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Consumers' food waste behaviour in restaurants

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1 June 2017

1. Abstract

Reducing food waste is one strategy to minimize environmental food print, and to handle a growing population in a sustainable way. Restaurants have the highest consumer food waste in the public sector (Silvennoinen et al., 2015), which point to room for improvements in this area. There is also a lack of research on food waste behaviour in restaurants. Using theory of planned behaviour (TPB), two conceptual models of factors that influence consumers' food waste behaviour was developed. A first aim of this study is to fill the empirical gap of quantitative methods on food waste behaviour in restaurants. The second aim is to develop a model to explain what underlying factors cause food waste behaviour in restaurants. That can be a basis for reduced food waste behaviour.

Environmental attitudes and environmental beliefs turned out to be the strongest predictors of food waste behaviour. Moral norms also affect environmental attitudes. Other factors influencing consumers' food waste behaviour in restaurants are: situational factors and intention to avoid food waste.

2. Introduction

Many consumers enjoy lunch at restaurants, but not all of them clear their plate. The consequence is that edible food is being wasted. Edible food has a long journey from earth to table that requires different processing stages, such as farming, factories, transportation, retailing and cooking. For each stage there is an environmental impact, where resources, such as water and oil are used (Thyberg & Tonjes, 2016). Braun (2007) and Thyberg & Tonjes (2016) point out that the environmental impact from food waste generates high emissions and greenhouse effects.

According to Gustavsson et al. (2011), one third of edible food is wasted by consumers globally; much of this is wasted in restaurants. Since the global population is growing, there will be a greater demand on food and other resources (Godfrey et al., 2010). Godfrey et al. (2010) explain that minimizing food waste is one strategy to handle the growing population in a sustainable way.

As sustainability aspects rise on the agenda of society, actors in the market have started to take actions for a more sustainable future. One example is mobile apps, such as ResQ and Karma. These apps have been developed in order to "save" edible leftovers from restaurants. The concept is that customers can buy food that otherwise would have been wasted, for a cheaper price (Olsson, 2017). Looking into the food waste dilemma, "EAT foundation" is one example of how the service sector takes action to implement sustainable changes in the way we eat (eatforum, 2017). In order to reduce food waste, one strategy "EAT Foundation" uses to change consumer behaviour is through raising awareness about consequences of food

waste (eatforum, 2017). In spite of these actors, there is still a need of research regarding understandings of underlying factors that cause food waste behaviour.

Changing consumer behaviour is one promising way to reduce food waste (eatforum, 2017). Studies about food waste and consumer behaviour have mainly focused on households (Stancu et al., 2015, Farr-Wharton et al., 2014, Parizeau et al., 2015), but recently the food service sector has also received some attention (Silvennoinen et al. 2015, Mirosa et al., 2016, Charlebois, et al. 2016, Papargyropoulou et al., 2016, Heikkilä et al., 2016, Sirieix et al., 2017). Most research in the food service sector concentrates on food management operations, and the amount of food wasted, rather than consumer behaviour (Charlebois, et al. 2016, Papargyropoulou et al., 2016, Heikkilä et al., 2016). A study by Silvennoinen et al. (2015) revealed that the main cause of food waste in restaurants is not from preparation of food, but from served food to consumers. Furthermore, 20% of all food prepared was wasted and customer waste was highest in restaurants compared to other public dining, such as schools, day-care centres, workplace and canteens.

Mirosa et al. (2016) and Sirieix et al. (2017) emphasise the research gap on consumers' food waste behaviour in restaurants. The study from Sirieix et al. (2017) concerns the concept of doggy bags, and how restaurants can decrease food waste by offering a doggy bag to consumers. Whereas Mirosa et al. (2016) investigated customers' values and behaviour regarding plate waste at a university restaurant.

Mirosa et al. (2016), Sirieix et al. (2017), Charlebois, et al. (2016), Papargyropoulou et al. (2016), and Heikkilä et al. (2016) have in common that they all use qualitative methods in their research. Little quantitative research has been conducted on this area. Furthermore, the relationship of underlying factors of consumer's food waste in the food service sector has not yet been investigated. It is therefore an empirical gap on quantitative methods on food waste behaviour in the food service sector.

Looking at consumer behaviour, attitudes and norms it is possible to determine factors that drive food waste (Farr-Wharton et al. 2014). Reducing food waste is also a pro-environmental behaviour. Theory of planned behaviour (TPB) has been used both to predict consumer behaviour, and pro-environmental behaviour (Ajzen, 2011, Kollmuss & agyeman, 2002, Onwezen et al., 2013, Turaga et al., 2010). By identifying what factors influences food waste in restaurants; attitudes and behaviours can be changed. One way of changing consumer behaviour is to use marketing skills that enhance these factors, educate consumers and make them more aware of these issues.

This study applies a quantitative approach and focuses on attitudes and behaviour of consumers in order to investigate why consumers´ waste food in restaurants. This will give insights about *what factors influence consumers' food waste behaviour in restaurants.*

The aim of this study is first to fill the empirical gap of analysing food waste behaviour in restaurants. The second aim is to test the relationships of factors that drive food waste behaviour; in order to broaden the understanding of food waste behaviour.

Management implications are to provide restaurant managers with a model that explains what factors influence food waste behaviour. If the underlying factors which influence behaviour are known; restaurant managers could establish appropriate measures to reduce food waste behaviour. This in turn is a step towards a more sustainable society.

3. Literature review and theoretical framework

There is no established definition of food waste (Lebersorger & Schneider, 2011). One definition of food waste that will be used in this study is defined by United States Department of Agriculture (USDA) as a food loss that occurs when edible food, that at the time of disposal still are edible, is unconsumed (Buzby et al., 2014). Mirosa et al. (2016) defined plate leftovers as *"edible food which diners have taken but have not eaten"* (Mirosa et al., 2016, p.447).

3.1 Pro-environmental behaviour

Despite the environmental impact food waste generates, prior literature points out that consumers do not make any connection between food waste and environmental impacts when wasting food (Hoek et al., 2017, Parizeau et al., 2015, Watson & Meah, 2013). Nevertheless, prior studies have found that wasting food generates a feeling of guilt, and that many individuals feel an obligation to reduce food waste (Parizeau et al., 2015, Stefan et al., 2013). This suggests that a change in attitudes and behaviour among consumers could lead to reduced food waste and a more sustainable lifestyle. Farr-Wharton et al. (2014) also stresses that the environment is important to consider when researching food waste behaviour.

Stancu et al. (2016), Visschers et al. (2016), and Stefan et al. (2013) addressed the lack of a conceptual model on consumer food waste behaviour in households. To explain the underlying factors on food waste behaviour in household they used Theory of planned behaviour (TPB). Furthermore, TPB is also one theory among others, such as norm-activation theory and value-belief-norm (VBN) that are used to explain pro-environmental behaviour (Kollmuss & agyeman, 2002, Onwezen et al., 2013, Turaga et al., 2010).

Moral norms have proven to be important when it comes to pro-environmental behaviour (Kollmuss & agyeman, 2002, Onwezen et al., 2013, Turaga et al., 2010). According to Schwartz (1977) moral norms consist of awareness that certain action has consequences and that persons need to feel responsibility to undertake action. Nevertheless, moral norms alone cannot explain or predict pro-environmental behaviour. Thus, the norm-activation theory is often mixed with both VBN and TPB to better explain pro-environmental behaviour (Onwezen et al., 2013, Turaga et al., 2010).

Following that VBN and TPB is commonly used when researching pro-environment behaviour; these theories have been used in food waste research (Farr-Wharton et al., 2014, Stefan et al., 2013, Stancu et al., 2016, Visschers et al., 2016). TPB and VBN are similar as both theories emphasises on attitudes, beliefs, and norms, to predict or change behaviour. The main difference is that external influences, knowledge and skills are included in VBN (Farr-Wharton et al., 2014, Kollmuss & agyeman, 2002, Turaga et al., 2010). In addition Turaga et al. (2010) point out that New Environmental Paradigm (NEP) scales has been used to measure beliefs of an ecological worldview in VBN theory. However, VBN is rarely used in quantitative studies, since it has shown to be underspecified, due to poor fit and weak correlations (Kaiser et al., 2005, Turaga et al, 2010). Turaga et al. (2010) point out that TPB and VBN also have been combined in order to explain pro-environment behaviour.

3.2   Food waste behaviour

TPB has been used as a basis for analysing relationships of factors that drives consumer behaviour (Armitage & Conner, 2001, Barr et al., 2001). TPB is commonly used in quantitative research in consumer behaviour on food waste (Stefan et al., 2013, Stancu et al., 2016, Visschers et al., 2016). Moreover, perceived behaviour control (PBC), that is potential barriers to engage in behaviour, is included in TPB, reflecting external factors that can cause barriers affecting behaviour (Ajzen, 1991). According to Stefan et al. (2013) TPB is a flexible theory that allows additional concepts. Therefore factors, such as moral norms and environmental beliefs for example, could be included in TPB.

However, prior studies using TPB (Stefan et al., 2013, Stancu et al., 2016, Visschers et al., 2016) determining consumer food waste behaviour are not in agreement of which underlying factors impacts on behaviour. Stancu et al. (2016) indicate that attitudes and intentions to not waste food have a greater impact on food waste behaviour, while moral norms and perceived behaviour control (PBC) have no significant impact. Contrary, Visschers et al. (2016) argue that PBC and moral norms are good predictors of food waste behaviour. Moreover, Visschers et al. (2016) agree that intention to avoid food waste, and attitudes also predict food waste behaviour. Stefan et al. (2013) did however, not find *intention to avoid* food waste to be a significant indicator of food waste behaviour. In agreement to Stancu et al. (2016) and Visschers et al. (2016), Stefan et al. (2013) also point out attitudes to be of importance when determining food waste behaviour. This indicates that there are further needs to investigate the causes of consumers' food waste behaviour. As this paper aims to test the relationships of factors that drive food waste, TPB is a good theory to do so.

Another factor which influences food waste behaviour is income, Charlebois et al. (2015) and Mirosa et al. (2016) found that low cost items, such as starch is more likely to be left on the plate than high cost items, such as proteins. Higher income also results in more eating in restaurants and more diverse food leads to higher food waste (Thyberg & Tonjes. 2016, Stancu et al., 2016).

3.3 Theory of Planned Behaviour (TPB)

To test the relationships of factors that drive food waste behaviour, TPB was used. TPB focuses on *consumer's beliefs, intentions and attitudes* (Ajzen, 2011). Consumer behaviour was first attempted to be explained with attitudes in 1969 (Wicker, 1969). However, it was established that attitudes alone were hard to use when predicting behaviour (Wicker, 1969). Ajzen (1991) solved this problem by adding intentions to do behaviour as a mediator between underlying factors that causes behaviour, such as attitudes. A further development of TPB is perceived behaviour control (PBC), which was also added by Ajzen (1991). PBC includes external factors that can affect behaviour, regardless the intention. When TPB is used to understand pro-environmental behaviour, such as minimise food waste; moral norms and environmental beliefs can be added (Kaiser et al., 2005, Stefan et al., 2013, Turaga et al., 2010). Socio-economic factors have also shown to affect food waste behaviour (Parizeau et al., 2015, Stefan et al., 2013, Quested et al., 2013, Thyberg & Tonjes, 2016).

3.3.1 Intentional process

The *intentional process*, which is the motivation and willingness to act, are what drives behaviour (Ajzen, 1991). This in turn is determined by subjective norms, attitudes and perceived behaviour control (PBC) of the consumer (Ajzen, 1991). Visschers et al. (2016) confirmed that attitudes, PBC, and moral norms indirectly affect food waste behaviour, through intention to perform behaviour. The results from Stancu et al. (2016) and Visschers et al. (2016) explain that the intention to avoid food waste is one of the primary factors that determine food waste behaviour in household. Stefan et al. (2013), Stancu et al. (2016) and Visschers et al. (2016) point out, that consumers tend to perceive themselves as waste aversive, therefore it is more natural to measure intention to avoid food waste, rather than expect consumers to form an intention to waste food. Thus the first hypothesis *(H1) is that intention to avoid food waste is the main predictor of food waste behaviour.*

3.3.2 Perceived behaviour control (PBC) and situational factors

According to Ajzen (1991) *PBC* can predict both intention and behaviour. This is also confirmed by other studies (Lac et al., 2013, Stefan et al., 2013, Visschers et al., 2016). PBC includes potential barriers, such as personal- and external barriers, and perceived ease or difficulty to engage in behaviour, (Ajzen, 1991). However, consumers might have limited PBC in a restaurant setting, as they have little control over restaurant management. Although they can control their own plate waste behaviour. With regards to the restriction a restaurant setting might have on food waste behaviour. It is believed that *situational factors*, that are similar to PBC, could be used instead. As situational factors can create potential barriers and have an impact on how easy it is to engage in certain behaviour (Schneider, 2008). Schneider (2008) mean that situational factors, such as appetite, smell, sight and desire for food influence if a consumer waste- or consume food. Mirosa et al. (2016) also point out that hunger and taste are dominant rationalisations for plate waste behaviour. Since situational

factors are of external nature, it is believed that *(H2) situational factors have a direct impact on food waste behaviour in restaurants.*

3.3.3 Norms

Subjective norms, which are shared beliefs of how one should behave, affects intention to perform behaviour (Stancu et al., 2016). With subjective norms means the perceived social pressure to undertake certain behaviour (Ajzen, 1991). However, prior studies about food waste behaviour in households have point out that subjective norms have weak or no effect to food waste behaviour (Visschers et al., 2016, Stefan et al., 2013, Quested et al., 2013). Quested et al. (2013) suggested that people in households could not judge one another since household food waste is not visible to others, and therefore subjective norms were not significant in these studies. However, a restaurant setting is public where people can judge the behaviour of one another. Thus subjective norms are hypothesised *(H3) to affect food waste behaviour through intention to avoid food waste.*

In addition to subjective norms, it has been found that *moral norms*, such as feeling guilty when wasting food (Parizeau et al., 2013, Quested et al., 2013), and having principles to always clear the plate (Mirosa et al., 2016) to be important for food waste behaviour (Visschers et al., 2016, Stefan et al., 2013). Rats et al. (1995) point out that moral aspects are important when it comes to consumer's food choice behaviour. According to Armitage & Conner (2001), moral norms have been found to independently predict intentions. On the other hand Kaiser et al. (2005), Kaiser (2006) and Rats et al. (1995) emphasise that moral norms act indirectly through attitudes toward behaviour. Furthermore, Visschers et al. (2016) found that moral norm affected not only intentions, but also had a weak, but significant direct relation to food waste behaviour. As moral norms have shown to be a good predictor of food waste behaviour, it is assumed that: *(H4) moral norms affect intention to avoid food waste and/or attitudes.*

3.3.4 Attitudes

Ajzen (1991) explain that *attitudes* toward behaviour are used to evaluate performing of the behaviour which translates into intentions to perform certain behaviour. With other words; a positive attitude creates a stronger intention to perform certain behaviour, while a negative attitude creates a stronger intention to not perform certain behaviour. Therefore, attitudes are of importance in order to determine and understand how consumers behave and why food wasting occurs. According to previous studies, consumers have shown negative attitudes toward food waste, as they have felt bad and concerned when wasting food (Graham-Rowe et al., 2014, Stancu et al., 2016, Visschers et al., 2016). Thus, it is hypothesised *(H5), that food waste attitudes affect intention to avoid food waste*. Even though previous studies point out that consumers are not thinking about the environmental effects food waste have, Parizeau et al. (2014), Quested et al. (2013), and Mirosa et al. (2016) found out that those who care for

the environment are more likely to waste less food. Therefore*, environmental have an impact on food waste behaviour, through intention to avoid food waste. (H6).*

3.3.5   Environmental beliefs

Similar to moral norms, *environmental beliefs*, are an underlying part of environmental attitudes (Pienaar et al., 2013). Due to the environmental impact food waste causes (Thyberg & Tonjes, 2016, Braun, 2007), and the fact that prior studies on food waste behaviour indicate environmental factors important (Farr-Wharton et al., 2014); environmental beliefs will be included in the TPB model. Environmental beliefs, also referred as environmental concerns (Pienaar et al., 2013) are about whether the consumer is concerned about the environmental development, and whether or not, individuals themselves can change this environmental development (Dunlap et al., 2000). As indicated from environmental attitudes, Mirosa et al. (2016) mean that people concerned about the environment tend to waste less. In addition, Parizeau et al. (2014) found that consumers believe that the responsibility to reduce food waste is an individual concern. *This indicates that environmental beliefs affect food waste behaviour, through intention (H7).*

3.3.6   Socio-demographic factors

Finally, socio-demographic factors may be associated with food waste behaviour. Stefan et al. (2013) and Thyberg & Tonjes (2016) mean that higher incomes results in more eating in restaurants, whereas Parizeau et al. (2015) point out that consumers that eat at restaurants more often tend to also waste more food than those who eat rarely at restaurants. Parizeau et al. (2015) also found out that those who spend more money on restaurants tended to feel less guilty when wasting food. Charlebois et al. (2015) and Mirosa et al. (2016) found that low cost items, such as starch is more likely to be left on the plate than high cost items, such as proteins.

Age is also believed to have some effect on food waste behaviour, as Quested et al. (2013) point out that older people tend to waste less. However, the reason why older people waste less is explained not to be because of environmental concerns, but rather because their attitudes toward food waste are that wasting food is wrong (Quested et al., 2013). Meanwhile Quested et al. (2013) mean that younger people are more likely to express a concern about the environment when wasting food. Following, *socio-demographics, such as income, education and age could also affect food waste behaviour (H8).*

3.3.7   Hypothesis

The hypotheses for this study are outlined in figure 1 showing a model which will be tested in this paper. All hypotheses are stated below figure 1.
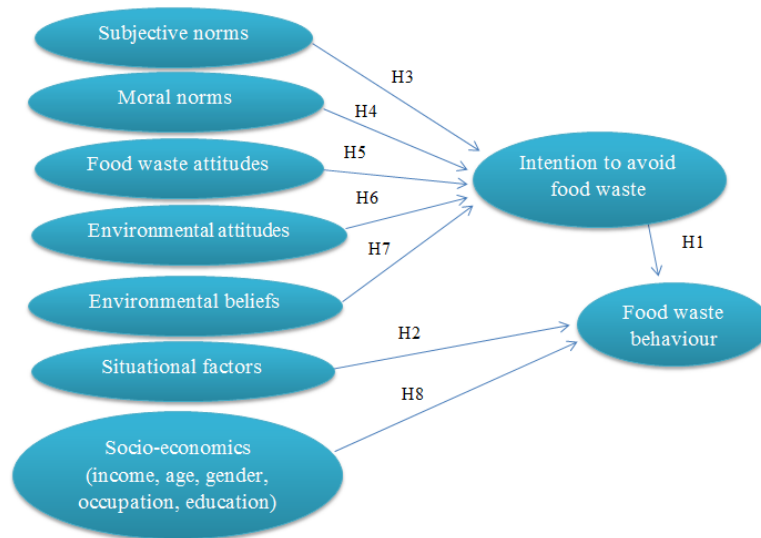
Figure 1 Model derived from hypothesis

- H1 = *intention to avoid food waste is the main predictor of food waste behaviour.*
- H2 = *situational factors have a direct impact on food waste behaviour in restaurants.*
- H3 = *subjective norms affect food waste behaviour through intention to avoid food waste.*
- H4 = *moral norms affect intention to avoid food waste and/or attitudes.*
- H5 = *food waste attitudes affect intention of wasting food.*
- H6 = *environmental attitudes have an impact on food waste behaviour, through intention to avoid food waste.*
- H7 = *environmental beliefs affect food waste behaviour, through intention to avoid food waste.*
- H8 = *socio-demographics, such as income, education and age affect food waste behaviour.*

3.3.8   Limitations

TPB does, however, have some limitations. (1) Kollmuss & Agyeman (2002) mean that the underlying assumptions of TPB are that people act rationally, thus emotional aspects of behaviour are not considered. (2) Due to the rational aspects of consumers Armitage & Conner, (2001) point out that TPB tends to rely on self-reported behaviour that can create biases. (3) Another issue is the measurement of intentions that are mediating attitudes and norms to behaviour (Ajzen, 2011). According to Kiriakidis (2015) TPB is able to accurately predict behaviour, but only when the conditions of intention – behaviour relationship are stable. (4) Subject norms have been found to be a weak component that is inadequate (Sparks et al., 1995, Visschers et al., 2016).

4. Methodology

Research on food waste is a relatively new topic. Most research uses qualitative methods to understand the phenomena. A lack of empirical evidence exists which emphasises a need of quantitative approaches to test results of previous research, such as: Stefan et al. (2013), Stancu et al., (2015), Visschers et al. (2015), Mirosa et al. (2016), Quested et al. (2013), Farr-Wharton et al. (2014), and Parizeau et al. (2014).

4.1   Procedure and sample

Data was collected by means of questionnaires. An online survey was sent out, with the survey tool Webropol, through e-mail invitations to volunteer respondents. According to Silvennoinen et al. (2015) most food waste occurs from buffet restaurants during lunch time. Therefore, data was gathered in connection with buffet restaurants during lunch time. Data was collected in the course of four weeks on weekdays; between 9th March to 9th April 2017 in Borås, Sweden. In addition, the questionnaire was mailed to students at University of Gothenburg during the last week of data gathering.

Due to few participants in the first attempted method to gather data, three different ways of collecting data were used. The first and second methods are similar, as both allowed a randomly selection of restaurant visitors. Whereas, the last data collection method was more limited as it was not completely at random and only students could be asked.

The *first data collection* occurred outside a buffet restaurant during one and a half week. E-mails were collected from every third group of people leaving the restaurant after lunch.

The *second data collection* was inside another type of restaurant. Every third company was asked at the table, during lunch, to participate in an online survey. The duration of data collection inside the restaurant was two and a half weeks.

To achieve variation within the sample a *third method of data collection* was to send out the questionnaire to students at Gothenburg University.

The questionnaire was developed in English, and translated into Swedish. All the questions in the survey were mandatory to answer; leading to no missing data in the sample. To increase the response rate, two cinema tickets were raffled among those who did respond. Since cinema tickets are a small token, it is not believed that the raffle changed the nature of answers among the respondents. The program Webropol kept track of those who responded, which enabled to send out two reminders to the non-responders. All respondents were anonymous.

In total 207 out of 540 respondents answered. This equals a response rate of 38 percent. Socio-economic information of gender, age, education, occupation and yearly income (before

tax) are shown in table 1. There were more female respondents (56 %) compared to males (44 %). According to Stefan et al. (2013) higher respond rate of women in food related studies are common since they tend to be more willing to answer questions related to food issues. In addition, majority of the respondents were students (55 %). Data from SCB (2017) revealed that more females (66 %) study at university. It is also evident that majority of the respondents in this study have higher education at university (77.5 %). The age of the respondents were also young with a majority (52 %) between 20 – 29 years old. Following 53 percent of the respondents had low yearly income; between 0 – 200 000 SEK.

These socio-economic characteristics represent young respondents that are mainly students, with a low income.

Table 1: Socio-economic characteristics of respondents (N = 207)

Variable	Sample (%)	Variable	Sample (%)
Gender		**Yearly income (before tax)**	
Female	56	0 – 100 000 SEK	34
Male	44	100 001 – 200 000 SEK	19
Education		200 001 – 300 000 SEK	12.5
Junior high school	2	300 001 – 400 000 SEK	20.5
Senior high school	17.5	400 001 – 500 000 SEK	12
Professional college	3	500 001 SEK and over	2
University less than 3 years	24	**Age**	
University 3 years or more	53.5	20 – 29	52
Occupation		30 – 39	24
Students	55	40 – 49	12
Employed	38	50 – 59	8
Self-employed	2.5	60 and older	4
Unemployed	1		
Retired	0.5		
Other	3		

4.2 Questionnaire and measure

The questionnaire contained six sections. In order to avoid biases from the other questions, the two first sections concerned restaurant habits, self-reported food waste behaviour, and intention to avoid food waste. The restaurant habits were measured with four items, referring to how often the consumer eats at a restaurant every month (Parizeau et al., 2015). Self-reported food waste behaviour, intention to avoid food waste, food waste attitudes, environmental attitudes, subjective norms, moral norms, and situational factors were all

measured with a seven point Likert scales (Table 3). Socio-demographic questions were put at the end of the questionnaire.

Self-reported food waste behaviour, covers the avoidable leftover plate waste in this study. This included five items (protein (meat, fish), starches (potatoes, pasta, rice), vegetables, sauce, and fruits) that prior research has indicated are wasted the most (Mirosa et al., 2016, Stefan et al., 2013, Stancu et al., 2016, Visschers et al., 2016). In addition a question about how likely it is that the consumer left food from a buffet on the plate was added (Mirosa et al., 2016).

Intention to avoid food waste, respectively *food waste attitudes* were measured through four items, derived from Mirosa et al., (2016), Stancu et al. (2016), and Visschers et al. (2016). According to Stefan et al. (2013) and Stancu et al. (2016) it would have been considered an odd purposeful behaviour for the respondent to be asked about intention to waste food. Hence it makes more sense for the respondent to be asked about intention to avoid food waste.

Environmental attitudes were measure with four items that were developed from mainly Stancu et al. (2016), but also from Stefan et al. (2013). These items concentrates about guilt and negative impacts food waste generates.

Subjective norms are measured with three items, derived from Visschers et al. (2016). Following prior research on food waste behaviour, it has been common to measure subjective norms with only two items (Visschers et al., 2016, Stefan et al., 2013). It is however, notably that it has resulted in non- or weak statistical significance between subjective norms and food waste behaviour in previous studies.

Moral norms consist of four items derived from Stancu et al. (2016), Visschers et al. (2016), and Schwartz (1977) measuring food waste principles and conscience.

Another three items measuring *PBC* were derived from Stancu et al. (2016) and Visschers et al. (2016). However, these items were not significant in the Cronbach α analysis; hence PBC was not further used in other analyses.

Situational factors were developed from Mirosa et al. (2016), containing five items, measuring external reasons of wasting food. These items concerns hunger, taste, food appearance, stress and avoiding food coma.

In order to understand the respondents' *environmental beliefs*, three items were measured, using New Ecologic Paradigm (NEP), derived from Pienaar et al. (2015) and Amburgey & Thoman (2012). These items concerns resources of earth and human interference with these resources.

4.3   Data analysis

Major concerns in quantitative methods are reliability and validity (Gilbert & Churchill, 1979, Hair et al., 2014). To increase validity and reliability, data were analysed (through SPSS) by different analyses, namely; Cronbach α, regression analysis, confirmatory factor analysis (CFA), and structural equation modelling (SEM), as suggested by Gilbert & Churchill (1979).

In accordance with (Gilbert and Churchill, 1979), Cronbach α was the first tool used in this study to asses internal consistency among the constructs. Highly intercorrelated constructs indicates reliable constructs (Gilbert and Churchill, 1979, Hair et al., 2014).

Gilbert & Churchill (1979), and Garland (1990) stress the importance of using multi-item measures, such as summated scales provides. Hence, summated scales were used, based on result from the Cronbach α analysis. According to Hair et al. (2014), summated scales reduce measurement errors, and represent multiple aspects of a concept in a single measurement.

Linear regression analysis was then used to test the hypothesis of this study. Regression analysis predicts the dependent variable's value by using independent variables (Hair et al., 2014). In order to assure that independent variables did not correlate with each other, multicollinearity test was used. A first conceptual model was developed.

A good way to test reliability is to compare Cronbach α analysis with CFA (Hair et al., 2014). According to Hair et al. (2014), CFA has more indicators of construct validity, compared to Cronbach α. Convergent validity, discriminant validity, nomological validity, and face validity were investigated.

 SEM is a more valid and reliable analysing tool than regression analysis, as it builds on CFA. In contrary to regression, SEM can examine both dependent and independent relationships simultaneously (Hair et al., 2014). SEM also corrects measurement error (Hair et al., 2014).

Provided that CFA and SEM are more valid and reliable, these methods are preferable to increase goodness of fit of a conceptual model (Gilbert & Churchill, 1979). This study therefore, emphasises more on model fit in CFA and SEM. While the Cronbach α and regression analyses have a more theoretical approach in this study; to assure face validity. This approach resulted in two different models. Since both analyses (SEM and regression) showed same factors as strongest variables, it can be assumed that validity and reliability are good in this study.

5. Results

5.1 Descriptives

Majority of the respondents indicates eating at restaurant 1 – 4 times a month (72 %). Only 4.8 % stated to eat five times a week or more.

Looking at table 2, the self-reported *food waste behaviour* shows that consumers are most likely to waste only a little, when eating at restaurants (SD = 1.02, Mdn = 2.57). The *intention to avoid food waste* is high (SD = 1.05, Mdn = 7.00). Table 2 shows a negative skewness and a peaked distribution (skewness = -12.97, kurtosis = 13.5). The distribution of *food waste attitudes* are also negative skewed, and high, as majority of the respondents think wasting food is negative and upsetting (SD = 1.37, Mdn = 5.67, skewness = -5, kurtosis = 0.08).

Moral norm and *subjective norm* are lower (SD = 1.33, Mdn = 5.00, and SD = 1.08, Mdn = 5.00). Respondents did also have a positive *environmental beliefs* about reaching the limit of what earth can support (SD = 1.26, Mdn = 5.67). The *environmental attitudes* were lower, and almost neutral among the respondents (SD = 1.51, Mdn = 4.33). *Situational factors* indicates that different situations could cause more food waste (SD = 1.18, Mdn = 3.80).

Table 2: Descriptives of the factors (N=207)

	SD	Mdn	M	Skewness	Kurtosis
Food waste behaviour	1.02	2.57	2.77	3.50	-.68
Intention to avoid food waste	1.05	7.00	6.37	-12.97	13.50
Food waste attitudes	1.37	5.67	5.46	-5.00	.08
Moral norm	1.76	5.00	4.73	-3.20	-.58
Subjective norm	1.08	5.00	5.08	-.93	1.20
Environmental beliefs	1.26	5.67	5.45	-3.40	-1.56
Environmental attitudes	1.51	4.33	4.44	-.68	-2.08
Situational factors	1.18	3.80	3.79	-1.04	.62

Only situational factors showed normal distribution on both Kolmogorov-Smirnov test and Shapiro-Wilk test, meaning that the data is not normally distributed. However, a sample size of 200 or more can cancel out effects of non-normal assumptions (Hair et al., 2014). Although, the factor "intention to avoid food waste" with a skewness -12.97 and kurtosis 13.5, are too high to be ignored. However, it is not recommended to use transformation in social science as it complicates the interpretation of the findings (Hair et al., 2014). Thus, no attempt to improve normality was made.

From univariate detection analysis, two outliers were detected in the factor intention to avoid food waste, and 4 outliers in food waste attitudes. Due to the characteristics of the data this were ignored.

6. Data analysis

6.1 Reliability analysis

Internal reliabilities of the factors were analysed through Cronbach α. Five factors had Cronbach α above the threshold of .70, two factors were above .60, which is also acceptable (Hair et al., 2014) (table 3). Subjective norm had Cronbach α of 0.537, which indicates low reliability. One item was deleted from both *intention to avoid food waste*, and *food waste attitudes* in order to increase Cronbach α. Furthermore, two items were deleted in the factor environmental attitudes. One item (protein; meat and fish) was also deleted from food waste behaviour to improve Cronbach α. Cronbach α then improved to .726. The items scored low on the 7-point Likert scales, indicating that meat and fish are not wasted to the same extent as the other items.

The construct of PBC was removed as the items violated the reliability model assumptions (Cronbach α = -0.07).

Table 3: Questionnaire items per construct, including internal reliability (Cronbach α), mean and SD of the construct, as well as mean and SD per item.

	M	SD	Cronbach α if item deleted
Food waste behaviour (Cronbach α = 0.726, N = 5, M = 14.53, SD = 5.74)			
How likely did you have plate leftovers the last five times at a buffet?*	2.99	1.71	.725
How likely would you leave ... on your plate?			
Starch (potatoes, rice, and pasta)*	3.37	1.65	.648
Vegetables*	2.64	1.67	.630
Sauce*	3.12	1.73	.679
Fruits*	2.41	1.55	.705
Intention to avoid food waste (Cronbach α = 0.720, N = 3, M = 19.12, SD = 3.14)			
I try to eat all food that I have taken myself	6.32	1.16	.752
I intend to not throw food away	6.42	1.40	.546
I try to leave as little food as possible	6.38	1.36	.551
Food waste attitudes (Cronbach α = 0.723, N = 3, M = 16.39, SD = 4.11)			
It is immoral to discard food while other people in the world is starving	4.70	1.94	.619
In my opinion wasting food is negative	6.22	1.30	.672
It upsets me when leftover food from the buffet end up in the waste bin	5.47	1.82	.599
Moral norms (Cronbach α = 0.735, N = 4, M = 18.92, SD = 5.31)			
I feel guilty about poor people when I leave leftover food	3.21	1.89	.726
Leaving leftovers give me a bad conscience	4.61	1.89	.597
I have been raised to eat all food I have taken myself	5.90	1.51	.733

It is contrary my principles when I have to discard food	5.19	1.78	.622
Subjective norm (Cronbach α = 0.537, N = 4, M = 20.31, SD = 4.30)			
People who are important to me think it is unnecessary to reduce the amount of food waste**	5.21	1.59	.518
People who are important to me think that I am greedy when I try to eat all food that I have taken myself**	5.94	1.53	.528
I do not believe that I can do anything about the food wasted in a restaurant**	4.49	1.73	.448
Other restaurant guests make it impossible for me to reduce the amount food wasted in the restaurant**	4.66	1.77	.338
Environmental beliefs (Cronbach α = 0.618, N = 3, M = 16.34, SD = 3.78)			
We are approaching the limit of the number of people the earth can support	5.32	1.72	-
The earth is like a spaceship with very limited room and resources	5.00	1.97	-
Environmental attitudes (Cronbach α = 0.716, N = 3, M = 13.3, SD = 4.53)			
One should not load the environment with food waste	5.32	1.49	.766
Wasting food would make me feel guilty about the environment	3.82	2.02	.469
I don't think about the environment when I waste food**	4.19	2.11	.565
Situational factors (Cronbach α = 0.648, N = 4, M = 16.69, SD = 5.23)			
Indicate why you would leave food:			
I'm full	2.25	1.77	.648
The food did not taste good**	2.09	1.48	.582
The food did not appeal to me**	4.70	1.90	.536
I'm in a hurry and does not have time to finish my meal**	4.54	2.03	.557
I do not want to get food coma**	5.36	2.03	.549

Note: All items were assessed on a 7-point Likert scales; higher values correspond to stronger agreement to the statement.

*1 = never and 7 = always.

**item was reverse coded.

Following the reliability analysis (table 3); moral norm, food waste behaviour, food waste attitudes, intention to avoid food waste, and environmental attitudes have strong internal reliability, as these factors have Cronbach α >.7. With the threshold of .6, situational factors and environmental beliefs have also good internal reliability. This indicates that each factor is reliable and can be further used in regression analysis (Hair et al., 2014).

6.2 Regression analysis

The items with highest intercorrelations, from the reliability analysis (table 3) were summated to create each factor that is used in the regression analysis. Summated scales were used, to reduce measurement errors, and to make one measurement containing multiple items. Linear regression analysis was then used to test the hypothesis (figure 1).

Intention to avoid food waste was first analysed as the dependent variable in order to test H1, H3 – H8. Only H1 and H4 were significant and supported. The model is significant at p = 0.000 with R^2 of 31.2 %. Moral norm has highest impact with Beta (β) coefficient 0.232, and a significance of p = .001. Food waste behaviour shows a significance of p = .010 (table 4).

Table 4: Regression analysis with intention to avoid food waste as dependent variable; $R^2 = .097$.

Factor	β	t	Sig. (p-value)
Moral norm	.232	3.440	.001
Food waste behaviour	-.175	-2.590	.010

Secondly, food waste behaviour was analysed as the dependent variable. Resulting in a significant model with prediction (R^2) of 46.1 %. That supported H1 (negative relation between intention to avoid food waste and food waste behaviour), with a significance of .021 (table 5). H2 (situational factors) was also supported with a negative relation of a significance of .009. Both environmental attitudes (p = .000), and environmental beliefs (p = .000) correlates directly with food waste behaviour and do not have any relation to intention to avoid food waste. Environmental beliefs and environmental attitudes have the highest impact on food waste behaviour. Thus H6 and H7 are not supported, but redirected to a direct relation to food waste behaviour. Socio-economics factors (H8) were also tested, but education and income were not significant, and therefore deleted from the analysis. Age was significant with p-value of .019 (table 5).

Table 5: Regression analysis with food waste behaviour as dependent factor; $R^2 = .461$.

Factor	β	t	Sig. (p-value)
Environmental beliefs	-.289	-4.413	.000
Environmental attitudes	-.248	-3.699	.000
Situational factors	.170	2.643	.009
Intention to avoid food waste	-.151	-2.322	.021
Age	.148	2.366	.019

Further testing of linear regression analysis with different dependent factors was made to explore other constructs. With moral norms as dependent variable R^2 showed a good prediction of 47.5 %. Significant factors in this model are: food waste attitudes (p = .000) and intention to avoid food waste (p = .007) (table 6). Moral norms did not show any relation to food waste behaviour. Instead, moral norms predicted other factors that were significant to food waste behaviour. This indicates that moral norms do not have a direct relationship with food waste behaviour, but rather an indirect relationship through environmental attitudes and intention to avoid food waste.

Table 6: Regression analysis with moral norms as dependent factor; $R^2 = .475$.

Factor	β	t	Sig. (p-value)
Environmental attitudes	.407	6.445	.000
Intention to avoid food waste	.112	2.719	.007

Finally, a multicollinearity test was made to test if the independent variables correlated with each other. There was no multicollinearity among the independent variables in the different models. The tolerance was above the threshold of .2, and VIF was below the threshold of 10 (Hair et al., 2014).

Notable is that H3 was not supported, as subjective norms were never significant in any of the regression analysis.
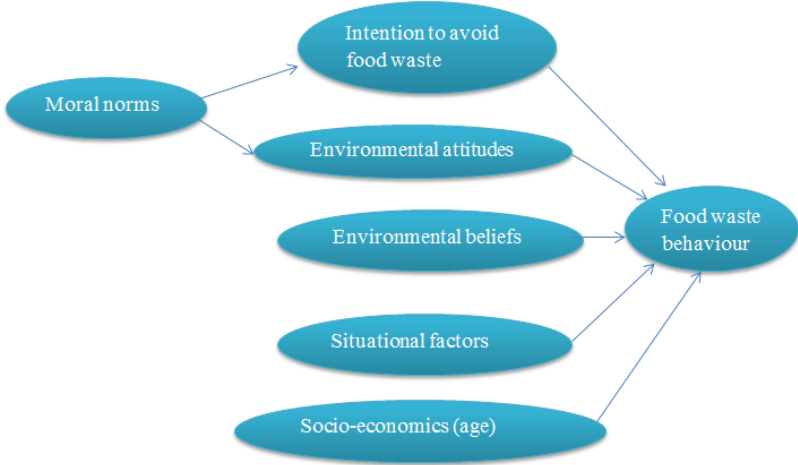

Figure 2: Model derived from the regression analysis, based on the data of this study.

6.3 Confirmatory factor analysis (CFA)

Ensuring validity and reliability of the factors in this study; CFA were used. Starting with validity of the construct; convergent validity, discriminant validity, nomological validity and face validity were considered. Construct reliability (CR) was also analysed to improve convergent validity and test reliability. With the optimization for goodness of fit in the CFA, many factors were candidates for deletion. Only a few factors remained; food waste behaviour, environmental beliefs, environmental attitudes, and moral norms. See the result in table 8 and figure 3.

To improve convergent validity, items with standardised estimates below .5 were candidates of deletion (Hair et al., 2014). One factor in *food waste behaviour* and *environmental attitudes* were not deleted although it was below the threshold of .5.

According to Hair et al. (2014), threshold for CR is above .7. Moral norms, environmental attitudes and food waste behaviour have CR above .7, whereas CR of environmental beliefs is below .7.

Discriminant validity was analysed by average variance extracted (AVE) with a threshold of at least .5 (Hair et al., 2014). Moral norms and environmental beliefs have AVE above .5. The AVE of food waste behaviour and environmental beliefs is under .5.

Nomological validity and face validity fit with theory about food waste, both from the reliability analysis and compared to prior studies about food waste; Farr-Wharton et al. (2014), Mirosa et al. (2016), Stefan et al. (2013), Stancu et al. (2016), and Visschers et al. (2016). Standardized residual covariances were assured to be below the threshold of 2.5 (Hair et al., 2014).
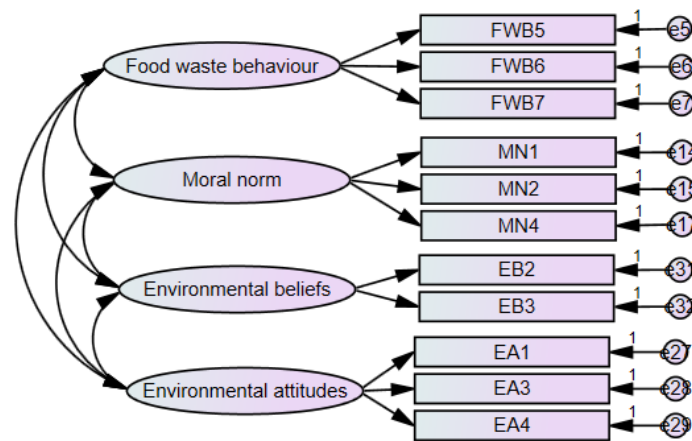

Figure 3: Final construct of CFA analysis

The result, shown in table 8, includes three items measuring food waste behaviour, three items measuring moral norms, three items measuring environmental attitudes, and two items measuring environmental beliefs.

Table 7: Result of CFA, including items of measures (N = 207).

	Factor loadings (>.5)	CR (>.7)	AVE (>.5)
Food waste behaviour		.0722	.491
Vegetables (FWB5)*	.982		
Sauce (FWB6)*	.496		
Fruits (FWB7)*	.513		
Environmental beliefs		.622	.452
We are approaching the limit of the number of people the earth can support (EB2)	.671		
The earth is like a spaceship with very limited room and resources (EB3)	.673		
Environmental attitudes		.737	.507
One should not load the environment with food waste (EA1)	.429		
Wasting food would make me feel guilty about the environment (EA3)	.954		
I don't think about the environment when I waste food (EA4)**	.654		

		.751	.508
Moral norms			
I feel guilty about poor people when I leave leftover food (MN1)	.680		
Leaving leftovers give me a bad conscience (MN2)	.851		
It is contrary my principles when I have to discard food (MN4)	.580		

Note: All items were assessed on a 7-point Likert scales; higher values correspond to stronger agreement to the statement.

*1 = never and 7 = always.

**item was reverse coded.

Moral norms and environmental attitudes show good construct validity, with CR and AVE above thresholds. Food waste behaviour has good CR, but AVE (.491) is under the threshold of .5. Environmental beliefs have weaker construct validity, with both CR and AVE below thresholds.

Looking at the indices of this CFA analysis, table 9 shows a high goodness of fit; CFI = .983, GFI = .962, RMSEA = .035, PCLOSE = .788, SRMS = .05.

Table 9: Indices of CFA analysis.

Measure	Observed	Threshold
Chi-square (X^2)	47.383	-
DF	38	-
CMIN/DF	1.247	< 5
CFI	.983	>.9
GFI	.962	>.9
RMSEA	.035	<.08
PCLOSE	.788	>.05
SRMR	.050	>.1

CMIN/DF (1.247) indicates a good model fit since it is below the threshold of 5. CFI (.983) and GFI (.962) are above the thresholds of .9; also indicating good model fit. PCLOSE (.788) is above the threshold of .05. Moreover, RMSEA (.035) and SRMR (.05) are below their thresholds of .08 and .01, supporting a good model fit. This evidence a good model fit that is suitable for a SEM analysis.

6.4   Structural Equation Modelling (SEM)

Building on the CFA analysis, the SEM analysis provided a good model, predicting food waste behaviour in restaurants (figure 4). All relations in this model are significant with a p-value of .000.
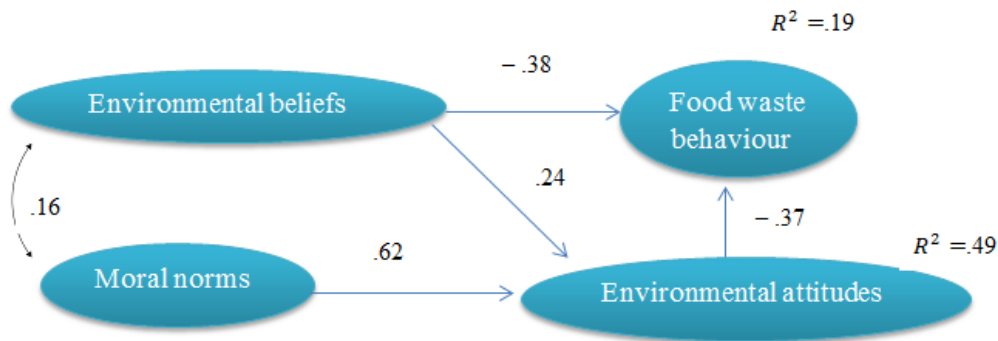
Figure 4: Conceptual model derived from the SEM analysis

As shown in figure 4, predictors of food waste behaviour are environmental attitudes and environmental beliefs, both with a negative relation to food waste behaviour. This indicates that consumers with high environmental beliefs and attitudes tend to waste less food. Moral norms and environmental beliefs influences environmental attitudes. Moreover, moral norms (.62) tend to have a greater influence on environmental attitudes than environmental beliefs (.24) have.

The final model from the SEM analysis has a good model fit (table 10) with all indices in accordance to their thresholds.

Table 10: Final construct of SEM analysis.

Measure	Observed	Threshold
Chi-square (X^2)	49.647	-
DF	39	-
CMIN/DF	1.273	< 5
CFI	.981	>.9
GFI	.959	>.9
RMSEA	.036	<.08
PCLOSE	.765	>.05
SRMR	.050	>.1

Similar to the CFA analysis, the indices point to a good model fit in this SEM analysis. With CMIN/DF 1.27, CFI of .981, GFI of .959, PCLOSE of .036, RMSEA of .036, and SRMR of .05.

A good model fit implies that the result is valid and theory fits with the data (Hair et al., 2014). Since the result from regression analysis has similarities, this SEM model shows good reliability.

7. Discussion

First, the results from regression- and SEM analyses, based on theory of planned behaviour (TPB), are discussed under theoretical implications. Secondly, management implications are implied. Thirdly, suggestions of future research are discussed, followed by limitations of this study.

7.1 Theoretical implications

This study examined what factors influences consumer's food waste behaviour in restaurants, through conceptual models. Based on TPB two models were derived, first, from a regression analysis, secondly, from a SEM analysis. The Cronbach α and regression analysis emphasised more on theoretical aspects than the CFA and SEM analyses did. The CFA- and SEM analyses focused to improve goodness of fit in order to increase validity and reliability of the model (Gilbert and Churchill, 1979).

TPB, together with pro-environmental aspects and prior literature on food waste behaviour, suggested that eight factors (figure 1) influences food waste behaviour. The regression analysis included six factors (figure 2) influencing food waste behaviour. With improved validity, the CFA- and SEM analyses resulted in three factors (figure 3 and 4) influencing food waste behaviour.

7.1.1 Model from regression analysis

Looking at the model that was derived from the regression analysis (figure 2), intention to avoid food waste, environmental attitudes, environmental beliefs, situational factors and age were predictors of food waste behaviour. Moral norms did also show an indirect relation to food waste behaviour through intention to avoid waste, and environmental attitudes.

Following TPB, intention to avoid food waste should both predict food waste behaviour and act as a mediator to predict behaviour through underlying factors (Ajzen, 1991). The result support that intention to avoid food waste is a predictor of food waste behaviour. Intention to avoid food waste does also mediate moral norms, as suggested by Visschers et al., (2016) and Stefan et al., (2013). In accordance with Rats et al. (1995), moral norms do also affect environmental attitudes.

Surprisingly the underlying factors of environmental attitudes and environmental beliefs do not mediate through intention to avoid waste; instead, they have a significant direct impact on food waste behaviour. This is contrary the assumptions of TPB, where intention act as a mediator between underlying factors and behaviour (Ajzen, 1991). However, the reason why intention is used as a mediator is because it has been hard to predict behaviour directly through these underlying factors (Ajzen, 1991, Wicker, 1969). Hence, there should not be an

issue that environmental attitudes- and beliefs are significant predictors of food waste behaviour.

Further support of implementing environmental factors to predict behaviour (Farr-Wharton et al., 2014) is that environmental beliefs and environmental attitudes were the strongest predictors of food waste behaviour in both regression- and SEM analyses. This is also in accordance to Mirosa et al. (2016) that consumers' concerned about the environment tending to waste less.

Food waste attitudes were not significant in any of the models derived. This is contrary to the results of Stefan et al., (2013), Graham-Rowe et al., (2014), Stancu et al., (2016), and Visschers et al., (2016). On the other hand, environmental attitudes, showed to be one of the strongest predictor of food waste behaviour, as suggested by Mirosa et al. (2016). Since both food waste attitudes and environmental attitudes measures attitudes, the assumptions of TPB; that attitudes affect behaviour (Ajzen, 1991) is supported. This result also implies the importance of environmental factors on predicting food waste behaviour, as Farr-Wharton et al. (2014) suggests.

As proposed by Mirosa et al. (2016) and Schneider (2008), situational factors also affect food waste behaviour. However, Cronbach α indicated that hunger and taste were not the main reasons of leaving food. This is contrary of what Mirosa et al. (2014) found out. Instead food appearance, stress, and avoidance of food coma were major causes of leaving food, which Mirosa et al. (2016) and Schneider (2008) also point at.

Subjective norms were not significant in any of the models. This is not a surprise, as prior studies has pointed out that subjective norms have weak or no effect on food waste behaviour (Visschers et al., 2016, Stefan et al., 2013, Quested et al., 2013). Due to the weak impact from subjective norms, other authors have removed this factor from analysing, despite using TPB (Sparks et al., 1995).

Only age as socio-economic factors was significant to predict food waste behaviour, with a positive relation. This indicates that young consumers tend to have a food wasting behaviour, since majority of the respondents in this study are under the age of 40 years. This is in accordance to Quested et al. (2013).

Parizeau et al. (2015), Stefan et al. (2013) and Thyberg & Tonjes (2016) state that those with high income tend to eat more at restaurants. However, there was no evidence supporting income as a significant factor of food waste behaviour. This result could be due to the lack of high income among the respondents in this study, as the majority had a yearly income (before tax) between 0 – 200 000 SEK.

7.1.2 Model from SEM

The SEM model has a high goodness of fit. The result indicates that three factors can be used to predict food waste behaviour. Namely: environmental attitudes, environmental beliefs, and moral norms (figure 4).

In accordance with the model from the regression analysis; environmental beliefs and environmental attitudes had greatest impact on food waste behaviour. As already discussed, this result supports Farr-Wharton et al. (2014) and Mirosa et al. (2016). It also explains that attitudes and beliefs influences behaviour (Ajzen, 1991). Furthermore, moral norms influences behaviour indirect through attitudes as Rats et al. (1995) explains.

Intention to avoid food waste was not significant in the CFA- and SEM analyses, and was therefore not used in the model. The models' goodness of fit also improved after removing intention to avoid food waste. Stefan et al. (2013) did also get a result where intention to avoid food waste did not significantly impact the reported food waste. Stefan et al. (2013) suggests that consumers have weak intention of avoiding food waste because food waste has become part of everyday life. Thus consumers waste food without reflecting about it, and therefore have a weak intention to avoid wasting food.

Situational factors were not significant in the SEM analysis either, and the goodness of fit improved when this factor was deleted. Thus, situational factors were not included in the SEM model. One explanation why neither situational factors nor intention to avoid food waste were significant in the SEM model could be that they were weak predictors to food waste in the regression analysis. Since age had weakest impact on food waste behaviour in the regression analysis, socio-economic factors were not tested in either CFA- or SEM analyses.

7.2 Management implications

The result from regression- and SEM analyses (figure 2 and 4) provides useful information for designing campaigns aimed to reduce food waste in restaurants. In contrary to other studies (Parizeau et al., 2015, Watson & Meah, 2013), this study show that consumers do in fact connect food waste and environmental impacts. Since environmental attitudes- and beliefs are main predictors of food waste behaviour.

Raising awareness about environmental impacts, caused by wasting food, is believed to change behaviour in a more sustainable direction. A good example of how the service sector uses marketing to change consumer behaviour is the EAT Foundation. That uses marketing tools to raise awareness and promoting strategies to reduce food waste (eatforum, 2017). Other tools that are used to diminish food waste in restaurants are mobile apps (ResQ, and Karma), developed to "save" food. The app enables restaurants to sell edible leftover food that would have been wasted, to a lower price (Olsson, 2017). Since EAT Foundation and

both mobile apps were launched in 2016 (eatforum, 2017, svd, 2017, feber, 2017), the awareness of environmental concerns of food waste might have increased.

Judging the result of this study, it indicates that consumers are more aware of the environmental impacts from food waste, and are more concerned of wasting food, than before. It also shows that emphasises on environmental impacts have an effect on consumer behaviour.

7.3   Suggestions for future research

The main findings in this study are that environmental concerns and attitudes affects consumers' food waste behaviour. This is contrary Parizeau et al. (2015) and Watson & Meah (2013), as their results point to consumers that are less concerned about environmental aspects, and more concerned of economic and social aspects of food waste. Although Mirosa et al. (2016) Quested et al. (2013) and Farr-Wharton et al. (2014) mean that environmental aspects need to be added in food waste research. Additional research to clarify the importance of environmental aspects in food waste behaviour is needed. Additionally, there is a need to investigate how effective marketing campaigns to reduce food waste are. For example if consumers waste less when they are aware of environmental impacts food waste causes.

Another aspect that haven't been considered in this study is the impact of healthy, and more sustainable food consumptions in restaurants, such as eating less meat, choosing organic food etcetera. Hoek et al. (2017) suggest that consumers are more concerned over sustainable, healthy food than environmental impacts. Whereas this study suggests that the environmental impact does affect consumers' food waste behaviour. Future studies could investigate further whether health concerns or environmental impact lead to a more reduced food waste behaviour in restaurant.

The TPB model did not perform as expected in this study, as intention was not significant in the SEM model, and only a weak predictor in the regression model. Stefan et al. (2013) had similar results and agree that there is a need of developing improved models to predict consumers' food waste behaviour. There have been different outcomes in other studies on consumers' food waste behaviour (Stefan et al., 2013, Parizeau et al., 2015, Stancu et al., 2016, Visschers et al., 2016). This further emphasise a need of improved models predicting food waste behaviour.

There is a need to develop better measurements of food waste related factors, such as food waste attitudes, intentions and subjective norms. According to Gilbert and Churchill (1979) marketing research has been slow to provide valid and reliable measures of marketing constructs.

7.4   Limitations of the study

This study has some limitations. First, TPB relies in self-reported behaviour that can cause biased estimates of true behaviour (Armitage & Conner, 2001). Armitage & Conner (2001) mean that self-reported items are not as reliable as more objective behaviour measures. Secondly, some measurements were adapted to the nature of food waste behaviour. For example intention to avoid food waste was measured to avoid food waste, rather than measure an intention to waste food. This does not follow the original recommendations of TPB (Ajzen, 1991). It was considered to be more natural to ask about an intention that people could relate to (Stancu et al., 2016, Visschers et al., 2016).

Another limitation with this research is problems with skewed and kurtosis data on intention to avoid food waste and food waste attitudes. This could explain the lack of intention as a mediator, as well as the absence of food waste attitudes in the analysis. The factor of subjective norm did not reach the threshold of .6 in the Cronbach α test. This could explain the absence of this factor in this study.

8. Conclusion

The conceptual models in this study answers the question of *what factors influences consumers' food waste behaviour in restaurants.*

Using the model from SEM analysis, the most important factors that influence consumers' food waste behaviour are environmental attitudes, environmental beliefs, and moral norms. Environmental attitudes and environmental beliefs have negative impacts on food waste behaviour; indicating that consumers with high concerns for the environment tend to waste less food. Moral norms have an indirect relation to food waste behaviour through attitudes.

Other factors that predict food waste behaviour are: intention to avoid food waste, and situational factors. The regression analysis revealed that intention to avoid food waste had a negative relation to food waste behaviour, meaning that consumers' intending to not wasting food, tends to waste less. Situational factors had positive relation to food waste behaviour. This indicates that situational factors, such as stress and food appearance, leads to more food waste.

In order to change food waste behaviour in restaurants, managers should raise the awareness of the environmental impacts food waste causes. Marketing these aspects and encourage consumers to waste less, could lead to a change in consumer food waste behaviour.

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