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Food waste and out-of-home-dining: antecedents and consequents of the decision to take away leftovers after dining at restaurants

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ABSTRACT

The rising trend of eating out has contributed noticeably to the increase in food waste generated by the hospitality sector. Therefore, it is essential to understand the drivers of food waste generation and the mitigation intentions of diners. Academic research in the area so far is fragmented, with particularly limited insights regarding the intentions to take away leftovers after dining out. The present study addresses this gap by using the theoretical lens of Behavioural Reasoning Theory (BRT) to examine the antecedents of diners' intentions to take away leftovers and how these are associated with their food over-ordering and leftover reuse routine. The hypothesised associations are tested by analysing data collected from 426 diners using a mixed-method approach. The findings suggest that moral norms are associated with reasons for and attitude towards taking away leftovers; these are further associated with intentions, which, in turn, associate positively with over-ordering behaviour. In comparison, the reasons against are negatively associated with attitude. The results also confirm the mediation effect of reasons for, attitude, and intentions on the proposed relationships and moderation effect of leftover reuse routine.

1. Introduction

Food waste is a global issue associated with several socioeconomic and environmental challenges (Dhir et al., 2020; Luu, 2020). Underscoring food waste as a significant public policy concern, "*responsible production and consumption*" has been included as one of the United Nations' (UN) 17 sustainable development goals (SDGs). Specifically, the "*responsible production and consumption*" goal highlights the need to reduce the per capita food waste at the retailer and consumer levels globally by 50% by 2030 to help promote food security and a resource-efficient economy (United Nations (UN),), 2015). Given the importance of reducing food waste from both sustainability and food security perspectives, it is essential to understand the sources and causes

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of food waste, which can serve as input for devising strategies to mitigate such waste. Regarding the sources of food waste, scholars note that it is generated at different stages of the food chain, including the consumption level, where both households and the hospitality industry contribute to food waste (Dhir et al., 2020). A rising concern in this regard is the food waste generated by the hospitality sector, which is among the top three generators of waste, contributing around 12% of the total waste (Filimonau et al., 2019; Tostivint et al., 2016). This figure is constantly increasing since the number of people dining out has risen in developed and developing nations (Mintel, 2016).

It is little surprising then that food waste generated across the globe has attracted substantial attention from hospitality and food service researchers, which has focused on both the quantification and the causes of the food waste generated (Okumus, 2020; Stefan et al., 2013). However, most of the studies in the hospitality domain have examined food waste from the perspective of food service establishments, focusing on areas, such as (a) the waste generated by restaurant employees (e.g. chefs, managers, serving, and so on) and the mitigation strategies used by them (Filimonau et al., 2019; Okumus, 2020; Principato et al., 2018), (b) employees' attitudes (Goh & Jie, 2019), and perspective towards food waste in the hospitality industry (Okumus et al., 2020), (c) quantification and characterisation of the waste in the hospitality sector (Filimonau et al., 2019), and (d) food recovery/waste disposal methods used in the sector (Okumus, 2020; Sakaguchi et al., 2018).

In comparison to this relatively rich body of literature on food waste from a business perspective, scholars have noted that studies on consumer behaviour related to food waste in out-of-home dining are limited (e.g. Coşkun & Özbük, 2020), even though prior studies have acknowledged it as a significant cause of food waste in restaurant dining (e.g. Martin-Rios et al., 2018, Wang et al., 2017). These studies have identified factors, such as over-ordering and leaving uneaten food on the plate, as the key factors related to restaurant food waste at the consumption level (Bharucha, 2018; Papargyropoulou et al., 2016). However, how this food waste can be mitigated has not been discussed much in the accumulated literature. Given that there has been a substantial increase in out-of-home dining in different parts of the world (Wang et al., 2017), which can impact food waste generation, such lack of insights represents a gap in the literature that needs to be addressed. We propose to address this gap in the literature by examining the factors that drive consumer behaviour towards food waste generation and the potential mitigation strategies in out-of-home dining, with specific reference to restaurant dining.

Our literature review reveals that scholars who have examined food waste behaviour in out-of-home dining have contended that the lack of acknowledgement that diners may have different portion requirements is a significant reason for waste generation (e.g. McAdams et al., 2019). Thus, the portion size served by a restaurant may be more than the quantity required to satiate the hunger of the diners, which results in food being left unconsumed. This burdens the restaurants with the responsibility to dispose of the remaining food. Due to this, there is a rising trend of offering diners takeaway boxes packed with unconsumed dishes (Filimonau & De Coteau, 2019). However, the consumer/diner perspective on food waste mitigation through taking way leftover dishes (popularly called doggy/doggie bags) has been discussed only by a limited number of studies (e.g. Dagiliūtė & Musteikytė, 2019; Liao et al., 2018; Sirieix et al., 2017), and it continues to be under-explored as a viable food waste recovery strategy (Filimonau et al., 2019; Principato et al., 2018). This indicates a need for more research to clarify the leftover takeaway behaviour of diners better.

We argue that simply trying to understand the drivers of takeaway behaviour is insufficient to offer viable theoretical explanations and actionable, practical inputs for addressing food waste in the hospitality sector. Instead, a broader view is required. For instance, we need to understand whether taking away leftovers reduces food waste or shifts its location from the restaurant to the diners' home. Thus, we propose to examine the role of leftover reuse routine to understand food waste generation and reduction better. Scholars have suggested leftover reuse as an effective waste reduction strategy in a household setting (e.g. Stancu et al., 2016). At the same time, we propose to examine whether the intent to take away leftovers would serve as a guilt

offsetting alternative, causing diners to indulge in over-ordering food while dining out. Over-ordering food embodies the possibility of waste because, by definition, over-ordering implies buying more of anything than required. Over-purchase of food or shopping routine, which represents buying more food than needed, has been examined by scholars as a food waste-related variable in household settings (e.g. Stancu et al., 2016; Stefan et al., 2013). Over-ordering behaviour, which is anecdotally well-recognized, has been examined recently in the context of food delivery apps (FDAs) also (Sharma et al.,2021), wherein called as shopping routine, the over-ordering behaviour has been measured in terms of ordering unintended food items, that exceed the amount actually required. In sum, we contest that consumer behaviour towards food waste generation and mitigation in out-of-home dining, particularly in restaurants, is a complex phenomenon with various dimensions. This is in concordance with the prior studies that have suggested that consumers' food waste behaviour is the outcome of multiple reasons and beliefs (Secondi et al., 2015; Setti et al., 2018). Furthermore, we propose to extrapolate the food waste-related variables examined in household settings to out-of-home dining based on the prior findings that have revealed a positive association between individuals' workplace and household food waste behaviour (Luu, 2021), indicating the possibility of the same manifestations in different settings.

Appreciating this complexity and multi-faceted nature of food waste behaviour, we propose to use the theoretical framework of Behavioural Reasoning Theory (BRT) (Westaby, 2005) to conceptualise the related associations. BRT is effective in explicating context-specific behaviour (Sahu, Padhy, & Dhir et al., 2020). It suggests that individuals, driven by their values, weigh the reasons for and against engaging in a particular behaviour, which ultimately influences their attitude and intentions towards that given behaviour (Westaby, 2005). Based on the preceding discussion, we propose three research questions to help us hypothesise the association explaining the food waste-related behaviour of diners. Specifically, we propose four main research questions:

> **RQ1**. How do the values interact with reasons for and against taking away leftovers after dining out, if at all? **RQ2**. How are the values and reasons associated with attitude and intentions to take away leftovers after dining out and over-ordering behaviour, if at all? **RQ3**. How do the intervening mediating mechanisms affect the associations between value, reasons, attitude, intentions, and behaviour? **RQ4**. How, if at all, does leftover reuse routine affect the strength of association of intentions and behaviour?

Since the variables we propose to examine have been investigated in other contexts, such as household food waste, or only to a limited extent in the out-of-home settings, we use a mixed-method approach for data collection, wherein we first conducted open-ended essays with representatives of our target group. This qualitative study aimed to understand the values, reasons, and related behaviour of diners in the context of leftover takeaway, over-ordering, and leftover reuse routine. Through the content analysis of the qualitative responses and review of the extended literature in the area, we identified moral norms to represent values component of BRT, as well as delineated the reasons for, and reasons against that drive the attitude to takeaway leftovers and engage in over-ordering behaviour. In addition, we identified leftover reuse routine as a moderating variable that would affect over-ordering behaviour. After that, we collected data from 426 individuals residing in the United States (US) who dine out frequently to test our proposed associations.

The rest of the article is structured as follows: the theoretical framework and hypotheses development are discussed in Section 2, followed by various aspects of qualitative and quantitative data collection in Section 3, results in Section 4, discussion of the findings in Section 5, and implications, limitations and future research areas in Section 6.

2. Theoretical framework and hypotheses development

2.1. Behavioural reasoning theory (BRT)

This study utilises BRT to develop a comprehensive research framework to understand diners' behaviour related to taking away leftovers after dining out at restaurants, a significant source of

food waste in the consumption stage (the United States Environmental Protection Agency, 2019). BRT theorises an association between values/beliefs, the dichotomous reasoning process of individuals (reasons for and against), global motives, intentions, and behaviour (Westaby, 2005). Furthermore, BRT emphasises the context-specific reasons for and against behaviour and appraises the impact of these theoretically different constructs in a single framework (Sahu et al., 2020). The reasoning (for and against) that BRT entails is crucial as it identifies the reasons to opt or not to opt for a particular behaviour before analysing the influence of these reasons on an individual's attitude and intentions (Sahu et al., 2020). BRT is quite close to functional theorising (Snyder, 1992), which states that individuals use reasoning to support their decisions based on available alternatives (Claudy et al., 2015).

Moreover, attitude can be contemplated as a global motive because it represents an essential factor that typically predicts intention and behaviour across various domains (Claudy & Peterson, 2014; Diddi et al., 2019). Although BRT has primarily been applied to marketing, business, and banking (e.g. Gupta & Arora, 2017), as well as retail and consumer studies (e.g. Diddi et al., 2019), we employ BRT to explain the reasons for consumers' favourability, adaptation, and rejection of the concept of leftover take away. As a result, we can say that BRT provides a complete understanding of context-specific behaviour to link values, attitude (global motive), and intention.

Values/beliefs and reasons represent context-specific cognitions that individuals use to form attitudes, intentions, and behaviour. Due to this, we conducted a qualitative study through open-ended essays to understand the values/beliefs and reasons associated with the leftover takeaway decision of the target group. Through a content analysis of the responses, as reported below, we identified moral norms as the values, as well as mapped the reasons for and against the leftover takeaway decision. In addition, since the context of the study is taking away leftovers after dining out, we measured global motives through attitude towards taking away leftovers and intentions to do so. Based on the qualitative study findings, we similarly identified over-ordering behaviour as capturing the possibility of food waste generation, with dining out as the target behaviour and leftover reuse routine as a factor that could moderate the individual decision-making process. The operational description of the variables under the study is presented in Table 1.

Based on the identified variables, we propose a model in which moral norms are hypothesised to be associated with reasons and attitudes. This is consistent with the classic propositions of BRT. Since BRT postulates that reasons can also be independently associated with global motives (i.e. attitude) and intentions, our model further postulates the direct association of reasons with attitude and intentions. In addition, we propose to examine the direct association of reasons with behaviour to gain a more nuanced understanding of how diners rationalise their over-ordering behaviour. This proposition is consistent with BRT, which considers context-specific reasons to be important determinants of behaviour (Westaby, 2005).

Moreover, since BRT contends that reasons alone do not provide a complete explanation of intentions and behaviour, we propose a direct association of attitude with intentions and intentions with behaviour, in consonance with the theory (Westaby, 2005). Furthermore, since BRT argues that there may be factors beyond individual awareness that might affect behaviour (Westaby, 2005), we postulate leftover reuse routine as a moderating variable that might offer rationalisation for indulging in over-ordering behaviour. Finally, we also considered the mediation effect of the intervening variables, since BRT provides scope for both the direct effects and the potential automated process (mediation), as confirmed by prior studies (e.g. Ryan & Casidy, 2018; Tandon et al., 2020). Thus, our proposed model, which accommodates all possible interaction mechanisms among the variables, adequately captures the complex dimensions of the food waste behaviour of individuals in out-of-home dining. The model, controlled for the confounding effect of age, gender, household size, and educational background, is presented in Figure 1.

Table 1. Operational description of study variables.

Variable	Operational description
Moral norms (MN)	MN are values/beliefs of diners that represent their morals and capture the sense of feeling of guilt and regret arising from leaving leftovers which would ultimately lead to food waste and thereby wastage of resources. MN also embody the feeling of remorse and bad conscience that arises from wasting food when so many people are deprived of basic meals.
Reasons for (RF)	The reasons for taking away leftovers are primarily situational and incumbent upon the benefits and savings derived from consuming them for another meal, avoiding cooking, saving cooking time, saving the cost of another meal, and salvaging uneaten food to offset the dissonance arising from the price paid.
Reasons against (RA)	Reasons against taking away leftovers represent the largely intrinsic/internal convenience-related factors that may dissuade diners from taking unconsumed food away after dining out. These factors include hassles associated with carrying the doggy/doggie bag home, handling/ storing/refrigerating the leftovers brought home, disposing of the packaging, and dealing with the pressure of consuming them as soon as possible.
Attitude towards taking away leftovers (ATT)	ATT captures the favourable disposition that diners have towards taking away leftovers after dining, perceiving it to be an extremely positive, wise, and fabulous act.
Intentions to take away leftovers (INT)	INT is a well-documented variable in consumer behaviour research, which captures the aim, intent, and readiness of individuals to indulge in the said behaviour (taking away leftovers in the present context) whenever the opportunity arises.
Over-ordering behaviour (OOB)	OOB is a novel construct developed for the present study to capture better the dynamics surrounding the leftover takeaway decision of diners. The variable is theorised to measure the frequency of ordering more food than planned or warranted for satisfying hunger/appeasing appetite, as tempted by the variety being offered by the restaurant.
Leftover reuse routine (LRR)	LRR captures the at-home aspect of the potential food waste averted in the out-of-home setting. It represents the routine of diners surrounding the leftovers brought home. The routines include refrigerating and handling the leftovers brought home to ensure that they are definitely consumed, either as it is or by reheating when needed.

2.2. Hypotheses development

The proposed model comprises the direct, mediating, and moderating associations consistent with the postulates of BRT.

2.2.1. Attitude and intentions

BRT postulates that individuals' attitudes are influential precursors that predict their behavioural intention and, later, their actual behaviour (Westaby, 2005). In the context of food waste behaviour and leftovers, researchers have revealed that individuals' attitudes to not waste food positively influence their intention to consume food wisely (Stancu et al., 2016). Other studies have similarly confirmed that consumers' attitudes towards food waste affect their behavioural intentions (van der Werf et al., 2021). The attitude-intention association is the bedrock of BRT and has been confirmed in the case of food waste. We thus anticipate that in the context of leftovers, the attitudes of diners will align with their intentions. Hence, we posit:

H1: Diners' attitude toward taking away leftovers is positively associated with their intentions to do so.

2.2.2. Reasons (for and against), attitude, and intentions

Individuals use reasons (for/against) to support and justify their behaviour (Claudy et al., 2015). These reasons, in turn, play a crucial role in attitude formation (Westaby, 2005). The association between these two factors has been supported in a wide range of pro-environmental behaviours, such as organic food consumption (Tandon et al., 2020), renewable energy systems adoption (Claudy et al., 2013), and bicycle commuting (Claudy & Peterson, 2014). Furthermore, BRT is unique
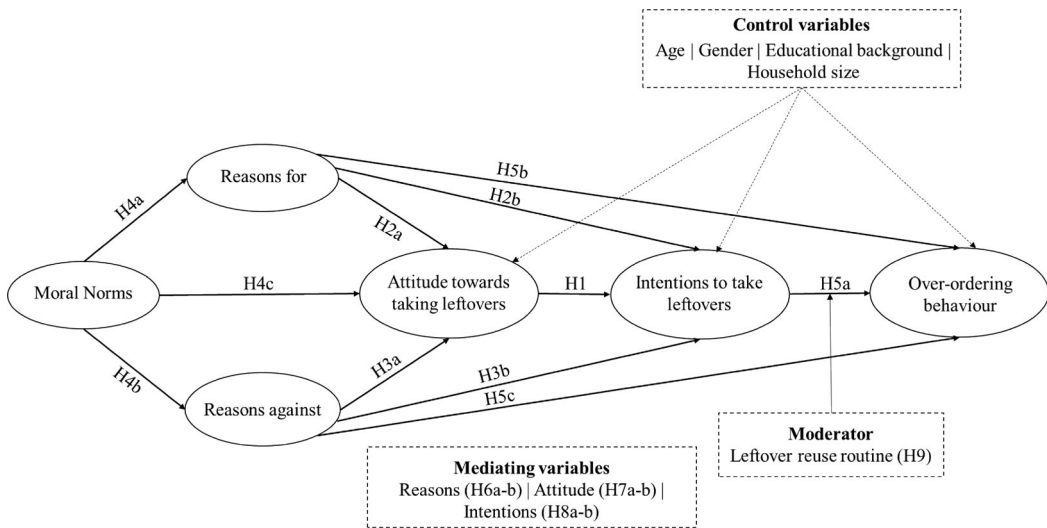
Figure 1. Proposed research model.

compared with other belief-based models because it also proposes that reasons (for/against) can directly explain a varying intent to perform the behaviour beyond the impact of the global motive (i.e. attitude; Claudy & Peterson, 2014). Westaby (2005) emphasised studying the direct impact of individuals' reasoning on their behavioural intentions. Previous research has also supported this relationship in a wide range of areas, such as renewable energy systems (Claudy et al., 2013) and adoption of innovation (Claudy et al., 2015). Since food waste reduction through taking leftovers is also a pro-environmental behaviour, it is plausible to argue that similar associations exist in the present context, whereby reasons are associated with both attitude and intentions.

It is important to note that individuals' reasoning is not limited to cost-benefit analysis but includes broader perspectives as well (Westaby, 2005). For instance, diners might find it economical to take leftovers to consume later. Moreover, different cultural environments in the West and East (i.e. individualistic versus collective cultures) may activate the cognitive process to change the intention of individuals. For instance, considering the formal environment of restaurants, there is a possibility that diners from individualistic cultures like the United States will take away leftovers without hesitation. However, consumers from collective cultures (e.g. Asian countries; Okumuş, 2019) may feel that taking away leftovers will seem unsophisticated or socially unacceptable, hence generating a negative attitude towards it.

Furthermore, past studies have noted that the food waste generated by consumers is driven by various internal and external factors (Gaiani et al., 2018). Consequently, our study proposes various situational and intrinsic factors that may impact the attitude and intentions of diners to take away leftovers. As revealed by our qualitative study, such factors act as reasons for and reasons against taking away leftovers. Hence, we propose:

H2: Diners' reasons for taking away leftovers are positively associated with their (a) attitude and (b) intentions.

H3: Diners' reasons against taking away leftovers is negatively associated with their (a) attitude and (b) intentions

2.2.3. Moral norms, reasons (for and against), and attitude

The association of norms with different aspects of food waste behaviour has been emphasised by prior studies (e.g. Schanes et al., 2018). Moral norms represent the feelings of guilt and bad conscience that individuals develop when they waste food (Stancu et al., 2016). The role of moral

norms in driving pro-environmental behaviours has also been well-documented in multiple contexts, such as energy-saving (Chen,2016). In the specific context of food waste, scholars have noted that weak moral norms cause individuals to justify their food waste behaviour (Parizeau et al., 2015). Similarly, McCarthy and Liu (2017) contended that a sense of guilt drives individuals to be careful about food resources since food waste has environmental implications. In another study, Quested et al. (2013) found that people do not like wasting food, and the sense of guilt they experience by doing so motivates them to reduce food waste at the household level; this is because moral norms can influence consumers to change their household food-related routines to minimise waste (Graham-Rowe et al., 2014; Parizeau et al., 2015). Although most of the existing literature has examined moral norms in household food waste behaviour, it is plausible to expect the same effect in the case of food waste in out-of-home settings.

We base our argument on the understanding that the awareness of the adverse implications of food waste at restaurants is likely to make diners experience a sense of guilt, which would make them seek to take away leftovers as a possible waste reduction strategy. This would not only heighten their reasons for doing this behaviour but would also create a favourable attitude towards such a practice. This is consistent with prior studies showing that individuals' internalised value (i.e. moral norms in the current study) plays an essential role in influencing their attitude towards a particular behaviour (de Barcellos et al., 2015). Similarly, BRT also supports the contention that values can directly impact one's attitude, as individuals use "*different, distinct, and systematic psychological processes or paths*" in their decision-making (Westaby, 2005). Although there is no prior evidence to support our proposition, we anticipate moral norms to directly associate with attitude and reasons based on the evidence presented in the preceding discussion. At the same time, we venture to speculate that the sense of guilt associated with food waste and its adverse impact would cause moral norms to be negatively correlated with reasons against taking away leftovers. Hence, we hypothesise:

H4: Diners' moral norms are positively associated with their (a) reasons for, (b) reasons against, and (c) attitude towards taking away leftovers.

2.2.4. Reasons, intentions, and behaviour

Prior literature has noted that consumers follow a shopping routine while purchasing food (Stefan et al., 2013) and end up buying more than is required (Evans, 2012), resulting in food waste at a later stage. We argue that consumers will also manifest this tendency to order more than required in out-of-home dining as well. This aligns with recent studies, which have confirmed the manifestation of an excess ordering tendency in food service, hotels, and restaurants (e.g. Okumus, 2020; Okumus et al., 2020). Based on our qualitative study, reported in the next part, we use the term 'over-ordering behaviour' as a counterpart of shopping routine in the context of out-of-home dining to capture this excess ordering. We expect such over-ordering behaviour will be enhanced by the intentions of diners to take away leftovers. Our anticipation is driven by the supposition that diners may indulge in over-ordering food due to a multitude of tangible and intangible factors, including the hedonic pleasure of food consumption and its associated well-being (Cornil & Chandon, 2016), viewing food consumption as a source of relaxation and happiness (Li & Wang, 2020), and considering buying a large quantity of the food as a source of joy and symbol of success (Chang, 2021). They may even be tempted to order more due to available discounts and variety.

Furthermore, they may feel free to seek this hedonic pleasure and order more food than they require without guilt by rationalising that they would take away leftovers. Therefore, nothing would be wasted. Although there is no a priori finding for this, the preceding discussion provides us with a sufficient basis to speculate that intentions to take away leftovers might make diners less worried about food waste, which causes them to indulge in the pleasure of ordering

a sumptuous quantity of food. While the intention-behaviour association is arguable in the generic BRT setting, the contention that consumers' food waste behaviour is complicated and impacted by various variables (Quested et al., 2013) motivates us to examine whether reasons are also associated directly with over-ordering behaviour. In this case, reasons for taking away leftovers are likely to be positively correlated with diners' tendency to indulge in over-ordering. In contrast, reasons against could be negatively associated with it. Hence, we propose:

H5a: Diners' intentions to take away leftovers are positively associated with their over-ordering behaviour.

H5b: Diners' reasons for taking away leftovers are positively associated with their over-ordering behaviour.

H5c: Diners' reasons against taking away leftovers are negatively associated with their over-ordering behaviour.

2.2.5. Mediation effect of reasons, attitude, and intentions

Aschemann-Witzel and Aagaard (2014) argued the importance of understanding the roles of mediating variables, such as attitude and reasoning, which are both context-specific in reducing the attitude-intention gap. This understanding better elucidates the mechanism by which individuals' decision-making is motivated in a particular situation (Tandon et al., 2020). Claudy et al. (2013) contended that values act as an important antecedent of attitude towards behaviour but that this relationship is mediated by context-specific reasoning (the reasons for/reasons against). Sahu et al. (2020) argued that attitude (global motive) mediates reasons on intentions, while Ryan and Casidy (2018) found that reasons for significantly mediate the association between values and attitudes.

Similarly, Sreen et al. (2021) and Kumar et al. (2021) confirmed the mediation effect of attitude and reasons for. We argue that with food waste being a complex behaviour, it is entirely plausible to anticipate a more dynamic interaction mechanism between the antecedents and outcomes in the present context. This, coupled with the findings underscoring the importance of a mediation effect in the BRT framework, motivates us to examine the mediation effect of reasons, attitudes, and intentions on the hypothesised associations. Hence, we propose:

H6: (a) Reasons for and (b) Reasons against taking away leftovers mediate the association of moral norms with attitude.

H7: Attitude mediates the association of (a) Reasons for and (b) Reasons against taking away leftovers with intentions.

H8: Intentions mediate the association of (a) Reasons for and (b) Reasons against taking away leftovers with over-ordering behaviour.

2.2.6. Moderation effect of leftover reuse routine

Taking away leftovers is worthwhile only if they are reused; otherwise, it would just shift the location of waste from out-of-home to the household. This is in line with prior studies that have acknowledged the reuse of food leftovers as a viable waste reduction strategy (Kim et al., 2020; Stancu et al., 2016). In this regard, leftover reuse routine serves as a helpful way to evaluate the individual differences in approach to leftovers. Scholars have argued that leftover reuse routine, as a part of food-related routines, can be expected to serve as a way for individuals to regulate their food-related behavioural processes (Allom & Mullan, 2012). Furthermore, individual differences have been argued to impact the translation of intentions into a given behaviour (Hall et al., 2008). Recent studies in different contexts have examined the moderation effect of leftover reuse routine (Luu, 2021). We extrapolate these findings to the present context to speculate that individual differences in the leftover reuse routine are likely to impact the association of intentions to takeaway leftovers with food over-ordering behaviour while dining at a restaurant. In other

words, we anticipate that leftover reuse routine will moderate the association of intentions with behaviour. Since there is no a priori evidence for this, it cannot be said whether the influence will be positive or negative. There are thus two equally plausible outcomes that can be anticipated.

On the one hand, it can be argued that the diners who are high in leftover reuse routine are more likely to order more food while dining out since their leftover reuse routine could serve as a way to assuage their guilt related to food waste arising from over-ordering. An overarching explanation can be that they use the leftover reuse routine as a self-regulatory mechanism that offsets the possibility of food waste in this out-of-home context. On the other hand, it can also be argued that the diners who have a high leftover reuse routine are individuals who are conscious about food waste, and it is this consciousness that might deter them from over-ordering in the first place. In other words, the diners with positive intentions to take away leftovers, coupled with a high leftover reuse routine, will not order extra food because they are concerned about food waste and leftovers. Although we antici-pate the moderation effect of leftover reuse routine on the association of intentions with over-ordering, we thus do not venture to speculate about the direction of the effect. Accordingly, we propose:

> **H9**. Leftover reuse routine moderates the positive association between intentions to take away leftovers and over-ordering behaviour such that the relationship is different for varying levels of leftover reuse routine.

2.2.7. Control variables

Prior studies on food-related behaviours have considered various socio-demographic factors as control variables. For instance, Vollmer (2021) controlled the study participants' model for age and gender while examining eating behaviour. Similarly, other studies on food-related consumer behaviour have controlled the proposed outcome variables for the effect of socio-demographic factors, such as age, gender, educational background, economic background, and household size (Talwar et al., 2021; Tandon et al., 2021). Hence, we have also controlled our model for the potential confounding effect of four socio-demographic factors: age, gender, educational back-ground, and household size.

3. Data and methods

3.1. Qualitative study

We collected 47 qualitative responses from the target group (US-based individuals who dined out frequently) via open-ended essays. The age range of the respondents was 25 to 60 years [mean age: 39.62 years], with 28 of the respondents being females. The open-ended essay com-prised seven questions and explored various aspects of the individuals' dining out behaviour related to their leftover takeaway and reuse decisions. These questions were: (a) What causes you to over-order (order more food than required) when dining out? (b) What are the various reasons for leftovers, i.e. leaving uneaten food behind when dining out? (c) Do you know of the concept 'Doggy bag'? Do you have any experience with it? (d) What are the factors or situations that motivate or encourage you to take leftovers in a doggy bag when dining out? (e) What are the factors or situations due to which you leave the uneaten leftovers behind when dining out? What factors stop you from requesting a doggy bag to pack the leftovers? (f) When leftover food is brought home in the doggy bag, what happens next? and (g) What are the reasons that may motivate you not to throw away food?

3.2. Qualitative data analysis

We applied thematic coding to the qualitative responses via a content analysis to identify key themes (Creswell, 2014). The coding process, guided by the research questions in consonance with prior studies (e.g. Mkono & Hughes, 2020), was undertaken manually by a panel of two researchers. First, the researchers focused on identifying the key causes of leftover generation and familiarity with the concept of doggy/doggie bags. Second, the content was analysed to identify the key themes. Towards this end, we first discerned broader codes, which were then synthesised based on similarities and patterns. We thus delineated fewer content categories comprising keywords, which is the central idea behind undertaking content analysis (Weber, 1990). Finally, as presented in Table 2, five key themes emerged: prevalence of over-ordering behaviour, reasons/motivators of taking away leftovers, reasons against/inhibitors of taking away leftovers, reuse of leftovers at home, and motivators of the decision to prevent food waste and salvage leftovers.

3.3. Quantitative study

We collected quantitative data using a cross-sectional survey administered online through *Prolific Academic*, a popular platform for data collection used by recent studies (e.g. Bhutto et al., 2021). The measurement scale for some constructs (moral norms, reasons, over-ordering behaviour, and leftover reuse routine) was developed based on the keywords/themes that emerged from the content analysis of the qualitative responses. Moral norms, reasons against, and over-ordering behaviour were measured through a six-item scale, while reasons for was measured through a seven-item scale, and leftover reuse routine was measured through a five-item scale. The scales for other constructs (attitude and intentions) were developed by adapting pre-validated scales to the present context. Attitude was measured through a three-item scale, and intentions were measured through a four-item scale adapted from Stancu et al. (2016) and Kim and Hall (2019).

After the initial questionnaire was developed, we used the recommended procedure to ensure content and face validity. To begin with, we sought the opinion of four specialists from the area (professors and professionals) and modified the items based on their feedback. Next, we administered the survey to six academic researchers experienced in psychometric measurement and further revised the language where suggested. Following these changes, we pilot-tested the revised instrument with 17 participants representing our target user group to evaluate whether they understood the items or found any wording to be ambiguous. We then made minor changes in language based on the feedback received at this stage.

The final questionnaire used a five-point Likert scale and was administered to the target sample comprising US-based individuals between 25 to 60 years of age who had dined out frequently during the period preceding the time of data collection. The US was selected as the target location due to the well-established practice of taking home leftovers in that geography (Principato et al., 2018), thereby making the examination of related behaviours more relevant and pertinent. The respondents were compensated for filling out the survey and were ensured complete anonymity.

A total of 426 responses were taken forward after rejecting 10 incomplete responses. The demographic details of the respondents are presented in Table 3.

3.4. Method of data analysis

We employed the popular two-step covariance-based structural equation modelling (CB-SEM) technique using SPSS and AMOS version 27. In the first step, the measurement model was assessed through confirmatory factor analysis, and in the second step, hypotheses were tested by analysing the structural model. Finally, we conducted mediation and moderation analyses

Table 2. Qualitative data analysis.

Themes	Sample responses	Measurement items
Fundamental causes of leftover generation	*I ordered too much* [P18]	
	I get greedy, and order too much [P21]	
	Eyes bigger than my belly [P24]	
	Over-ordering food for special deals or offers in a restaurant [P38]	
Familiarity with the concept of doggy/doggie bags	*Yes, the term doggy bag is well used* [P21]	
	I don't like wasting food, so I ask for leftover food to be packaged to take home [P29]	
	Yes, I know what a "doggy bag" is [P31]	
	I very much like this idea and regularly ask for a doggy bag [P36]	
	I think doggy bags are a widespread concept [P41]	
Moral norms	*Wanting to save it for later and feeling bad for wasting food as people out there don't get food* [P1]	1. Leaving leftovers after dining out leads to food waste, so it makes me feel guilty about people who do not have enough food
	It is better for the environment to make full use of what you have and not throw it away [P7]	2. Leaving leftovers after dining out leads to food waste, so it gives me a bad conscience
	It helps you to save money in the long term, and waste less energy [P15]	3. Leaving leftovers after dining out leads to food waste, so it is against my morals
	Environment damaged by lots of waste [P20]	4. Leaving leftovers after dining out leads to food waste, so it makes me feel guilty about the wastage of resources
	Feeling guilty as there are plenty of people who need food, preserve resources as much as possible [P22]	5. Leaving leftovers after dining out leads to food waste, so it makes me feel bad
	I feel regret when I waste good food [P31]	6. Leaving leftovers after dining out leads to food waste, so it gives me a feeling of regret
	I feel it is against my morals to waste food [P37]	
	Wasting food gives me bad conscience [P46]	
Reasons for taking away leftovers	*I really like eating leftovers* [P12]	1. Leftovers are taken away after dining out if there are multiple uses
	I appreciate having another meal that all I have to do is reheat in the microwave [P21]	2. Leftovers are taken away after dining out to consume as breakfast or dinner
	I feel like I get a better deal if I get two meals for the cost of one [P23]	3. Leftovers are taken away after dining out if I want to avoid cooking again
	If I have leftover food, I will always take it home for tomorrow and not to waste money on food not eaten [P33]	4. Leftovers are taken away after dining out if I want to save the cost of another meal
	I'm not going to waste food and money [P39]	5. Leftovers are taken away after dining out since I have paid for the food
	What motivates me is I do not want to waste it and would rather eat it later on the night or the next day [P43]	6. Leftovers are taken away after dining out when I feel I cannot eat anymore
	I know that it will save me or my wife from having to cook our next meal [P47]	7. Leftovers are taken away after dining out since it helps save time and money

(continued)

Table 2. Continued.

Themes	Sample responses	Measurement items
Reasons against taking away leftovers	*I do not take away leftovers … ..*	1. Leftovers are not taken away after dining out as they create the pressure of consuming them for the next meal
	If the dish won't travel well (desserts that'll melt or squash, soups) [P7]	2. Leftovers are not taken away after dining out as it puts the burden on me to carry the bag home
	If I am travelling and don't have access to a refrigerator [P16]	3. Leftovers are not taken away after dining out as it creates the hassle of storing
	If the food doesn't last well or reheat well [P27]	4. Leftovers are not taken away after dining out as it creates the hassle of disposing of the box
	If the food isn't good or possibly won't travel well (as in noodles or soup dishes) [P34]	5. Leftovers are not taken away after dining out as I worry about handling them
	If it is burdensome to carry the box home and to dispose the package [P39]	6. Leftovers are not taken away after dining out as I worry about refrigerating them
	If I don't know if and when I will be able to eat leftovers taken home [P43]	
Over-ordering behaviour	*I over-order … .*	1. How often do you order more food dishes that are too much for your appetite?
	When there's a lot on the menu, and I can't decide what to get [P10]	2. How often do you order more food dishes that are too much for satisfying your hunger?
	Seeing two dishes on the menu that I want to try and I can't decide between them if there is a deal going on [P19]	3. How often do you order more food dishes than required without thinking when dining out?
	Since I just get greedy and want to buy a lot more food because it's fun [P33]	4. How often do you order more food dishes than required because of the variety in the restaurant food?
	I naturally order three courses to prolong and fully enjoy the eating out experience [P37]	
	Due to my inability to determine how much food I can actually manage [P46]	
Leftover reuse routine	*When I take leftovers home … ..*	1.Leftovers brought home after dining out are eaten as it is or reheated when needed
	I put it in the fridge and reheat later when I am ready to eat it [P17]	2. Leftovers brought home after dining out are stored in appropriate conditions so they will last longer
	I almost always eat the leftovers for lunch or dinner the following day [P20]	3. Leftovers brought home after dining out are definitely eaten
	I reheat them either on the stove, oven, or microwave (depending on the exact type of food leftover) [P23]	4. Leftovers brought home after dining out are placed in the fridge
	I store in the fridge and decide when to eat it next [P28]	5. Leftovers brought home after dining out are utilised as much as possible
	Sometimes, I'll take it to work the next day in a lunch bag, other times I'll eat it at home for my next meal [P45]	

using the PROCESS macro in SPSS. Since CB-SEM has various data-related requirements, as discussed by recent studies (e.g. Talwar et al., 2021), we screened the data for these requirements as discussed below.

Table 3. Demographic description of the study participants.

Demographic variable	Category	Frequency	Percentage
Age	25–30 years	114	27%
	31–35 years	95	22%
	36–40 years	66	15%
	41–45 years	58	14%
	46–50 years	37	9%
	51–60 years	56	13%
Household size	Only one member	74	17%
	Two members	131	31%
	Three members	106	25%
	Four members	90	21%
	Five members	20	5%
	Six members	4	1%
	Seven members	1	0%
Gender	Male	179	42%
	Female	247	58%
Educational background	Completed high school	105	25%
	Pursuing/completed professional degree/vocational school	36	8%
	Pursuing/completed bachelors' degree	173	41%
	Pursuing/completed masters' degree	92	22%
	Pursuing/completed doctorate (PhD or equivalent)	20	5%
Monthly income	Less than 2,000 USD	171	40%
	2,000–3,999 USD	117	27%
	4,000–5,999 USD	62	15%
	6,000–7,999 USD	30	7%
	8,000–9,999 USD	13	3%
	10,000 and more USD	33	8%

Table 4. Marker variable test.

Model	χ	df	CFI	RMSEA (90% of CI)	p-value	Model Comparison
CFA with Marker	1911.2	968	0.933	.048(.045,.051)		
Baseline	2518.9	981	0.891	.061(.058,.064)		
Model C	2530.8	981	0.89	.061(.058,.064)	df is 0	vs Baseline
Model U	1872.3	939	0.934	.048(.045,.052)	not significant ($p = 1$)	vs Model C
Model R	1872.5	954	0.935	.048(.044,.051)	not significant ($p = 1$)	vs Model R

4. Results

4.1. Data screening

We first screened the data for normality and outliers. Our analysis confirmed that the data is normally distributed, as there is no deviation in the value of skewness and kurtosis value beyond the recommended limit (Kline, 2011). Furthermore, there are no outliers or missing values in the dataset. We also confirmed that there are no multicollinearity issues by evaluating the tolerance and variance inflation factor (VIF), which were in keeping with the recommended cut-offs (O'Brien, 2007).

4.2. Common method bias (CMB)

Since our research design included data collection through self-reported surveys, we employed both a priori and post hoc approaches recommended by Podsakoff et al. (2012) as a safeguard against the risk of common method bias (CMB). For the a priori measure, we ensured that the cover story did not reveal the study's actual purpose and arranged the items randomly to collect data. We also used attention-check questions to check for respondents' alertness while responding and assured them that their responses would be kept anonymous.

For the post-hoc measure, we employed two statistical tests to evaluate the collected data for CMB. First, we conducted Harman's single factor test to check if the data had CMB (Podsakoff et al., 2003). The test results revealed that a single factor explained only 28.24% of the total variance, well below the recommended threshold value of 50% (Talwar et al., 2020a, 2020b). We also conducted a Marker variable test for CMB, which also confirmed the absence of the issue, as reported in Table 4.

4.3. Validity and reliability statistics

Initially, the measurement model was evaluated using confirmatory factor analysis (CFA). The model returned a good model fit ($\chi2/df = 1.88$, $RMSEA = 0.05$, $TLI = 0.96$, $CFI = 0.96$). Next, we evaluated the convergent and discriminant validity of the constructs. Composite reliability (CR), average variance extracted (AVE), and factor loadings were examined to confirm convergent validity. As presented in Table 5, the CR value of the constructs meets the suggested cut-off of 0.70 (Hair et al., 2006), and the AVE values meet the suggested cut-off of 0.50. In addition, as presented in Table 6, the factor loadings for all items exceed the cut-off value of 0.60 (Bagozzi & Yi, 1988). Furthermore, the data possesses discriminant validity as the square root of AVE of each construct is higher than its corresponding correlational value (Fornell & Larcker, 1981), as presented in Table 5. Additionally, we performed heterotrait-monotrait (HTMT) analysis to assess the discriminant validity, in line with previous recommendations (Henseler et al., 2015). The HTMT values, as presented in Table 7, were below 0.85, thus reaffirming discriminant validity.

4.4. Structural model and testing of hypotheses

The study results suggest that age, gender, educational background, and household size have no confounding effect on the three outcome variables of attitude, intentions, and over-ordering. The structural model returned a good data fit with key statistics ($\chi2/df = 1.88$, $CFI = 0.95$, $TLI = 0.94$, $RMSEA = 0.05$) having satisfactory values. The variance explained values are as follows: reasons for (7.3%), reasons against (0.8%), attitude (45.1%), intentions (60%) and over-ordering (6.8%). H1 is thus supported as attitude towards taking leftovers reported a significant positive association with the intentions to take away leftovers ($ß = 0.45$, $p < .001$). Hypotheses H2a & H2b are supported since the reasons for is positively associated with attitude ($ß = 0.51$, $p < .001$) and intentions ($ß = 0.43$, $p < .001$). Similarly, H3a is supported, with reasons against having a negative association with attitude ($ß = -0.17$, $p < .001$). However, H3b is not supported, with reasons against having no association with intentions ($ß = 0.03$, $p > .05$). Next, H4a and H4c are supported with moral norms having a positive association with both reasons for ($ß = 0.27$, $p < .001$) and attitude ($ß = 0.26$, $p < .001$). In comparison, H4b is not supported, with moral norms having no association with reasons against ($ß = -0.09$, $p > .05$). H5a is supported since intentions have a positive association with over-ordering ($ß = 0.21$, $p < .01$). In comparison, H5b is not supported since reasons for has no association with over-ordering ($ß = -0.01$, $p > .05$). A more surprising result is the statistically significant positive association between reasons against and over-ordering ($ß = 0.16$, $p < .01$). However, H5c is not supported as we had posited a negative association between the two. The results are presented in Figure 2.

4.5. Mediation analysis

We analysed the mediation hypotheses using Model 4 of the PROCESS macro. Herein, we tested the significance of the mediation effect of reasons, attitude, and intentions using the non-parametric bootstrapping method for 5000 resamples, with a 95% confidence interval (Preacher & Hayes, 2008). Results of the analysis, presented in Tables 8 and 9, reveal that reasons for partially

Table 5. Descriptive, validity, and reliability statistics.

	Mean	SD	α	CR	AVE	MSV	ASV	OOB	MN	RF	RA	ATT	INT
OOB	2.60	0.96	0.93	0.93	0.70	0.03	0.01	**0.84**					
MN	3.67	1.05	0.93	0.93	0.68	0.15	0.07	0.05	**0.83**				
RF	3.91	0.97	0.92	0.92	0.63	0.48	0.23	0.08	0.26	**0.80**			
RA	1.83	0.87	0.88	0.89	0.57	0.19	0.09	0.09	−0.08	−0.44	**0.76**		
ATT	3.86	0.85	0.84	0.85	0.65	0.49	0.24	0.13	0.39	0.63	−0.39	**0.81**	
INT	3.46	1.18	0.92	0.93	0.76	0.49	0.25	0.16	0.37	0.70	−0.32	0.70	**0.87**

Note: Composite reliability = CR, Average variance extracted = AVE, Maximum shared variance = MSV, Average shared variance = ASV, the diagonal values mentioned in bold represent square root of AVE. OOB = Over-ordering behaviour, MN = Moral norms, RF = Reasons for, RA = Reasons against, ATT = Attitude towards taking away leftovers, INT = Intentions to take away leftovers.

mediate the association between moral norms and attitude towards taking leftovers, thereby indicating support for H6a. However, H6b is not supported as reasons against have no mediating influence on this association. The results also reveal support for H7a-b since attitude partially mediates the relationship between both reasons and intentions. Finally, the results of the mediation analysis confirm support for H8a-b, wherein intentions fully mediate the association between reasons for and over-ordering (H8a). In contrast, it partially mediates the association between reasons against and over-ordering (H8b).

4.6. Moderation analysis

We conducted a moderation analysis in Model 1 of the PROCESS macro, bootstrapping the effects 5,000 times to generate the interaction terms and the related 95% confidence intervals. The results of the analysis, presented in Table 10 and Figure 3, reveal support for H9, indicating that leftover reuse routine negatively moderates the association between intentions to take away leftovers and over-ordering.

5. Discussion

The study has identified and addressed four research questions framework based on the review of the prior extended literature, the theoretical tenets of BRT, and the qualitative and quantitative study results. To address **RQ1.**, which queried if and how the values/beliefs in the BRT framework interact with reasons for and against taking away leftovers after dining out, we identified moral norms as the value and delineated the reasons for and reasons against through our qualitative study. We then proposed and tested the hypothesised positive association of values with reasons for and the hypothesised negative association of values with reasons against. The results revealed support for the positive association of values with reasons for, as anticipated based on the prior findings (e.g. McCarthy & Liu, 2017; Parizeau et al., 2015; Stancu et al., 2016). This finding implies that bad conscience, moral conflict, the feeling of guilt, and regret arising from leaving leftovers after dining out (which leads to food waste), are positively associated with the reasons that motivate diners to take away leftovers. In other words, diners' moral norms encourage them to consider taking leftovers away for later consumption.

In comparison, moral norms are not statistically associated with reasons against. A potential explanation for this finding could be that most of the reasons against are related to convenience, i.e. difficulty in carrying the leftovers and storing them, due to which the diners feel practical constraints that are not tied to the moral aspect of the situation. This result is acceptable from the BRT perspective, which argues that beliefs and values may not always become the reasons for a behaviour (Westaby, 2005). Accordingly, our related research question also embodied the possibility of no association by inquiring whether and how such an association could occur. An overarching explanation can also be offered from the evolving valence in the consumer

Table 6. Study measures, measurement items, and factor loadings for measurement and structural model.

Study Measures	Measurement items	CFA	SEM
Moral norms (MN)	Leaving leftovers after dining out leads to food waste, so it makes me feel guilty about people who do not have enough food	0.77	0.77
	Leaving leftovers after dining out leads to food waste, so it gives me a bad conscience	0.84	0.84
	Leaving leftovers after dining out leads to food waste, so it is against my morals	0.77	0.77
	Leaving leftovers after dining out leads to food waste, so it makes me feel guilty about the wastage of resources	0.83	0.83
	Leaving leftovers after dining out leads to food waste, so it makes me feel bad	0.92	0.92
	Leaving leftovers after dining out leads to food waste, so it gives me a feeling of regret	0.81	0.81
Reasons for (RF)	Leftovers are taken away after dining out if there are multiple uses	0.63	0.63
	Leftovers are taken away after dining out to consume as breakfast or dinner	0.83	0.82
	Leftovers are taken away after dining out if I want to avoid cooking again	0.79	0.79
	Leftovers are taken away after dining out if I want to save the cost of another meal	0.81	0.82
	Leftovers are taken away after dining out since I have paid for the food	0.83	0.83
	Leftovers are taken away after dining out when I feel I cannot eat anymore	0.81	0.80
	Leftovers are taken away after dining out since it helps save time and money	0.86	0.86
Reasons against (RA)	Leftovers are not taken away after dining out as they create the pressure of consuming them for the next meal	0.77	0.76
	Leftovers are not taken away after dining out as it puts the burden on me to carry the bag home	0.72	0.72
	Leftovers are not taken away after dining out as it creates the hassle of storing	0.86	0.86
	Leftovers are not taken away after dining out as it creates the hassle of disposing of the box	0.69	0.69
	Leftovers are not taken away after dining out as I worry about handling them	0.74	0.75
	Leftovers are not taken away after dining out as I worry about refrigerating them	0.75	0.75
Attitude towards taking away leftovers (ATT)	Taking away leftovers after dining out is an extremely positive thing	0.86	0.85
	Taking away leftovers after dining out is a wise act	0.82	0.81
	Taking away leftovers after dining out is a fabulous act	0.74	0.73
Intentions to take away leftovers (INT)	My goal is to take away leftovers after dining out	0.81	0.80
	I try to take away leftovers after dining out	0.85	0.85
	I intend to take away leftovers after dining out	0.92	0.91
	I plan to take away leftovers next time I dine out	0.91	0.90
Over-ordering behaviour (OOB)	How often do you order more food dishes than required when dining out?	0.89	0.89
	How often do you end up ordering more food dishes than you originally planned to order?	0.83	0.83
	How often do you order more food dishes that are too much for your appetite?	0.84	0.84
	How often do you order more food dishes that are too much for satisfying your hunger?	0.83	0.83
	How often do you order more food dishes than required without thinking when dining out?	0.85	0.85
	How often do you order more food dishes than required because of the variety in the restaurant food?	0.80	0.80
Leftover reuse routine (LRR)	Leftovers brought home after dining out are eaten as it is or reheated when needed	Moderator	
	Leftovers brought home after dining out are stored in appropriate conditions so they will last longer		

Table 6. Continued.

Study Measures	Measurement items	CFA	SEM
	Leftovers brought home after dining out are definitely eaten		
	Leftovers brought home after dining out are placed in the fridge		
	Leftovers brought home after dining out are utilised as much as possible		

Note. CFA = Confirmatory factor analysis in the measurement model, SEM = structural equation modelling.

behaviour and marketing literature, such as the valence of word of mouth (WOM), which scholars argue are distinct concepts rather than opposites. Both positive and negative WOM, in this instance, are driven by a separate set of factors (Talwar, Kaur et al., 2020). Drawing from this, it can be argued that diners' reasons for are driven by values, but reasons against are not. In any case, this is the first study to contemplate the association between values and reasons against in the context of taking away leftovers, so we suggest that the association be investigated with different samples before drawing any conclusions.

In response to **RQ2**, inquiring if and how the values and reasons are associated with attitude and intentions to take away leftovers after dining out and engage in over-ordering behaviour, we analysed the collected data to evaluate if the proposed associations are statistically supported. First, we examined the association of moral norms and reasons with attitude. The results indicated support for a positive association of values (moral norms) and reasons for with attitude. These outcomes are in tandem with existing findings in varied contexts (e.g. de Barcellos et al., 2015; Westaby, 2005), implying that bad conscience, regret, and the guilt associated with wasting food when so many are deprived of basic meals, as well as the draining effect that such waste has on resources, will positively associate with diners' favourable disposition towards taking away leftovers. At the same time, the rationalisation that the leftovers taken away can be consumed later to save money and time is also positively associated with the attitude that taking away leftovers is an affirmative, wise, and fabulous act. Similarly, reasons against, which are factors related to convenience, such as difficulty in taking away leftovers, handling them, the pressure of consuming them, storing them, and hassle in disposing of the box, negatively correlate with the attitude of considering taking away leftovers as a wise and commendable act.

Consistent with BRT propositions and the prior extended literature (e.g. Chang, 2021; Okumus et al., 2020; Quested et al., 2013; Stefan et al., 2013; Westaby, 2005), we also proposed and tested the association of reasons with intentions to take away leftovers and engage in over-ordering behaviour. The results only reveal support for the positive association of reasons for with intentions, implying that reusing leftovers taken home to save cooking time and money has a relationship with the intent and plan to take away leftovers after dining out. In comparison, reasons against are not found to have a statistically significant negative association with over-ordering. We had anticipated this association, rationalising that the hassle of handling leftovers in transit and at home would cause diners to order such that there are no leftovers. A possible explanation for this could be that reasons against taking away leftovers associate with behaviour indirectly through the intervening mechanism of intentions, as we also examined, rather than a simple, obvious direct association. Here we would like to mention that the results revealed an unexpected positive association between reasons against and over-ordering. While there is a growing trend in the literature (e.g. Talwar et al., 2021) to evaluate such results from the perspective of paradoxical findings, we contend that this lack of direct association between reasons against and behaviour is attributable more to the intervening mechanism.

In addition, the results reveal that reasons for and against are not associated with over-ordering behaviour. Since the current research is one of the first empirical attempts to examine these associations, further research is required to explain the dynamics better and consider hitherto un-explored dimensions. However, if we venture to speculate, an explanation for this

Table 7. HTMT analysis.

	MN	RF	RA	ATT	INT	OOB
MN	■					
RF	0.26	■				
RA	0.07	0.43	■			
ATT	0.38	0.62	0.39	■		
INT	0.37	0.70	0.32	0.70	■	
OOB	0.04	0.10	0.09	0.14	0.17	■

OOB = Over-ordering behaviour, MN = Moral norms, RF = Reasons for, RA = Reasons against, ATT = Attitude towards taking away leftovers, INT = Intentions to take away leftovers.
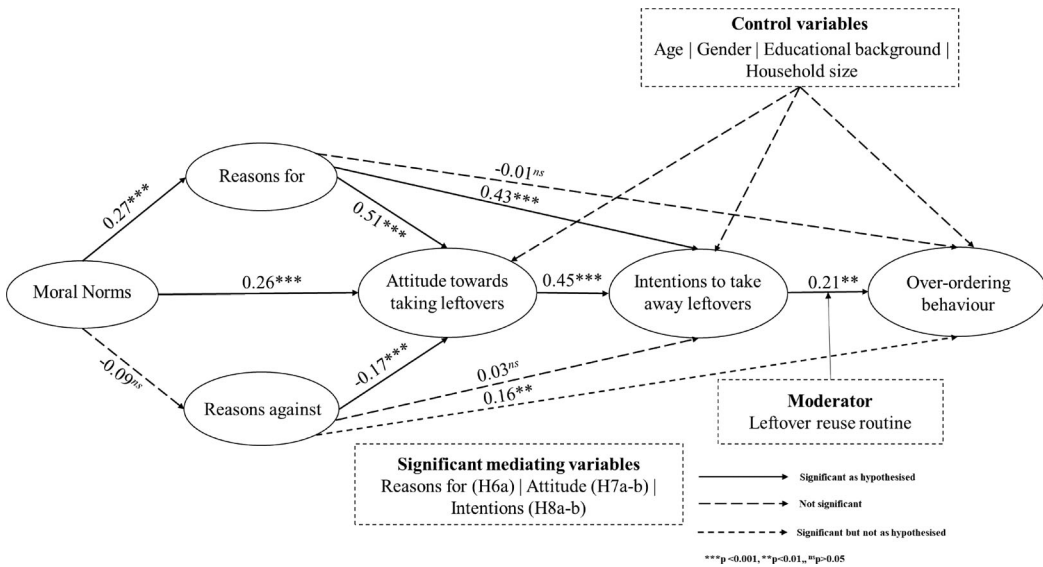

Figure 2. Results of hypotheses testing.

unanticipated finding could be that there are so many nuances (societal, environmental, and familial) that may prevent diners from taking cognitive shortcuts rather than making them go through the path of intentions to make a decision. However, as there is no a priori evidence to invoke, we rationalise that there could be a more complex mechanism that could be impacting these two associations, as we discovered through the mediation analysis discussed below.

Through **RQ3**, we accommodated the possibility of the mediation effect of the variables in the BRT universe to elucidate the complexities of the human decision-making process better. In consonance with prior studies (e.g. Aschemann-Witzel & Aagaard, 2014; Claudy et al., 2013; Sahu et al., 2020), we proposed the mediation effect of reasons, attitude, and intentions and found support for all but one association, i.e. the mediation effect of reasons against on the association of moral norms with attitude. These results confirm that the decision of diners to take away leftovers is one that has multiple layers to it that go beyond the anticipated direct effects and flow through the pathway of intervening variables.

To respond to **RQ4**, we examined the moderation effect of leftover reuse routine on the association of intentions and behaviour. The results revealed a negative moderation effect. This implies that diners with low leftover reuse routine exhibited high over-ordering compared with the ones with high and medium intensities across the different magnitudes of intentions. In addition, the diners with low intentions experience similar strength of over-ordering for varied intensities of reuse routine. However, the intensity of over-ordering escalates with the increase in the strength of the intentions. This implies that the diners who have a high leftover reuse routine are quite conscious about food waste, which deters them from ordering more food than

Table 8. Results of mediation analysis.

MN → RF/RA → ATT

	β	se	t	p	LLCI	ULCI
MN → RF	.23	.04	5.17	.00	.1401	.3118
MN → RA	-.05	.04	−1.33	.19	-.1318	.0254
MN → ATT	.18	.03	5.40	.00	.1118	.2398
RF → ATT	.37	.04	9.87	.00	.2993	.4481
RA → ATT	-.15	.04	−3.64	.00	-.2322	-.0695
Total effect of MN → ATT	.27	.04	7.25	.00	.1956	.3410

RF → ATT → INT

	β	se	t	p	LLCI	ULCI
RF → ATT	.47	.04	13.23	.00	.4009	.5407
RF → INT	.53	.05	10.94	.00	.4367	.6280
ATT → INT	.52	.06	9.36	.00	.4134	.6331
Total effect of RF → INT	.78	.04	17.33	.00	.6904	.8670

RA → ATT → INT

	β	se	t	p	LLCI	ULCI
RA → ATT	-.32	.04	−7.22	.00	-.4124	-.2359
RA → INT	-.13	.05	−2.31	.02	-.2346	-.0187
ATT → INT	.81	.06	14.46	.00	.7007	.9212
Total effect of RA → INT	-.39	.06	−6.15	.00	-.5139	-.2651

RF → INT → OOB

	β	se	t	p	LLCI	ULCI
RF → INT	.78	.04	17.33	.00	.6904	.8670
RF → OOB	-.02	.06	-.27	.79	-.1378	.1050
INT → OOB	.13	.05	2.64	.01	.0344	.2352
Total effect of RF → OOB	.09	.05	1.86	.06	-.0050	.1820

RA → INT → OOB

	β	se	t	p	LLCI	ULCI
RA → INT	-.39	.06	−6.15	.00	-.5139	-.2651
RA → OOB	.15	.06	2.74	.01	.0424	.2586
INT → OOB	.16	.04	3.90	.00	.0783	.2372
Total effect of RA → OOB	.09	.05	1.66	.10	-.0162	.1943

Table 9. Indirect effects between dependent and independent variable.

	Effect	se	LLCI	ULCI	Mediation
MN → RF → ATT	.08	.02	.0456	.1303	Partial
MN → RA → ATT	.01	.01	-.0034	.0251	No
RF → ATT → INT	.25	.04	.1739	.3225	Partial
RA → ATT → INT	-.26	.05	-.3637	-.1715	Partial
RF → INT→ OOB	.10	.04	.0289	.1847	Full
RA→ INT→ OOB	-.06	.02	-.1010	-.0262	Partial

Table 10. Moderation effect of leftover reuse routine (LRR).

Moderator: LRR	β	t	p	LLCI	ULCI	Moderation?
INT → OOB	.19	−3.23	.00	-.3045	.0742	Yes

required to satisfy their hunger. In other words, concern for food waste expressed through having a high leftover reuse routine dissuades diners from indulging in over-ordering while dining out.

6. Conclusion

Leftovers from dining out are acknowledged as crucial food waste generators (Restaurant Food Waste Action Guide, 2018; WRAP, 2013). At the same time, a growing body of literature (e.g. Sirieix et al., 2017) has initiated a debate on how taking away the leftovers after dining out is a viable food waste reduction strategy. However, these studies have largely focused on what would motivate or prevent diners from taking away leftovers. Our study seeks instead to provide
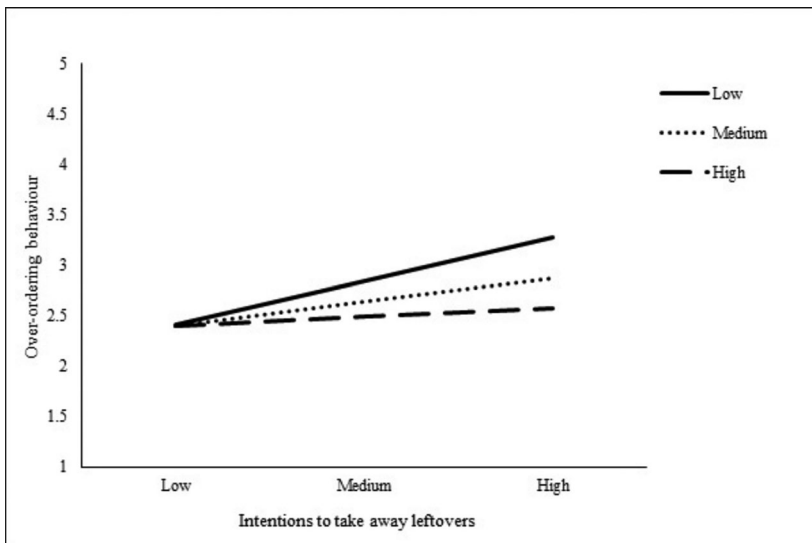
Figure 3. Moderation effect of leftover reuse routine (LRR).

a broader view of diners' leftovers takeaway decision by proposing moral norms as values and reasons for as positive antecedents of attitude and intentions related to taking away leftovers as well as reasons against as inhibitors of the same. Going a step further, we also considered the possibility of over-ordering food and the potential role of leftover reuse routine to bring forth the entire spectrum of diners' decision-making related to taking away leftovers after dining out.

This study makes two novel contributions to the existing literature on food waste in the hospitality sector. First, it is one of the pioneering attempts to empirically assess and explain the antecedents and consequents of diners' attitudes and intentions to take away their leftovers after dining at restaurants. In this regard, the present study uncovers the complex mechanism of how individual values, along with reasons for and against associated with taking away leftovers, drive attitude and intentions to engage in this behaviour. Furthermore, the study reveals how favourable attitude and intentions to take away leftovers, along with the moderation effect of leftover reuse routine, cause diners to rationalise over-ordering food, which may potentially lead to food waste. In particular, the research investigates the proposed associations through the lens of BRT, which is adept at explicating complex interactions among study variables. Second, the study identifies a novel construct, over-ordering food, and how it is associated with diners' intentions to take away leftovers. Although it has been discussed anecdotally that ordering excess food results in food waste in out-of-home dining, to our knowledge, no published research has formalised its measurement so far nor examined its association with food waste variables. However, lending credibility to the need for such a formal measure, this concept of over-ordering is an extrapolation of the concept of shopping routine, which has been examined in the context of household food waste by prior studies (Stancu et al., 2016; Stefan et al., 2013).

6.1. Theoretical implications

The current study offers four theoretical implications. First, our findings extend the understanding of individuals' out-of-home dining decision-making process that results in food waste generation and reduction. We provide new insights into individuals' dining behaviour in out-of-home settings by including a broad spectrum of variables, ranging from moral values that motivate waste reduction to the hedonic pleasure of over-ordering, which by diners' admission, increases leftovers. Most importantly, our study proposes the novel construct of over-ordering behaviour,

which captures the motivation and tendency to over-order and highlights the intricacies of pro-environmental decisions. This construct can help researchers better analyse the behaviour of diners in varied hospitality settings.

Second, our study advances the accumulated knowledge in the area by exploring more complex mechanisms of mediation and moderation that explain the decision-making process related to taking away leftovers more extensively than the anticipated direct effects. For instance, by revealing that leftover reuse routine interacts with leftover take away intentions to reduce the urge to indulge in the behaviour of over-ordering (which is not sustainability-oriented), our study provides a wider and more textured understanding of how the at-home, sustainability-oriented manifestation of leftover reuse routine spills over to the out-of-home setting to dissuade diners from over-ordering and, thus, exhibit sustainability-oriented behaviour.

Third, the study gives momentum to the concept of taking away leftovers and reusing them as an effective and easily implementable way of diverting food from being wasted, particularly from the perspective of restaurants. In the food waste literature, safety concerns have been raised about donating edible plate waste for the less-privileged to consume, especially with strict local regulations in some countries (e.g. Okumus et al., 2020; Prescott et al., 2020). Leftovers being taken to be consumed by the diners themselves would help reduce such issues and save the restaurants from the legally challenging alternative of donating food to charity. In sum, by reinforcing the significance of leftover takeaway as a viable food waste management strategy for restaurants, our study opens another area of study for hospitality researchers.

Finally, our study answers the recent calls for greater behavioural insights related to food waste to explicate the psychology of consumers in a more nuanced way (e.g. Kaur et al., 2021). Our study utilises BRT to offer a deep dive into diners' intentions to take away leftovers. By doing so, we contribute to the theoretical advancement of the food waste literature by offering a theoretical lens that has not been previously applied in the context. In addition, we also contribute to extending the applicability of BRT to pro-environmental and sustainability-oriented decision-making, thereby enhancing its contemporary relevance.

6.2. Practical implications

The present study offers important implications for multiple stakeholders, such as the restaurants, society, and governments, for promoting sustainability-oriented behaviours and routines. First, since our findings reveal that moral norms related to the concern for food waste when so many people are deprived of food and the guilt associated with the adverse effect of food waste on resources are positively associated with the reasons for and attitude towards taking away leftovers, restaurants should try to leverage these norms to impact the decision of diners to take away leftovers. Restaurants would be willing to expend this effort since leftovers taken away after dining reduce the burden on the restaurants to divert or dispose of the leftovers generated. Indeed, after understanding that moral norms and feeling of guilt can work effectively to heighten positive disposition of diners towards taking leftovers away after dining, the restaurants may endeavour sincerely to devise effective strategies in this regard since recent research has noted that the restaurateurs are quite excited now a days by the opportunities to foster sustainability related engagements (e.g. Higgins-Desbiolles & Wijesinghe, 2019). There are multiple ways in which restaurants can engage the attention of diners to take away leftovers by using moral dimension. The strategies could be as simple as displaying posters in the dining area with a moral appeal to conserve resources and consider people who are deprived of proper meals, or as intuitive as overtly emphasizing their own eco-friendly practices such as using reusable napkins. They can also plan a '*green day*' once every week/fortnight/month and inform patrons about the same. Such earmarked day and communication about it can be expect to engage the attention of diners, making them think about their own environmental and moral responsibility

of reducing food waste. On the whole, our study supports the fact that engaging with diners at moral level could be rewarding as it is likely to make them feel socially responsible, and make them contemplate taking away their leftovers.

Second, since our findings indicate that reasons against, such as the hassle related to taking away leftovers and storing them, are negatively associated with attitude to take away leftovers, we suggest that restaurants spend some effort designing easy to carry, spill-proof packages that are of a suitable size to fit in the refrigerator directly and that are made of microwave-safe material for convenient reheating. Given that the frontline employees are the ones who interact with the diners, restaurant management should also focus on training these employees to engage with the diners and offer to pack up unconsumed leftovers in a non-intrusive and polite way such that the diners do not get offended, while emphasising how easy and convenient their restaurants takeaway boxes are to carry, store, and dispose of.

Third, our results reveal that the diners who have a high leftover reuse routine tend to over-order less frequently, despite the rationalisation offered by their high intentions to take away leftovers. Put differently, high leftover reuse routine is an indicator of individuals' greater sustainability orientation. This implies that from a societal standpoint, the concerned stakeholders, such as governments, should create awareness of the importance of leftover reuse as a strategy to reduce food waste. Some local, national, and global campaigns related to food waste have thus far focused on the adverse outcomes of such waste, which may create dissonance in individuals' minds and cause them to either order and eat less or order as much as they want and go on eating (even after their hunger is satiated) so that nothing is wasted. Both behaviours can result in poor health outcomes.

In comparison, campaigns focused on leftover reuse will motivate diners to choose a more practical approach to reducing food waste without compromising their dining pleasure or health. As our results confirmed that moral norms positively influence reasons to take away leftovers, such campaigns should focus on values and norms to be more effective, as discussed by prior extended literature in different contexts (Claudy et al., 2013). These campaigns can trigger emotions, such as shame/guilt for wasting food (Jagau & Vyrastekova, 2017), further promoting not only leftover takeaway intentions but also diners' reuse routine.

6.3. Limitations and future research areas

The present research makes a notable contribution to theory and practice. However, like any empirical effort, the study has certain limitations that should be kept in mind while evaluating the findings. First, the study used a cross-sectional design to collect self-report data from respondents, which could have created the possibility of socially desirable responses (Kaiser et al., 2008). We tried to counteract this challenge by assuring the respondents' complete anonymity. Second, we examined relationships among antecedents and consequents of leftover takeaway intentions using a cross-sectional survey, collecting data in a single wave to produce correlational findings. Although this is a promising exploratory study, experimental or longitudinal studies need to be undertaken to uncover causal associations. Third, the data for our study were collected from a developed country (i.e. the US), and therefore the results may not be generalisable to developing countries or under-developed countries due to different economic and cultural contexts. We recommend that future research should corroborate our findings in different countries, taking into consideration cultural dimensions, such as individualism-collectivism (Hofstede et al., 2010).

While our results indicated that the socio-demographic factors (i.e. age, gender, education background, and household size) had no confounding effect on the proposed relationships, there could still be some psychographic variables, such as food safety concerns and health consciousness, that may affect the proposed association. We suggest that future studies identify and

incorporate such variables in our model. Moreover, our study is based on self-reported intentions and behaviours. More insightful findings can thus be generated through observation-based studies to report actual behaviour. In addition, the takeaway of the food waste studies can be improved by quantification of the waste generated.

Furthermore, we have examined only over-ordering as a behaviour that may lead to food waste. There can be a number of other reasons that may cause diners to leave unconsumed food uneaten food after eating out. For instance, large portion sizes, bad taste of food, dirty serving dish, sudden loss of appetite, dispute about item ordered and so on. We suggest that future researchers may expand the current understanding of food waste in out-of-home settings by considering larger set of factors that can potentially drive food waste.

Disclosure statement

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