per person per week). This average is lower than, the averages reported in another waste compositional analysis in the Netherlands which reported 629 g per week per person (32.7 kg per year, Van Dooren et al., 2019). This can be partly explained by the general decline in food waste in the Netherlands between 2016, when data for the Van Dooren paper was collected, and 2021, when our data was collected (Voedingscentrum, 2022). The discrepancy may also be attributed to a potential self-selection bias, as participants in our study voluntarily signed up, which could have influenced the results. Moreover, our results indicate that there is substantial variance in the amount of food waste, with some households wasting up to 4.8 kg and others wasting nothing. This wide range of food waste is further discussed in the general discussion.

In terms of the types of food waste, fruit and vegetables accounted for 33% of the total, while meal scraps, bread, and meat represented 22.4%, 21.7%, and 3.2% respectively. These findings suggest that households tend to waste a substantial amount of perishable food, particularly fruits and vegetables.

Table 2
Means and standard deviations of motivations to avoid food waste.

	<i>M</i>	<i>SD</i>
Moral	5.63	1.11
Environmental	5.47	1.21
Financial	4.10	1.60
Social	1.72	1.14

Table 3
Correlation table motivations to avoid food waste.

Correlations	Moral	Environmental	Financial	Social
Moral	1.0			
Environmental	0.683***	1.0		
Financial	0.371***	0.330***	1.0	
Social	0.058	0.071	0.313***	1.0

*** $p < .001$.

Table 4
Descriptive statistics of household food waste variable.

	<i>N</i>	<i>Min</i>	<i>Max</i>	<i>M</i>	<i>SD</i>
Bread	230	0	1825	111.41	238.00
Vegetables & fruit	230	0	2105	173.23	300.36
Meat	230	0	630	16.23	61.29
Meal scraps	230	0	3170	115.49	314.45
Others	230	0	2087	98.12	238.00
Food waste total	230	0	4755	514.48	747.62

Note: min, max and means are displayed in grams per household. Number of participants who wasted no food totals 55.

4.3. Effect of motivations on food waste

The results of the Tobit regression shows that food waste is predicted by moral motivations only ($b = -273.80, p < .001$) (see Table 5). Environmental ($b = -41.54, p = .526$), financial ($b = 9.91, p = .810$) and social motivations ($b = -13.43, p = .801$) do not exert any significant effect on household food waste. The Log(scale) coefficient ($p < .001$) quantifies the spread of the error terms or residuals, reflecting how well the model's assumptions about the data's distribution fit the actual data. A highly significant and precisely estimated Log(scale) parameter, as seen in our results, suggests that the model's assumptions about how error variance is handled are appropriate for the data.

Yet, when entered into the Tobit regression individually (i.e., *not* controlling for the other motivations), results showed that both moral ($b = -247.66, p < .001$) and environmental motivations ($b = -172.22, p < .001$) were significantly associated with food waste, whereas the financial motivation was marginally significant ($b = -57.84, p = .059$). The effect of social motivation on food waste was *not* statically significant ($b = -43.18, p = .318$). In the general discussion we elaborate more on these findings.

When examining the effect of the motivations on the different food categories, the benefit of differentiating between different types of motivations becomes more evident (Table 6). Concern about the financial costs of food waste marginally influenced households' leftover waste ($b = -74.8, p = .084$) and meat waste ($b = -35.3, p = .100$). Environmental motivations affected food waste that was not classified as bread, fruit and vegetables, meat and meal scraps ($b = -97.47, p = .017$), but the exact content of this waste category is unknown. Social motivations did not have a significant effect on any of the different food waste categories (all $ps > .180$). As expected, based on its strong effect on total household food waste, moral motivations influenced households' wastage of bread ($b = -177.3, p < .001$), meal scraps ($b = -191.1, p = .008$), and food waste not classified within the other categories ($b = -122.8, p = .008$). Moral motivations also marginally influenced meat wastage ($b = -61.2, p = .067$). None of the motivational factors had explanatory power for fruit and vegetable waste ($ps > .514$).

4.4. Additional effects of household demographics

We added household size and age to the former Tobit regression because they are widely known predictors of household food waste (Schanes et al., 2018). Indeed, both age ($b = -10.99, p = .027$) and

Table 5
Tobit regression of motivations on household food waste.

	<i>B</i>	<i>SE</i>	<i>z</i>	<i>p</i>
(Intercept)	2124.79	311.16	6.83	<.001
Moral	-273.80	72.04	-3.80	<.001
Environmental	-41.54	65.50	-0.63	<.526
Financial	9.91	41.19	0.24	<.810
Social	-13.43	53.20	-0.25	<.801
Log(scale)	6.73	0.06	121.64	<.001

Note: we used a Tobit model (gaussian distribution) as the data is zero-inflated. Hence, we set the lower bound for our food waste variable to 0 g.

Table 6
Tobit regression of motivations on household food waste in categories.

	Bread			Vegetables & fruit			Meat			Meal scraps			Other		
	<i>b</i>	<i>SE</i>	<i>p</i>	<i>b</i>	<i>SE</i>	<i>p</i>	<i>b</i>	<i>SE</i>	<i>p</i>	<i>b</i>	<i>SE</i>	<i>p</i>	<i>b</i>	<i>SE</i>	<i>p</i>
(Intercept)	501.80	171.34	0.003	279.06	185.90	0.133	24.65	133.67	0.854	1035.45	306.66	<.001	971.04	20.51	<.001
Moral	-177.29	41.70	<.001	-27.68	42.41	0.514	-61.20	33.39	0.067	-191.08	71.88	0.008	-122.82	46.53	0.008
Environmental	53.59	37.14	0.149	-15.13	39.00	0.698	-2.98	29.71	0.480	-35.53	66.06	0.591	-97.47	41.00	0.017
Financial	28.27	23.93	0.238	-11.76	24.51	0.631	35.33	21.49	0.100	-74.82	43.29	0.084	25.73	27.98	0.358
Social	-19.39	3.59	0.526	0.94	32.05	0.977	-7.37	25.25	0.770	39.10	55.82	0.484	-53.57	39.98	0.180
Log(scale)	6.03	0.08	0.000	6.16	0.07	<.001	5.52	0.16	<.001	6.55	0.10	<.001	6.13	0.09	<.001

Note: we used a Tobit model (gaussian distribution) as our data was zero-inflated. Each participant has an observation for each product category ($N = 230$). Instances where 0 g of food waste were recorded are considered valid responses and are included as such in the analysis.

household size ($b = 113.99, p = .029$) predicted the amount of food waste (see Table 7). Most importantly, the results with regard to the effect of the motivations on food waste did not change. In summary, environmental, financial and social motivations were not significant predictors of the amount wasted (all $ps > .477$), and moral motivation remained the strongest predictor in the model ($b = -286.43, p < .001$).

4.5. Additional effects of compost heap and animal feeding practices

We investigated the potential impact of alternative disposal methods on the regression results. Specifically, we examined whether the practices of using a compost bin or feeding leftover food scraps to animals had any influence on the results of the four motivations (see Table 8). The results indicated that using a compost bin as an alternative disposal method did not have a significant effect ($b = 134.99, p = .176$). Feeding food waste to animals, however, showed a marginally significant effect ($b = 254.49, p = .064$) in the sense that respondents who fed leftover food to their pets disposed of less food waste in the waste bags. It is worth noting that the main finding of our study, namely that moral motivation was the only significant predictor of food waste ($b = -287.82, p < .001$), remained unchanged even when these alternative disposal methods were included in the regression analysis. Specifically, the other motivations we examined still did not show significant associations with food waste ($ps > .677$), suggesting that moral motivation is the primary driver of food waste reduction behavior.

5. Discussion

Food waste is a wicked problem that happens in a big and complex web of household food management behaviors (Block et al., 2016; Boulet et al., 2021; Principato et al., 2021; Vittuari et al., 2023). Individuals must consistently act upon their motivation along every step of the squander sequence in order to accomplish food waste reduction, encompassing every action from purchasing and storage to preparation, consumption, and disposal. Strong goal-oriented motivation is crucial for this purpose, especially since food management behaviors are deeply embedded in strong habits (Russell et al., 2017), and constrained by environmental circumstances (van Geffen et al., 2020b). Fortunately, people are often averse to wasting (Bolton and Alba, 2012; van Herpen and de Hooge, 2019), particularly wasting food (Raghunathan and Chandrasekaran, 2021). Numerous reasons are documented as to why consumers are averse to wasting food, encompassing environmental, moral, financial, and social motivations (Ribbers et al., 2023). These motivations can either operate in tandem or independently influence food waste. Therefore, the objective of this paper was to comprehensively examine the impact of these four different motivations on consumers' food waste behaviors.

Utilizing food waste data collected via waste sorting, our findings reveal intriguing insights. First, contrary to expectations, the moral motivation is found to be the only significant predictor of food waste. This means that individuals' ethical considerations play a dominant role in determining their food waste. Second, our findings underscore the

Table 7
Tobit regression of motivations and demographics on household food waste.

	b	SE	z	p
(Intercept)	2165.76	510.75	4.24	< .001
Moral	-286.43	77.64	-3.69	< .001
Environmental	-8.96	69.76	-0.13	0.898
Financial	24.15	47.86	0.51	0.614
Social	-44.14	62.09	-0.71	0.477
Age	-10.99	4.96	-2.21	0.027
Household size	131.99	60.42	2.19	0.029
Log(scale)	6.70	0.07	102.03	< .001

Note: we used a Tobit model (gaussian distribution) as the data is zero-inflated. Hence, we set the lower bound for our food waste variable to 0 g.

Table 8
Tobit regression of motivations, compost usage and feeding to animals on household food waste.

	b	SE	z	p
(Intercept)	-163.02	1011.65	-0.16	.082
Moral	-287.82	71.91	-4.00	<.001
Environmental	-27.32	65.58	-0.42	0.677
Financial	15.17	40.9	0.37	0.711
Social	-18.71	54.91	-0.34	0.733
Compost heap	134.99	99.77	1.35	0.176
Animals	254.49	137.35	1.85	0.064
Log(scale)	6.72	0.06	121.26	0.000

Note: we used a Tobit model (gaussian distribution) as the data is zero-inflated. Hence, we set the lower bound for our food waste variable to 0 g.

importance of distinguishing between various motivations when analyzing their impact on different food categories. Up until now, research has predominantly centered on food waste overall, without an eye for differences between product categories. Yet, our results indicate that food waste may have different drivers across categories. Concerns about the financial and environmental impact appear to influence certain food waste categories. It is imperative to note that the effects of financial motivation on the waste of meal scraps and meat are only marginally significant. Environmental motivations significantly influence the waste of those food items that do not fit in one of our predefined categories. Moral motivations notably shape bread, meal scraps, and uncategorized food waste, leaving fruit and vegetable waste relatively unaffected. The confluence of rapid perishability of healthy food items and caregivers trying to encourage their families to eat healthily by buying large quantities of healthy products might explain why it is hard to prevent this type of waste (the latter phenomenon is also referred to as the good provider identity; Visschers et al., 2016; Wang et al., 2021). This raises the need for further investigation into the reasons behind this lack of influence of the various motivations on fruit and vegetable waste, and highlights the importance of future research and policy interventions specifically targeting this category. Finally, despite our explicit instructions to put all waste in the trash bag, we observed that individuals occasionally chose to feed leftover food to animals, which reduces food waste. While this practice may not align perfectly with the waste hierarchy's ideal recycling methods (EPA and ERG, 2023), it is a preferable alternative to food disposal in landfills as the latter contributes substantially to greenhouse gas emissions.

Recent research in the food waste domain underscores that the aversion to wasting money frequently emerges as a key motivator for consumers to minimize waste (Blichfeldt et al., 2015; Graham-Rowe et al., 2014; Grandhi and Appaiah Singh, 2016; Neff et al., 2015; Secer et al., 2023), and campaigns that emphasize these financial drawbacks have proven to be effective (van der Werf et al., 2021). In light of these findings, it is remarkable that our study did not uncover financial motivation as a predictor of household food waste. This incongruity suggests the presence of other motivations, psychological processes and/or situational factors that merit further investigation.

Several reasons may make it challenging for individuals to track the financial losses associated with food waste. First, there is a time gap between incurring the costs of purchasing food products and the act of discarding them. This delay can obscure the direct financial consequences of food waste, as the cost of the food is not immediately apparent at the time of its disposal (Setti et al., 2018). Second, habitual activities like grocery shopping can result in less conscious decision-making, often causing consumers to overlook the cost of items they buy regularly. Third, food is frequently processed into a meal, making it complex to calculate the expenses associated with discarding meal remnants. Fourth, the presence of multiple actors within a household who can all contribute to food waste complicates precise measurement. Finally, food waste often involves the disposal of relatively small quantities of food over a prolonged period, further impeding accurate

tracking.

Given the difficulty of cost calculation, it is not strange that consumers are not fully aware of the financial implications of their food waste and likely underestimate its financial consequences. Instead of engaging in the intricate task of calculating these costs, individuals tend to mentally downplay the significance of their waste episodes (van Geffen et al., 2020a). This psychological mechanism allows consumers to mitigate the negative emotions associated with food waste, such as discomfort, guilt, or shame. Future research should delve into the possibility that people engage in motivated reasoning, by altering their perceptions of the significance of such waste events or even ignoring them altogether, to alleviate negative emotions.

Concerns about the costs of food waste may become more pronounced and influential in situations of economic hardship. Individuals facing economic hardship, such as in poorer countries, or people with a relatively low income, are likely to be more sensitive to the economic implications of food waste. The absence of a significant effect of financial motivation in our study may be attributed to the relatively low proportion of household income allocated to food expenses in the Netherlands. The level of concern regarding the costs of food waste was significantly lower than the more altruistic, moral and environmental motivations, which further affirms these speculations. We encourage future research to look into potential cultural differences.

Further exploration into the potential significance of financial motivation across diverse scenarios and food categories is imperative. For instance, financial incentives may assume greater importance when food is perceived as pricier such as when purchasing food from specialty stores, opting for takeout, or considering specific categories such as costly proteins. Future research endeavors should incorporate more accessible methodologies alongside waste sorting techniques to elucidate the effects of financial motivations across these varied scenarios, which holds promise for yielding valuable insights into consumer behavior.

Our research confirms that morality plays a crucial role in reducing household food waste. This finding aligns with existing research on food waste, which has consistently shown that moral values, norms, and attitudes significantly influence intentions to avoid waste as well as self-reported food waste (Brennan et al., 2021; Filimonau et al., 2022; Nguyen et al., 2023; Stefan et al., 2013; Talwar et al., 2022; Visschers et al., 2016). For example, Nguyen et al. (2023) emphasize that normative motivations, which encompass both moral and environmental motivations, play a significant role in reducing food waste through various daily food management behaviors, such as planning, storing, and managing leftovers. Building on this, our research differentiates between moral and environmental motivations, highlighting how they differently influence specific food waste categories and reinforcing the critical role of morality in promoting sustainable food practices. Moreover, the parallels between our findings and existing research on environmentally friendly behavior are noteworthy. This body of research consistently underscores the influential role of morality (Hertz and Krettenauer, 2016; Skitka et al., 2021) and self-conscious emotions (Rees et al., 2015; Zelenski and Desrochers, 2021). Specifically, guilt is frequently cited as the mechanism through which morality affects environmentally friendly behavior (Antonetti and Maklan, 2014), but has also been associated with the intention to reduce food waste (Mattar et al., 2018; Parizeau et al., 2015; Qi and Roe, 2016; Russell et al., 2017; Sirieix et al., 2017). These cohesive findings reinforce the notion that food waste is regarded as a moral transgression (Misiak et al., 2018, 2020) and underscore the pivotal role of moral motivations in reducing food waste in households.

Both moral and environmental motivations are associated with abstract, altruistic values, yet, while moral motivations have been shown to be influential, the role of environmental motivations is less clear. Environmental motivations are associated with less food waste, but are no longer significant when moral motivations are included in the model. A compelling question for future research is whether increasing

knowledge about the environmental impact of food waste would lead to changes in consumers' food management behaviors. Investigating the potential impact of enhanced environmental awareness on reducing food waste holds promise for advancing our understanding and informing interventions in this area. Another interesting question for future research is to see if addressing multiple motivations simultaneously may enhance the effectiveness of these motivations. For example, Prelez et al. (2023) found that presenting both the monetary and environmental benefits is more effective for food waste reduction intentions than benefit alone, particularly for individuals with high environmental concerns.

Social motivation, as observed in our study, did not demonstrate a significant effect on food waste reduction. Household food management practices are often performed in private and therefore not subject to social scrutiny. It is consistent with the broader literature indicating that individuals tend to engage in more pro-social and pro-environmental behaviors when they are under social scrutiny (Brick et al., 2017; Nettle et al., 2013; van Rompay et al., 2009). However, the absence of a significant impact of social motivation on food waste reduction within the household presents intriguing possibilities for future research. For instance, exploring situations where people consume or waste food in the presence of others, such as in workplace settings or restaurants, may shed light on the role of social dynamics in food waste. Possibly, social motivations become impactful in situations where people are observed by others. Examining these contexts can provide valuable insights into how social motivations may manifest and interact with other factors to influence individuals' food-related choices and behaviors.

5.1. Limitations

Although waste sorting is a robust method to measure household food waste (van Herpen et al., 2019), it does come with limitations. First, waste sorting studies always suffer from human error and subjectivity which can lead to inaccuracies. Second, waste sorting studies often focus on specific types of waste or certain categories, due to which we were unable to ascertain the specific food categories that fell into the "other" category of food waste. Third, the representativeness of the waste samples collected is often limited. In our study, participants were restricted to those who live within specific neighborhoods served by the waste collection company. Moreover, since participation in our study was voluntary, there is a potential for self-selection bias, which could further limit the representativeness of our findings. This means that the sample may not fully represent the broader population due to this geographic constraint. In comparison to the Dutch population, we have a slightly older sample, more women, and relative more couples that live at home with their children. As stated before, the fact that we sampled participants that were predominantly responsible for food management in their household possibly explains the first two differences. Given this limitation, we suggest that future research should consider using a combination of research methods, such as waste sorting in different locations or supplementing waste sorting data with additional measures that capture a broader range of participants within the country or even across countries.

Another limitation arises from the possibility that participants feeding leftover food to animals might introduce a source of bias into our findings. Notably, 84.3% of respondents indicated that they did not provide any leftover food to their pets, with an additional 14.3% mentioning giving only a small amount. This shows that fewer than 1.5% of participants offered more than half of their remaining food to their pets. Consequently, we expect that the influence of this bias is likely to be limited in scope.

5.2. Future research

Future research could explore self-conscious emotions that may play a mediating role. For example, investigating the connection between

social and financial motivations, food waste, and the experience of shame could be an intriguing avenue for further research. Just like the financial and social motivations are self-interested, shame, in contrast to guilt which arises more from failures in communal relationships, is more self-focused and closely tied to individual standards and social expectations (Sheikh and Janoff-Bulman, 2010). It is posited that the experience of positive self-transcendent emotions, such as awe, compassion, and gratitude, plays an important role in fostering pro-environmental behaviors (Zelenski and Desrochers, 2021). Exploring the interplay between self-conscious emotions and message framing in the food waste context should be a focus of future research.

A promising direction for future research is to investigate the role of specific product attributes that may moderate the effects of motivations on food waste amount. For instance, our results showed marginal impacts of moral and financial motivations on leftover meat, specifically on meats that are in their original packaging (cooked meat was recorded as meal scraps). This suggests that animal products and more expensive items may be less likely to be wasted due to moral and financial considerations. Exploring how different product attributes, such as local, organic, or fair-trade products, influence food waste could be another intriguing avenue for future research (Nadricka et al., 2024). These products carry moral weight and may be less prone to being wasted, but this hypothesis needs further confirmation.

5.3. Practical implications

People's motivations are key to any behavioral change intervention. Without motivation behavior change is unlikely to occur, and motivation is both crucial for initiating behavior change from the outset and for reinforcing and maintaining desired behaviors during later stages in the behavior change process (Vermeir et al., 2020). In support, prior research has shown that an explicit focus on motivational elements can strengthen the effectiveness of interventions using tools to diminish food waste (van Herpen et al., 2023). Following this line of thought, the effectiveness of interventions to reduce food waste may be enhanced by ensuring the presence of a motivational element, and our study indicates which type of motivation to best focus on.

Government bodies and NGOs should consider more strongly leveraging moral motivations to reduce food waste. In the Netherlands, reduction efforts by consumers are primarily fostered through practical tools, consumer awareness campaigns, and school programs (Bos-Brouwers et al., 2023). Developing campaigns that emphasize the moral aspects of food waste could resonate with consumers and encourage behavior change. Incorporating moral motivations into food waste reduction campaigns may be particularly effective when targeting household segments that hold this specific motivation (Vermeir et al., 2020). Our findings also suggest that waste reduction campaigns may be more successful if these appeal to specific motivations for different food categories. Highlighting the moral impact of food waste may work best for reducing bread wastage, but a combination of moral and financial motivations seems relevant for the encouragement of meal leftover consumption. Furthermore, our results indicate a compelling need for educational initiatives aimed at promoting awareness about both the preservation of fruits and vegetables and the environmental consequences of food waste.

Besides awareness raising and education, previous research has suggested the use of persuasion, incentivization and coercion as interventions specifically suited for triggering motivations (Michie et al., 2011). Persuasion involves using communication to induce feelings or stimulate action. Moral motivations can be utilized, for example, to encourage food donation and redistribution by leveraging people's concerns about hunger and food insecurity. As mentioned in the future research section, emotions such as guilt may be used to persuade individuals to reduce waste. Such interventions should ensure that preventing waste is perceived as easy, to prevent a potential backfiring effect (Birau and Faure, 2018). Furthermore, incentivization can be

added by creating an expectation of reward, such as providing incentives for food sharing like access to services (such as cooking classes) and innovative technologies (such as waste prevention apps). In addition, policies such as Pay-as-You-Throw systems can further be leveraged to create an expectation of costs (i.e., coercion) and consequently trigger financial motivation (Messina et al., 2023; Nguyen et al., 2023) as these systems charge households based on the amount of waste they produce, incentivizing waste reduction. The Netherlands employs a variety of PAYT systems, including weight-based, volume-based, and frequency-based systems. In this regard, especially weight-based systems, requiring people to pay for every kilogram wasted, have been shown to effectively reduce waste quantities (Card and Schweitzer, 2016). Incorporating moral motivations next to these weight-based systems may further enhance their effectiveness.

Businesses can leverage moral motivations in their marketing strategies. Highlighting ethical considerations and the social responsibility of reducing food waste could resonate with consumers and enhance brand reputation. Insights regarding which product categories are more susceptible to waste reduction due to specific motivations can guide the development of communication campaigns within those categories. Companies in the meat industry, for example, can reduce concerns about the costs of wasted food by communicating how to best prevent wastage of their product. Moreover, implementing feedback mechanisms that allow customers to provide insights on their food waste reduction efforts can help businesses tailor their strategies and offerings to better match consumers' motivations. In the absence of such feedback mechanisms, or when there is a lack of insight into the specific motivations of consumers, it is advisable for organizations to primarily focus on moral motivations. This recommendation is based on our research findings, which demonstrate that moral motivations are the most effective in reducing household food waste overall.

CRedit authorship contribution statement

Daphne Ribbers: Writing – review & editing, Writing – original draft, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Erica van Herpen:** Writing – review & editing, Supervision, Resources, Methodology, Conceptualization. **Mario Pandelaere:** Writing – review & editing, Supervision, Funding acquisition, Conceptualization. **Maggie Geuens:** Writing – review & editing, Supervision, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.spc.2024.09.012>.

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