

Article

How the Extended Theory of Planned Behavior Can Be Applied in the Research of the Influencing Factors of Food Waste in Restaurants: Learning from Serbian Urban Centers

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Abstract: This study is based on the general notion that restaurants should find more responsible solutions to dispose of the large amount of food that is not consumed. Moreover, the food wasted has great environmental, social and financial impacts, and yet this issue is still insufficiently presented in contemporary studies on food waste management. This paper applied the extended theory of planned behavior as a theoretical framework to elicit consumers' behavior concerning food waste. A standard paper and pen survey recorded quantitative data provided by 221 respondents. The findings reported the following: (1) personal attitudes toward food waste positively affect an individual's intention not to waste food; (2) perceived behavioral control positively affects an individual's intention not to waste food; (3) the intention not to waste food negatively affects self-reported food waste behavior; (4) negative environmental attitudes negatively affect intention not to waste food; (5) hygiene-based food waste negatively affects perceived behavioral control. This study contributes to understanding consumers' food waste behavior in restaurants and might have practical implications in the hospitality sector.

Keywords: food waste; consumer behavior; theory of planned behavior; restaurant

1. Introduction

According to The Food and Agriculture Organization of the United Nations (FAO) "food waste is the decrease in the quantity or quality of food resulting from decisions and actions by retailers, food services, and consumers" [1] (p. 5). Food waste represents a global problem which is becoming a focus of interest of governments, non-governmental organizations, industry and media. Since eating out of home is becoming very common these days, the reduction of food waste in the food-service sector is of great importance [2]. In their study, Heikkilä et al. [3] emphasized that one-third of the population uses public food services daily. There are estimates that 20 to 25% of food waste is generated in the food-service sector, where plate waste is the most significant component [4]. Plate waste is defined as the amount of edible parts of the food served but not eaten and it is a common reason for food waste in this sector and at the consumer level [5]. The management of plate waste is also a great economic problem that restaurant operators are facing. Non-consumed food may be interpreted by restaurant managers as a sign of guests' dissatisfaction, but it can also be seen as a cost incurred without adding value for the consumer [6]. Most research

in the food service sector deals with food management operations, and the amount of food wasted, rather than consumers' behavior [3,7–11]. Ajzen's theory of planned behavior (TPB) is probably one of the most frequent models used in the studies aimed at recognizing consumer behavior in different circumstances. It supposes that the most important factor that determines an individual's behavior is their intention to behave in a certain way; that is, their motivation and willingness to act [12]. TPB has attracted the attention of numerous researchers who deal with food waste habits and activities in the context of everyday life [13–21]. The extended TPB model for investigating food waste in the restaurant and hotel industry has been applied by several researchers [22–26]. The aim of this study was to build on the existing research and expand the comprehension of food wasting behavior in the context of restaurant guests, where little such research has been undertaken, particularly in Serbia. The primary aim of this study was to test the expanded TPB in restaurants of the three major city centers in Serbia (Belgrade, Novi Sad, Subotica), as well as to investigate how the inclusion of environmental attitudes and situational factors (restaurant food waste causes) increases the prognostic ability of the primary TPB model to further clarify restaurant customers' food waste activities and habits.

2. Literature Review and Hypothesis Development

Ajzen [12] explains that personal attitudes toward behavior are used to evaluate the behavior that further turns into the intentions to perform certain behavior. Accordingly, a positive attitude creates a stronger intention to behave in a certain way, while a negative attitude creates a stronger intention not to behave in a certain way. Based on numerous studies, it has been proved that consumers have a negative attitude toward food waste; i.e., they feel bad and conscience-stricken if they waste food [17,18,27,28], and they show concern if they have wasted food [29]. The positive effect of personal attitudes toward food waste has also been proved in other reports [20,22]. Moreover, the intention to waste food is also influenced by the norms and attitudes of other people, so-called subjective norms. Subjective norms imply the perceived social pressure to perform certain behavior [12]. In some studies which dealt with food waste in households, it was proved that subjective norms have no or quite insignificant impact on the intention to waste food [13,18], while others proved that there is a significant positive impact of personal standards on the intention not to waste food [20,22,30]. The reason for adding into the TPB the final antecedent of intention, perceived behavioral control, was to extend the applicability of the theory to behaviors which cannot be always classified as based completely on one's will. This construct refers to past experience as well as to potential barriers or facilitators of the behavior and represents the perceived ease or difficulty of behaving in a certain way. It contributes to stronger intentions and in case of reduced volitional control, it adds to the prediction of behavior [12]. Previous studies proved that in the case of food waste behavior, supposed behavioral control has a significant positive influence on the intention not to waste food [22,25,31], and a negative impact on food waste behavior [17,18,22,25]. According to [12], intentional process (motivation or willingness to act) is what drives behavior. Previous studies also found that a higher intention to avoid or decrease food waste undesirably impacts food waste behavior [13,16,18,19,25]. Moreover, ref. [12] suggests that TPB contains other constructs beyond the base model. The extended TPB models were applied in several studies aimed at investigating the factors which affect food waste in households or restaurants. This paper aimed to shed more light on the restaurants' consumer food waste behavior by conducting an extended TPB, which involved environmental attitudes and restaurant food waste causes (food-based, ambiance-based, staff-based and hygiene-based) as additional predictors.

Restaurants and food services have a significant share in food waste, which is why they represent an important unsustainability hotspot [32]. On average, 21% of food waste in the sector arises from food spoilage, 45% from food preparation and 34% from consumers' plates [33]. Miroso et al. [34] believe that the people who take natural environment issues seriously are a lot more aware of the importance of food waste reduction. Due to the impact

that food waste in restaurants has on the natural environment, and the fact that prior studies of food waste behavior have emphasized the important effect of environmental factors [17,35,36], environmental attitudes have been included in the TPB model.

According to Schneider [37], situational factors can cause potential barriers and affect certain behavior. The author emphasizes that food waste behavior can be influenced by situational behavior, such as appetite, desire for food and the smell and appearance of food as well. Coşkun and Özbük [25] also point out that price awareness and food taste have a direct effect on food waste behavior and the plan to decrease food waste. Among situational factors which affect the perceived behavioral control and food waste behavior, Lorenz et al. [22] also include the portion size.

Many authors also emphasized the role of the ambience of the dining hall in affecting certain behavior, for example, the lack of time to eat and the pressure on children to finish their meals [9,38–40]. Itthiophakorn [41] includes several situational factors which affect the food waste in restaurants: food presentation, size of portions, variety of food, salience of food, shape of food equipment and quality of service. The author concludes that most of the respondents preferred a relaxed atmosphere and ambience, where layout, location and appearance of the staff working at the restaurants were equally important. Kim et al. [42] explicitly claimed that non-material elements, such as the atmosphere, interior design, lighting and ambience of a restaurant can be important business advantages. As a consequence of changes in lifestyle, eating out is becoming a habit, and consumers require new tastes and new experiences of the restaurant atmosphere and interior design [43]. The ambience affects people's attitudes and behavior, the design has an effect on how long they will take to consume their meal, how pleasant they will feel, what they will remember about the restaurant and whether they will wish to come there again [44].

The perceived quality of products and services in the restaurant industry is not the sum of individually (partially) determined state of quality features, but an integral whole formed by the specific structure and numerous interrelations of certain factors within, as well as among, all the groups of the factors referring to the quality of products and services in the food service sector [45]. The factors which cause dissatisfaction among guests in restaurants can relate to the undesired characteristics of products (cold dish, small portion, insufficiently heat-treated ingredients, low level of the hygiene of cutlery, tables, chairs, etc.), to ambience which is not in accordance with the guests' expectations (noise, inadequate room temperature, poor ventilation, etc.), as well as inefficient service processes (rude staff, too long waiting time, wrongly taken order, incorrect charge, etc.). If these factors are present, the guests' satisfaction is almost certainly going to be lower, and then it is possible that the desire to consume the food will decrease, which may lead to an increase in food waste. If one believes that the factors which cause food waste are under their control, their intention to decrease food waste rises [16,46], but if these factors are beyond their control, it will have a negative impact on their perceived behavioral control. Based on the already mentioned four situational factors of food-based, ambience-based, staff-based and hygiene-based food waste causes which affect food waste behavior through perceived behavioral control have been included in the TPB model. Figure 1 shows the proposed model of research.

Based on a review of the literature regarding the theory of planned behavior and influencing factors of food waste in restaurants, the following hypothesis are proposed:

Hypothesis 1 (H1). *Personal attitudes toward food waste positively affect an individual's intention not to waste food.*

Hypothesis 2 (H2). *Subjective norms positively affect an individual's intention not to waste food.*

Hypothesis 3 (H3). *Negative environmental attitudes negatively affect the intention not to waste food.*

Hypothesis 4 (H4). *Perceived behavioral control positively affects an individual's intention not to waste food.*

Hypothesis 5 (H5). *The intention not to waste food negatively affects self-reported food waste behavior.*

Hypothesis 6 (H6). *Perceived behavioral control negatively affects self-reported food waste behavior.*

Hypothesis 7 (H7). *Food-based food waste causes negatively affect perceived behavioral control.*

Hypothesis 8 (H8). *Ambiance-based food waste causes negatively affect perceived behavioral control.*

Hypothesis 9 (H9). *Staff-based food waste causes negatively affect perceived behavioral control.*

Hypothesis 10 (H10). *Hygiene-based food waste causes negatively affect perceived behavioral control.*

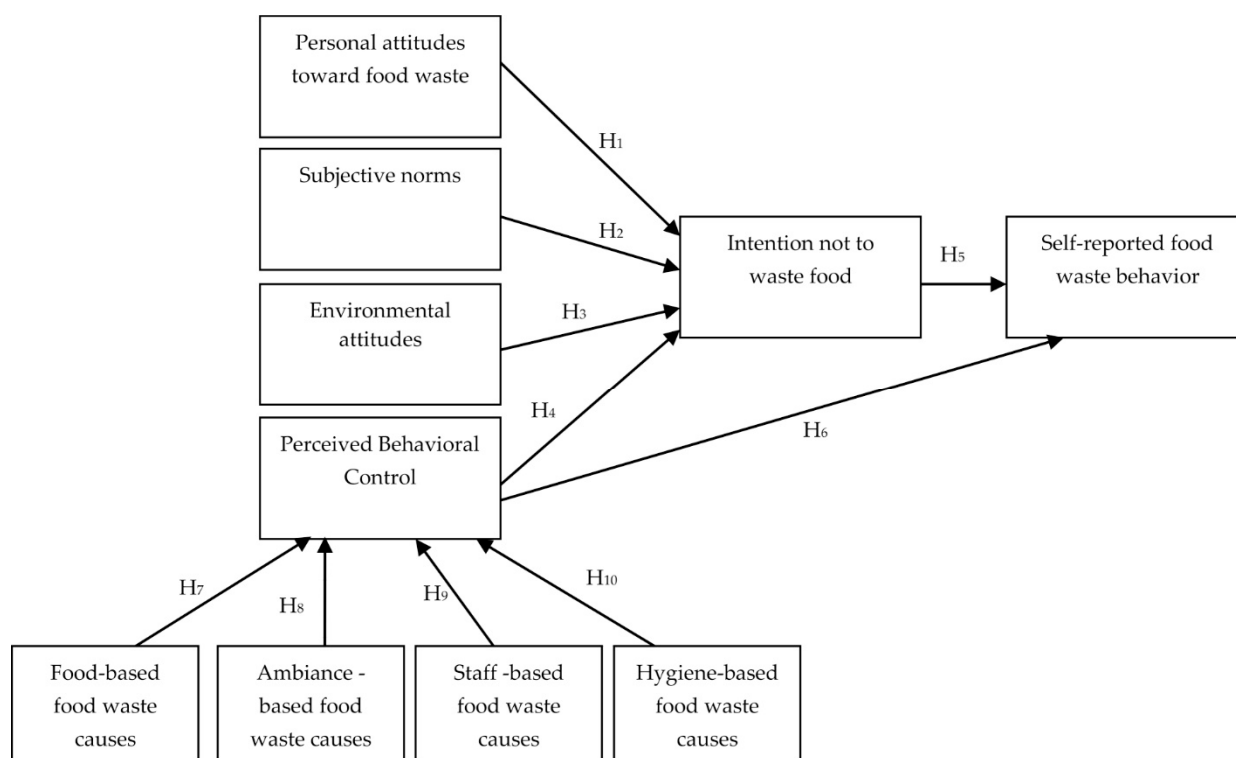


Figure 1. Proposed model of research.

3. Methods

3.1. Instruments

The questionnaire used in this study consisted of three parts. The first part of the questionnaire contained a question related to the frequency of eating in restaurants (1—rarely, 2—occasionally, 3—always). Further, respondents were asked to specify companions when eating in restaurants among the following choices: alone, with family, with friends, with business partners, and other. The second part measured the main sociodemographic characteristics of the participants, including age, educational level and sex. The third section comprised 10 sub-sections, which present the key components of the study model. Self-reported food waste behavior was measured with six items that previous research indicated are wasted the most [13,34]. Items worded as: How likely would you be to leave ... on your plate? The statements were assessed on the 5-point Likert-type scale (1—never, 2—rarely, 3—sometimes, 4—usually, 5—every time). One item related to the waste of dairy products was dropped out during the confirmatory factor analysis due to cross-loading with another factor. The other nine constructs were dignified with multi-item scales from earlier studies, by applying a five-point Likert-type scale—ranging from absolutely disagree (1) to strongly agree (5). Three items were applied to measure intention not to waste food adapted from [17]. Subjective norms were measured by two items, and personal attitudes toward food waste were evaluated by three items adapted from [18]. Perceived

behavioral control was measured with three items from [22]. Environmental attitudes were assessed using four items from [17]. The statements related to the environmental attitudes were negatively worded. Food-based food waste causes (seven items), ambience-based food waste causes (six items), staff-based food waste causes (four items) and hygiene-based food waste causes (four items) were adapted from [47]. All the statements related to food waste causes were negatively worded. Table 1 shows key factors' constructs and items.

Table 1. Key factors' constructs and items.

Factors	Items	Sources
Self-reported food waste behavior (SR)	How likely would you be to leave potatoes/rice/pasta on your plate?	(Mirosa et al., 2016)
	How likely would you be to leave vegetables on your plate?	(Stefan et al., 2013)
	How likely would you be to leave bread and other bakery products on your plate?	(Stefan et al., 2013)
	How likely would you be to leave dairy products on your plate?	(Stefan et al., 2013)
	How likely would you be to leave sauce on your plate?	(Mirosa et al., 2016)
	How likely would you be to leave meat/fish on your plate?	(Stefan et al., 2013)
Intention not to waste food (INT)	I intend not to leave food.	(Stancu et al., 2016)
	My goal is not to leave food.	
	I generally try not to leave food.	
Subjective norms (SUB)	People who are important to me find my attempts to reduce the amount of food wasted unnecessary.	(Stancu et al., 2016)
	People who are important to me think that I am greedy when I try to eat all food from my plate.	
Perceived behavioral control (PBC)	Predicting food amount at food choice is easy.	(Visschers et al., 2016)
	Finishing all the food on my plate is usually easy for me.	
	I could always finish all the food on my plate if I wanted to.	
Personal attitudes toward food waste (ATTD)	It is unnecessary to waste food—it can always be used in some way.	(Lorenz et al., 2017)
	It is immoral to throw away food while other people in the world are starving.	
	It upsets me when unused products end up in the waste bin.	
Environmental attitudes (ENV) *	Wasting food wouldn't make me feel guilty about the environment.	(Stancu et al., 2016)
	I don't think about the environment when I waste food.	
	I don't think about recycling the food waste generated (e.g., composting).	
	I don't think about reusing leftovers.	
Food-based food waste causes (FOOD) *	If the food that needs to be cold is warmed up, I don't consume all the food on my plate.	(Tekin and İlyasov, 2017)
	If the food that needs to be hot is cold, I consume all the food on my plate.	
	If I find the presentation of the food not interesting, I don't consume all the food on my plate.	
	If I take more food than I can eat, I don't consume all the food on my plate.	
	If I do not know about the content of the food, I don't consume all the food on my plate.	
	If I take more food than I can consume, I don't consume all the food on my plate.	
	If I find the look of the food not attractive, I don't consume all the food on my plate.	

Table 1. Cont.

Factors	Items	Sources
Ambiance-based food waste causes (AMB) *	If the restaurant is very noisy, I don't consume all the food on my plate.	(Tekin and İlyasov, 2017)
	If the heat conditions in the restaurant disturb me, I consume all the food on my plate.	
	If the music playing in the restaurant disturbs me, I don't consume all the food on my plate.	
	If the ventilation conditions of the restaurant are insufficient, I don't consume all the food on my plate.	
	If the smell in the restaurant disturbs me, I don't consume all the food on my plate.	
	If the comfort of my seat that I am sitting on while eating disturbs me, I don't consume all the food on my plate.	
Staff-based food waste causes (STAFF) *	If the staff at the restaurant has inadequate interest, I don't consume all the food on my plate.	(Tekin and İlyasov, 2017)
	If the communication between the staff at the restaurant is disturbing, I don't consume all the food on my plate.	
	If the communication of the staff at the restaurant with me is disturbing, I don't consume all the food on my plate.	
	If the service quality of the staff in the restaurant is insufficient, I don't consume all the food on my plate.	
Hygiene-based food waste causes (HYG) *	If the hygiene of the cutlery that I use to eat disturbs me, I don't consume all the food on my plate.	(Tekin and İlyasov, 2017)
	If the hygiene of the plate that I use to eat disturbs me, I don't consume all the food on my plate.	
	If the hygiene of the seat that I am sitting on while eating disturbs me, I don't consume all the food on my plate.	
	If the hygiene of the table on which I eat disturbs me, I don't consume all the food on my plate.	

Notes: * Attitudes are negatively worded.

3.2. Procedure

Before completing data collection, the content validity of the items was ensured with the assistance of two academics working on restaurant food waste management. A pilot test was engaged with the final form of the questionnaire to guarantee readability and clarity of the items with 35 respondents (students from the Department of Geography, Tourism and Hotel Management of the University of Novi Sad in Serbia). After the pilot test, minor changes in wording were made to the questionnaire.

The data were collected through a standard paper and pen survey, employing a convenient method for sampling. The survey was conducted from December 2019 till March 2020, and participation was anonymous and voluntary. The research was conducted in ordinary restaurants, and upscale restaurants (fine dining) in three urban destinations in Serbia (Belgrade, Novi Sad, Subotica). Initially, the restaurant managers were contacted with a request to help with this research by giving permission to interview their guests. The guests agreed to participate in the research, and they completed the survey questionnaire while waiting for their ordered food to be prepared. The average time needed for the completion of the questionnaire was 15 min. The research was performed in a total of 34 restaurants and 221 valid completed survey questionnaires were obtained. These data were processed by R and RStudio (lavaan, semPlot, and semTools packages) which was used for the CFA and SEM analyses.

4. Results

4.1. Study Sample

The sample consisted of 221 participants. There was a higher number of women in the sample (55.2%), while the average age of the participants was 38.83 (age range 18–70). The biggest group of those surveyed had finished undergraduate school (47.1%). When it came to the frequency of eating in restaurants, 40.7% said that they occasionally ate in restaurants, followed by 31.7% indicating that they often ate in restaurants. The majority of the respondents (42.5%) said that they ate with their friends (Table 2).

Table 2. Characteristics of respondents (N = 221).

Gender (%)		Education (%)	
Male	44.8	Secondary/High school	21.3
Female	55.2	Undergraduate	47.1
		Graduate/M.Sc. degree	24.4
		Graduate/Ph.D. degree	7.2
Age		Frequency of eating in restaurants (%)	
Average: 38.83, Std. 14.49		Rarely	5.9
		Occasionally	40.7
		Often	31.7
		Very often	20.8
		Always	0.9
Monthly income (in Serbian dinars—RSD) (%)		Company in a restaurant (%)	
Bellow 30,000	6.3	Alone	9.0
30,001–40,000	12.2	With family	31.7
40,001–50,000	22.6	With friends	42.5
50,001–60,000	30.8	With business partners	11.8
Above 60,000	28.1	Other	5.0

4.2. Measurement Model Validity—Confirmatory Factorial Analysis

Prior to evaluating the structural model and testing hypothesis, the measurement model was checked for innate construct validity and reliability using confirmation factor analysis (CFA). One item from the factor ‘self-reported food waste behavior’ was dropped out during the confirmatory factor analysis due to cross-loading with another factor. The residuals between the item related to the waste of dairy products and those for other items were high and it was recommended to exclude such an item from the model. Beaujean [48] states that a “troublingly large” residual is “>0.1,” pointing out that a residual less than 0.1 would not allow a product of two salient loadings. Table 3 shows the results of the measurement model estimation. According to the results, all fit indices (TLI = 0.994; CFI = 0.995; RMSEA = 0.024; SRMR = 0.055) revealed a satisfactory fit.

Table 3. CFA results.

Factors	Items	β	t Value	α	AVE	CR
Self-reported food waste behavior (SR)	How likely would you be to leave potatoes/rice/pasta on your plate?	0.812	*	0.915	0.813	0.950
	How likely would you be to leave vegetables on your plate?	0.783	27.642			
	How likely would you be to leave bread and other bakery products on your plate?	0.813	31.589			
	How likely would you be to leave dairy products on your plate?	**	**			
	How likely would you be to leave sauce on your plate?	0.883	34.275			
	How likely would you be to leave meat/fish on your plate?	0.889	30.175			
Intention not to waste food (INT)	I intend not to leave food.	0.897	*	0.925	0.839	0.965
	My goal is not to leave food.	0.898	22.699			
	I generally try not to leave food.	0.870	21.019			
Subjective norms (SUB)	People who are important to me find my attempts to reduce the amount of food wasted unnecessary.	0.855	*	0.681	0.566	0.838
	People who are important to me think that I am greedy when I try to eat all food from my plate.	0.633	2.753			
Perceived behavioral control (PBC)	Predicting food amount at food choice is easy.	0.846	*	0.899	0.776	0.908
	Finishing all the food on my plate is usually easy for me.	0.751	13.467			
	I could always finish all the food on my plate if I wanted to.	0.832	14.184			
Personal attitudes toward food waste (ATTD)	It is unnecessary to waste food—it can always be used in some way.	0.813	*	0.898	0.846	0.903
	It is immoral to throw away food while other people in the world are starving.	0.883	27.313			
	It upsets me when unused products end up in the waste bin.	0.854	26.125			
Environmental attitudes (ENV)	Wasting food wouldn't make me feel guilty about the environment.	0.760	*	0.857	0.703	0.896
	I don't think about the environment when I waste food.	0.842	16.832			
	I don't think about recycling the food waste generated (e.g., composting).	0.889	19.536			
	I don't think about reusing leftovers.	0.770	16.386			
Food-based food waste causes (FOOD)	If the food that needs to be cold is warmed up, I don't consume all the food on my plate.	0.895	*	0.923	0.761	0.925
	If the food that needs to be hot is cold, I consume all the food on my plate.	0.861	21.521			
	If I find the presentation of the food not interesting, I don't consume all the food on my plate.	0.830	19.652			
	If I take more food than I can eat, I don't consume all the food on my plate.	0.689	14.235			
	If I do not know about the content of the food, I don't consume all the food on my plate.	0.872	32.494			
	If I take more food than I can consume, I don't consume all the food on my plate.	0.868	36.862			
	If I find the look of the food not attractive, I don't consume all the food on my plate.	0.866	31.915			

Table 3. Cont.

Factors	Items	β	t Value	α	AVE	CR
Ambiance-based food waste causes (AMB)	If the restaurant is very noisy, I don't consume all the food on my plate.	0.817	*	0.870	0.688	0.876
	If the heat conditions in the restaurant disturb me, I consume all the food on my plate.	0.824	29.405			
	If the music playing in the restaurant disturbs me, I don't consume all the food on my plate.	0.736	16.895			
	If the ventilation conditions of the restaurant are insufficient, I don't consume all the food on my plate.	0.796	19.120			
	If the smell in the restaurant disturbs me, I don't consume all the food on my plate.	0.773	16.265			
	If the comfort of my seat that I am sitting on while eating disturbs me, I don't consume all the food on my plate.	0.815	16.444			
Staff-based food waste causes (STAFF)	If the staff at the restaurant has inadequate interest, I don't consume all the food on my plate.	0.851	*	0.829	0.772	0.830
	If the communication between the staff at the restaurant is disturbing, I don't consume all the food on my plate.	0.841	23.834			
	If the communication of the staff at the restaurant with me is disturbing, I don't consume all the food on my plate.	0.829	24.802			
	If the service quality of the staff in the restaurant is insufficient, I don't consume all the food on my plate.	0.889	32.509			
Hygiene-based food waste causes (HYG)	If the hygiene of the cutlery that I use to eat disturbs me, I don't consume all the food on my plate.	0.901	*	0.949	0.865	0.948
	If the hygiene of the plate that I use to eat disturbs me, I don't consume all the food on my plate.	0.885	31.653			
	If the hygiene of the seat that I am sitting on while eating disturbs me, I don't consume all the food on my plate.	0.879	22.902			
	If the hygiene of the table on which I eat disturbs me, I don't consume all the food on my plate.	0.887	29.702			

Notes: * Items fixed to 1 in CFA; ** item removed from CFA; β —Std. regression weights; α —Cronbach's alpha; CR—composite reliability; AVE = average variance expected.

The composite reliability values for the latent factors exhibited satisfactory levels exceeding the recommended minimum value of 0.7 [49,50]. A convergent validity is achieved when all item-to-factor loadings are significant and the AVE score is higher than 0.50 within each dimension [51]. The results showed that all the dimensions had AVE higher than 0.50 and CR higher than 0.70, which indicates that good convergent validity of Cronbach's α values for each factor were greater than 0.70. The results showed that the alpha coefficients of the nine factors ranged from 0.847 to 0.898, which demonstrates that the scales of the questionnaire had considerable reliability [52] (Table 2).

Discriminant validity was checked by comparing the average variances extracted (AVEs) for each latent factor with the squared correlation estimates between latent constructs (Table 4). The range of the squared correlations based on the total scores was from 0.0001 to 0.5929, which was lower than AVE. Thus, the results confirm that all the dimensions had sufficient discriminant validity [51].

Table 4. Discriminant validity assessment.

	SR	INT	SUB	PBC	ATTD	ENV	FOOD	AMB	STAFF	HYG
SR	0.813									
INT	0.1909	0.839								
SUB	0.0256	0.0007	0.566							
PBC	0.0708	0.2520	0.0012	0.776						
ATTD	0.0853	0.1918	0.0036	0.0188	0.846					
ENV	0.0497	0.0180	0.0061	0.0038	0.0188	0.703				
FOOD	0.0009	0.0040	0.0090	0.0064	0.0125	0.0009	0.761			
AMB	0.0001	0.0090	0.0154	0.0222	0.0003	0.0001	0.3469	0.688		
STAFF	0.0001	0.0038	0.0062	0.0066	0.0017	0.0018	0.5929	0.2862	0.772	
HYG	0.0127	0.0745	0.0142	0.0094	0.0001	0.0098	0.0454	0.0005	0.0671	0.865

4.3. Results of the Path Model

The variety of forms in the proposed model were assessed and the overall fit of the model was considered satisfactory for the observed sample (CFI = 0.960; TLI = 0.936; RMSEA = 0.049; SRMR = 0.044; $df = 24$, $p < 0.000$). Fit indices were acceptable for addressing the hypothesized interrelations between each latent factor.

Table 5 shows the outcomes of the hypothesized interactions in the proposed model. The effect of personal attitudes on the intention not to waste food (H1) was reinforced ($\beta = 0.461$, $p < 0.000$). Subjective norms were not found to positively affect the intention not to waste food (H2) ($\beta = 0.008$, $p = 0.853$). Environmental attitudes had a significant negative effect on the intention not to waste food ($\beta = -0.123$, $p < 0.05$) thus supporting H3. H4 was supported, indicating that the perceived behavioral control had a significant positive impact on the intention not to waste food ($\beta = 0.597$, $p < 0.000$). Intention not to waste food had a significant negative effect on self-reported food waste behavior ($\beta = -0.553$, $p < 0.000$), so H5 can be confirmed. Supposed behavioral control did not have a significant effect on self-reported food waste behavior ($\beta = 0.099$, $p = 0.225$), thus we rejected H6. Regarding the influence of waste causes on perceived behavioral control, food-based, ambiance-based and staff-based food waste causes did not affect perceived behavioral control. This means that H7, H8 and H9 were rejected. H10 was supported, indicating that hygiene-based food waste causes had a significant negative effect on perceived behavioral control ($\beta = -0.204$, $p < 0.01$). The results of the path model are shown in Figure 2.

Table 5. The results of model (standardized regression weights).

Hypothesized Paths	β	S.E.	z-Value	p-Value	Hypothesis
H ₁ : Personal attitudes toward food waste → Intention not to waste food (+)	0.461	0.066	8.038	0.000	Supported
H ₂ : Subjective norms → Intention not to waste food (+)	0.008	0.060	0.186	0.853	Not supported
H ₃ : Environmental attitudes → Intention not to waste food (−)	−0.123	0.070	−2.214	0.027	Supported
H ₄ : Perceived behavioral control → Intention not to waste food (+)	0.597	0.068	8.831	0.000	Supported
H ₅ : Intention not to waste food → Self-reported food waste behavior (−)	−0.553	0.078	−7.307	0.000	Supported
H ₆ : Perceived behavioral control → Self-reported food waste behavior (−)	0.099	0.085	1.213	0.225	Not supported
H ₇ : Food-based food waste causes → Perceived behavioral control (−)	−0.000	0.140	−0.001	0.999	Not supported
H ₈ : Ambiance-based food waste causes → Perceived behavioral control (−)	0.130	0.133	1.632	0.103	Not supported
H ₉ : Staff-based food waste causes → Perceived behavioral control (−)	0.054	0.132	0.462	0.644	Not supported
H ₁₀ : Hygiene-based food waste causes → Perceived behavioral control (−)	−0.204	0.055	−3.154	0.002	Supported

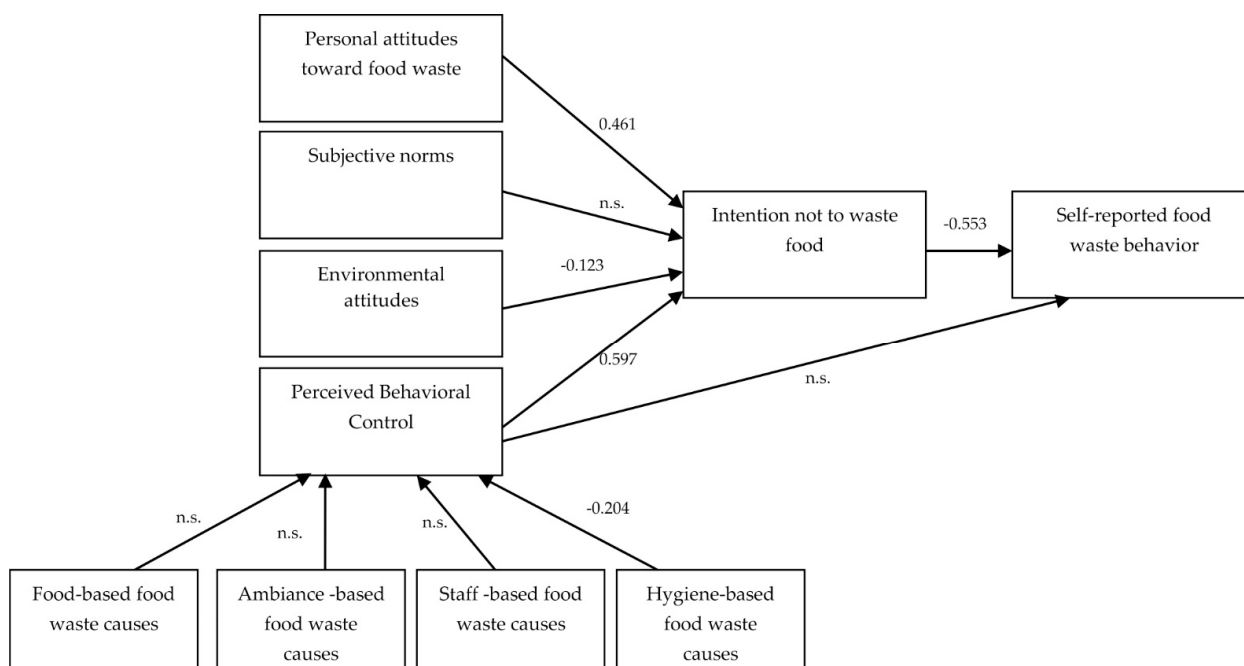


Figure 2. The results of the path model based on standardized regression weights.

5. Discussion

The aim of the research was to apply the extended TPB model by including two constructs of environmental attitudes and food waste causes (e.g., food-based, ambience-based, staff-based and hygiene-based), in order to investigate their impact on consumers' behavior in the context of food waste. The authors started with the supposition that individual norms, subjective attitudes toward food waste and perceived behavioral control would forecast intention not to waste food. Based on [12]'s TPB model, it was supposed that the intention not to waste food and perceived behavioral control also predict food waste behavior. Additionally, it was supposed that environmental attitudes and food waste causes, divided into four key factors for the experience of the products and services in a restaurant—food, ambience, staff and hygiene—could have an impact on food waste behavior through intentions and PBC. These constructs were added with the supposition that they would improve the predictive capability of the TPB model. The previous studies proved that subjective norms are not connected with the intention not to waste food [13,18,25], or that their impact is very weak [16,22]. The impact of personal norms on the intention not to waste food has not been proved in this research either.

When it comes to the prediction of the intention not to waste food, personal attitudes proved to have a significant impact. These results are in accordance with the previous studies [6,17,20,22], which prove that more positive attitudes of the respondents toward leaving and wasting food lead to a stronger intention to avoid food waste.

Perceived behavioral control proved to be the most significant predictor of the intention not to waste food. These results are in accordance with the previous studies, which proved that perceived behavioral control affects the intention not to waste food or the intention to reduce food waste [18,20,25,31]. Thus, the greater the readiness of the respondents to control their behavior regarding leaving food on the plate in restaurants, the stronger are their intentions not to waste food. However, the effect of perceived behavioral control on self-reported food waste behavior has not been proved in this research. The effect of perceived behavioral control on self-reported food waste behavior was not proved by Visschers et al. [18], including for the ready-to-eat groups of products (convenience foods and processed foods), while there was a negative impact of perceived behavioral control on the self-reported food waste behavior recorded for other groups of products that the

authors selected (fruit and vegetables, protein products, bakery products and starches). This was contrary to the authors' expectation and it suggests that self-reported food waste behavior may not be the result of food waste behavior. A plausible explanation is that the consumers may have a limited PBC in restaurants. On the other hand, it was proved that there is a direct negative impact of the intention not to waste food on self-reported food waste behavior. Such results are in accordance with the previous studies [17,18], even though there are those which suggest that the intentions are often an inadequate behavior predictor [53]. This study has also proved the impact of environmental attitudes on the intention not to waste food. As Williams and Walton [54] state, individuals with a highly developed awareness of the significance of environmental protection are less likely to waste food, and those who do not have this awareness show a stronger intention to waste food. Consumers' behavior related to food waste is also connected with their knowledge of the harmful effects on the natural environment [55], among which the most significant are large emissions of greenhouse gases and wasteful use of resources such as water and fertile land [17]. Individuals with knowledge of the harmful effects of food waste on the natural environment will most probably avoid wastage. Of the four situational factors related to restaurant services, the negative impact on PBC was confirmed only for hygiene-based food waste causes. Previous studies proved that certain situational factors, such as food taste [25], palatability, portion size [22], or the role of intervention from the waiters [26], may affect the food waste behavior in restaurants. The hygiene of restaurant halls, tables and cutlery includes the basic, expected level of service quality, which, if reached, will not lead to the guest's satisfaction, but if it is not reached, leads to dissatisfaction [56]. In this study as well, the factors related to the hygiene in restaurants had a strong negative impact on PBC.

6. Conclusions

The main aim of this study was to test the TPB as a valuable model for understanding consumers' behavior related to food waste in restaurants. The additional predictors showed a significant impact on consumers' behavior, which implies that the TPB model includes additional constructions. Moreover, the obtained results also contribute to the already rich literature and can be used by other scholars to extend the TPB framework with the constructs they need for measuring specific features. Additionally, this study also has several practical implications for restaurant managers. Primarily, the proof that perceived behavioral control has the strongest impact on the intention not to waste food could encourage managers to inform consumers that they can control the quantity of food they order or leave on their plates. Certain studies proved that written messages alongside meal options which encourage hotel guests to come up for more food once they have finished their first plate can reduce the amount of food waste by up to 20% [57]. A useful technique for reducing food waste can be the implementation of various educational programs on the harmful effects of food waste from sociological, economic, moral and environmental aspects.

Limitations and Suggestions for Future Studies

This research also has certain limitations that should be indicated. The presented outcomes cannot be universal, bearing in mind that the data were collected through a convenient method for collection. Further research can be based on a stratified sample which should include the strata proportionally included in the final sample. Additionally, the research should also be extended to other destinations in Serbia, such as restaurants in mountain and spa tourism centers, as well as to the restaurants in rural areas. The fact that the assessment of food waste behavior was mostly based on self-reported food waste behavior in the questionnaire may also be misleading, especially in terms of the actual amount of food waste. Authors have considered a "stated" behavior instead of the observed behavior, as suggested by Ajzen [12]. Even though the extended TPB model pointed to the justified inclusion of certain constructs into the model, further research should contribute

to a deeper consideration of consumers' behavior and habits. Accordingly, this could reinforce future investigations of the effects of other predictors, such as consumers' lifestyle and eating habits, level of hunger and actual mood. Finally, the elements of restaurant design features, such as lighting, dominant colors and interior design could prove to have a significant impact on food waste behavior.

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References

1. FAO. *The State of Food and Agriculture, Moving Forward on Food Loss and Waste Reduction*; Food and Agriculture Organization of the United Nations (FAO): Rome, Italy, 2019.
2. Giorgi, S.; Lyndhurst, B. *Understanding out of Home Consumer Food Waste: Final Summary Report*; Project code: CFP104-015; WRAP: Banbury, UK, 2013.
3. Heikkilä, L.; Reinikainen, A.; Katajajuuri, J.M.; Silvennoinen, K.; Hartikainen, H. Elements affecting food waste in the food service sector. *Waste Manag.* **2016**, *56*, 446–453. [CrossRef] [PubMed]
4. Ofei, K.; Mikkelsen, B.E. Food Waste Food Service. FoodServInSPRIe Project. *Meal. Sci. Public Health Nutr.* **2011**. Available online: <https://vbn.aau.dk/ws/portalfiles/portal/60351514/FoodwasteNK4no.pdf> (accessed on 16 August 2021).
5. Ozcicek-Dolekoglu, C.; Var, I. Analysis of food waste in university dining halls: A case study from turkey. *Fresenius Environ. Bull.* **2019**, *28*, 156–166.
6. Von Massow, M.; McAdams, B. Table scraps: An evaluation of plate waste in restaurants. *J. Foodserv. Bus. Res.* **2015**, *18*, 437–453. [CrossRef]
7. Mabaso, C.H.; Hewson, D.S. Employees' perceptions of food waste management in hotels. *Afr. J. Hosp. Tour. Leis.* **2018**, *7*, 1–15.
8. Linh, N.K. Food Waste Management in the Hospitality Industry. Case Study: Clarion Hotel Helsinki. Bachelor's Thesis, Haaga-Helia University of Applied Sciences, Helsinki, Finland, 2018.
9. Eriksson, M.; Osowski, C.P.; Björkman, J.; Hansson, E.; Malefors, C.; Eriksson, E.; Ghosh, R. The tree structure—A general framework for food waste quantification in food services. *Resour. Conserv. Recy.* **2018**, *130*, 140–151. [CrossRef]
10. Freedman, M.R.; Brochado, C. Reducing portion size reduces food intake and plate waste. *Obesity* **2010**, *18*, 1864–1866. [CrossRef] [PubMed]
11. Cristóbal, J.; Castellani, V.; Manfredi, S.; Sala, S. Prioritizing and optimizing sustainable measures for food waste prevention and management. *Waste Manag.* **2018**, *72*, 3–16. [CrossRef]
12. Ajzen, I. The theory of planned behavior. *Organ. Behav. Hum. Decis. Process.* **1991**, *50*, 179–211. [CrossRef]
13. Stefan, V.; van Herpen, E.; Tudoran, A.A.; Lähteenmäki, L. Avoiding food waste by Romanian consumers: The importance of planning and shopping routines. *Food Qual. Prefer.* **2013**, *28*, 375–381. [CrossRef]
14. Ghani, W.A.; Rusli, I.F.; Biak, D.R.; Idris, A. An application of the theory of planned behaviour to study the influencing factors of participation in source separation of food waste. *Waste Manag.* **2013**, *33*, 1276–1281. [CrossRef]
15. Pakpour, A.H.; Zeidi, I.M.; Emamjomeh, M.M.; Asefzadeh, S.; Pearson, H. Household waste behaviours among a community sample in Iran: An application of the theory of planned behaviour. *Waste Manag.* **2014**, *34*, 980–986. [CrossRef]
16. Graham-Rowe, E.; Jessop, D.C.; Sparks, P. Predicting household food waste reduction using an extended theory of planned behaviour. *Resour. Conserv. Recy.* **2015**, *101*, 194–202. [CrossRef]
17. Stancu, V.; Haugaard, P.; Lähteenmäki, L. Determinants of consumer food waste behaviour: Two routes to food waste. *Appetite* **2016**, *96*, 7–17. [CrossRef] [PubMed]
18. Visschers, V.H.; Wickli, N.; Siegrist, M. Sorting out food waste behaviour: A survey on the motivators and barriers of self-reported amounts of food waste in households. *J. Environ. Psychol.* **2016**, *45*, 66–78. [CrossRef]
19. Van der Werf, P.; Seabrook, J.A.; Gilliland, J.A. Food for naught: Using the theory of planned behaviour to better understand household food wasting behaviour. *Can. Geogr.* **2019**, *63*, 478–493. [CrossRef]

20. Soorani, F.; Ahmadvand, M. Determinants of consumers' food management behavior: Applying and extending the theory of planned behavior. *Waste Manag.* **2019**, *98*, 151–159. [\[CrossRef\]](#)
21. Heidari, A.; Mirzaii, F.; Rahnama, M.; Alidoost, F. A theoretical framework for explaining the determinants of food waste reduction in residential households: A case study of Mashhad, Iran. *Environ. Sci. Pollut. Res.* **2020**, *27*, 6774–6784. [\[CrossRef\]](#)
22. Lorenz, B.A.; Hartmann, M.; Langen, N. What makes people leave their food? The interaction of personal and situational factors leading to plate leftovers in canteens. *Appetite* **2017**, *116*, 45–56. [\[CrossRef\]](#) [\[PubMed\]](#)
23. Liao, W.L.; Fang, C.Y. Applying an extended theory of planned behavior for sustaining a landscape restaurant. *Sustainability* **2019**, *11*, 5100. [\[CrossRef\]](#)
24. Goh, E.; Jie, F. To waste or not to waste: Exploring motivational factors of Generation Z hospitality employees towards food wastage in the hospitality industry. *Int. J. Hosp. Manag.* **2019**, *80*, 126–135. [\[CrossRef\]](#)
25. Coşkun, A.; Özbük, R.M. What influences consumer food waste behavior in restaurants? An application of the extended theory of planned behavior. *Waste Manag.* **2020**, *117*, 170–178. [\[CrossRef\]](#)
26. Yu, Z.; Ju, X.; Bai, L.; Gong, S. Consumer's over-ordering behavior at restaurant: Understanding the important roles of interventions from waiter and ordering habits. *Appetite* **2021**, *160*, 105092. [\[CrossRef\]](#)
27. Evans, D. Beyond the throwaway society: Ordinary domestic practice and a sociological approach to household food waste. *Sociology* **2012**, *46*, 41–56. [\[CrossRef\]](#)
28. Watson, M.; Meah, A. Food, waste and safety: Negotiating conflicting social anxieties into the practices of domestic provisioning. *Sociol. Rev.* **2012**, *60*, 102–120. [\[CrossRef\]](#)
29. Abeliotis, K.; Lasaridi, K.; Chroni, C. Attitudes and behaviour of Greek households regarding food waste prevention. *Waste Manag. Res.* **2014**, *32*, 237–240. [\[CrossRef\]](#) [\[PubMed\]](#)
30. La Barbera, F.; Ajzen, I. Control interactions in the theory of planned behavior: Rethinking the role of subjective norm. *Eur. J. Psychol.* **2020**, *16*, 401–417. [\[CrossRef\]](#) [\[PubMed\]](#)
31. Mondéjar-Jiménez, J.A.; Ferrari, G.; Secondi, L.; Principato, L. From the table to waste: An exploratory study on behaviour towards food waste of Spanish and Italian youths. *J. Clean. Prod.* **2016**, *138*, 8–18. [\[CrossRef\]](#)
32. Matzembacher, D.E.; Brancoli, P.; Maia, L.M.; Eriksson, M. Consumer's food waste in different restaurants configuration: A comparison between different levels of incentive and interaction. *Waste Manag.* **2020**, *114*, 63–73.
33. WRAP. *Overview of Waste in the UK Hospitality and Food Service Sector*; Responsible Hospitality Partnership and WRAP, The Waste and Resources Action Programme (WRAP): Oakdene Hollins, UK, 2013.
34. Miroso, M.; Munro, H.; Mangan-Walker, E.; Pearson, D. Reducing waste of food left on plates: Interventions based on means-end chain analysis of customers in foodservice sector. *Brit. Food J.* **2016**, *118*, 2326–2343. [\[CrossRef\]](#)
35. McCarthy, B.; Liu, H.B. Food waste and the 'green' consumer. *Australas. Mark. J.* **2017**, *25*, 126–132. [\[CrossRef\]](#)
36. Farr-Wharton, G.; Foth, M.; Choi, J.H. Identifying factors that promote consumer behaviours causing expired domestic food waste. *J. Cust. Behav.* **2014**, *13*, 393–402. [\[CrossRef\]](#)
37. Schneider, F. Wasting food—An insistent behaviour. In *Proceedings of the Waste: The Social Context*, Edmonton, AB, Canada, 11–15 May 2008; pp. 1–10.
38. Betz, A.; Buchli, J.; Göbel, C.; Müller, C. Food waste in the Swiss foodservice industry e magnitude and potential for reduction. *Waste Manag.* **2015**, *35*, 218–226. [\[CrossRef\]](#)
39. Silvennoinen, K.; Heikkilä, L.; Katajajuuri, J.M.; Reinikainen, A. Food waste volume and origin: Case studies in the Finnish food service sector. *Waste Manag.* **2015**, *46*, 140–145. [\[CrossRef\]](#)
40. Wilkie, A.C.; Graunke, R.E.; Cornejo, C. Food waste auditing at three Florida schools. *Sustainability* **2015**, *7*, 1370–1387. [\[CrossRef\]](#)
41. Itthiphakorn, D. Tourist's perception of buffet's food waste in hotels in Bangkok. *Dusit Thani Coll. J.* **2021**, *15*, 83–99.
42. Kim, W.G.; Lee, Y.K.; Yoo, Y.J. Predictors of relationship quality and relationship outcomes in luxury restaurants. *J. Hosp. Tour. Res.* **2006**, *30*, 143–169. [\[CrossRef\]](#)
43. Liu, Y.; Jang, S.C.S. Perceptions of Chinese restaurants in the U.S.: What affects customer satisfaction and behavioral intentions. *Int. J. Hosp. Manag.* **2009**, *28*, 338–348. [\[CrossRef\]](#)
44. Baraban, R.S.; Durocher, J.F. *Successful Restaurant Design*; Hoboken, John Wiley & Sons Inc.: Hoboken, NJ, USA, 2010.
45. Popov-Raljić, J. *Tehnologija I Kvalitet Gotove Hrane*; Tehnološki fakultet: Novi Sad, Srbija, 1999.
46. Russell, S.V.; Young, C.W.; Unsworth, K.L.; Robinson, C. Bringing habits and emotions into food waste behaviour. *Resour. Conserv. Recycl.* **2017**, *125*, 107–114. [\[CrossRef\]](#)
47. Tekin, Ö.A.; İlyasov, A. The food waste in five-star hotels: A study on turkish guests' attitudes. *J. Tour. Gastron. Stud.* **2017**, *5*, 13–31. [\[CrossRef\]](#)
48. Beaujean, A.A. *Latent Variable Modeling Using R: A Step-By-Step Guide*; Routledge: New York, NY, USA, 2014.
49. Kline, R.B. *Principles and Practice of Structural Equation Modeling*; The Guilford Press: New York, NY, USA, 2016.
50. Hair Jr, J.F.; Hult, G.T.M.; Ringle, C.; Sarstedt, M. *A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM)*; Sage Publications: Los Angeles, CA, USA, 2017.
51. Fornell, C.; Larcker, D.F. Evaluating structural equation models with unobservable variables and measurement error. *J. Mark. Res.* **1981**, *18*, 39–50. [\[CrossRef\]](#)
52. Nunnally, J.C. *Psychometric Theory*; McGraw-Hill: New York, NY, USA, 1978.

-
53. Armitage, C.J.; Conner, M. Efficacy of the theory of planned behaviour: A meta-analytic review. *Br. J. Soc. Psychol.* **2001**, *40*, 471–499. [[CrossRef](#)]
 54. Williams, P.; Walton, K. Plate waste in hospitals and strategies for change. *e-SPEN Eur. J. Clin. Nutr.* **2011**, *6*, 235–241. [[CrossRef](#)]
 55. Principato, L.; Secondi, L.; Pratesi, C.A. Reducing food waste: An investigation on the behaviour of Italian youths. *Brit. Food J.* **2015**, *117*, 731–748. [[CrossRef](#)]
 56. Kosar, L.; Rašeta, S. *Izazovi Kvaliteta—Menadžment Kvaliteta u Hotelijerstvu*; Viša hotelijerska škola: Beograd, Srbija, 2005.
 57. Kallbekken, S.; Sælen, H. ‘Nudging’ hotel guests to reduce food waste as a win-win environmental measure. *Econ. Lett.* **2013**, *119*, 325–327. [[CrossRef](#)]