



What drives diners' eco-friendly behaviour? The moderating role of planning routine

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ABSTRACT

Research focusing on diners' intentions towards leftovers, which are considered one of the main sources of consumer food waste in restaurants, is still at a nascent stage and requires further investigation. The present study attempts to address this gap by investigating the antecedents of diners' intentions to take away leftovers and thereby mitigate food waste in an out-of-home setting. Towards this end, we examined the role of personal and social norms as antecedents of the facilitators, inhibitors, and intentions of taking away leftovers. Using the theoretical lens of the Stimulus-Organism-Response (SOR) paradigm, we tested the proposed hypotheses by analysing data collected from 281 diners residing in the United States through a cross-sectional survey on *Prolific Academic*. The findings indicate that personal norms are positively associated with facilitators and intentions. In comparison, social norms are positively associated with facilitators but negatively associated with inhibitors. The results also confirmed the mediation effect of facilitators and inhibitors and the moderation effect of planning routine to provide valuable insights into the drivers of pro-environmental/eco-friendly behaviour in out-of-home dining to thus aid strategy formulation and future research.

1. Introduction

Food waste is a major concern for economic sustainability, the environment, and society at the global level (Dhir et al., 2020; Papatyropoulou et al., 2016). Furthermore, it has a significant negative impact on food security for the world's growing population (Loke and Leug, 2015) in both developing and developed nations (Filimonau et al., 2019; Goh and Jie, 2019). Indeed, according to a report released in 2021, the aggregate annual food waste data, including waste generated by households, retail, and food service establishments, is 931 million tonnes (Forbes, Quested, & O'Connor, 2021). Food waste or food loss happens at two different stages: a) the loss of food due to infrastructural issues in the supply chain (Chauhan et al., 2021), and b) loss at the consumption stage, such as dining out, household consumption, and so on (Principato et al., 2015; Principato et al., 2018). Food supply chains

have been investigated extensively in the recent literature (e.g., Kazancoglu et al., 2020; Zhao et al., 2020), and the food waste concerns have further heightened the interest. Given that the hospitality sector is the third-largest contributor to food waste (Filimonau et al., 2019), such waste is a major concern (Sharma et al., 2021; Kaur et al., 2021). Scholars have even argued that the waste generated by the hospitality sector can be expected to increase in developed as well as developing nations because increases in disposable income are facilitating out-of-home dining (Mintel, 2016).

Prior scholars have primarily investigated food waste in the hospitality sector from the perspective of food service establishments and have focused mainly on factors such as the amount of waste generated (e.g., Heikkila et al., 2016), waste disposal methods (e.g., Okumus et al., 2020), characterisation of the waste into different types (Filimonau et al., 2019) and the attitude of catering staff towards food waste (Goh

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and Jie, 2019; Okumus et al., 2020). In comparison, research from consumers' perspective, particularly the food waste behaviour among restaurant diners and their approach to leftovers, is limited and requires further investigation (Papargyropoulou et al., 2016). In fact, the leftover behaviour of restaurant diners cannot be ignored since leftovers are the second-highest contributors to food waste in the hospitality sector (Principato et al., 2018). Therefore, the limited accumulated findings in this context represent a research gap that needs immediate attention. The present study proposes to address this gap by addressing the following research questions: RQ1. What are the antecedents that stimulate diners' evaluation of positive and negative aspects of taking away leftovers after eating out? RQ2. How does diners' evaluation of the positive and negative aspects of taking away leftovers after eating out facilitate or inhibit their intentions to take away leftovers? RQ3. How do the facilitators and inhibitors mediate the association of antecedents with intention? RQ4. How do diners' routines moderate the association of intentions with the proposed antecedents?

The proposed research questions are grounded in the theoretical framework of the Stimulus-Organism-Response theory (SOR; Mehrabian and Russell, 1974). We followed a mixed-method approach to identify the relevant stimuli, facilitators, and inhibitors that may drive diners' intentions to take away leftovers after dining out. To this end, we first conducted a qualitative study through in-depth telephonic interviews to understand why diners feel that they should or should not take away leftovers after eating out. We also inquired about their food-related routines and decisions. Thereafter, we analysed data collected from 281 diners residing in the United States to test the proposed hypotheses.

We analysed the content of the interview responses and substantiated the same with a comprehensive review of the literature to identify personal and social norms as the antecedents associated with positive and negative evaluations that facilitate or inhibit the intentions of diners to take away leftovers. In the context of SOR, our model comprises personal and social norms as stimuli, facilitators and inhibitors of taking away leftovers as the organismic internal state, and intentions to take away leftovers as the response. In addition, we propose to examine the moderation effect of planning routine, a construct that captures the tendency to plan the meal before dining out. This is in consonance with the prior food waste literature in the household context, which has revealed the important role of such routine in generating/mitigating food waste (e.g., Stancu et al., 2016; Stefan et al., 2013).

The novelty of the study is as follows: First, the study is among the pioneering attempts to understand how norms (personal and social) drive the positive and negative evaluation of taking away leftovers, which further act as facilitators or inhibitors of the diners' intentions to take away leftovers. Since taking away leftovers would reduce the food waste generated by restaurants and also save the cost of a meal when consumed at home, our study reveals the drivers of diners' eco-friendly (or pro-environmental) behaviours that advance the global sustainability agenda. Second, by examining the potential moderation effect of planning routine in influencing leftover takeaway intentions, we draw attention to a factor that can enhance the eco-friendly behaviours of diners, thereby reducing food waste generation. Third, the study extends the food waste literature by investigating diners' leftover takeaway decision through the theoretical framework of SOR, which has been effectively utilised by existing scholarship to examine other pro-environmental behaviours (e.g., Tandon et al., 2021; Kumar et al., 2021) but has remained under-used in the context of food waste. The theory has been especially lauded for its versatility in providing the necessary framework for explicating complex human decision-making processes.

2. Theoretical background and research model

2.1. Stimulus-Organism-Response (SOR) theory

SOR states that various aspects of environmental stimuli (S) affect

the cognitive evaluations of individuals or organisms (O), which further lead to response (R). The model, proposed by Mehrabian and Russell (1974), offers a sequential mechanism to explain the contours and complexities of human decision-making settings, in general, as well as pro-environmental contexts, in particular. Stimulus (S) represents the cues present in the individuals' immediate environment. Organism (O) captures the internal state of individuals, which is an organismic expression of their cognitive evaluation. Response (R) captures the decision made based on the interplay of stimulus and organism.

Researchers have previously argued that food waste behaviour is a comparatively complex process (Mondéjar-Jiménez et al.; Quedsted et al., 2013). SOR is thus suitable for conceptualising diners' leftover takeaway intentions, directly affecting the amount of food waste generated at restaurants. SOR also allows us to consider the sequential thought process of individuals to anticipate, rationalise, internalise, and act upon the cues presented by the external environment and their internal cognitions. Furthermore, past studies have successfully used the SOR model to examine food-related behaviours (e.g., Tandon et al., 2021; Kumar et al., 2021). Due to this, we contend that SOR provides a suitable theoretical framework to ground our research questions.

2.2. Adapting SOR to the present context

We conducted a qualitative study through in-depth telephonic interviews to understand various aspects of diners' leftover takeaway decisions. To this end, we first conducted an extensive review of the literature to generate the interview guide. Thereafter, we sought the opinion of two professors with expertise in eco-friendly and pro-environmental behaviours and one practitioner from the hospitality area to further refine the guide prepared. Once the guide was ready, we conducted telephonic interviews with ten individuals who dine out frequently. The questions were as follows: (a) What are the factors that make you conscious about reducing food waste by taking away leftovers after eating out?; (b) How do your friends and peers respond to food waste and leftovers?; (c) What makes you take leftovers away when eating out?; (d) What stops you from taking away leftovers?; and (e) Do you think about the meal and what you would order before eating out and ordering? If yes, then why? In general, what do you think about food waste and leftovers?

The content analysis of the responses revealed that individuals have certain personal norms and are also influenced by some social norms, which shape their thinking about food waste and leftovers. In addition, the results revealed that taking away leftovers is not a simple choice. Individuals tend to map various facilitators of taking away leftovers, which act as reasons that make them positively disposed towards engaging in this behaviour. At the same time, individuals also consider various inhibitors of taking away leftovers, which act as reasons that make them negatively disposed towards doing so. Moreover, individuals have the routine/habit of pre-planning the meal by checking various sources of information and the menu available. Based on these findings, we propose personal and social norms as stimuli. This is also in consensus with the prior literature, which has noted the role of personal and social norms in influencing the food waste-related behaviours of individuals (e.g., Siriex, Lála and Kocmanová, 2017; Visschers et al., 2020).

Next, we have identified facilitators and inhibitors of taking away leftovers to capture the dilemma that diners experience when deciding whether to take leftovers away or not. These represent the organism. We anticipate that individuals' evaluation of the negative consequences of leaving leftovers behind will act as facilitators causing them to be positively disposed towards taking away leftovers after eating out. At the same time, we expect that their perception of the benefits or positive outcomes of not taking away leftovers will act as inhibitors that cause them to be negatively disposed towards taking away leftovers. In other words, facilitators and inhibitors act as a link between stimuli and response, indicating that diners not only respond to norms related to

food waste mitigation directly but also use reasoning (facilitators and inhibitors) to evaluate their decision before acting. This is in line with the findings of prior studies (Sharma et al., 2021; Sreen et al., 2021), especially as reasoning is more about sense-making. We have used intentions, which is an accepted proxy of behaviour (Lepoutre, van den Berghe, Tilleuil and ; Tausch and Becker, 2013), to measure the behavioural response of diners to taking away leftovers, which we speculate to be a net outcome of their positive and negative evaluations.

In addition to the proposed direct effects, we also anticipate the intervening and interacting effects of related variables given the complexity of the human decision-making process. Accordingly, we have examined the mediation effect of facilitators and inhibitors and the moderation effect of planning routine, which captures individuals' tendency to plan the meal in advance before dining out. Finally, the model is controlled for the confounding effect of age, gender, educational background, economic background, and household size on intentions to take away leftovers. The proposed research model and the operational description of the variables used in the study are provided in Fig. 1 and Table 1.

3. Hypothesis development

3.1. Personal norms, facilitators, inhibitors, and intentions to take away leftovers

Past studies have provided empirical evidence to suggest that a given behaviour or act will be easily chosen by individuals if they perceive this action to be in consonance with their personal values (Claudy, Garcia, & O'Driscoll, 2015; Karahanna, Agarwal and Angst, 2006). The role of personal values, or, more specifically, personal norms, in influencing individual decisions or actions is perhaps more pronounced in the case of eco-friendly or pro-environmental behaviours. There is ample evidence in the accumulated literature to support this argument. For instance, using the hospitality and tourism sector as context, Han et al. (2016) revealed the central role of personal norms in driving intentions to make environmentally responsible decisions. Several other studies have revealed the critical role of personal norms in motivating eco-friendly behaviours or acts as well (e.g., Klöckner, 2013; Zhang et al., 2013). In the specific context of food waste, the prior literature has noted that a sense of obligation to reduce waste serves as a motivator of the decision to mitigate it (Graham-Rowe et al., 2015; Stockli and Dorn, 2021). There is empirical evidence to suggest that personal norms

Table 1
Study variables and their definition.

Constructs	Definition
Personal norms	Personal norms capture individuals' tendency to behave in a given situation that is consistent with what they internalise as good or bad (Thøgersen, 2006).
Social norms	Behavioural standards based on shared beliefs about how individuals of a particular group behave in a specific situation (Fehr and Fischbacher, 2004)
Facilitators and inhibitors of the practice of taking away leftovers	Facilitators and inhibitors are crucial in decision-making, as individuals use them to justify their actions and behaviour (Ryan and Casidy, 2018; Westaby, 2005). Facilitators justify a choice, whereas inhibitors justify an opposing view
Intentions to take away leftovers	The disposition to act in a particular way (Talwar et al., 2020), which, in the present context, implies the intent to take away leftovers after dining out
Planning routines	Planning meals in advance (Bell et al., 2011) and taking inventory before shopping for food items (Aktas et al., 2018). In the present context, it implies the tendency to plan the meal in advance before dining out.

related to food waste prevention drive the intention to avoid at-home food waste (Visschers et al., 2016) as well as out-of-home plate waste (Visschers et al., 2020).

Although there are no prior findings supporting the role of personal norms in driving the facilitators and intentions of taking away leftovers after eating out, such associations are rationally acceptable, given that taking away leftovers is a pro-environmental behaviour. It is also equally plausible to expect the role of personal norms in reducing the inhibitors of the decision to take away leftovers after eating out. Based on the prior extended literature, we thus anticipate that the personal norms of diners related to environmental and resource conservation are likely to correlate positively with their evaluation of the facilitators of taking away leftovers (facilitators) and the intentions to take away leftovers. Going by the same argument, personal norms can be expected to correlate negatively with diners' assessment of the inhibitors of taking away leftovers (inhibitors). Hence, we posit:

H1. Personal norms of diners are positively associated with facilitators

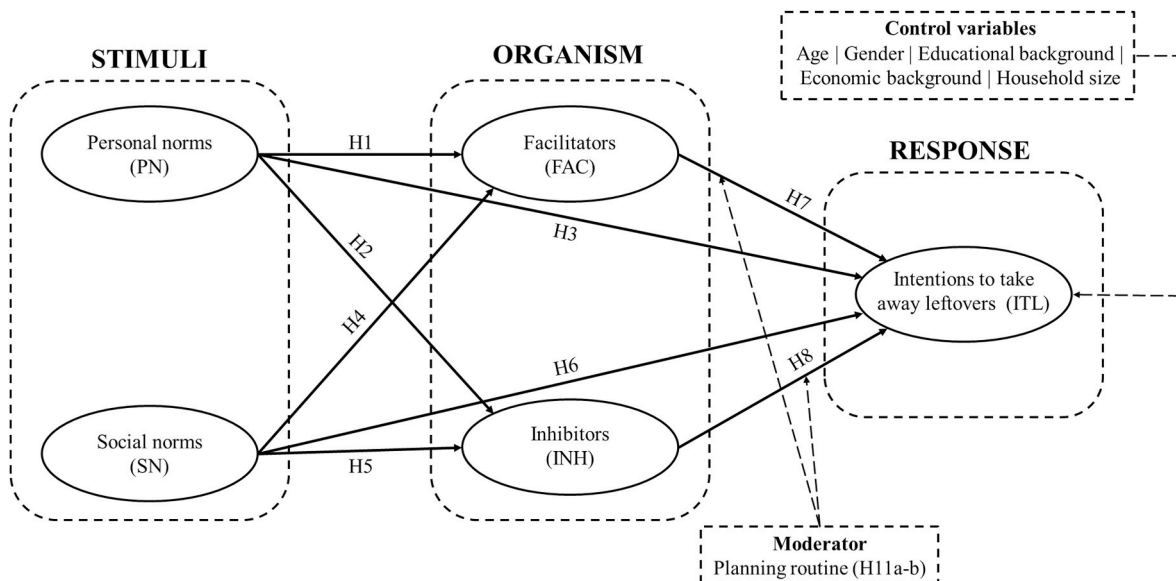


Fig. 1. Proposed research model.

of taking away leftovers (facilitators)

H2. Personal norms of diners are negatively associated with inhibitors of taking away leftovers (inhibitors)

H3. Personal norms of diners are positively associated with intentions to take away leftovers

3.2. Social norms, facilitators, inhibitors, and intentions to take away leftovers

Different theories of social psychology consider behaviour to be an interaction between individuals' psychological states and the impact of social context (Allport, 1985). In this regard, social norms play an important role in shaping individual behaviour via two primary human desires: to be right and to be liked (Deutsch and Gerard, 1955). The impact of social norms on consumers' decision-making process is widely acknowledged (Rettie et al., 2014; Schuster et al., 2016). The impact of social norms has also been observed in the case of the pro-environmental or eco-friendly decisions made by individuals in varied settings, where the existing scholarship has contended that if individuals think that others are behaving pro-environmentally, they will also engage more in such behaviours (e.g., Geiger, Steg, van der Werff and Ünal, 2019). For instance, Isock et al. (2021) confirmed the importance of social norms in motivating households to recycle waste. Other scholars, such as Nguyen et al. (2017) and Alhassan et al. (2018), have also confirmed the critical role of social norms in driving pro-environmental behaviours.

There is also a counter view, wherein scholars have argued that social norms may actually reduce the intent to take away leftovers, i.e., the tendency to behave pro-environmentally. For instance, Sirix et al. (2017) reported that diners do not ask the staff to pack their leftovers, as they feel ashamed due to their social norms. Similarly, Hamerman et al. (2018) revealed that diners are not willing to take away leftovers from restaurants, as they consider it embarrassing and a violation of social norms in front of other diners.

However, the sustainability debate and the importance of behaving in pro-environmental ways has gained more prominence in the immediate past, due to which we are predisposed to speculate that social norms are likely to correlate positively with facilitators of taking away leftovers as well as the intentions to do so. At the same time, we expect social norms to correlate negatively with the inhibitors of the decision to take away leftovers after eating out. Expressed differently, we tend to agree more with the prior findings that support the positive role of social norms in driving eco-friendly and pro-environmental behaviours, much like personal norms. Hence, we propose:

H4. Social norms of diners are positively associated with facilitators of taking away leftovers (facilitators)

H5. Social norms of diners are negatively associated with inhibitors of taking away leftovers (inhibitors)

H6. Social norms of diners are positively associated with intentions to take away leftovers

3.3. Facilitators, inhibitors, and intentions to take away leftovers

Our qualitative study revealed that diners do not consider taking away leftovers to be a simple decision. Rather, they evaluate various positive and negative aspects of taking away leftovers after eating out. The positive aspects are facilitators of the decision to take away leftovers, and the negative aspects are inhibitors of such a decision. This careful consideration of facilitators and inhibitors is consistent with the behavioural reasoning perspective, which implies that individuals make decisions after weighing reasons for and against an act or behaviour (Westaby, 2005; Sahu et al., 2020). This may be interpreted to indicate that individuals assess both the pros and cons of a decision, and their resultant behaviour/intention is the net outcome of the two diverse

forces, one favouring a particular act and the other opposing it. Since such reasons for and against are context-specific (Sharma et al., 2021), we drew upon the findings of our qualitative study to identify facilitators of taking away leftovers as reasons for and inhibitors of taking away leftovers as reasons against. Although there is no a priori basis for this supposition, we contend that facilitators of taking away leftovers, such as concern for reducing food waste and protecting the environment, would have a positive impact on the intent of diners to take away leftovers, so that good food does not get thrown away. Similarly, the inhibitors of taking away leftovers, such as the hassle and inconvenience of packing and carrying leftovers home, are likely to impinge upon the intentions of the diners to take away leftovers. Our expectation is consistent with the literature on the Behavioural Reasoning Theory (BRT; Westaby, 2005), which has a well-documented effect of reasoning on consumer intentions/decisions (Ryan and Cassidy, 2018). Thus, we hypothesise:

H7. Facilitators of taking away leftovers (facilitators) are positively associated with intentions to take away leftovers

H8. Inhibitors of taking away leftovers (inhibitors) are negatively associated with intentions to take away leftovers

3.4. Mediation effect of facilitators and inhibitors

Research on taking away leftovers as a potential food waste reduction strategy is still in an embryonic state. There are many dimensions and degrees that remain unexplored. Since our study is one of the early efforts to uncover some aspects of the decision to take away leftovers, we propose to offer a deeper understanding of the surrounding dynamics by examining not only the direct associations but also the indirect mediation effects. We contend that examining the mediation effect of facilitators and inhibitors can be useful in better explicating the complex decision-making of diners by clarifying the intervening mechanism of how norms are associated with intentions. Our expectation is aligned with the prior pro-environmental behaviour literature, where examining the mediation effect of relevant variables is quite prevalent (e.g., Bhatto et al., 2021; Farooq et al., 2021; Isock et al., 2021). Hence, we propose:

H9. Facilitators of taking away leftovers mediate the association of (a) personal norms and (b) social norms with intentions to take away leftovers

H10. Inhibitors of taking away leftovers (inhibitors) mediate the association of (a) personal norms and (b) social norms with intentions to take away leftovers

3.5. Moderation effect of planning routine

Planning routine refers to an individual's preparation before shopping for food items in terms of knowing what is already there in their inventory (Aktas et al., 2018), and it also includes planning meals in advance (Bell et al., 2011). Prior studies have argued that understanding the impact of planning routine is crucial as it plays a significant role in food waste and has the potential to reduce such waste (Stefan et al., 2013). Furthermore, the existing scholarship has revealed the association of planning routine with leftovers (Stancu et al., 2016; Stefan et al., 2013) and the willingness to reuse them (Visschers et al., 2016). Specifically, planning routine can decrease individuals' underestimation of purchased food and the stored inventory at home (Bell et al., 2011), potentially resulting in higher intention towards leftover reuse routine (Stancu et al., 2016). As we know that the research related to leftover take away behaviour among diners is still at the nascent stage, it would be interesting to explore if diners' personal characteristic of adhering to their planning routine by planning meals prior to dining out moderates the association of facilitators and inhibitors with the intentions to take away leftovers after dining out. Hence, we propose:

H11. Planning routine moderates the association of (a) facilitators of taking away leftovers and (b) inhibitors of taking away leftovers with intentions to take away leftovers

4. Methods and material

4.1. Measurement instrument

We have adapted pre-validated scales from past studies to measure the study constructs as well as items generated from the findings of our qualitative study. Personal norms were measured using a three-item scale adapted from Han et al. (2016), social norms were measured using a six-item scale adapted from Kim and Hall (2021), and intentions to take away leftovers were measured using a six-item scale adapted from Stancu et al. (2016). Two constructs, facilitators of taking away leftovers and inhibitors of taking away leftovers, were each measured through a four-item scale developed through our qualitative study. All items are presented in Table 3. We used a five-point Likert scale to collect responses, with 1 representing strongly disagree and 5 representing strongly agree.

4.2. Data collection

After developing the initial questionnaire, we tested it for content and face validity, in line with the process followed by recent studies (e.g., Talwar et al., 2020b). To this end, we first sought inputs from an expert panel of two professors with expertise in pro-environmental behaviours and one practitioner from the hospitality area. They suggested some modifications in the language of items that we duly implemented. Next, we pilot-tested the survey with ten individuals representing the target group. The main idea behind this step was to evaluate whether (a) the items conveyed the intended meaning, (b) the length of the questionnaire mitigated participant fatigue, and (c) the survey observed a logical flow. The respondents gave useful feedback that helped us improve the readability of the questionnaire. The final questionnaire comprised three sections. Screening questions were used to ensure that respondents from the identified target segment were selected. The questions concerned the participants' frequency of eating out and age. The next part of the questionnaire comprised questions related to socio-demographic details, such as age, gender, educational background, economic background, and household size. The final part of the questionnaire comprised the items used to measure the constructs.

Data was collected online through *Prolific Academic*. The target population was individuals residing in the US who were frequent diners at restaurants (i.e., a few times per week). A total of 281 complete responses were received and taken forward for hypothesis testing. The profile of the respondents is presented in Table 2.

4.3. Data analysis approach

We analysed the data using covariance-based structural equation modelling (CB-SEM) in SPSS 27 and AMOS 27. Herein, we followed the two-step procedure of generating the measurement model and evaluating the structural path. Prior to conducting CB-SEM, we confirmed that the data were suitable for the method, as suggested by recent studies (e.g., Talwar et al., 2021). To this end, we checked the data for outliers and normality. No outlier was identified among the responses, as confirmed by the Z-scores. The data were also normally distributed, as the skewness and kurtosis values were below the prescribed threshold (Kline, 2011). Furthermore, we also checked and confirmed that there were no multicollinearity issues (O'Brien, 2007). Finally, we conducted mediation and moderation analyses in the PROCESS Macro.

Table 2
Demographic profile of respondents.

	Socio-demographic profile	Frequency	Percentage
Age	25–30 years	78	27.8%
	31–35 years	58	20.6%
	36–40 years	50	17.8%
	41–45 years	29	10.3%
	46–50 years	27	9.6%
	51–60 years	39	13.9%
Gender	Male	102	36.3%
	Female	179	63.7%
Educational qualification	Completed high school	66	23.5%
	Completed/pursuing professional/vocational school	24	8.5%
	Completed/pursuing bachelors	122	43.4%
	Completed/pursuing Masters	58	20.6%
Economic background	Completed/pursuing doctorate	11	3.9%
	Low income (Less than \$40,100)	90	32%
	Middle income (\$41,000-\$120,400)	147	52.3%
	Upper income (More than \$120,400)	44	15.7%
Household size	One member	52	18.5%
	Two members	93	33.1%
	Three members	56	19.9%
	Four members	59	21%
	Five members	15	5.3%
	Six members	4	1.4%
	Seven members	2	0.7%

5. Result

5.1. Common method bias (CMB)

As the responses were collected through a self-report survey, and both independent and dependent constructs were measured through a single instrument, CMB posed a potential threat (Podsakoff et al., 2003). Accordingly, both statistical and procedural methods were used to control CMB (Podsakoff et al., 2003). As procedural precautions, items were taken from different sources, and their sequence was also shuffled. Furthermore, the respondents were assured of the anonymity of their responses. Regarding the statistical precautions, Harman's single factor test was conducted. The result reported that no single item explained a total variance of more than 36.89%, which is less than the recommended threshold value of 50% and below. This shows that the data is robust and free from any concern for CMB.

5.2. Measurement model

The measurement model was assessed using Confirmatory Factor Analysis (CFA), which helps in generating validity and reliability measures. The CFA model returned a good fit, as recommended by the values of the recommended indicators ($\chi^2/df = 2.33$, $CFI = 0.94$, $TLI = 0.93$, $RMSEA = 0.07$). Furthermore, the analysis was done to assess the convergent and discriminant validity among the constructs. Convergent validity was analysed using the factor loading, composite reliability (CR), and average variance extracted (AVE). The factor loadings of items were above 0.50 (Bagozzi and Yi, 1988), conforming to the suggested criteria (Table 3). The CR value of all the constructs was above 0.70, which met the recommended threshold value (Bagozzi and Yi, 1988). The AVE also met the suggested threshold of 0.50 and above (Hair et al., 1998), proving that the constructs satisfied the required criteria for convergent validity (Table 4). In addition, the discriminant validity was also confirmed by the results of heterotrait-monotrait (HTMT) analysis (Henseler et al., 2015) (Table 5) and by the square root of the AVE of each construct exceeding the correlation between the pair of constructs (Fornell and Larcker, 1981) (Table 4).

Table 3
Results of confirmatory factor analysis.

Study Measures (Reference)	Measurement items	CFA	SEM
Personal Norms (PN)	I feel an obligation to take away leftovers after eating out to reduce food waste	0.86	0.86
	Regardless of what other people do, because of my own values/principles, I feel that I should always try to take away leftovers after eating out to reduce food waste	0.91	0.91
	I feel that it is important to take away leftovers after eating out to reduce food waste in order to reduce the degradation of our environment	0.69	0.69
Social Norms (SN)	Most people who are important to me think I should take away leftovers after eating out to reduce food waste	0.90	0.90
	Most people who are important to me would want me to take away leftovers after eating out to reduce food waste	0.93	0.93
	Most people who are important to me support my taking away leftovers after eating out to reduce food waste	0.79	0.79
	Most people who are important to me are proud of my taking away leftovers after eating out to reduce food waste	0.78	0.78
	Most people whose opinions I value would prefer me to take away leftovers after eating out to reduce food waste	0.85	0.85
	Most people I know take away leftovers after eating out to reduce food waste	0.77	0.77
Facilitators (FAC)	Not taking away leftovers results in food waste	0.69	0.69
	Not taking away leftovers is a waste of the planet's resources and good food	0.82	0.83
	Not taking away leftovers causes more food to end up in landfill	0.72	0.72
	Not taking away leftovers is damaging to the environment	0.73	0.72
Inhibitors (INH)	Leaving leftovers after eating out saves the hassle of carrying the food around with you until you get home	0.93	0.93
	Leaving leftovers after eating out saves the worry of carrying the smelly food around with you until you get home	0.82	0.82
	Leaving leftovers after eating out saves the inconvenience of carrying a bag/box packed with leftovers	0.93	0.93
	Leaving leftovers after eating out saves the inconvenience of asking for a bag/box to pack leftovers at the restaurant	0.76	0.76
Intentions to take away leftovers (ITL)	I intend to take away leftovers after eating out	0.87	0.87
	I try to take away leftovers after eating out	0.87	0.87
	I aim to take away leftovers after eating out	0.90	0.90
	I plan to take away leftovers next time I eat out	0.89	0.89
	I would take away leftovers next time I eat out	0.77	0.76
	I am very likely to take away leftovers next time I eat out	0.84	0.84

Table 4
Validity and reliability analysis.

	Mean	SD	α	CR	AVE	MSV	ASV	ITL	PN	SN	FAC	INH
ITL	4.12	0.94	0.94	0.94	0.74	0.24	0.19	0.86				
PN	4.09	0.91	0.84	0.86	0.68	0.36	0.23	0.48	0.82			
SN	3.77	0.90	0.93	0.93	0.70	0.36	0.21	0.41	0.60	0.84		
FAC	4.26	0.70	0.82	0.83	0.55	0.28	0.21	0.49	0.53	0.46	0.74	
INH	2.73	1.15	0.92	0.92	0.75	0.12	0.08	-0.35	-0.21	-0.28	-0.30	0.86

Note: Standard deviation = SD, Cronbach's alpha = α , Composite reliability = CR, Average variance extracted = AVE, Maximum shared variance = MSV, Average shared variance = ASV, Intentions to take away leftovers = ITL, Personal norms = PN, Social norms = SN, Facilitators = FAC, Inhibitors = INH. The values mentioned in bold represent the square roots of AVEs.

5.3. Control variables

We had controlled the model for the confounding effect of socio-demographic factors, such as age, gender, educational background, economic background, and household size, on intentions to take away leftovers. The results indicated that only economic background has a confounding influence on intentions ($\beta = -0.14, p < 0.05$).

5.4. Structural model & hypotheses testing

The structural model also returned a good fit as the goodness of fit statistics were found to be satisfactory ($\chi^2/df = 1.97, CFI = 0.94, TLI = 0.93, RMSEA = 0.06$). We had proposed a positive association of personal norms with facilitators and intentions (H1 and H3) and a negative association with inhibitors (H2). The results of the statistical analysis supported H1 ($\beta = 0.39, p < 0.001$) and H3 ($\beta = 0.23, p < 0.01$) but not H2 ($\beta = -0.09, p > 0.05$). Similarly, we had proposed a positive association of social norms with facilitators and intentions (H4 and H6) and a negative association with inhibitors (H5). The results of the statistical analysis supported H4 ($\beta = 0.23, p < 0.01$) and H5 ($\beta = -0.23, p < 0.01$) but not H6 ($\beta = 0.10, p > 0.05$). In addition, we also proposed a positive association of facilitators with intentions (H7) and a negative association of inhibitors with intentions (H8). Both hypotheses were supported by the results, i.e., H7 ($\beta = 0.25, p < 0.01$) and H8 ($\beta = -0.19, p < 0.001$). The research model explained 31.6% variance in facilitators, 8.2% for inhibitors, and 35.5% in intentions. The results are presented in Fig. 2 and Table 6.

5.5. Mediation analysis

The parallel mediation analysis was run using Model 4 in the PROCESS macro in SPSS. The analysis sought to examine the mediating influence of facilitators and inhibitors on the association of norms with intentions. The results report that both partially mediate the association of personal and social norms with intentions (see Tables 7 and 8).

5.6. Moderation analysis

The moderation analysis was also conducted in the PROCESS macro using Model 1 to examine the moderation effect of planning routine. The results reveal that planning routine positively moderates the association of inhibitors with intentions but does not moderate the relationship between facilitators and intentions (see Table 9). The graph indicates that different intensities of routine have high intentions in the case of low levels of inhibitors as compared to high levels (see Fig. 3). Specifically, users with low routine have higher intentions at a low level of inhibitors. In contrast, users with high routines had elevated levels of intentions for a high level of inhibitors.

6. Discussion and implications

6.1. Discussion

The present study addressed four research questions. To seek an answer to RQ1, related to the antecedents that stimulate diners'

Table 5
HTMT analysis.

	PN	SN	FAC	INH	ITL
PN					
SN	0.63				
FAC	0.61	0.48			
INH	0.23	0.27	0.30		
ITL	0.49	0.43	0.50	0.35	

Note: Intentions to take away leftovers = ITL, Personal norms = PN, Social norms = SN, Facilitators = FAC, Inhibitors = INH.

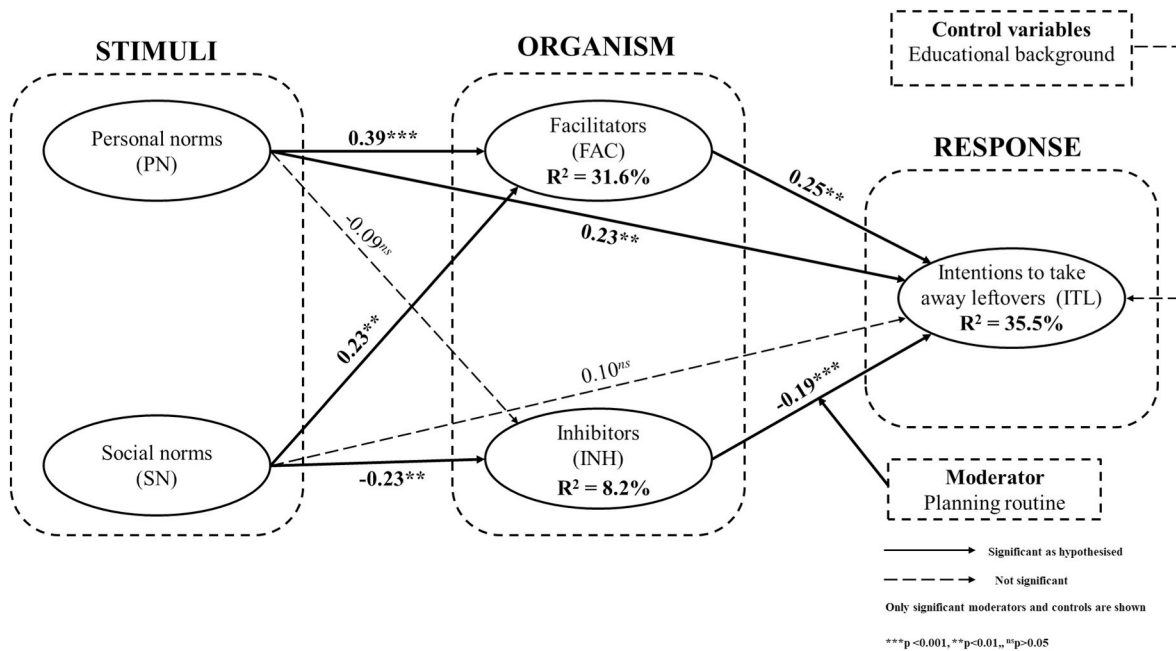


Fig. 2. Result of hypotheses testing.

Table 6
Hypotheses testing.

Hypothesis	Path	Estimate	p	Support
H1	PN → FAC	0.39	<0.001	Yes
H2	PN → INH	-0.09	>0.05	No
H3	PN → ITL	0.23	<0.01	Yes
H4	SN → FAC	0.23	<0.01	Yes
H5	SN → INH	-0.23	<0.01	Yes
H6	SN → ITL	0.10	>0.05	No
H7	FAC → ITL	0.25	<0.001	Yes
H8	INH → ITL	-0.19	<0.001	Yes

Note: Intentions to take away leftovers = ITL, Personal norms = PN, Social norms = SN, Facilitators = FAC, Inhibitors = INH.

evaluation of the facilitators and inhibitors of taking away leftovers after eating out, we tested four hypotheses proposing the association of personal and social norms with both outcome variables. Results revealed that personal norms had a significant positive impact on the facilitators of taking away leftovers (H1), supporting the prior findings on pro-environmental or eco-friendly behaviours (e.g., Han et al., 2016; Stöckli and Dorn, 2021; Visschers et al., 2016; Visschers et al., 2020).

Table 7
Results of mediation analysis.

PN → FAC/INH → ITL						
	β	se	t	p	LLCI	ULCI
PN → FAC	.40	.04	10.12	.00	.3209	.4760
PN → INH	-.26	.07	-3.43	.00	-.015	-.1089
PN → ITL	.28	.06	4.53	.00	.1576	.4002
FAC → ITL	.32	.08	3.95	.00	.1613	.4818
INH → ITL	-.17	.04	-3.93	.00	-.2545	-.0847
Total effect of PN → ITL	.45	.06	8.06	.00	.3403	.5603

SN → FAC/INH → ITL						
	β	se	t	p	LLCI	ULCI
SN → FAC	.32	.04	7.69	.00	.2408	.4065
SN → INH	-.32	.07	-4.34	.00	-.4664	-.1755
SN → ITL	.25	.06	4.13	.00	.1284	.3619
FAC → ITL	.38	.08	4.98	.00	.2316	.5345
INH → ITL	-.16	.04	-3.55	.00	-.2419	-.0693
Total effect of SN → ITL	.42	.06	7.33	.00	.3066	.5316

Note: Intentions to take away leftovers = ITL, Personal norms = PN, Social norms = SN, Facilitators = FAC, Inhibitors = INH.

Table 8
Indirect effects between dependent and independent variable.

	Effect	se	LLCI	ULCI
PN → FAC → ITL	.13	.04	.0551	.2065
PN → INH → ITL	.04	.02	.0114	.0889
SN → FAC → ITL	.12	.03	.0666	.1934
SN → INH → ITL	.05	.02	.0140	.0991

Note: Intentions to take away leftovers = ITL, Personal norms = PN, Social norms = SN, Facilitators = FAC, Inhibitors = INH.

Table 9
Results of moderation analysis.

Planning Routine						
	B	T	p	LLCI	ULCI	Moderation?
FAC → ITL	-.10	-1.22	.22	-.2717	.0636	No
INH → ITL	.15	2.76	.01	.0417	.2497	Yes

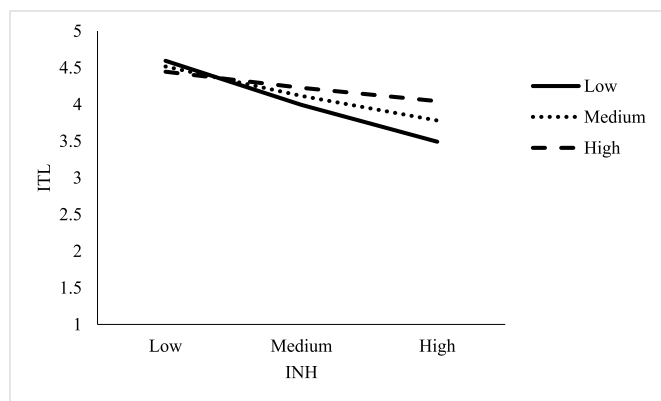


Fig. 3. Moderation effect of planning routine on the association of inhibitors of taking away leftovers (INH) with intentions to take away leftovers (ITL).

This result implies that the feeling of obligation to take away leftovers after eating out, driven by one’s own values/principles to prevent degradation of the environment, is positively associated with diners’ evaluation of facilitators of taking away leftovers. Thus, diners’ personal norms will increase their awareness/internal state that not taking away leftovers will result in food waste, erosion of the planet’s resources, and wasteful disposal of good food in landfills, which will ultimately damage the environment.

Going by the same reasoning, personal norms that cause diners to think reducing food waste is important are positively associated with the intentions to take away leftovers (H3). In comparison, personal norms do not negatively influence inhibitors of taking away leftovers (H2). This implies that the feeling of obligation and responsibility that the diners have about reducing wasting food does not impact their assessment of inhibitors of taking away leftovers, which act as reasons against this behaviour. A possible reason for this could be that diners’ personal values/norms do not reduce their perception that it is quite inconvenient to ask for leftovers to be packed and subsequently carry the bag around until arriving home. Such a tendency to not exhibit pro-environmental behaviour when it causes hassle/inconvenience has been observed by recent reports (Gilchrist, 2021). However, the present study is the first empirical investigation into such an association, and more findings with larger and varied samples are required to draw a firm conclusion.

Another stimulus examined by the study, social norms, was found to have a statistically significant impact on both facilitators and inhibitors of taking away leftovers after eating out, indicating support for H4 and H5. This result is in consonance with the prior studies related to the impact of social norms on pro-environmental or eco-friendly behaviours

(e.g., Geiger et al., 2019; Issock et al., 2021; Nguyen et al., 2017; Alhassan et al., 2018). These findings imply that diners’ observation that most people who are important, take away leftovers after eating out and also prefer that these diners also take away leftovers to reduce food waste would cause them to positively internalise the facilitators of taking away leftovers. Such factors considered by diners include the fact that not taking away leftovers would result in food waste, a waste of the planet’s resources, good food ending up in landfills, and environmental damage. At the same time, the impact of the pro-environmental behaviour of people whose opinion is important to them would cause diners to be less concerned about the hassle and inconvenience associated with asking for a bag/box to pack leftovers at the restaurant and then carrying it home.

In comparison, H6, proposing a positive association between social norms and intentions to take away leftovers, is not supported. This finding is confounding, and further investigations are needed to clarify whether there are certain moderating, mediating, or cultural influences at work that have caused the respondents in this study to completely dissociate social norms from the intent of taking away leftovers. Since food waste has a social aspect, we feel that this association is important and needs to be tested further.

RQ2, inquiring about the potential association of diners’ evaluation of positive and negative aspects of taking away leftovers after eating out with their intentions to take away leftovers, was addressed by investigating the association of facilitators and inhibitors of taking away leftovers with the intention to do so. The results of the data analysis indicated that facilitators, as measured by reasons for taking away leftovers, have a positive association with intentions. At the same time, inhibitors, as measured by reasons against taking away leftovers, have a negative association with intentions. These findings confirm support for H7 and H8, as we anticipated based on the prior extended literature (e.g., Westaby, 2005; Sahu et al., 2020; Ryan and Cassidy, 2018). Support for H7 implies that diners who think that taking away leftovers after eating out will reduce food waste, protect resources, save good food from getting disposed of in landfills, and protect the environment will have high intentions of taking away leftovers. In a similar vein, diners who find it cumbersome and inconvenient to ask for bags/boxes to pack leftovers after eating out will have lower intentions of taking away leftovers. At the same time, the hassled feeling at the thought of having to cart the box/bag around until they reach home will also lower the diners’ intentions to take away leftovers after eating out.

The analysis of the data to address RQ3 revealed the mediation effect of facilitators and inhibitors on the association of norms with intentions. More specifically, the results report that both facilitators and inhibitors of taking away leftovers partially mediate the association of personal and social norms with intentions, thereby indicating support for H9a-b and H10 a-b. The finding is consistent with our anticipation that indirect effects may exist, in line with the prior pro-environmental literature (Bhutto et al., 2021; Farooq et al., 2021; Issock et al., 2021).

RQ4, inquiring about the potential moderation effect of diners’ routines on the association of facilitators and inhibitors with intentions, was addressed by examining the moderating effect of planning routine, a variable that has previously been studied in the context of food waste behaviour (e.g., Bell et al., 2011; Stefan et al., 2013). The results revealed that planning routine positively moderates the association of inhibitors of taking away leftovers with intentions but does not moderate the relationship of facilitators of taking away leftovers and intentions. Thus, H11b is supported, whereas H11a is not.

6.2. Theoretical implications

The current study contributes to the literature on pro-environmental behaviours, in general, and food waste mitigation behaviours, in particular, in the following three ways. First, to our knowledge, this study is among the first attempts to apply the SOR model in understanding and explaining leftover takeaway intentions among diners in

the out-of-home dining setting. Using the SOR framework to examine food waste mitigation behaviour provides new insights as this framework articulates complex human behaviour quite effectively (Tandon et al., 2021; Kumar et al., 2021). Extending the SOR theory to examine the diners' leftover takeaway intentions after eating out also enriches the SOR literature and opens a new context for future researchers to apply this research framework.

Second, the study has used facilitators and inhibitors as an organism (O) linking external stimuli (S) and the response (R), thereby providing a deeper insight into the intentions of diners to exhibit pro-environmental/eco-friendly behaviours under the influence of opposing factors that may facilitate or hinder their intent to take away leftovers after eating out. This insight can be expected to help future researchers further explore various aspects of diners' leftover takeaway behaviour better.

Lastly, the study accommodates the impact of individual differences between the diners by examining the moderating influence of planning routine on the association of facilitators and inhibitors with intentions to take away leftovers. Planning routine has not been used as a moderator in the context of food waste in out-of-home dining before; as such, understanding it will provide useful inputs for future researchers. Emphasising the role of a moderator is also considered a significant contribution to the literature, as researchers have argued that moderators are important to generate a more nuanced understanding of the effect of individual differences in consumer behaviour (Zhou et al., 2014).

6.3. Managerial implications

The findings of the study provide three useful inferences for food service establishments as well as policymakers to manage and mitigate diners' food waste in out-of-home dining by encouraging diners to take away leftovers.

First, since personal and social norms positively impact the facilitators of leftover takeaway intentions, regulators, policymakers, and non-governmental organisations should make comprehensive plans to foster a sense of obligation, responsibility, and commitment to reducing food waste by taking away leftovers after dining. At the same time, such conscious individuals should also be encouraged to actively talk about the importance of such behaviour to positively influence their social group. In this regard, the concerned stakeholders can use various nudges and interventions to target norms to foster personal values, principles, and standards to make them exhibit certain behaviours (Schwartz, 1973, 1977). Another way to do so is to make it mandatory for educational institutions to make curricular modifications to emphasise the perceived benefits of reducing food waste and the negative emotions attached to it, such as shame (Azar, 2004; Sirix et al., 2017). This would inculcate food waste prevention awareness in consumers at an early age. This can also be done by requiring restaurants to display posters and place cards encouraging food waste prevention and leftover takeaway behaviour (Kallbekken and Sælen, 2013; Stöckli et al., 2018).

Second, since disposing of food waste is burdensome for restaurants, they can encourage leftover takeaway behaviour by offering to pack leftovers rather than waiting for a request from diners (Sakaguchi et al., 2018). This will motivate diners to take their leftovers without the fear of being judged by others in the restaurant. It can also help them overcome the stigma that taking away leftovers is socially and culturally unacceptable, as discussed by prior studies (e.g., Hamerman et al., 2018).

Lastly, diners may refuse to take leftovers home since it might not be convenient or practical to reuse later (Hamerman et al., 2018). At the same time, the leftovers may be reusable immediately, but restaurants may not donate them to charity out of fear of legal liability, as discussed by past studies (e.g., Sakaguchi et al., 2018). To overcome this challenge and mitigate food waste at the same time, restaurants can share with individual diners the details of food banks or locations where they can

give away their packed leftovers immediately for charity. Since individuals need not fear any legal liability, they might readily agree to be the good samaritan and take away the leftovers to donate.

6.4. Limitations and scope for future researches

Like any other empirical research, the present study has some limitations, and findings should be interpreted with them in mind. First, the study has measured a self-reported intention that proxy's behaviour instead of observing the said behaviour. As such, the collected data may be influenced by social desirability bias. However, it is a common and well-accepted practice in social science research to measure reported behaviour, as the information can be collected easily and helps researchers understand the behaviour that may not be possible to observe otherwise (Kormos and Gifford, 2014). In the future, future researchers can evaluate and expand our findings by modelling actual/observed behaviour. Second, we collected and analysed data from only one country. This restricts the generalisability of our findings. Future researchers can undertake comparative as well as replication studies in different countries to test the robustness of our model and enrich the extant literature in the area. Lastly, even though the study constructs explained an appreciable percentage of variance in diners' intentions to take away leftovers, there are other constructs worth investigating that this study did not consider. Future studies can expand our model by taking into consideration other variables, such as hygiene consciousness, over-ordering behaviour, leftover reuse intentions, and injunctive norms, while examining the antecedents and consequents of leftover takeaway intentions. In addition, future studies can examine the role of emotions in food waste behaviour, as suggested by prior scholars (e.g., Russell et al., 2017). Furthermore, future research can provide a cross-functional perspective by considering how food safety concerns, as discussed by prior studies (Lu et al., 2020; Mangla et al., 2020) and how these can be linked to food waste.

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