



The balancing act: How do moral norms and anticipated pride drive food waste/reduction behaviour?

Shalini Talwar^a, Puneet Kaur^{b,c}, Sushant Kumar^d, Jari Salo^e, Amandeep Dhir^{c,f,g,*}

^a K J Somaiya Institute of Management, Somaiya Vidyavihar University, Mumbai, India

^b Department of Psychosocial Science, University of Bergen, Norway

^c Optentia Research Focus Area, North-West University, Vanderbijlpark, South Africa

^d Indian Institute of Management (IIM), Raipur, Chhattisgarh, India

^e Department of Economics and Management, Faculty of Agriculture and Forestry, University of Helsinki, Finland

^f Department of Management, School of Business & Law, University of Agder, Norway

^g Norwegian School of Hotel Management, University of Stavanger, Stavanger, Norway

ARTICLE INFO

Keywords:

Food waste behaviour
Household
Leftover reuse
Moral norms
Over-purchasing of food
Stimulus-organism-response theory

ABSTRACT

Food waste is a serious problem that impacts the environment and sustainability by increasing greenhouse gas emissions from landfills. Food waste also represents a social challenge because it raises serious concerns about food security. While acknowledging that households waste a great deal of food because they lack a proper routine for reusing leftovers and purchase more food than required, few studies have extensively examined the drivers of leftover reuse and over-ordering. We address this gap using the stimulus-organism-response paradigm. Moral norms and anticipated pride are conceptualised as stimuli that impact the organismic state of intentions against food waste and response in the form of leftover reuse routines and over-purchasing of food. Data collected from 443 individuals residing in the United States confirm the positive association of norms and pride with intentions. Statistical analyses also reveal a positive association between intentions and leftover reuse routines and a negative association between intentions and over-purchasing of food. The results further demonstrate the mediation effect of intentions on the association of moral norms and anticipated pride with both response variables; in addition, we find that household income exerts a positive moderation effect on the association of norms and pride with intentions and a negative moderation effect on the association of anticipated pride with over-purchasing of food. Researchers, organisations and policymakers can draw upon these findings to motivate future research, propose effective strategies and enact favourable policies to promote sustainability and reduce food-related waste at the household level.

1. Introduction

Each year, approximately 24% of the food suitable for consumption is lost or wasted at various stages of the food supply chain, such as production, processing, distribution and consumption (A. Kumar et al., 2020; Stancu et al., 2016). Such waste represents a grave challenge to sustainability and society (Dhir et al., 2020; Sharma et al., 2021; Puntillo et al., 2021). Indeed, food waste contributes not only to food security-related issues but also to various environmental challenges, such as the wastage of resources, greenhouse gas emission and others (van Herpen and van der Lans, 2019; S. Talwar, Kaur et al., 2021c; S. Talwar, Kaur et al., 2021d). Specifically, food waste raises food security

concerns because it represents a lost opportunity to feed nearly 820 million food-insecure people (FAO, 2021). In addition, scholars observe that food waste globally contributes to approximately 8 to 10% of all greenhouse gas emissions and costs approximately 1 trillion USD annually (Qvested et al., 2020).

Alarmingly, households contribute approximately 570 million tonnes of the 931 million tonnes of total food wasted annually (United Nations Environment Programme, 2021). These statistics have motivated researchers around the world to investigate the causes, origins and outcomes of food waste. The preceding discussion reveals that addressing the issue of food waste is one of the most challenging but crucial ways to ensure the sustainable existence and development of

* Corresponding author. Department of Management, School of Business & Law, University of Agder, Norway.

E-mail addresses: shalini.t@somaiya.edu (S. Talwar), puneet.kaur@uib.no (P. Kaur), 321kumarsushant@gmail.com (S. Kumar), jari.salo@helsinki.fi (J. Salo), amandeep.dhir@uia.no (A. Dhir).

<https://doi.org/10.1016/j.jretconser.2021.102901>

Received 25 December 2020; Received in revised form 4 December 2021; Accepted 23 December 2021

Available online 13 February 2022

0969-6989/© 2022 The Authors. Published by Elsevier Ltd. This is an open access article under the CC BY license (<http://creativecommons.org/licenses/by/4.0/>).

humankind in times to come. This challenge becomes even more grave in light of the continued increase in the world population, which means that the pressure on resources will continue to increase.

For these reasons, we advocate investigating various aspects of food waste generation and conservation. Observing that households generate more than half of the world's total food waste (Aschemann-Witzel et al., 2018; United Nations Environment Programme, 2021), we propose examining food waste at the household level. Moreover, because the per capita food waste generated at the household level is, on average, the same for all countries in the world—whether high-, upper-, middle- or lower-income countries, we assert the importance of studying consumer food waste in various countries. However, we base our present investigation on the United States, where the Environmental Protection U.S. Environmental Protection Agency (2020) estimates food waste to total 59 kg per capita annually, which translates into a total food waste of 19,359,951 tonnes annually at the household level. Because the generation of household food waste occurs at the individual level, we endeavour further to examine the drivers of consumers' decisions and behaviours that can increase or decrease food waste at the household level.

Advancing the academic knowledge related to household food waste requires investigating the identified aspects. Indeed, a review of the literature suggests various gaps in this context. For example, few empirical studies have explored food waste behaviour at the household level, with most recent studies focusing on out-of-home dining (e.g. S. Talwar, Kaur et al., 2021a; Sharma et al., 2021). The extant literature has also failed to specifically address consumer actions and motives that can reduce food waste. Furthermore, few studies have explored the ways in which intentions against food waste drive leftover reuse and control the consumer instinct to purchase excess food, and the studies that do exist tend to examine the latter behaviour in terms of shopping routines or the over-ordering of food (e.g. Sharma et al., 2021; Stancu et al., 2016; Stefan et al., 2013). Similarly, the literature regarding the role of moral norms (a deterministic value; e.g. Neubig et al., 2020) in food waste reduction remains scarce. In addition, most prior studies on household food waste, which have been conducted in multiple countries, including Turkey (Cakar et al., 2020), Serbia (Djekic et al., 2019), Poland (Filimonau et al., 2020a), the UK (Filimonau et al., 2020b), China (Filimonau et al., 2020c) and Romania (Stefan et al., 2013), have primarily examined the impact of campaigns (e.g. educational programmes, talks, exhibitions and the publication of articles; Zamri et al., 2020), the various motivators of and barriers to food waste (Visschers et al., 2016) and the role of gratitude in emotionally persuading individuals to avoid wasting food (Septianto et al., 2020). More geographically diverse inputs are, therefore, required to verify these findings globally. Finally, compared to the total available literature on food waste, consumer behaviour studies on food waste are largely fragmented and scarce. We note that the majority of food waste literature focuses on food waste at the industrial level—at the stages of production, processing and distribution—rather than at the household level.

Based on the visible gaps in the literature elucidated above, the present study aims to identify and examine various aspects of individual/consumer thought processes and milieus that may drive their food waste-related choices. After extensively reviewing the extended literature, we propose to examine the norms and emotions that affect intentions to reduce household waste, the tendency to reuse leftover food and the tendency to indulge in the over-purchase of food items. These variables conceptualise individuals' overall evaluations of food waste and their inclinations to reduce such wastage. For example, moral norms act as guiding principles that help individuals make decisions in multiple situations, including food waste (Stancu et al., 2016). Nevertheless, questions remain regarding whether moral norms can induce individuals to reduce food waste by consuming leftovers and whether emotions can affect the related decisions (since over-purchasing of food by shopping frequently indicates individuals' unwillingness even to attempt wasting less food). In fact, many such questions can enable

scholars to better map household food waste reduction strategies. Synthesising the above discussion, we address four specific research questions (RQs): **RQ1:** How do norms and emotions shape intentions to avoid wasting food at the household level? **RQ2:** How do norms and emotions impact routines related to the reuse of leftovers and over-purchasing of food at the household level? **RQ3:** In what ways—including any mediating effects—do intentions to avoid wasting food impact routines related to the reuse of leftovers and over-purchasing of food? **RQ4:** What are the potential moderating effects of household size and income on the contemplated associations?

To provide conceptual clarity, we have grounded the identified constructs and proposed associations in the stimulus-organism-response (SOR) theory. According to SOR theory, stimuli (S) drive individuals', or organisms', internal state (O), which shapes individuals' responses (R; S. Kumar, Jain & Hsieh, 2021b). SOR theory has proved useful in assessing consumer behaviour towards varied products, such as natural (S. Kumar Dhir et al., 2021), organic (Tandon et al., 2021) and local (S. Kumar, Murphy et al., 2021c) products, and scholars have conducted these assessments in different contexts, such as purchases during the COVID-19 pandemic (Laato et al., 2020; S. Kumar and Shah, 2021). In the current context, SOR theory provides a theoretical framework that suggests norms (measured as moral norms) and emotions (measured as anticipated pride in food waste reduction) act as stimuli, which are likely to impact individuals' internal state (measured as intentions against food waste), which further drives such individuals' actions/responses (measured as leftover reuse routines and over-purchasing of food items while shopping for the household). To examine the proposed associations and answer the four research questions, we utilised *Prolific Academic* to collect data from 443 individuals residing in the US.

Our findings offer three novel contributions to the growing research on food waste. First, we advance the existing understanding of household food waste prevention behaviour by bringing together variables that have remained under-explored thus far, despite their prominence in the extended food waste literature. In sum, we offer a greater understanding of the association of moral norms and anticipated pride with intentions against food waste, leftover reuse routines as a food waste reduction strategy and over-purchasing of food items while shopping as a food waste generation behaviour. Second, we consolidate the theoretical advances in the area by grounding our conceptualisation in SOR theory, which is well recognised in the pro-environmental consumer behaviour literature in general but remains underutilised in the current context. Finally, acknowledging that household food waste generation and reduction decisions are complex, we uncover the intervening mechanisms—both moderating and mediating—that impact the associations between stimuli, organisms and responses.

2. Background literature

2.1. Food waste: definition and dynamics

Defining food waste is quite challenging because, from a practical perspective, no clear distinction exists between food waste and loss (Filimonau et al., 2020a). Scholars have differentiated the meanings of these concepts by associating food loss with waste that occurs during the processing stage and food waste with waste that occurs at the consumption or distribution level (Kaur et al., 2021). Next, drawing upon previous studies and data from the Food and Agriculture Organisation of the United Nations (FAO, 2021), we explain food waste as food that humans could have consumed if it had not been discarded due to expiration, spoilage or other such issues. In fact, food may spoil for a variety of reasons, such as an oversupply of food in the market or consumer shopping habits (Zamri et al., 2020).

Food waste occurs in multiple settings, including restaurants or industries and households (e.g. Goggins, 2018). In out-of-home-settings, i. e. restaurants or industries, Filimonau Matute et al. (2020)a and Filimonau Todorova et al. (2020)b argue that food waste is generated

mainly at three stages: preparation (approximately 45%), consumption (approximately 34%) and transit or storage (approximately 21%). Reviewing past studies, [Dhir et al. \(2020\)](#) reveal that food waste in the hospitality and food service sector (HaFS) differs in quantity and composition depending on establishment type. In at-home settings, i.e. households, scholars note that food waste is generated as a result of deficient food management and is influenced by planning, over-purchasing of food or shopping routines ([Aschemann-Witzel et al., 2020](#); [Djekic et al., 2019](#)). Waste in this setting is thus related to household practices and routines ([Wahlen and Winkel, 2016](#)). Household routines include planning, buying, storing, cooking, consuming and handling leftovers. These routines play a significant role in food waste behaviours ([Waitt and Phillips, 2016](#)), which, in turn, are driven by various factors. For example, over-buying could result from time constraints ([Graham-Rowe et al., 2014](#)), marketing offers ([Graham-Rowe et al., 2014](#)) or oversized packaging ([Graham-Rowe et al., 2014](#); [Schanes et al., 2018](#)).

Past studies also observe the ability of interventions and nudges to alter the tendency to waste. For instance, [Young et al. \(2018\)](#) show that consumers exhibit changes in food waste behaviour when they receive interventions through communication channels, such as in-store magazines, e-newsletters, Facebook sites, demonstrations and product labels. In the case of households, scholars also observe that consumers consider discarding food to be an unacceptable behaviour ([Porpino et al., 2015](#)) and express concerns about food waste ([A. Kumar et al., 2020](#)). Researchers further argue that such concerns about food waste drive consumers' efforts and intentions to reduce it ([Principato et al., 2015](#); [Stancu et al., 2016](#)). In addition, past studies propose managing leftover food as a viable approach to reduce waste ([Schanes et al., 2018](#)). Research also finds that food waste reduction behaviour is driven by individuals' emotions, such as anticipated pride, which is known to drive sustainability-oriented decisions ([Han et al., 2019](#); [Lagorio et al., 2018](#)). Individuals who express deep environmental concerns are also more worried about wasting food ([Goggins, 2018](#); [Melbye et al., 2017](#)).

A comprehensive literature review reveals that studies have acknowledged the need to reduce food waste and have identified key variables; however, a limited number of studies have empirically investigated the role of norms and emotions in driving intentions to avoid wasting food, reuse leftovers and indulge in the over-purchase of foods.

2.2. Stimulus-Organism-Response (SOR) theory

[Mehrabian and Russell \(1974\)](#) originally propounded SOR to examine the underlying variables from the perspective of environmental psychology. However, researchers later applied the theory to a variety of contexts. SOR posits that multiple internal or external elements in the environment act as stimuli (S) driving the internal organismic state of an individual or organism (O), which, in turn, drives individuals' responses to the stimuli (S. [Kumar, Dhir et al., 2021a](#)). Here, the stimulus (S) refers to environmental changes that can influence individuals' physical and psychological elements (S. [Talwar, Kaur et al., 2021b](#)), while the organism (O) refers to people's internal structures and processes that influence thinking, feeling and perception ([Zhai et al., 2020](#)), and response (R) is the outcome of the stimulus and organism, which can be positive, i.e. approach, or negative, i.e. avoidance ([Bigne et al., 2020](#)). A review of the literature in diverse areas reveals that existing scholarship has utilised SOR in a wide variety of contexts, such as natural food (S. [Kumar, Dhir et al., 2021a](#)) and online food delivery platforms ([Jabeen et al., 2022](#); S. [Kumar and Shah, 2021](#)), among others.

Motivated by the growing popularity and relevance of SOR theory for examining consumer behaviour, we have utilised it to understand food waste behaviour in the household setting. Certain advantages of SOR guided our selection of it. For example, SOR has the flexibility to integrate multiple variables that act as stimuli and thus as antecedent variables driving both cognitive and affective internal processes. At the

same time, the theory allows for both favourable and non-favourable responses in the form of approach and avoidance, respectively. Such versatility and flexibility enable us to conceptualise the entire phenomenon more holistically. Because food waste has not only a social desirability dimension but also an economic dimension, the ability to incorporate these various aspects is particularly valuable in the present context. Thus, the theory offers an overarching framework that helps develop a comprehensive model to explain food waste behaviour in households. Further, it enables the parsimonious mapping of variables ranging from internal processes to external actions that affect consumer decision-making and is thus suitable to explain households' behaviour towards food waste.

2.2.1. Mapping the variables of interest to SOR

The proposed model is grounded in SOR. Accordingly, we have conceptualised the proposed constructs as stimulus, organism or response. Thus, moral norms representing norms and anticipated pride representing emotions are theorised as stimuli (S), intentions against food waste are proposed as an internal state of consumers/the organisms (O) and leftover reuse routines as well as the over-purchasing of food are proposed as responses (R).

The study utilises moral norms and anticipated pride as stimuli for two reasons. First, moral norms help consumers to understand that it is wrong to waste food ([Graham-Rowe et al., 2014](#); [Schanes et al., 2018](#); [Stefan et al., 2013](#)). Second, consumers not only associate negative emotions, such as disgust ([Radzymińska et al., 2016](#)), hate ([Waitt and Phillips, 2016](#)), frustration ([Graham-Rowe et al., 2014](#)) and guilt ([Parizeau et al., 2015](#); [Stefan et al., 2013](#)), with food waste but also take pride in displaying sustainability-oriented behaviours by reducing waste ([Han et al., 2019](#); [Lagorio et al., 2018](#)).

Moreover, we utilise intentions against food waste as an organismic/internal state for two main reasons. First, intentions against food waste are considered pro-environmental behaviours ([Melbye et al., 2017](#)), which are guided by individuals' moral norms. Second, intentions against food waste can help individuals consciously seek to reduce food waste.

Finally, leftover reuse routines and over-purchasing of food are utilised as responses for two reasons. First, household food purchase decisions are an outcome of several functions, including planning, visiting stores, making actual purchases, etc., which may lead consumers to purchase more food than they require, even as they claim to be/are convinced that they have purchased adequate quantities ([Parizeau et al., 2015](#)). The fact is that consumers often tend to buy more than they require ([Schanes et al., 2018](#)). Second, although the reuse of leftovers is a crucial approach/routine for reducing food waste ([Schanes et al., 2018](#)), several challenges hinder its execution. For example, households struggle to estimate the quality of leftovers and express concerns about health risks ([Farr-Wharton et al., 2014](#)). Moreover, serving leftovers to children can evoke a sense of guilt if parents or guardians perceive it as a failure to provide proper care ([Cecere et al., 2014](#)). Finally, household members may prefer not to reuse leftovers if it means repeatedly eating the same foods ([Cappellini and Parsons, 2012](#); [Schanes et al., 2018](#)) or if they are apprehensive about the quality and freshness of reheated leftovers ([Cappellini and Parsons, 2012](#)).

In addition to proposing and examining the direct associations suggested by generic SOR principles, we also extend the theory and thus increase its relevance to the multi-dimensional pro-environmental/sustainability context by contemplating the possibility of direct associations between stimuli and responses as well as the influence of intervening mediating and moderating effects. Thus, we propose and test the mediating effect of intentions between stimuli (i.e. moral norms and anticipated pride) and response (i.e. leftover reuse and over-purchasing). In addition, we examine the moderating effects of household size and income on the strength of the association between stimuli and response. We also acknowledge the possibility of confounding effects from various socio-demographic aspects of the consumer profile

and control both outcome variables for the effect of three socio-demographic variables (i.e. age, gender and educational background), in particular. Fig. 1 presents the model with all variables and proposed associations while Table 1 offers a brief definition of the variables.

3. Hypotheses development

3.1. Stimuli-organism and stimuli-response: Moral norms, anticipated pride in food waste reduction and intentions against food waste

Schwartz (1977) defined moral norms as a moral obligation people feel to follow a certain line of behaviour. They represent an individual's beliefs about right or wrong. In the past, scholars have used the terms personal norms, moral norms and moral obligations interchangeably (Olsen et al., 2010). Examining these variables in different contexts, past studies have found them to be associated with intentions and attitudes towards various behaviours. For instance, Neubig et al. (2020) report that increased personal norm activation associates positively with a favourable attitude towards the reduction of food waste.

In the current study, we interpret moral norms as beliefs that motivate individuals to avoid wasting food (Olsen et al., 2010; Stancu et al., 2016). Although past studies have examined the association between norms and waste, the relationship between these variables remains unclear. For instance, certain studies have found no relationship between norms (commonly approved behaviours in society) and food waste behaviour (e.g. Stefan et al., 2013; Visschers et al., 2016). Similarly, Stancu et al. (2016) report finding no statistically significant association between moral norms and food waste. However, other studies have supported an association between norms and intentions to avoid wasting food (e.g. Graham-Rowe et al., 2015) and thus suggest that social conformity strengthens beliefs against food waste. Because intentions are precursors of actual behaviour, we propose adding clarity to the underlying literature by examining the associations between norms

Table 1
Description of variables under study.

SOR construct	Variables	Description
Stimuli	Moral norms	Consumers' evaluation of what is right and what is wrong, which impinges on their behaviour related to food waste reduction decisions in their household
	Anticipated pride in food waste reduction	The positive emotions, such as a sense of accomplishment and confidence, that consumers experience when they act to reduce food waste in their household
Organism	Intentions against food waste	Intentions against food waste that reflect consumers' mindset/inclination not to waste food in their household
Response	Leftover reuse routine	The reasonably established approach/tendency of consumers to reuse food that remains unconsumed from previous household meals for future meals
	Over-purchasing of food	Consumer behaviour that involves shopping for more food items than required for household consumption

and intentions to avoid wasting food in household settings. In proposing that moral norms enhance intentions to avoid wasting food, we draw upon previous findings that strong moral norms imply stronger beliefs against wasting food (e.g. Neubig et al., 2020). This association also seems plausible in light of past findings showing that moral norms can cause individuals to experience guilt if they waste food (e.g. Qi and Roe, 2016). Hence, we propose the following:

H1. Moral norms are positively associated with intentions to avoid wasting food.

Although norms are a manifestation of the tendency to be guided by a certain line of behaviour, emotions, such as pride, also play a self-

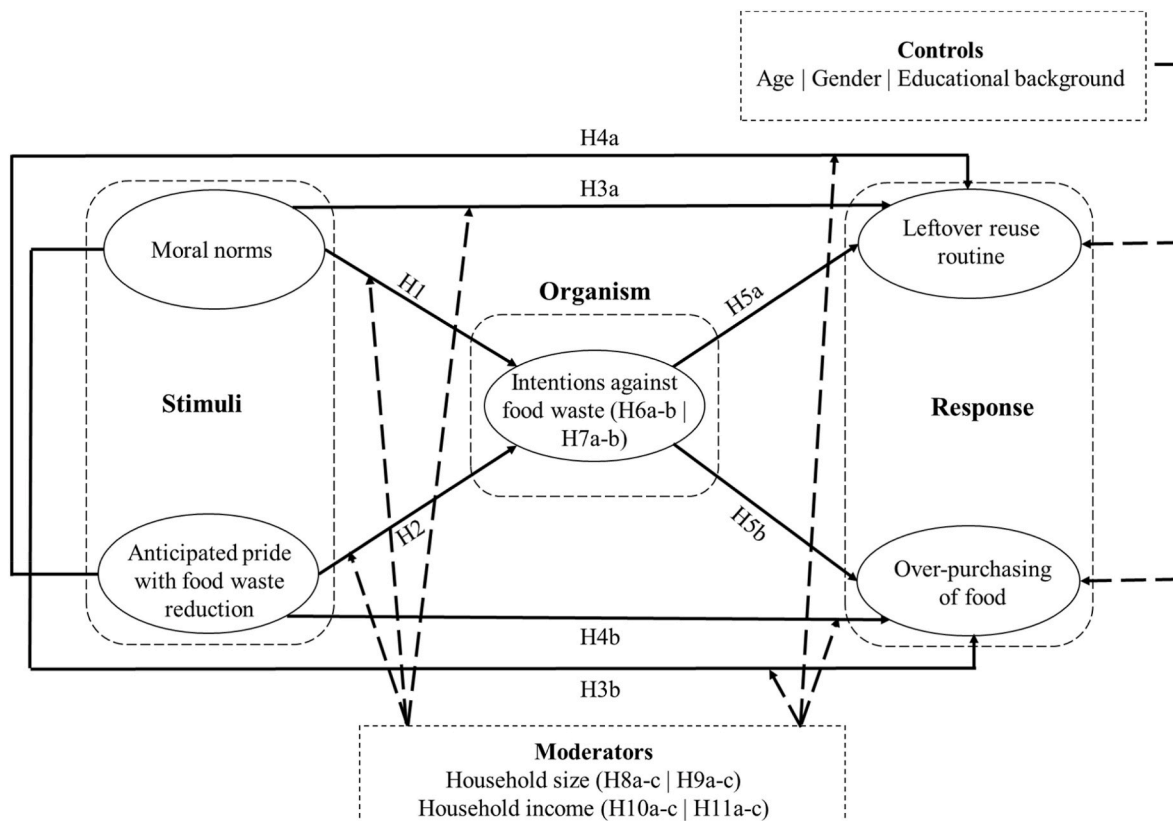


Fig. 1. Conceptual model.

regulating role in enhancing pro-environmental behaviours (Onwezen et al., 2013; Onwezen et al., 2014) and influencing behavioural intentions (M. J. Kim and Hall, 2019). Research has revealed the relationship between pride (measured as anticipated pride in and intentions to reduce waste) in several consumption contexts, such as out-of-home (e.g. restaurant) dining (M. J. Kim and Hall, 2019), eco-cruises (Han et al., 2019) and environmentally friendly consumer choices (Onwezen et al., 2014). However, scholars have yet to examine this relationship in the context of household waste. We aim to understand whether the pride individuals anticipate feeling when they behave in pro-environmental ways in out-of-home settings also manifests in more private, household settings. Based on the prior literature, we expect that the pride individuals anticipate feeling when they reduce food waste in household settings will stimulate their increased intentions to avoid wasting food. Hence, we propose the following:

H2. Anticipated pride in food waste reduction is positively associated with intentions to avoid wasting food.

While SOR framework offers no a priori evidence to anticipate a direct association between stimuli and response in the food waste context, the preceding discussion leads us to make an overarching suggestion that norms (measured as moral norms) and positive emotions (measured as anticipated pride) are likely to motivate consumers to adhere to leftover reuse routines, which, in turn, help them to reduce the food waste their household generates. Leftover reuse routines refer to individuals' plans and inclination to use food that remains unconsumed after a meal (Stancu et al., 2016). Such leftover reuse routines, which are related to household skills (Stancu et al., 2016), determine the quantity of food wasted by any household (Stancu et al., 2016). We posit that individuals with stronger moral norms and anticipated pride are more likely to exhibit routines for using leftover food, which, if wasted, causes them to feel guilty for the impact of such waste on food-insecure individuals and the environment. It is also reasonable to posit that individuals with strong norms and pride in food waste reduction efforts would endeavour to develop routines for using food items that remain unconsumed after meals.

Over-purchasing of food refers to behaviour related to regular shopping for food and related items (Stancu et al., 2016). Although the association of moral norms and anticipated pride with over-purchasing remains under-explored, scholars have found that shopping behaviour contributes appreciably to household waste generation (Aschemann-Witzel et al., 2020; Djekic et al., 2019) because excessive purchases of food items are a common behaviour during shopping (Evans, 2012). These over-purchases are motivated by impulse buying, promotions or offers, such as buy one, get one free, which add to the household inventory and increase the chances of wastage (Stefan et al., 2013).

Drawing upon these findings, we posit that individuals with strong moral norms and anticipated pride are more likely to purchase appropriate quantities of food as a result of their concern for the environment, resource conservation and food-insecure people. In other words, we expect that heightened environmental awareness and pride in waste reduction will persuade consumers to purchase only the required quantity of food. In sum, moral norms and anticipated pride may discourage the over-purchasing of food. It is quite plausible to speculate that moral norms, which cause consumers to view food waste negatively, along with the sense of pride they associate with food waste, would cause them to exhibit greater restraint while purchasing food items for household use and, therefore, to avoid over-purchasing food items or to make fewer such purchases. Hence, we propose the following:

H3a. Moral norms are positively associated with leftover reuse routines.

H3b. Moral norms are negatively associated with over-purchasing of food.

H4a. Anticipated pride in food waste reduction is positively associated with leftover reuse routines.

H4b. Anticipated pride in food waste reduction is negatively associated with over-purchasing of food.

3.2. Organism-response: Intentions against food waste, leftover reuse routines and over-purchasing of food

Households that hold favourable attitudes against food waste tend to explore strategies to reduce it (Evans, 2012). This includes finding ways to reuse leftover food (van Herpen and van der Lans, 2019; Visschers et al., 2016)—for example, by reheating it or making some new dish with it (Stancu et al., 2016; Brook, 2007). These activities require effort and an understanding that wasting food poses serious problems (Williams et al., 2020). Suggesting that intentions to engage in a behaviour can lead to actual behaviour or strategies to accomplish an activity, Ajzen et al. (2004) argues that such behaviours are also usually preceded by a positive intent. Although existing scholarship has not adequately explored the relationship between intentions to avoid food waste and to reuse leftovers, the literature on consumer behaviour, in general, leads us to anticipate that intentions to avoid food waste will motivate individuals to follow a defined leftover reuse routine because consumers who *intend* to avoid household food waste are more likely to *attempt* to reduce waste. Furthermore, past studies have identified the reuse of leftovers as a significant strategy by which households can fulfil these attempts (e.g. Stancu et al., 2016). Hence, we hypothesise as follows:

H5a. Intentions to avoid food waste are positively associated with leftover reuse routines.

Scholars have observed that household food consumption involves multiple activities, such as planning, storing, cooking and shopping, which give rise to food waste (Waitt and Phillips, 2016). Of these activities, frequent shopping for food items is a significant variable that can affect the amount of food wasted because more often than not, households purchase more in each shopping visit than they can consume (Stancu et al., 2016). The present study proposes over-purchasing of food items as a behavioural response, which we anticipate will be associated with intentions. As mentioned above, consumer behaviour studies, in general, as well as the food waste literature, have documented the association between intentions and behaviour, although this association is less researched in the food waste context. For instance, S. Talwar, Kaur et al. (2021)e reveal a positive relationship between consumers' leftover takeaway intentions and over-ordering while eating out. In a more general context, Ajzen et al. (2004) argue that intentions for action are associated with individuals' efforts towards actual action. Although, to our knowledge, past studies have not specifically examined the association between intentions to avoid wasting food and over-purchasing, scholars have confirmed that over-purchasing of food leads to waste (Stancu et al., 2016; Stefan et al., 2013). This provides us with a sufficient basis to posit that household members' intentions to avoid wasting food are associated with over-purchasing of food. Furthermore, we anticipate this association to be negative because individuals' intentions to avoid wasting food should demand actions to reduce such waste (e.g. avoiding excessive food purchases). In other words, recognising that food will spoil if stored for too long, household members with intentions to avoid wasting food are likely to purchase food only in adequate quantities. This suggests that as individuals' intentions to avoid food waste increase, the chances that they will over-purchase household food items decrease. Hence, we hypothesise as follows:

H5b. Intentions to avoid wasting food are negatively associated with over-purchasing of food.

In addition to the direct effects of stimuli and organismic state on the two response variables, we anticipate that intentions to avoid wasting

food will mediate the association of moral norms and anticipated pride in food waste reduction, on one hand, and leftover reuse routines and over-purchasing of food, on the other. In proposing intentions as the intervening mechanism for transmitting the indirect effect of the two variables representing stimuli on the two variables representing response, we are primarily guided by our acknowledgement that consumers' food waste/prevention behaviours entail multiple layers and dimensions. In short, such behaviours are quite complex, with undercurrents that make it essential to consider myriad potential paths for transmitting the effects. Furthermore, recent studies that have employed SOR to examine the mediating effects of variables representing organisms on the association between stimuli and response motivate us to contemplate the same. For example, examining the mediational role of trust and attitude (representing organism) on the association of green factors (representing stimuli) with purchase intentions towards premium organic beauty products (representing response), [Lavuri et al. \(2022\)](#) confirm the role of attitude. Similarly, [S. Kumar, Jain and Hsieh \(2021\)](#)^b confirm the mediating effect of pleasure and arousal (representing organism) on the association of aesthetic appeal and formality (representing stimuli) with word of mouth and revisit intentions (representing response) in the context of online food delivery (OFD) apps. Our anticipation of the organism's mediating role is further strengthened by evidence from other recent studies that likewise employ the SOR paradigm (e.g. [Bigne et al., 2020](#); [S. Kumar and Shah, 2021](#); [S. Kumar, Murphy et al., 2021c](#)). Hence, we posit the following:

H6. Intentions to avoid wasting food mediate the association of moral norms with (a) leftover reuse routines and (b) over-purchasing of food.

H7. Intentions to avoid wasting food mediate the association of anticipated pride in food waste reduction with (a) leftover reuse routines and (b) over-purchasing of food.

3.3. Moderation effect of household size and household income

Moderating variables reveal the effect of individual differences on the strength of underlying associations. Depending on their nature, some moderating variables strengthen the associations they affect, while others weaken such associations. The role of moderating variables is well-acknowledged in the consumer behaviour literature, including in studies exploring the behaviour of individuals related to food waste in various settings. For example, [Dhir et al. \(2021\)](#)^{a,b} and [S. Kumar and Yadav \(2021\)](#) confirm the moderating effect of demographic variables in the context of green apparel, and [Tran et al. \(2019\)](#) uncover the moderating effect of ratings on the association between e-satisfaction and continuance intentions of online customers. In the specific context of food waste, [Luu et al. \(2021\)](#) examined the moderating role of leftover reuse while [S. Talwar, Kaur et al. \(2021\)](#)^d confirm the moderating role of a planning routine on the relationship between inhibitors of leftover takeaway decisions and intentions to take away leftovers after eating out. These findings motivate us to consider potential moderating variables in the present context. Furthermore, we anticipate demographic characteristics to play a potential moderating role in the association of stimuli variables with organism and response variables.

Although the food waste literature offers no a priori evidence, we identify household size and income as our moderating variables based on studies that confirm their role in consumer behaviour. For instance, [S. Kumar Dhir et al. \(2021\)](#)^a report the moderating influence of household size on the association of environmental concern with usage barriers and regional products, and the association of natural content and brand love for natural products. Similarly, [Annunziata et al. \(2019\)](#) confirm the moderating effect of household size on the purchase of local products.

With regard to household income, [Qi and Roe \(2016\)](#) demonstrate that higher-income households tend to waste more food, and they note that discarding unconsumed food offers perceived private benefits. Other studies have also examined the impact of household income on food waste. However, the findings are far from unanimous. While some

studies have revealed that higher income leads to more food waste generation (e.g. [Stancu et al., 2016](#); [Qi and Roe, 2016](#)), others have found no such association (e.g. [Visschers et al., 2016](#)). With past evidence supporting the role of household size and income in consumer decisions, including those related to food waste, we consider it useful to examine the impact of household size and income as intervening variables between moral norms and anticipated pride in food waste reduction, on the one hand, and intentions to avoid wasting food, leftover reuse routines and over-purchasing of food, on the other. Because the current study represents the first effort to examine these moderating influences on the proposed association, we refrain from positing any direction, i.e. any positive or negative moderating effect, and simply propose the following:

H8. Household size moderates the association of moral norms with (a) intentions to avoid wasting food, (b) leftover reuse routines and (c) over-purchasing of food.

H9. Household size moderates the association of anticipated pride in food waste reduction with (a) intentions to avoid wasting food, (b) leftover reuse routines and (c) over-purchasing of food.

H10. Household income moderates the association of moral norms with (a) intentions to avoid food, (b) leftover reuse routines and (c) over-purchasing of food.

H11. Household income moderates the association of anticipated pride in food waste reduction with (a) intentions against food waste, (b) leftover reuse routines and (c) over-purchasing of food.

3.4. Control variables

The literature on food waste acknowledges the influence of factors such as age, gender and educational background on food waste behaviour in household settings. However, the existing scholarship does not offer a consensus regarding the effect of age on food waste. Some scholars contend that younger people tend towards greater waste (e.g. [Stancu et al., 2016](#); [Visschers et al., 2016](#)), while others suggest a positive association between food waste and age (e.g. [Cecere et al., 2014](#)). Similarly, past studies offer mixed findings regarding the effect of gender. While some indicate that females play a greater role in waste reduction (e.g. [Cecere et al., 2014](#)), others find no role for gender in food waste reduction (e.g. [Principato et al., 2015](#)), and still others suggest that females generate more waste (e.g. [Visschers et al., 2016](#)). Regarding educational background, the literature is quite limited and includes conflicting findings. For example, [Cecere et al. \(2014\)](#) reports weak correlation between food waste and education. Based on our comprehensive review of the literature, we expect that three demographic variables—age, gender and educational background—may potentially confound the outcome variables. Thus, to explore the profound effect of these variables on food waste-related behaviours, we propose to control for their effects on leftovers reuse routines and over-purchasing of food.

4. Research methodology

4.1. Questionnaire design and data collection

The current study employed a survey-based structured questionnaire approach to collect data from the respondents through *Prolific Academic*. We developed the questionnaire by adapting items from pre-validated scales to the present context. Accordingly, we derived the items for the two antecedents representing the stimuli from the following sources: moral norms from [Olsen et al. \(2010\)](#), [S. Talwar, Kaur et al. \(2021\)](#)^e and [Wan et al. \(2017\)](#) and anticipated pride in food waste reduction from [Onwezen et al. \(2013\)](#) and [Tracy and Robins \(2007\)](#). Next, we derived the variable representing the organism/internal state from the following sources: intentions against food waste from [S. Talwar, Kaur et al. \(2021\)](#)^d and [S. Talwar, Kaur et al. \(2021\)](#)^e. Finally, we derived the variables

representing response from the following sources: over-purchasing of foods from Stefan et al. (2013), S. Talwar, Kaur et al. (2021)c and S. Talwar, Kaur et al. (2021)d and leftover reuse routines from Stancu et al. (2016) and S. Talwar, Kaur et al. (2021)e. Responses were collected on a five-point Likert scale where 1 represented ‘Strongly disagree’ and 5 represented ‘Strongly agree’. We also collected socio-demographic details, as presented in Table 2.

Before administering the survey, we sought the expert opinions of two professors from the area of sustainability and modified the instrument based on their feedback. The modified instrument was pilot tested with 15 representatives of the target group to determine whether its items were clear and simple to understand and answer. Consistent with the suggestions of recent studies (e.g. Jabeen et al., 2022; S. Talwar, Kaur Kumar et al., 2021b), these two steps helped to ensure the instrument’s face and content validity.

4.2. Data analysis

As suggested by many recent studies (M. Talwar et al., 2021a; Dhir et al., 2021b), we first subjected the data to various multivariate tests to ascertain their suitability for covariance-based structural equation modelling. Thereafter, we performed confirmatory factor analysis (CFA) to assess the measurement model, followed by structural path analysis to test the proposed hypotheses using SPSS AMOS Version 27. Finally, we tested the proposed mediation and moderation hypotheses using PROCESS macro.

5. Results

5.1. Preliminary analysis

The preliminary analysis sought to examine the normality of the data. The skewness and kurtosis values were well within the acceptable range recommended by prior studies (e.g. George and Mallery, 2019), confirming that the data were normally distributed, as required. We also examined the collected data for the issue of multicollinearity, which was not present because for all constructs, the VIF values were below five, and tolerance values exceeded 0.1. These are the recommended values according to recent studies (e.g. S. Kumar, Talwar et al., 2021d; M. Talwar et al., 2021a).

Because we had collected the data via a single instrument, we next

Table 2
Socio-demographic details of respondents.

Variable	Scale	Frequency	Percentage
Age	25–34 years	309	69.75%
	35–44 years	87	19.64%
	45–54 years	33	7.45%
	55–63 years	14	3.16%
Gender	Male	147	33.18%
	Female	296	66.82%
Educational qualification	High school	93	20.99%
	Professional/vocational degree	20	4.51%
	Bachelor’s	198	44.70%
	Master’s	100	22.57%
Household size	Doctorate	32	7.22%
	Living alone	121	27.31%
	2 members	140	31.60%
	3 members	74	16.70%
	4 members	72	16.25%
Income	5 members	17	3.84%
	>5 members	19	4.29%
	Less than USD 2000	112	25.28%
	USD 2000–3999	154	34.76%
	USD 4000–5999	76	17.16%
	USD 6000–7999	34	7.67%
USD 8000–9999	22	4.97%	
USD 10000 or more	45	10.16%	

examined the data for common method bias. Consistent with recent studies (e.g. Sreen et al., 2021), we utilised Harman’s single-factor test for this purpose. The results revealed that a single factor accounted for less than 50% of the variance, indicating that the data were free from common method bias.

5.2. Measurement model

The measurement model returned a good fit ($\chi^2/df = 2.02$, $CFI = 0.96$, $TLI = 0.95$, $RMSEA = 0.05$) based on recommendations from the literature (Hair et al., 2016; Hu and Bentler, 1999). We next assessed various validity and reliability measures, which also conformed to the prescribed thresholds. First, convergent validity was confirmed through factor loading scores that exceeded the threshold value of 0.4 (Hair et al., 2016), as presented in Table 3. We also assessed convergent validity using construct reliability (CR) and the average variance extracted (AVE). Table 4 indicates that the CR values of all the constructs exceeded the threshold value of 0.7 (Fornell and Larcker, 1981), and the AVE values of all the constructs exceeded the cut-off value of 0.5 (Fornell and Larcker, 1981). In addition, we assessed discriminant validity using the following criteria: (a) the inter-construct correlation values were smaller than the square root of the AVE values (Table 4), indicating discriminant validity as suggested by Fornell and Larcker (1981) and (b)

Table 3
Factor loading scores.

Constructs	Measurement items	MM	SM
Moral norms	Wasting food makes me feel guilty about the wastage of resources.	0.77	0.77
	Wasting food gives me a bad conscience.	0.78	0.78
	Wasting food is against my morals.	0.69	0.69
	Wasting food makes me feel bad.	0.75	0.75
	Wasting food gives me a feeling of regret.	0.71	0.70
Anticipated pride in food waste reduction	I feel ashamed if I waste food even if nobody is aware of my action.	0.78	0.78
	I will be very proud of reducing food waste at home.	0.79	0.79
	I will feel very accomplished by reducing food waste at home.	0.82	0.82
	I will feel confident that I am reducing food waste at home.	0.81	0.81
	I will feel it worthwhile that I am reducing food waste at home.	0.75	0.75
Intentions against food waste	I will feel satisfied that I am reducing food waste at home.	0.82	0.82
	I intend not to throw food away.	0.78	0.78
	My goal is not to throw food away.	0.76	0.76
Leftover reuse routine	I will try not to throw food away.	0.74	0.74
	Leftovers from previous meals are eaten as such or just heated when used again.	0.56	0.56
Over-purchasing of food	Leftovers from previous meals are definitely eaten.	0.80	0.78
	Leftovers from previous meals are utilised as much as possible.	0.86	0.87
	I often buy food I didn’t intend to buy when shopping.	0.70	0.70
	I often buy too much food when shopping.	0.90	0.90
	I often buy more food than required when shopping.	0.88	0.88
	I often buy more food than needed for daily meals.	0.79	0.79
	I often buy food that is too much for my family’s appetite.	0.84	0.84
	I often buy more food than planned without thinking when shopping.	0.80	0.80
	I usually buy more food than required when the store offers a good value for the money.	0.69	0.69
	I often buy more food because of the variety on display.	0.71	0.71

Note: MM = Measurement model, SM = Structural model.

Table 4
Validity and reliability results.

	CR	AVE	MSV	ASV	OPF	MN	AP	INT	LRR
OPF	0.93	0.63	0.11	0.05	0.79				
MN	0.88	0.56	0.47	0.26	-0.17	0.75			
AP	0.90	0.64	0.37	0.21	-0.09	0.61	0.80		
INT	0.80	0.58	0.47	0.26	-0.23	0.69	0.58	0.76	
LRR	0.79	0.56	0.19	0.14	-0.33	0.39	0.34	0.43	0.75

Note: Composite reliability = CR, Average variance extracted = AVE, Maximum shared variance = MSV, Average shared variance = ASV, Moral norms = MN, Anticipated pride in food waste reduction = AP, Intentions against food waste = INT, Leftover reuse routine = LRR, Over-purchasing of food = OPF.

Table 5
HTMT analysis.

	MN	AP	INT	LRR	OPF
MN					
AP	0.62				
INT	0.70	0.58			
LRR	0.37	0.35	0.44		
OPF	0.14	0.09	0.21	0.32	

Note: Moral norms = MN, Anticipated pride with food waste reduction = AP, Intentions against food waste = INT, Leftover reuse routine = LRR, Over-purchasing of food= OPF

heterotrait-monotrait (HTMT) analysis indicated that the correlations among constructs were less than 0.90 (Henseler et al., 2015) (see Table 5).

5.3. Control variables

The study also examined the effect of three control variables: age, gender and educational background. However, none of the controls had any confounding effect on the two outcome variables: leftover reuse routines and over-purchasing of food. The specific coefficients for leftover reuse routines were as follows: age ($\beta = -0.01, p > 0.05$), gender ($\beta = -0.01, p > 0.05$) and educational background ($\beta = -0.08, p > 0.05$), and the specific coefficients for over-purchasing of food were as follows: age ($\beta = -0.05, p > 0.05$), gender ($\beta = 0.07, p > 0.05$) and educational background ($\beta = -0.01, p > 0.05$).

5.4. Structural model

Our analysis of the structural model indicated a good model fit, which was well within the threshold limit ($\chi^2/df = 2.07, CFI = 0.95, TLI = 0.94, RMSEA = 0.05$; Hair et al., 2016). Fig. 2 presents the results of the path analysis. Moral norms were positively associated with intentions against food waste (H1: $\beta = 0.53, p < 0.001$) but did not exhibit any statistically significant association with leftover reuse routines (H3a: $\beta = 0.15, p > 0.05$) or over-purchasing of food (H3b: $\beta = -0.06, p > 0.05$). Similarly, anticipated pride was positively associated with intentions to avoid wasting food (H2: $\beta = 0.26, p < 0.001$) but did not exhibit any statistically significant association with leftover reuse routines (H4a: $\beta = 0.08, p > 0.05$) or over-purchasing of food (H4b: $\beta = 0.09, p > 0.05$). Intentions against food waste were significantly and

positively associated with leftover reuse routines (H5a: $\beta = 0.29, p < 0.01$) and significantly and negatively associated with over-purchasing of food (H5b: $\beta = -0.25, p < 0.05$), as hypothesised. The percentages of variance explained by the model are as follows: 51.2% for intentions to avoid wasting food, 21.9.3% for leftover reuse routines and 6.8% for over-purchasing of food (Fig. 2).

5.5. Mediation analysis

We conducted the mediation analysis using PROCESS macro in SPSS. Here, Model 4 was used to examine the mediating role of intentions to avoid wasting food on the association between moral norms and anticipated pride in food waste reduction, on the one hand, and leftover reuse routines and over-purchasing of food, on the other. As presented in Tables 6 and 7, intentions partially mediated the association of moral norms and anticipated pride with leftover reuse routines while fully mediating the association of over-purchasing with moral norms and anticipated pride, thereby supporting H6a–b and H7a–b.

5.6. Moderation analysis

We examined the moderation effect of household size and income on the association of moral norms and anticipated pride with intentions to avoid wasting food, leftover reuse and over-purchasing using Model 1 in PROCESS macro. According to the results, presented in Table 8 and Figs. 3–5, household size had no moderating effect on the investigated associations; thus, H8a–c and H9a–c were not supported. In contrast, income positively moderated the association of intentions with moral norms (H10a) and anticipated pride (H11a). In addition, income negatively moderated the association of anticipated pride and over-

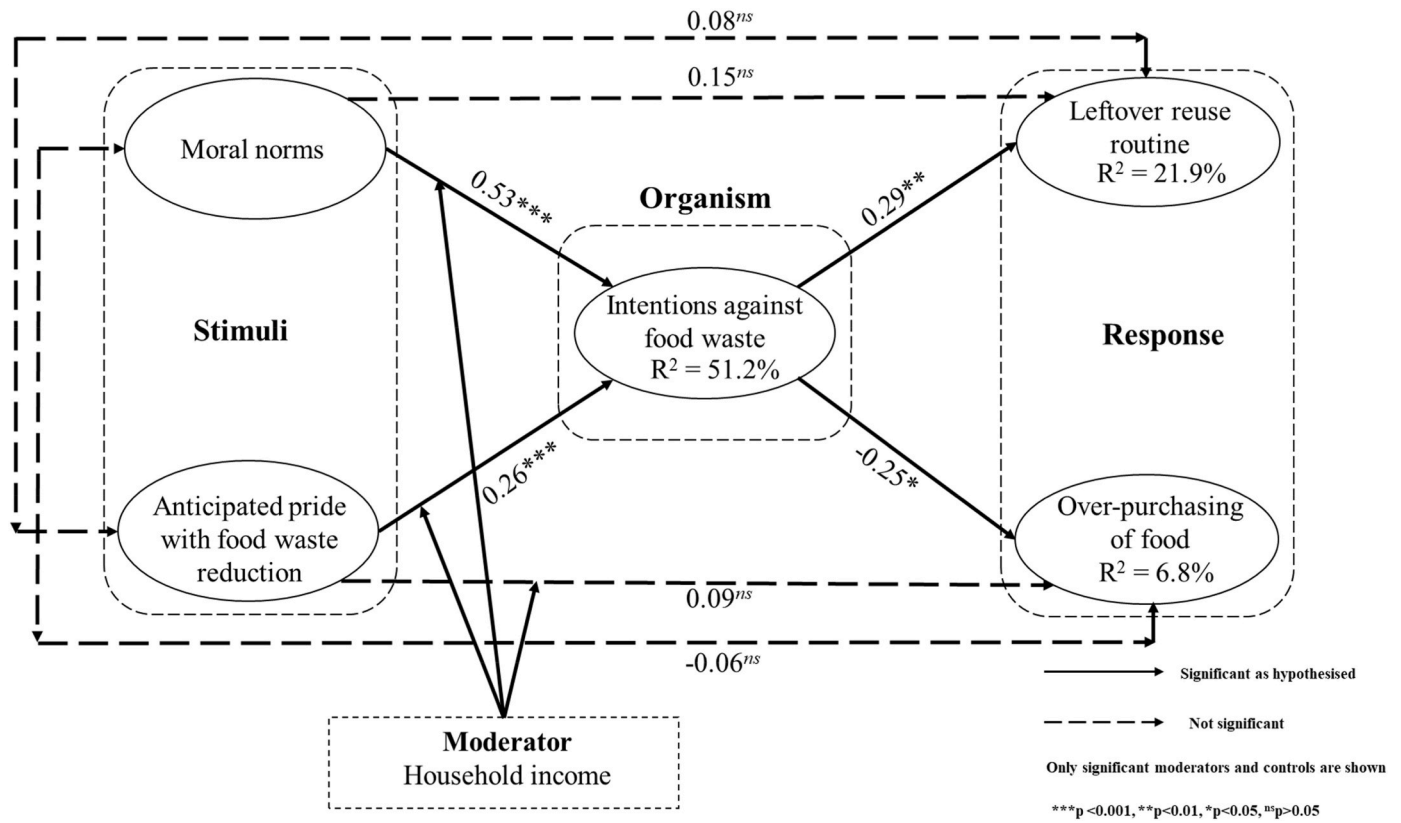


Fig. 2. Results of path analysis.

Table 6
Results of mediation analysis.

MN → INT → LRR						
	β	se	t	p	LLCI	ULCI
MN → INT	.48	.03	15.06	.00	.4149	.5395
MN → LRR	.16	.05	3.09	.00	.0598	.2693
INT → LRR	.30	.07	4.56	.000	.1687	.4245
Total effect of MN → LRR	.31	.04	6.91	.00	.2191	.3931
MN → INT → OPF						
	β	se	t	p	LLCI	ULCI
MN → INT	.48	.03	15.06	.00	.4149	.5395
MN → OPF	-.06	.08	-.77	.44	-.2209	.0963
INT → OPF	-.26	.10	-2.63	.01	-.4531	-.0658
Total effect of MN → OPF	-.19	.07	-2.82	.01	-.3158	-.0563
AP → INT → LRR						
	β	se	t	p	LLCI	ULCI
AP → INT	.41	.03	11.99	.00	.3454	.4807
AP → LRR	.16	.06	3.22	.00	.0638	.2630
INT → LRR	.32	.06	5.20	.00	.1968	.4359
Total effect of AP → LRR	.29	.05	6.49	.00	.2051	.3831
AP → INT → OPF						
	β	se	t	p	LLCI	ULCI
AP → INT	.41	.03	11.99	.00	.3454	.4807
AP → OPF	.02	.08	.25	.80	-.1320	.1701
INT → OPF	-.32	.09	-3.41	.00	-.4964	-.1337
Total effect of AP → OPF	-.11	.07	-1.64	.10	-.2438	.0216

Note: Moral norms = MN, Anticipated pride in food waste reduction = AP, Intentions against food waste = INT, Leftover reuse routine = LRR, Over-purchasing of food = OPF.

purchasing of food (H11c). However, income did not moderate the association of moral norms with leftover reuse or over-purchasing of food, thereby offering no support for H10b–c. Additionally, income did not moderate the association of anticipated pride with leftover reuse. Hence, H11b was also rejected.

Table 7
Indirect effects between dependent and independent variables.

	Effect	se	LLCI	ULCI
MN → INT → LRR	.14	.03	.0761	.2103
MN → INT → OPF	-.12	.04	-.2107	-.0347
AP → INT → LRR	.13	.03	.0810	.1845
AP → INT → OPF	-.13	.04	-.2078	-.0564

Note: Note: Moral norms = MN, Anticipated pride in food waste reduction = AP, Intentions against food waste = INT, Leftover reuse routine = LRR, Over-purchasing of food = OPF.

Table 8
Results of moderation analysis.

Household size						
	β	t	p	LLCI	ULCI	Moderation?
MN → INT	.03	1.26	.21	-.0168	.0764	No
MN → LRR	.03	.99	.32	-.0323	.0980	No
MN → OPF	.05	.98	.33	-.0484	.1454	No
AP → INT	.003	.16	.88	-.0422	.0496	No
AP → LRR	.02	.50	.62	-.0450	.0757	No
AP → OPF	-.01	-.23	.82	-.1005	.0792	No
Household income						
	β	t	p	LLCI	ULCI	Moderation?
MN → INT	.03	1.76	.08	-.0041	.0732	Yes
MN → LRR	-.02	-.62	.53	-.0713	.0369	No
MN → OPF	.02	.47	.64	-.0617	.1002	No
AP → INT	.08	3.57	.00	.0338	.1164	Yes
AP → LRR	.04	1.59	.11	-.0106	.0994	No
AP → OPF	-.09	-2.06	.04	-.1682	-.0039	Yes

Note: Note: Moral norms = MN, Anticipated pride in food waste reduction = AP, Intentions against food waste = INT, Leftover reuse routine = LRR, Over-purchasing of food = OPF.



Fig. 3. Results of moderation analysis.

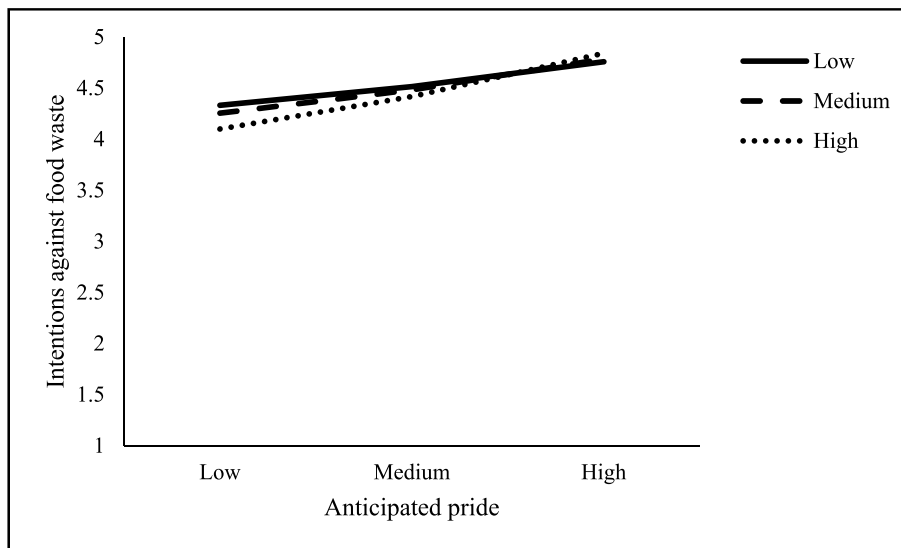


Fig. 4. Results of moderation analysis.

6. Discussion

This study investigated food waste reduction strategies by utilising the SOR theory. The previous section presented the analysis of data collected through a questionnaire survey method while this section discusses the study's findings.

First, **H1** and **H2**, which proposed a positive association between moral norms and anticipated pride receive statistical support, as we anticipated based on the reviewed literature (e.g. [Graham-Rowe et al., 2015](#); [Onwezen et al., 2014](#); [M. J. Kim and Hall, 2019](#)). We note, in particular, that our finding of a statistically significant association between moral norms and intentions is inconsistent with some existing studies (e.g. [Stefan et al., 2013](#); [Visschers et al., 2016](#)) and consistent with others (e.g. [Graham-Rowe et al., 2015](#)). This result indicates that the sense of guilt and regret that individuals experience upon wasting food increases their intentions to avoid wasting it. Along with morals, the pangs of conscience and shame that individuals experience upon wasting food—even if no one else is aware of their actions—enhance their intentions to avoid wasting food. Similarly, the feelings of pride, accomplishment, confidence, worthiness and satisfaction individuals

experience when reducing food waste at home cause such individuals to exhibit stronger intentions to avoid throwing household food away. In contrast to the positive, direct association of moral norms and anticipated pride with intentions, the results reveal the absence of any statistically significant association of these variables with leftover reuse routines (**H3a** and **H4a**) and over-purchasing of food (**H3b** and **H4b**). These results run counter to our anticipation of a direct association between stimuli and response, which we proposed on the basis of the existing food waste literature (e.g. [Stancu et al., 2016](#); [Asche-mann-Witzel et al., 2020](#)). Possibly explaining this surprising result could be consumers' thought processes, which may not enable them to connect leftover reuse routines and over-purchasing of food directly with norms and anticipated pride; rather, their internal processing appears to follow a sequential mechanism, wherein stimuli variables impinge on response variables via an organismic variable. However, the research surrounding consumer/individual food waste behaviour continues to evolve, and such behaviour therefore, remains less understood. We thus advocate strongly for more extensive research that draws its sample from diverse groups and geographies to better understand the interplay of moral norms and anticipated pride with leftover reuse and

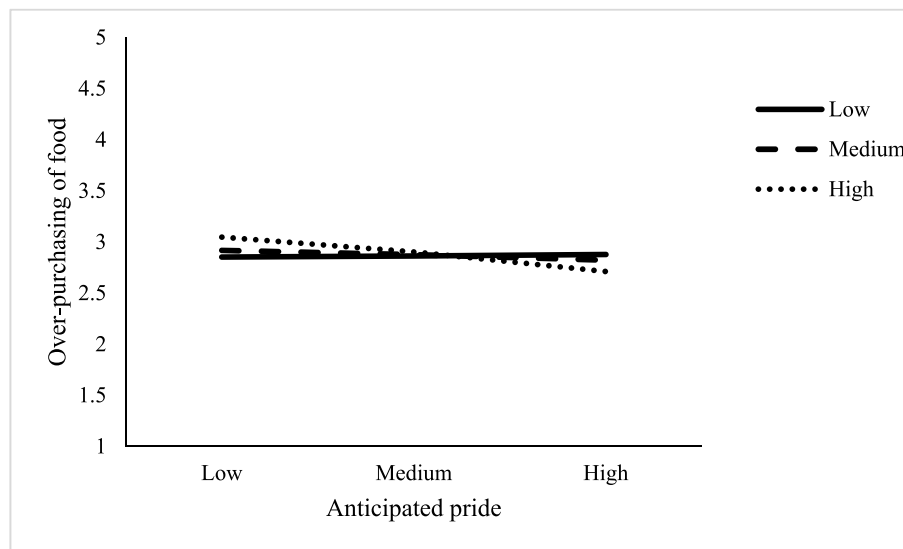


Fig. 5. Results of moderation analysis.

over-purchasing.

Consistent with the extant findings (e.g. van Herpen and van der Lans, 2019; Ajzen et al., 2004; S. Talwar, Kaur et al., 2021d) and H5a–b, the results confirm the positive association between intentions to avoid wasting food and leftover reuse routines as well as the negative association between such intentions and over-purchasing of food (H5b: $\beta = -0.25, p < 0.05$). This implies that the intent and goal of not discarding food causes individuals to adopt routines that utilise leftovers from previous meals as much as possible. The intent and goal of not discarding food also cause individuals to avoid purchasing food they did not intend to purchase and that is more than actually required to satisfy their family's appetite at daily meals, while others without such intentions are more likely to make such purchases, especially if a store offers good value for the money or displays a variety of products.

In addition to the direct associations discussed above, we examined mediation and moderation effects to better elucidate the intervening mechanism through which the underlying associations flow. Extrapolating the findings of the extensive literature on consumer behaviour and SOR (e.g. Lavuri et al., 2022; S. Kumar, Jain & Hsieh, 2021b; S. Kumar, Murphy et al., 2021d; Zhai et al., 2020), we confirm the mediating role of intentions to avoid wasting food on the association of moral norms and anticipated pride with leftover reuse and over-purchasing as a response. The results supporting H6a suggest that the guilt, regret and pangs of conscience associated with wasting resources (in this case, food) drive individuals' adoption of routines to reuse leftovers through the intervening variable of intention, which is captured as the goal of not discarding leftovers. Similarly, support for H6b indicates that moral norms, expressed as guilt, regret and pangs of conscience associated with wasting food, drive individuals' decisions to avoid shopping for more food than is necessary via a stronger intention to avoid wasting food. This is especially true if stores offer discounts or a variety of products. Overall, this result confirms our expectation that food waste prevention/reduction behaviour is complex and multi-layered. The results also support H7a–b and thus confirm that the sense of pride, satisfaction, worthiness and confidence individuals derive from reducing household food waste motivate them to adopt a well-defined routine of reusing leftovers by strengthening their intention to avoid discarding food. Pride associated with reducing household food waste also reduce the tendency to purchase more food than required by strengthening the individual's intention to avoid wasting food.

Finally, drawing upon the prior literature (e.g. Dhir et al., 2021; S. Kumar, Dhir et al., 2021a; S. Talwar, Kaur et al., 2021d), we examined the moderating effects of household size and household income on the

association of moral norms and anticipated pride with intentions to avoid wasting food, leftover reuse and over-purchasing. The results indicate that household size does not moderate the associations of moral norms and anticipated pride with intentions to avoid wasting food, leftover reuse routines and over-purchasing of food. Thus, we find no statistical support for H8a–c and H9a–c. The insignificant moderation effect of household size is particularly crucial to note because it may be rooted in the individualistic culture of the US (Rothwell, 2010), which prioritises individuals over groups (Hofstede, 2001; S. Kumar and Dhir, 2020).

In contrast, the results support H10a, with income positively moderating the association between moral norms and intentions. As Fig. 3 indicates, individuals with stronger moral norms tend to have stronger intentions to avoid wasting food, but this effect varies based on income level. In general, individuals in the lower-income group tend to have strong intentions to avoid wasting food compared to those who fall into the medium- and high-income groups. However, income does not moderate the association of moral norms with leftover reuse and over-purchasing; thus, H10b–c are not supported.

On the other hand, the results support H11a and H11c but not H11b. This means that income positively moderates the association of anticipated pride with intentions to avoid wasting food and over-purchasing but does not moderate the association of anticipated pride with leftover reuse. The support for the positive moderating effect of income on the association between anticipated pride and intentions implies that individuals with lower anticipated pride and low-to medium-income levels have stronger intentions to avoid wasting food than do individuals with lower anticipated pride and higher-income levels, as presented in Fig. 4. In contrast, individuals with greater anticipated pride and higher-income levels have stronger intentions to avoid wasting food than do individuals with greater anticipated pride and lower-income levels. Further, individuals with low anticipated pride but high-income levels exhibit a stronger tendency to over-purchase food than do those with low anticipated pride and low-income levels, as presented in Fig. 5. Among individuals with high anticipated pride, however, the opposite trend appears.

7. Implications

7.1. Theoretical implications

This study offers three key theoretical implications. First, it spotlights a growing global phenomenon and enriches the existing literature

on food waste (e.g. Filimonau et al., 2020a; Stancu et al., 2016; Stefan et al., 2013; Williams et al., 2020). Specifically, the study explores food waste in a household context and empirically investigates behaviours that may increase or decrease the food waste generated in this context. Because, as various reports and scholars have noted (e.g. United Nations Environment Programme, 2021; Hebrok and Heidenström, 2019), household food waste is responsible for a significant proportion of global food waste, household food waste requires more intense investigation than the extant literature offers. As recent studies have noted (Attiq et al., 2020), research into food waste reduction strategies are particularly imperative. By discussing various aspects of food waste generation and reduction, our study thus answers calls for additional research to enrich the available insights and promote future research on household food waste.

Second, by examining consumer behaviour related to household food waste, the present study addresses the deficiencies in empirical research on consumers' intentions to reduce food waste in household or at-home settings, as noted by past studies (Filimonau et al., 2020a; Filimonau et al., 2020b; Attiq et al., 2021). Insights related to non-cognitive factors, such as emotions, are particularly limited, despite calls in existing scholarship for recognising the importance of consumers'/household members' involvement in reducing food waste (e.g. J. Kim et al., 2019). Our study addresses these gaps in the literature by examining two non-cognitive aspects—moral norms and anticipated pride—as factors that stimulate consumers' intentions to avoid wasting food. By examining moral norms in this regard, we attempt to clarify the confusion in the literature regarding their influential role in reducing household food waste. Moreover, by conceptualising anticipated pride as an antecedent of intentions, we extend the literature by examining pride for the first time in the household context. While scholars have explored anticipated guilt in this context (e.g. Attiq et al., 2021), to our knowledge, they have not examined anticipated pride as a stimulus in the same context. Our study also examined two food waste reduction strategies—leftover reuse routines and (*avoiding*) over-purchasing of food—as behavioural responses. Both of these variables are known to be crucial for food waste reduction and generation, but they have not received much attention in this context.

Third, our study offers sound theoretical and conceptual underpinnings that acknowledge the complex nature of human behaviour, which is difficult to predict in any setting (Khan et al., 2019). This is particularly true for behaviours related to food waste, which are driven by various social, emotional and other factors (Dhir et al., 2020). From a theoretical standpoint, we employed the SOR framework, which has previously proven useful in a pro-environmental context (e.g. S. Kumar, Dhir et al., 2021a; S. Kumar, Murphy et al., 2021c; Tandon et al., 2021), to ground the proposed associations. From a conceptual perspective, our study not only examined the sequential, direct associations between the independent and outcome variables but also uncovered more complex, intervening mechanisms in the form of mediating and moderating variables. Thus, we offer a more nuanced understanding of the determinants and inconsistencies of human behaviour in the context of household food waste generation/reduction.

7.2. Practical implications

Our findings offer three main practical implications that may be useful to multiple stakeholders in the sustainability ecosystem, including organisations, policymakers and household members. First, by revealing the positive association of moral norms and anticipated pride with intentions to avoid wasting food, we provide clear input for the design of social marketing campaigns that aim to reduce food waste. Policymakers are primarily concerned about the social, environmental and sustainability consequences of food waste and have a significant interest in reducing food waste. To encourage behaviour that reduces such waste at the individual level, policymakers must engage consumers via social marketing campaigns, such as 'Save the Food' or the 'Food

Recovery Challenge' (NYC Foodpolicy, 2016). By revealing that the guilt, regret and pangs of conscience consumers experience upon wasting food as well as the confidence, pride and satisfaction they derive from reducing household food waste are key non-cognitive factors that increase intentions to avoid wasting food, we identify potential keywords campaigns and other communications can use to engage consumers and reduce food waste. This is a particularly important contribution because the formulation of the UN's 17 Sustainable Development Goals (SDGs), which include food waste reduction in SDG 12, has placed the issue of food waste prominently on the international agenda.

Second, by uncovering the extent to which quantity discounts and product variety contribute to consumers' over-purchasing behaviour, which, in turn, contributes to food waste, we offer food for thought both for policymakers and for firms that produce and sell food items. For example, policymakers might, in the interest of sustainability and the greater good, introduce regulations to limit package sizes and discounts related to essential food items. Firms, meanwhile, might consciously refrain from offering discounts beyond a certain quantity. Instead, they might introduce more innovative offers, such as frequent shoppers' incentives, which could motivate consumers to purchase smaller quantities at each visit while shopping more frequently. Such a shift has the potential to reduce food waste that results from bulk purchases without affecting the profits of firms producing/selling food items.

Finally, by examining and confirming leftover reuse routines as an important food waste reduction strategy at the household level, we offer the idea to food show hosts, cook-book writers and others involved in related activities to focus on recipes that incorporate leftovers. By adopting this suggestion, they might attract not only more people to their shows but also more sponsors and advertisements from firms that wish to be seen as socially responsible.

8. Conclusion

Food waste has become a global concern that impacts both developed and developing countries. Our study investigated the antecedents of behaviours with the potential to increase or decrease food waste. To achieve the study's objectives, we proposed four research questions (RQs) and grounded the hypothesised associations in the SOR framework. We then answered the research questions by analysing data from 443 individuals residing in the US.

In response to **RQ1**, which investigated the potential association of norms and emotions with intentions to avoid wasting food at the household level, we tested and found statistical support for two hypotheses proposing a positive association between the two antecedents (i.e. norms and emotions conceptualised as stimuli in the SOR framework) and intentions. To address **RQ2**, which addressed the potential association of norms and emotions with leftover reuse routines and over-purchasing of food at the household level, we tested four hypotheses, two investigating the positive association of moral norms and anticipated pride with leftover reuse routines (representing a response variable in the SOR framework), and two investigating the negative association of moral norms and anticipated pride with over-purchasing of food (representing another response variable in the SOR framework). However, none of the hypotheses received supported. Next, to respond to **RQ3**, which pertained to the direction as well as the potentially indirect effects of intentions on the two response variables, we first tested and confirmed the positive association of intentions to avoid wasting food with leftover reuse routines and the negative association of such intentions with over-purchasing. In addition, we tested the mediating role of intentions on the associations between the two stimuli and the two response variables. Here, we confirmed all mediation-related hypotheses except the one proposing the mediating effect of intentions on the association between anticipated pride and over-purchasing. Finally, we sought to answer **RQ4**, which was related to the potential moderation effect of household size and income on the associations of the two

stimuli variables with intentions, leftover reuse routines and over-purchasing. According to the results, household size did not moderate any of the associations of interest. However, household income positively moderated the association of norms and pride with intentions and negatively moderated the association of anticipated pride with over-purchasing of food. The findings of our study thus contribute to an increased understanding of food waste behaviour at the household level and strengthen the findings available for the reference of researchers and managers.

8.1. Limitation and future research direction

The present study contributes interesting insights to the existing literature but entails certain limitations related to method and scope. First, the data were collected in a single wave via a self-report survey, which raises the possibility of the social desirability bias affecting the participants' responses. Because we followed all procedural recommendations, such as assuring participants of their anonymity and thereby removing a potential motivation for biased responses, though, we consider it unlikely that this issue affected our results. In addition, however, we were unable to capture changes in behaviour over time because we collected the data in single waves. As this research area continues to evolve, cross-sectional data thus provide a good starting point for exploring and identifying variables of interest, and future efforts can build upon our work by conducting longitudinal and experiment-based studies.

Second, our study collected data from individuals residing in the US. Therefore, its results are not generalisable to other countries because each country exhibits a different culture, which may impact food waste behaviour. Furthermore, such behaviour can differ depending on the stage of a country's development, its climate, its rate of inflation and other factors. Nevertheless, our conceptual model includes variables that are relevant globally. Scholars would, therefore, find it easy to base their studies on our model and test it in other geographies.

Finally, although we proposed and tested a comprehensive model, we considered only a limited number of variables to keep the scope of the study manageable. Future scholars can thus explore other variables, such as anticipated guilt (e.g. Attiq et al., 2021), values, such as universalism (Schwartz, 1992), and personal and social norms (S. Talwar, Kaur et al., 2021d). Similarly, we examined only two moderators—household size and income, yet various other moderators, such as planning routine (S. Talwar, Kaur et al., 2021c) and hygiene consciousness (Sharma et al., 2021), could exert an influence on the proposed associations. These limitations notwithstanding, our study contributes useful theoretical and practical inferences that align with the SDGs.

References

Ajzen, I., Brown, T.C., Carvajal, F., 2004. Explaining the discrepancy between intentions and actions: the case of hypothetical bias in contingent valuation. *Pers. Soc. Psychol. Bull.* 30 (9), 1108–1121.

Annunziata, A., Agovino, M., Mariani, A., 2019. Sustainability of Italian families' food practices: mediterranean diet adherence combined with organic and local food consumption. *J. Clean. Prod.* 206, 86–96.

Aschemann-Witzel, J., Giménez, A., Ares, G., 2018. Consumer in-store choice of suboptimal food to avoid food waste: the role of food category, communication and perception of quality dimensions. *Food Qual. Prefer.* 68, 29–39.

Aschemann-Witzel, J., Giménez, A., Ares, G., 2020. Suboptimal food, careless store? Consumers' associations with stores selling foods with imperfections to counter food waste in the context of an emerging retail market. *J. Clean. Prod.* 121252.

Attiq, S., Habib, M.D., Kaur, P., Hasni, M.J.S., Dhir, A., 2021. Drivers of food waste reduction behaviour in the household context. *Food Qual. Prefer.*, 104300 <https://doi.org/10.1016/j.foodqual.2021.104300>.

Bigne, E., Chatzipanagiotou, K., Ruiz, C., 2020. Pictorial content, sequence of conflicting online reviews and consumer decision-making: the stimulus-organism-response model revisited. *J. Bus. Res.* 115, 403–416.

Brook, Lyndhurst, 2007. Food Behaviour Consumer Research Findings from the Quantitative Survey. Briefing Paper UK: WRAP, Banbury.

Cakar, B., Aydin, S., Varank, G., Ozcan, H.K., 2020. Assessment of environmental impact of FOOD waste in Turkey. *J. Clean. Prod.* 244, 118846.

Cappellini, B., Parsons, E., 2012. Practising thrift at dinnertime: mealtime leftovers, sacrifice and family membership. *Socio. Rev.* 60, 121–134.

Cecere, G., Mancinelli, S., Mazzanti, M., 2014. Waste prevention and social preferences: the role of intrinsic and extrinsic motivations. *Ecol. Econ.* 107, 163–176.

Dhir, A., Talwar, S., Kaur, P., Malibari, A., 2020. Food waste in hospitality and food services: a systematic literature review and framework development approach. *J. Clean. Prod.* 270, 122861. <https://doi.org/10.1016/j.jclepro.2020.122861>.

Dhir, A., Sadiq, M., Talwar, S., Sakashita, M., Kaur, P., 2021a. Why do retail consumers buy green apparel? A knowledge-attitude-behaviour-context perspective. *J. Retailing Consum. Serv.* 59, 102398. <https://doi.org/10.1016/j.jretconser.2020.102398>.

Dhir, A., Talwar, S., Sadiq, M., Sakashita, M., Kaur, P., 2021b. Green apparel buying behaviour: a stimulus-organism-behaviour-consequence (SOBC) perspective on sustainability-oriented consumption in Japan. *Bus. Strat. Environ.* 1–17. <https://doi.org/10.1002/bse.2821>.

Djekic, I., Miloradovic, Z., Djekic, S., Tomasevic, I., 2019. Household food waste in Serbia—attitudes, quantities and global warming potential. *J. Clean. Prod.* 229, 44–52.

Evans, D., 2012. Beyond the throwaway society: ordinary domestic practice and a sociological approach to household food waste. *Sociology* 46 (1), 41e56. <https://doi.org/10.1177/0038038511416150>.

FAO, 2021. The state of food security and nutrition in the world, 25th November 2021 at <https://www.fao.org/state-of-food-security-nutrition/en>.

Farr-Wharton, G., Foth, M., Choi, J.H.J., 2014. Identifying factors that promote consumer behaviours causing expired domestic food waste. *J. Consum. Behav.* 13 (6), 393–402.

Filimonau, V., Matute, J., Kubal-Czerwińska, M., Krzesiwo, K., Mika, M., 2020a. The determinants of consumer engagement in restaurant food waste mitigation in Poland: an exploratory study. *J. Clean. Prod.* 247, 119105.

Filimonau, V., Todorova, E., Mzembe, A., Sauer, L., Yankholmes, A., 2020b. A comparative study of food waste management in full service restaurants of the United Kingdom and The Netherlands. *J. Clean. Prod.* 120775.

Filimonau, V., Zhang, H., Wang, L.E., 2020c. Food waste management in Shanghai full-service restaurants: a senior managers' perspective. *J. Clean. Prod.* 120975.

Foodpolicy, N.Y.C., 2016. 10 campaigns working to reduce food waste, 15th June 2020 at <https://www.nycfoodpolicy.org/10-food-waste-campaigns/>.

Fornell, C., Larcker, D.F., 1981. Evaluating structural equation models with unobservable variables and measurement error. *J. Market. Res.* 18 (1), 39–50.

George, D., Mallery, P., 2019. IBM SPSS Statistics 26 Step by Step: A Simple Guide and Reference. Routledge.

Goggins, G., 2018. Developing a sustainable food strategy for large organisations: the importance of context in shaping procurement and consumption practices. *Bus. Strat. Environ.* 27 (7), 838–848.

Graham-Rowe, E., Jessop, D.C., Sparks, P., 2014. Identifying motivations and barriers to minimising household food waste. *Resour. Conserv. Recycl.* 84, 15–23.

Graham-Rowe, E., Jessop, D.C., Sparks, P., 2015. Predicting household food waste reduction using an extended theory of planned behaviour. *Resour. Conserv. Recycl.* 101, 194–202.

Hair, J.F., Black, W.C., Babin, B.J., Anderson, R.E., 2016. *Multivariate Data Analysis*, seventh ed. Pearson, India.

Han, H., Hwang, J., Lee, M.J., Kim, J., 2019. Word-of-mouth, buying, and sacrifice intentions for eco-cruises: exploring the function of norm activation and value-attitude-behavior. *Tourism Manag.* 70, 430–443.

Hebrok, M., Heidenstrøm, N., 2019. Contextualising food waste prevention—decisive moments within everyday practices. *J. Clean. Prod.* 210, 1435–1448.

Henseler, J., Ringle, C.M., Sarstedt, M., 2015. A new criterion for assessing discriminant validity in variance-based structural equation modeling. *J. Acad. Market. Sci.* 43 (1), 115–135.

Hofstede, G., 2001. *Culture's Consequences: Comparing Values, Behaviors, Institutions and Organisations across Nations*. SAGE Publications.

Hu, L.T., Bentler, P.M., 1999. Cut-off criteria for fit indexes in covariance structure analysis: conventional criteria versus new alternatives. *Structural Equation Modelling: A Multidiscip. J.* 6 (1), 1–55.

Jabeen, F., Kaur, P., Talwar, S., Malodia, S., Dhir, A., 2022. I love you, but you let me down! How hate and retaliation damage customer-brand relationship. *Technol. Forecast. Soc. Change* 174, 121183.

Kaur, P., Dhir, A., Talwar, S., Alrasheedy, M., 2021. Systematic literature review of food waste in educational institutions: setting the research agenda. *Int. J. Contemp. Hospit. Manag.* 33 (4), 1160–1193. <https://doi.org/10.1108/IJCHM-07-2020-0672>.

Khan, F., Ahmed, W., Najmi, A., 2019. Understanding consumers' behavior intentions towards dealing with the plastic waste: perspective of a developing country. *Resour. Conserv. Recycl.* 142, 49–58.

Kim, M.J., Hall, C.M., 2019. Can climate change awareness predict pro-environmental practices in restaurants? Comparing high and low dining expenditure. *Sustainability* 11 (23), 6777. <https://doi.org/10.3390/su11236777>.

Kim, J., Rundle-Thiele, S., Knox, K., 2019. Systematic literature review of best practice in food waste reduction programs. *J. Soc. Market.* 9 (4), 447–466.

Kumar, S., Dhir, A., 2020. Associations between travel and tourism competitiveness and culture. *J. Destin. Market. Manag.* 18, 100501.

Kumar, S., Shah, A., 2021. Revisiting food delivery apps during COVID-19 pandemic? Investigating the role of emotions. *J. Retailing Consum. Serv.* 62, 102595. <https://doi.org/10.1016/j.jretconser.2021.102595>.

Kumar, S., Yadav, R., 2021. The impact of shopping motivation on sustainable consumption: a study in the context of green apparel. *J. Clean. Prod.* 295, 126239.

Kumar, A., Mangla, S.K., Kumar, P., Karamperidis, S., 2020. Challenges in perishable food supply chains for sustainability management: a developing economy

- perspective. *Bus. Strat. Environ.* 29 (5), 1809–1831. <https://doi.org/10.1002/bse.2470>.
- Kumar, S., Dhir, A., Talwar, S., Chakraborty, D., Kaur, P., 2021a. What drives brand love for natural products? The moderating role of household size. *J. Retailing Consum. Serv.* 58, 102329. <https://doi.org/10.1016/j.jretconser.2020.102329>.
- Kumar, S., Jain, A., Hsieh, J.K., 2021b. Impact of apps aesthetics on revisit intentions of food delivery apps: the mediating role of pleasure and arousal. *J. Retailing Consum. Serv.* 63, 102686. <https://doi.org/10.1016/j.jretconser.2021.102686>.
- Kumar, S., Murphy, M., Talwar, S., Kaur, P., Dhir, A., 2021c. What drives brand love and purchase intentions toward the local food distribution system? A study of social media-based REKO (fair consumption) groups. *J. Retailing Consum. Serv.* 60, 102444.
- Kumar, S., Talwar, S., Murphy, M., Kaur, P., Dhir, A., 2021d. A behavioural reasoning perspective on the consumption of local food. A study on REKO, a social media-based local food distribution system. *Food Qual. Prefer.* 93, 104264.
- Laato, S., Islam, A.N., Farooq, A., Dhir, A., 2020. Unusual purchasing behavior during the early stages of the COVID-19 pandemic: the stimulus-organism-response approach. *J. Retailing Consum. Serv.* 57, 102224.
- Lagorio, A., Pinto, R., Golini, R., 2018. Food waste reduction in school canteens: evidence from an Italian case. *J. Clean. Prod.* 199, 77–84.
- Lavuri, R., Jabbour, C.J.C., Grebnevych, O., Roubaud, D., 2022. Green factors stimulating the purchase intention of innovative luxury organic beauty products: implications for sustainable development. *J. Environ. Manag.* 301, 113899. <https://doi.org/10.1016/j.jenvman.2021.113899>.
- Luu, L., Lee, S.Y., Nickols-Richardson, S.S., Chapman-Novakofski, K., 2021. Larger serving size and seasoning's role in consumer behaviors toward vegetables. *Food Qual. Prefer.* 88, 104105.
- Mehrabian, A., Russell, J.A., 1974. *An Approach to Environmental Psychology*. MIT Press.
- Melbye, E.L., Onozaka, Y., Hansen, H., 2017. Throwing it all away: exploring affluent consumers' attitudes toward wasting edible food. *J. Food Prod. Market.* 23 (4), 416–429.
- Neubig, C.M., Vranken, L., Roosen, J., Grasso, S., Hieke, S., Knoepfle, S., et al., 2020. Action-related information trumps system information: influencing consumers' intention to reduce food waste. *J. Clean. Prod.* 121126.
- Olsen, N.V., Sijtsema, S.J., Hall, G., 2010. Predicting consumers' intention to consume ready-to-eat meals. The role of moral attitude. *Appetite* 55 (3), 534–539.
- Onwezen, M.C., Antonides, G., Bartels, J., 2013. The norm activation model: an exploration of the functions of anticipated pride and guilt in pro-environmental behaviour. *J. Econ. Psychol.* 39, 141–153.
- Onwezen, M.C., Bartels, J., Antonides, G., 2014. The self-regulatory function of anticipated pride and guilt in a sustainable and healthy consumption context. *Eur. J. Soc. Psychol.* 44 (1), 53–68.
- Parizeau, K., von Massow, M., Martin, R., 2015. Household-level dynamics of food waste production and related beliefs, attitudes, and behaviours in Guelph, Ontario. *Waste Manag.* 35, 207–217.
- Porpino, G., Parente, J., Wansink, B., 2015. Food waste paradox: antecedents of food disposal in low-income households. *Int. J. Consum. Stud.* 39 (6), 619–629.
- Principato, L., Secondi, L., Pratesi, C.A., 2015. Reducing food waste: an investigation on the behaviour of Italian youths. *Br. Food J.* 117 (2), 731–748. <https://doi.org/10.1108/BFJ-10-2013-0314>.
- Puntillo, P., Gulluscio, C., Huisinigh, D., Veltri, S., 2021. Re-evaluating waste as a resource under a circular economy approach from a system perspective: findings from a case study. *Bus. Strat. Environ.* 30 (20), 968–984. <https://doi.org/10.1002/bse.2664>.
- Qi, D., Roe, B.E., 2016. Household food waste: multivariate regression and principal components analyses of awareness and attitudes among US consumers. *PLoS One* 11 (7), e0159250.
- Quested, T.E., Palmer, G., Moreno, L.C., McDermott, C., Schumacher, K., 2020. Comparing diaries and waste compositional analysis for measuring food waste in the home. *J. Clean. Prod.* 262, 121263.
- Radzymińska, M., Jakubowska, D., Staniewska, K., 2016. Consumer attitude and behaviour towards food waste. *J. Agribus.Rural Dev.* 39 (1), 175–181.
- Rothwell, J.D., 2010. In: *The Company of Others: an Introduction to Communication*. Oxford University Press, New York, pp. 65–84.
- Schanes, K., Dobernig, K., Gözet, B., 2018. Food waste matters—a systematic review of household food waste practices and their policy implications. *J. Clean. Prod.* 182, 978–991.
- Schwartz, S., 1977. Normative influences on altruism. In: *Advances in Experimental Social Psychology*, vol. 10. Academic Press, London, pp. 221–279.
- Schwartz, S.H., 1992. Universals in the content and structure of values: theoretical advances and empirical tests in 20 countries. *Adv. Exp. Soc. Psychol.* 25, 1–65. [https://doi.org/10.1016/s0065-2601\(08\)60281-6](https://doi.org/10.1016/s0065-2601(08)60281-6).
- Septianto, F., Kemper, J.A., Northey, G., 2020. Thanks, but no thanks: the influence of gratitude on consumer awareness of food waste. *J. Clean. Prod.* 258, 120591.
- Sharma, R., Dhir, A., Talwar, S., Kaur, P., 2021. Over-ordering and food waste: the use of food delivery apps during a pandemic. *Int. J. Hospit. Manag.* 96, 102977. <https://doi.org/10.1016/j.ijhm.2021.102977>.
- Sreen, N., Dhir, A., Talwar, S., Tan, T.M., Alharbi, F., 2021. Behavioral reasoning perspectives to brand love toward natural products: moderating role of environmental concern and household size. *J. Retailing Consum. Serv.* 61, 102549.
- Stancu, V., Haugaard, P., Lähteenmäki, L., 2016. Determinants of consumer food waste behaviour: two routes to food waste. *Appetite* 96, 7–17.
- Stefan, V., van Herpen, E., Tudoran, A.A., Lähteenmäki, L., 2013. Avoiding food waste by Romanian consumers: the importance of planning and shopping routines. *Food Qual. Prefer.* 28 (1), 375–381.
- Talwar, M., Talwar, S., Kaur, P., Tripathy, N., Dhir, A., 2021a. Has financial attitude impacted the trading activity of retail investors during the COVID-19 pandemic? *J. Retailing Consum. Serv.* 58, 102341.
- Talwar, S., Kaur, P., Kumar, S., Hossain, M., Dhir, A., 2021b. What determines a positive attitude towards natural food products? An expectancy theory approach. *J. Clean. Prod.* 327, 129204.
- Talwar, S., Kaur, P., Okumus, B., Ahmed, U., Dhir, A., 2021c. Food waste reduction and taking away leftovers: interplay of food-ordering routine, planning routine, and motives. *Int. J. Hospit. Manag.* 98, 103033. <https://doi.org/10.1016/j.ijhm.2021.103033>.
- Talwar, S., Kaur, P., Yadav, R., Bilgihan, A., Dhir, A., 2021d. What drives diners' eco-friendly behaviour? The moderating role of planning routine. *J. Retailing Consum. Serv.* 63, 102678. <https://doi.org/10.1016/j.jretconser.2021.102678>.
- Talwar, S., Kaur, P., Yadav, R., Sharma, R., Dhir, A., 2021e. Food waste and out-of-home-dining: antecedents and consequents of the decision to take away leftovers after dining at restaurants. *J. Sustain. Tourism* 1–26. <https://doi.org/10.1080/09669582.2021.1953512>.
- Tandon, A., Jabeen, F., Talwar, S., Sakashita, M., Dhir, A., 2021. Facilitators and inhibitors of organic food buying behavior. *Food Qual. Prefer.* 88, 104077.
- Tracy, J.L., Robins, R.W., 2007. The psychological structure of pride: a tale of two facets. *J. Pers. Soc. Psychol.* 92 (3), 506.
- Tran, L.T.T., Pham, L.M.T., Le, L.T., 2019. E-satisfaction and continuance intention: the moderator role of online ratings. *Int. J. Hospit. Manag.* 77, 311–322. <https://doi.org/10.1016/j.ijhm.2018.07.011>.
- United Nations Environment Programme, 2021. Food waste index report 2021 | UNEP—UN environment programme, 25th November 2021 at. <https://www.unep.org/resources/report/unep-food-waste-index-report-2021>.
- U.S. Environmental Protection Agency, 2020. 2018 Wasted Food Report estimates of generation and management of wasted food in the United States in 2018, 25th November 2021 at. https://www.epa.gov/sites/default/files/2020-11/documents/2018_wasted_food_report-11-9-20_final.pdf.
- van Herpen, E., van der Lans, I., 2019. A picture says it all? The validity of photograph coding to assess household food waste. *Food Qual. Prefer.* 75, 71–77.
- Visschers, V.H., Wickli, N., Siegrist, M., 2016. Sorting out food waste behaviour: a survey on the motivators and barriers of self-reported amounts of food waste in households. *J. Environ. Psychol.* 45, 66–78.
- Wahlen, S., Winkel, T., 2016. Household food waste. In: *Smithers, G. (Ed.), Reference Module in Food Science*, pp. 1–5.
- Waitt, G., Phillips, C., 2016. Food waste and domestic refrigeration: a visceral and material approach. *Soc. Cult. Geogr.* 17 (3), 359–379.
- Wan, C., Shen, G.Q., Choi, S., 2017. Experiential and instrumental attitudes: interaction effect of attitude and subjective norm on recycling intention. *J. Environ. Psychol.* 50, 69–79.
- Williams, H., Lindström, A., Trischler, J., Wikström, F., Rowe, Z., 2020. Avoiding food becoming waste in households—the role of packaging in consumers' practices across different food categories. *J. Clean. Prod.* 121775.
- Young, C.W., Russell, S.V., Robinson, C.A., Chintakayala, P.K., 2018. Sustainable retailing—Influencing consumer behaviour on food waste. *Bus. Strat. Environ.* 27 (1), 1–15.
- Zamri, G.B., Azizal, N.K.A., Nakamura, S., Okada, K., Nordin, N.H., Othman, N., et al., 2020. Delivery, impact and approach of household food waste reduction campaigns. *J. Clean. Prod.* 246, 118969.
- Zhai, X., Wang, M., Ghani, U., 2020. The SOR (stimulus-organism-response) paradigm in online learning: an empirical study of students' knowledge hiding perceptions. *Interact. Learn. Environ.* 28 (5), 586–601.