



HOW MUCH DO YOU LIKEWASTE?

THE EFFECT OF WASTE AVERSION ON FOOD WASTE BEHAVIOUR

Abstract: Reducing food waste is one strategy to minimize the environmental footprint and handle the growing population in a sustainable way. Households account for the largest share of food waste, which points to a impactful area for research. This research links, for the first time, waste aversion to household food waste behaviour. Waste aversion is a strong dislike towards unused utility, the waste of monetary assets or the environmental consequences of the disposal. Waste aversion is measured by conducting a survey at three supermarkets in Nijmegen, an average-sized city in the Netherlands. Several analyses are performed to measure the main effect. However, no direct effect between waste aversion and food waste is found. By analyzing this relationship in more detail, an indirect effect is observed. Waste aversion leads to an increase in consuming routines, which eventually leads to a decrease in food waste.

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1. Introduction

To be able to sustain the world's human population and provide an ample provision of food, the amount of food that is wasted needs to be reduced. Besides the concerns of securing food for everyone, food waste also has an enormous environmental impact. Securing the global demand for food, and a reduction of the effects of climate change can be achieved, if food consumption and usage is managed efficiently. (Godfray , et al., 2010). However, the sustainability of current food systems is questionable at best. By reducing the food waste, suppliers of food have to reduce their orders and so the demand for food can be decreased. The environmental pressure on the production of food will be alleviated.

Food waste can occur along in various steps of the food supply chain; production, processing, wholesale and logistics (in combination with retail and markets), food service and at the household level. According to a department of the European Commission almost 53% of the total food waste can be attributed to the household level (Fusion, 2016). Due to this the household level needs to be the primary area of focus, as this is likely to have the most impact in the reduction of food waste. Besides the alleviation of the environmental burden of food waste, the economic impact of a reduction in food waste should result in monetary gains for households. According to Soethoudt et al., (2015) the food waste per capita in the Netherlands is between 109-152 kg, which is similar to €140 per household.

Although food waste is costly to households, the largest share of waste is measured there. Wasting food can be seen as an anomaly in the view of a homo economicus (Herath & Felfel, 2016). A homo economicus would act rationally and has an optimal utilisation of food. In order to create appropriate interventions for reducing food waste it is important to understand the behaviour of consumers at the household level. Food waste has become a topic of interest recently in the field of behavioural economics, as it tries to explain the anomaly of wasting. The existing body of literature has not been able to give conclusive answers on what determinants actually influence food waste. Past research has put its focus on the theory of planned behaviour, which explains the food waste by the intention to carry out food reducing behaviour. This intention is realised by a combination of several cognitive determinants. However, the theory of planned behaviour suggests that certain behaviours are planned. Intuitively, this means that people plan to waste food. This seems extremely peculiar, as it means that people buy food with the plan to waste food. This rather odd starting point makes this research look at a different approach for explaining food waste. The approach with whom this research tries to explain food waste is the concept of waste aversion developed by Bolton & Alba (2012). It

explains that people can have a visceral aversion towards waste. Different levels of waste aversion then explain differences in food waste behaviour. This aversion towards waste can be based on three concepts; the aversion towards the squandering of money, the aversion towards unused utility and the aversion towards the environmental consequences of waste. Using this concept for explaining food waste behaviour is new to the existing body of literature and could attribute new insights to the literature on food waste behaviour.

Furthermore, a study on the determinants of food waste has never been conducted in the Netherlands. Culture is known to have an impact on the food waste behaviour of consumers (Stuart, 2009). Therefore, it is important to do a research in the Netherlands, as determinants of food waste behaviour tend to differ between countries. This is especially the case for countries in which more attention has been paid to the food waste problem (Stefan et al., 2013). This special attention to the issue of food waste is present in Netherlands, where they have agreed upon the goal to reduce the food waste by 50% in 2030. A taskforce, Circular Economy in Food, has been created to succeed in this goal. Furthermore, multiple tools and campaigns have been created to help consumers and companies in decreasing their food waste. For this reason it is important to understand the determinants of food waste in the Netherlands.

In order to understand the role of waste aversion the following research questions is constructed:
Research Question: What is the role of waste aversion in explaining differences in food waste behaviour?

To research question is answered in a structural way. In chapter two a literature review is conducted in combination with a theoretical framework. Chapter two ends with four hypothesis that are tested later on. Chapter three consists of the methodology, in which the method of research and analysis is explained. Chapter four includes the results of the several analyses that are conducted. Chapter five discusses the theoretical implications, the role of waste aversion, the limitations and the possibilities for future research. Finally, chapter six gives an overall conclusion, including an answer on the research question. In chapter seven and eight the bibliography and appendix can be found.

2. Theoretical framework and review

In this section the existing body of literature is discussed regarding food waste behaviour and its determinants. The concept of waste aversion (Bolton & Alba, 2012), that relates to the aversion someone has towards waste, is introduced. So far, waste aversion has never been used to explain food waste behaviour, although it seems reasonable. Therefore, the existing body of literature on waste aversion is discussed and the link with food waste is made. Besides that, in behavioural economics, the role of emotions is often described as an important determinant of people's behaviour (Triandis, 1977). Based on this theory, past literature has made the link between emotions and food waste (Jagau & Vyrastekova, 2016; Russel et al., 2017). Waste aversion can be seen as a psychological determinant of food waste, as it is something that lets people act in a certain way. Besides these purely psychological determinants, there is routinised behaviour in place when assessing food waste. Past literature has found that having certain routines in your household could help in reducing your food waste. These household routines are structured in a set of five general routines (planning, preparing, storing, provisioning and consuming) as is argued by Geffen et al. (2016). The household routines are discussed after the section about emotions. Finally, the emphasis of the past body of literature on the theory of planned behaviour has been crucial. Most literature about food waste behaviour in households used this theory to predict differences in food waste behaviour. This research changes the focus from the TPB towards waste. One of the reasons for doing so is that food waste is not something that is 'planned'. Therefore it seems rather odd to apply this theory of planned behaviour on a behaviour that is not planned. However, as the TPB is a rather important model in the literature about food waste behaviour, this research explains this theory and corresponding results to some extent. A small section is used to explain the focus of waste in this research, fruits and vegetables. Besides that, the role of several socio-demographic factors found in past literature is discussed. Finally, the hypotheses and conceptual model are constructed.

2.1 Waste Aversion

In this section the concept of waste aversion and the relation with food waste behaviour is discussed. First of all, waste aversion in general is discussed, after that the focus is shifted to the role of waste aversion in food waste behaviour. To the best of my knowledge, waste aversion is rarely used as a topic of research. However, some literature explained the concept of waste aversion. Waste aversion was first identified as an explanation of the sunk-cost bias (Arks, 1996). Although the cost of a certain product is already incurred, people persist in a losing endeavour, because discarding it would imply that earlier made investments in the endeavour

were wasted (Bolton & Alba, 2012). The small number of researches that studied waste aversion, looked at it from the perspective of product replacement. In essence, product replacement was an optimisation problem. The trade-off between the costs of the replacement of an old product for a new one, compared to the costs of not switching to an improved product were taken into consideration (Alba & Bolton, 2012). Thus, the replacement costs of a product were compared to the costs of not switching to an improved product at all. This latter cost is the costs people experience when wasting. Therefore, waste aversion can be best understood as an experience (Bolton & Alba, 2012).

In this research waste aversion is used in a more general way, instead of looking at the field of product replacement only. Waste aversion in general can be described as the considerations of the costs incurred to wasting, the motivation of avoiding waste or the nature of the waste (Bolton & Alba, 2012). Therefore, the aversion towards waste can be described as an aversion towards unused utility of a product or service. This consideration to waste or not is in particular interesting in the moment that consumers have to decide whether to discard or retain the product (Bolton & Alba, 2012). The concept of waste aversion can be distinguished into three possible ways; by looking at waste aversion as the aversion of wasting unused utility, by looking at waste aversion as an aversion towards the waste of money and by looking at waste aversion as the aversion towards the environmental consequences of the disposal. Unused utility is defined as the utility that is related to purchases that go unconsumed (Bolton & Alba, 2012). The distaste towards unused utility would be best illustrated in a situation of two products with identical prices and identical utility, and still possess unequal amounts of unused utility. This would then results in different levels of aversion towards disposal. Another way in which waste aversion might occur is the aversion towards wasting money. This concept has been introduced by Arkes (1996) and can be formulated as the persistment of people in a losing endeavor, because a desertion would represent monetary investments as wasted. This would results in a somewhat more straightforward behaviour, that is the aversion towards wasting monetary assets. Lastly, people have a aversion towards waste due to the environmental consequences of the disposal. This aversion is based on the rational that food is produced and burdens environmental costs. The production of food has environmental costs as it produces greenhouse gas emmisions (Godfray , et al., 2010). The impact of this environmental costs that are associated with food waste, could act as a motivator for people to reduce food waste. This results in people being waste aversive due to the environmental consquences of food waste.

2.1.1 Waste aversion and food waste

So far the relation between waste aversion and food waste behaviour has not been investigated in previous research. However, literature about motivations to reduce food waste suggest that such relationship might exist (Graham-Rowe, Jessop, & Sparks, 2014). A qualitative research, using an interview procedure, found that one of the big motivators was the desire not to waste money. Besides the waste of money, respondents appeared to have a concern to wasting utility. According to Zanolli (2016) waste aversion is a strong psychological motivator for households to reduce food waste. He builds this theory on the concept of loss aversion (Thaler & Sunstein, 2008), which explains that losses are more powerful motivators of behaviour than gains. If the same holds for waste aversion, it would mean that waste aversion would be a strong motivator to reduce waste. Waste aversion is considered to be a dislike of wasting resources that they possess. People who are aversive towards waste, tend to get feelings of guilt when wasting, therefore this could lead to a reduction in the actual waste of food (Zanolli, 2016). For this last explanation it is important to consider the role of emotions.

The concept of waste aversion, as described above, is related to purchasing behaviour of consumers. The theory suggests that people who are aversive towards waste, in terms of utility or money, would delay purchase or replacement of products if it requires the disposal of other products before the monetary investment in the product has been recouped (Bolton & Alba, 2012). In that line it is argued that purchases are delayed due to the distaste of unused utility. Furthermore, Brook Lyndhurst (2007) found that 50% of the respondents appeared to be really thinking about the cost of food they throw away. This provides evidence that consumers are bothered by the fact that they throw away food, which could be in line with the theory of waste aversion.

Therefore, it is argued that waste aversion, whether it is in the form of aversion towards unused utility, monetary waste or environmental consequences, leads to a lower level of food waste (i.e. waste aversion negatively influences food waste behaviour). People who are more waste aversive than others tend to be bothered by the fact that they are wasting food, which would act as a motivator (like in the theory of loss aversion) to decrease their food waste. In that case, people are motivated by the fact that they are concerned with the wasting of unused utility, the costs incurred to wasting or the environmental consequences of wasting.

This study makes an important contribution on both theoretical and applied literature. Although, some suggestions about waste aversion have been made, the relation between waste aversion and food waste behaviour has not been made so far. No quantitative and generalisable

study has been conducted for this relation. Therefore, this research is the first to investigate this relation.

2.2 Emotions

The theory of interpersonal behaviour explains that emotions are a strong determinant in predicting behaviour (Triandis, 1977). Furthermore, earlier research has already showed such a relation between emotions and food waste (Jagau & Vyrastekova, 2016; Russel et al., 2017). Emotions can be defined as a reaction to an event or an object and are related to both a feeling and a cognitive component (Russel, William Young, Unsworth, & Robinson, 2017).

Emotions can act as a signaling device that relates to the importance of an issue and therefore will act as a trigger for action. Besides that, this trigger for action can be either positive or negative (Lazarus & Smith, 1990). The role of emotions can affect both the intention and the actual behaviour. For this research no intentions are measured, so this research focusses on the relation to actual behaviour. This direct link between emotions and behaviour is based on the motivational impetus that an emotion gives to a person (Lazarus & Smith, 1990). This motivational impetus then ensures that a person acts in a way that goes with the impetus. Altogether, the theory suggests that emotions will have a direct effect on food waste behaviour.

Past research highlighted the potential influence of emotions on the intention of food waste and the actual food waste behaviour (Russel, William Young, Unsworth, & Robinson, 2017). The research showed that negative emotions were positively related to the intentions to reduce food waste, while positive emotions did not have a significant impact. Surprisingly, the study showed that negative emotions appeared to have a positive impact on actual food waste behaviour (i.e. negative emotions increased food waste). This latter finding is very interesting as it suggests that the presence of negative emotions results in a higher food wastage.

An explanation for this surprising results could be that emotions are a consequence of the food waste behaviour (people perceive negative emotions when the food is wasted) instead of a driver for food waste (people perceive negative emotions before they decide whether to waste food or not). Although the research of Russel et al., (2017) did not measure any significant impact of positive emotions, this research also takes those emotions into consideration. Another research found that social emotions like guilt and shame are linked to the intentions of customers to prevent food waste (Jagau & Vyrastekova, 2016). People who have the intention to reduce their food waste were found to feel more ashamed and guilty. In this research social emotions played a crucial role in the motivation of socially desirable behaviour. Altogether

strong evidence is found that emotions could play an important role in wasting food. They could act as a trigger for certain behaviour, or are a consequence of a certain behaviour. In line with the theory of interpersonal behaviour, this research predicts that emotions act as a trigger of food waste reducing behaviour. Therefore, it can be argued that people who experience negative emotions are wasting less. This effect is caused by the motivational impetus these negative emotions bring about. For positive emotions, theory does not indicate whether the effect on food waste is negative or positive. In line with the theory of negative emotions, positive emotions create also a motivational impetus. It could be argued that positive emotions have the opposite effect of negative emotions. Therefore, it can be argued that people who experience positive emotions are wasting more.

2.3 Household routines

This section of the theoretical framework describes routinised behaviours in the household. Past literature have showed the role routinised behaviour in food waste differences. For that reason it is important to include these routines in the theoretical framework as well as in the analysis. The routines are included to control for that effect when measuring the effect of waste aversion on food waste. Furthermore, an analysis is conducted to measure the influence of waste aversion on these routines.

Due to the repeatable nature of the provisioning of food, the steps in this process are often routinised. This can be seen as a short-cut for consumers as they try to find a specific solution that works for the times they have to make the same decision over and over again (Jastran, Bisogni, Blake, Devine, & Sobal, 2009). Consumers use planning, shopping and cooking routines as a guidance in the provisioning of food (Stancu, Haugaard, & Lähteenmäki, 2016). Another model was constructed containing five routinised steps in the food provisioning process (Geffen et al., 2016). Geffen et al., (2016) adjusted the consumer household management model in order to make it applicable for food waste behaviour in households (Boyd & McConocha, 1996). This model distinguished the following stages of the household management routines: planning, provisioning, storing, preparing, consuming and eventually the disposal of food. The model of Geffen et al., (2016) is more sophisticated and has is more diversified than the model of Stancu et al. (2016). For that reason the model of Geffen et al., (2016) is used in this research. The model is described by explaining each step of the process in detail.

2.3.1 Planning routines

The first phase, planning routines, affects food waste behaviour, as a lack of planning can contribute to an increase in food waste. Planning can be related to making a shopping list, checking the inventory and planning meals in advance (Geffen et al., 2016). Using a shopping list was found to reduce the food waste in households with almost 20% (Jörrissen et al., 2015). Furthermore, information about products at home is necessary to avoid purchasing unnecessary items (Farr-Wharton, Foth, & Choi, 2014). No direct effect was found between planning routines and reduced food waste levels, although an indirect effect through provisioning routines and cooking skills was found (Stancu et al., 2016). The frequency of which these planning routines were performed differ; checking the inventory was found to be a frequently performed routine, while planning meals in advance was not done as often (Parizeau, Massow, & Martin, 2015). All together, having a more frequent usage of these planning routines has a negative effect on food waste (i.e. a positive effect on food waste reducing behaviour), as it reduces food waste in households.

2.3.2 Provisioning routines

Literature about food waste emphasised the importance of the provisioning routines in determining food waste in households. The provisioning stage captures the point in which the food enters the household. If the provisioning of food extends the amount necessary for the household this could lead to an increase in the food waste. Factors related to this provisioning stage are: impulse buying, buying products that are too large packaged and the buying of promotions/discounted products (Geffen et al., 2016). Provisioning routines appeared to have the expected positive relation to food waste, which means that more promotional buying and buying large packaged products leads to a higher food waste (Williams et al., 2012; Stancu et al., 2016). Promotional buying and impulse buying was positively related to food waste (Graham-Rowe et al., 2014; Farr-Wharton et al., 2014). Household that were not tempted to buy promotional offerings, were found to have a lower degree of food waste (Jörrissen et al., 2015). Altogether, a more frequent usage of the above described provisioning routines has a positive effect on food waste as it increases the food waste in households.

2.3.3 Storing routine

The storing stage of the provisioning process refers to the storing of single items as well as the combination of items. The correct storing of food can result in a decrease of the food waste. Factors relevant for the storing process are; the optimal storing of products (i.e. a fridge, refrigerator or just at room temperature), the structural storing of products and the extent to which people are able to estimate the food edibility (Geffen, Herpen, & Trijp, 2016). Food

waste generation can be lowered by storing products systematically and doing this per category (Farr-Wharton et al., 2014). Storing systems can prevent consumers from forgetting hidden products. Besides the systematic storing of products, it is important that products are stored optimally. The food longevity is determined by the storing strategy (Farr-Wharton et al., 2014). So, the knowledge about where to store specific types of food is an important component of the food storing routine that aims to reduce food waste. However, a research investigating the storing of food and the amount of food that is wasted did not give any significant results (Visschers, Wickli, & Siegrist, 2016). Lastly, an important determinant in the storing process is that consumers can assess the edibility of a product. The edibility can be assessed simply by using their senses (Parizeau et al., 2015). Research showed that people throw away food because they were not able to correctly estimate the edibility of food (Graham-Rowe et al., 2014). Furthermore, the edibility can be assessed by looking at the expiration date of a product. Two different types of labels regarding the expiration dates exist; 'best before date' and 'use by date'. Although there is a clear difference between those labels considering the edibility of a product, there is much confusion about this distinction (Abeliotis et al., 2014). In the literature there is no consensus about the effect of understanding this difference and the subsequent food waste. One research found no correlation (Visschers et al., 2016) while another research found a strong effect (Melbye et al., 2017). Altogether, a more frequent usage of these storing routines decreases the food waste, thus negatively affects food waste.

2.3.4 Preparing routines

The preparing stage refers to the handling of food products while securing the edibility of it. The higher the edibility of the food that is prepared, the lower the food waste in those households. Factors relating to this step of the process are: cooking skills, the amount of food that is prepared, and the creativity of meal preparation with food that is left over (Geffen, Herpen, & Trijp, 2016). One of the most promising factors in reducing food waste is the precise estimation of the amount of food that has to be used for the dish (Jörissen et al., 2015; Graham-Rowe et al., 2014). Furthermore, the ability of producing a dish with food products that are left in the fridge or cupboards is a potential for food waste reduction (Graham-Rowe et al., 2014). Lastly, cooking skills in general are important for reducing food waste during the cooking of the dish (Stancu et al., 2016). It is, for example, effective to reduce food waste if nothing is spilled or burnt during the cooking process. Altogether, a more frequent usage of preparing routines decreases the food waste, thus negatively affects food waste.

2.3.5 Consuming routines

The last step in the process, before the food is discarded, is the consuming stage, in which leftovers from consumed meals are being handled (or not). Reusing leftovers has a positive effect on reducing the food waste (Geffen, Herpen, & Trijp, 2016). The process of consumer food management appears to be important for the food waste behaviour at household. Stancu et al., (2016) found that the reusing leftover was contributing to a reduction in food waste. However consumers are also concerned with reusing leftovers as they are cannot indicate the durability of them correctly (Farr-Warthon et al., 2014). This means that although leftovers are safed, they are thrown away later on due to safety issues. Altogether, a more frequent usage of consuming routines decreases the food waste in household, thus having a negative effect on food waste.

2.3.6 Literature overview

In table 1, the literature overview for household routines is summarised

Table 1: Literature overview household routines

	Planning routine	Provisioning routine	Storing routine	Preparing routine	Consuming routine
Stancu et al., (2016)	+	+			+
Farr-Warthon et al., (2014)	+	+	+		+
Graham-Rowe et al., (2014)		+		+	
Jörrissen et al., (2015)	+	+		+	

2.4 Theory of planned behaviour

The purpose of this section is purely informative. In the end the significance of the model is discussed by looking at several researches. The outcomes indicate that the model that is used is not able to predict food waste behaviour in a consistent way. Past literature used the theory of planned behaviour (henceforth: TPB) to predict food waste behaviour (Russel et al., 2017; Graham-Rowe, Jessop & Sparks 2015; Stefan et al., 2013; Stancu et al., 2016). The TPB, constructed by Ajzen (1991), states in essence that the most important factor for planned behaviour is the intention to pursue that behaviour. This intention is than constructed out of three components; attitudes towards the behaviour, subjective norms and perceived behavioural

control. The attitude towards a certain behaviour is on the one hand determined by the desirability of the behaviour and on the other hand by the desirability of the subsequent effect. This relates to the attitudes and beliefs of a person towards certain behaviour. So why should attitudes affect behaviour? According to the theory of cognitive dissonance, humans need to create consistency between their cognitions (Semin & Fiedler, 1996). Cognitions can be understood as the knowledge one has about oneself, which include cognition about their behaviour and their attitudes. If a person becomes aware of inconsistencies between those cognitions, the state of cognitive dissonance is reached which motivates the person to overcome this inconsistency. This line of thought lead to the expected positive relation between attitudes and behaviour (Semin & Fiedler, 1996).

The second determinant of the TPB is subjective norms, which is determined by the social influence of a person's environment. This is identified by social norms and normative beliefs, which measures to what extent people perceive a certain behaviour as expected by their environment. These expectations of the environment can be related to close friends and relatives as well as to society as a whole. "Subjective norms eventually reveal the beliefs of people about how they would be viewed by their reference groups if they perform a certain behaviour." (Al-Swidi, Huque, & Mohd, 2013, p. 1564). Therefore, if people perceive their social environment as being in favour of reducing food waste they would behave according to this perception.

The last factor of the TPB, perceived behavioural control, is a consequence of the concept of self-efficacy that is rooted in the social cognitive theory (Bandura, 1977). This factor relates to the conviction of an individual in that it can successfully execute certain behaviour that is needed to produce the desired outcome. This is linked to control beliefs, as it refers to beliefs about present factors that might contribute to the performance of a certain behaviour. If the conviction of a person is so that they think they are able in engaging a certain behaviour their intention to engage in that behaviour increases.

So, the intention of performing a certain behaviour is determined by attitudes, social norms and perceived behavioural control, according to the TPB (Ajzen J. , 1991). The intention is a central construct in the TPB model. The intentions measured, try to capture the motivational factors that affect the behaviour and to point out the extent to which people are willing to put effort in conducting a certain behaviour (Ajzen J. , 1991). A meta-analysis on the effectiveness of the TPB in explaining the eventual behaviour showed a significant relation between behavioural intention and the actual perceived behaviour (Armitage & Conner, 2001).

Two out of three determinants of the TPB model were found to have a significant effect on the intentions to reduce food waste and the actual food waste behaviour (Russel et al., 2017).

Attitudes were the only determinant in the TPB that showed no significant effect. Another research in the UK found that the TPB model explained a large variance of the food waste behaviour (45%) and all determinants appeared to be significant (Graham-Rowe et al., 2015).. In the Romanian society and exploratory study has been conducted to estimate the impact of several determinants of food waste behaviour (Stefan et al., 2013). Moral attitudes appeared to have a positive impact on the intention to not waste food, and were found to be the most important determinant. However, subjective norms and perceived behavioural control appeared to have no significant impact on the intention not to waste food. Furthermore, the intention to reduce food waste did not significantly influence the reported food waste. In the Danish society a survey was conducted relating food waste behaviour to the three determinants of food waste behaviour combined with one additional determinant, moral norms (Stancu, Haugaard, & Lähteenmäki, 2016). Although the overall fit of the model was good, only attitudes and subjective norms appeared to be a significant determinant.

2.5 Fruits and vegetables

This study is focussing in particular on the waste of fruits and vegetables due to several reasons. First of all, fruits and vegetables make up the largest share of the overall household food waste (WRAP, 2008). This makes it the group most interesting for interventions, as it would result in the highest impact. Secondly, the impact of fruit and vegetables on the environment are relatively high due to the heavy reliance on energy intensive production processes and transportation (Garnett, 2008). Besides that, fruits and vegetables are related to several routinised behaviours. The estimation of edibility and optimal storing of those products is relatively more important for fruits and vegetables compared to several other food categories, because those products perish faster.

2.6 Socio-demographic characteristics

The existing body of literature has identified several socio-demographic characteristics that are related to food waste behaviour. Understanding and measuring the role of these characteristics could lead to interesting insights. The socio-demographic characteristics that are investigated in this research are explained below.

Mixed evidence is found on the role of gender in food waste differences. One study reports that females are producing less food waste than males (Cecere et al., 2014) while another study reports no significant differences between male and female (Principato et al., 2015). One study even indicates that female waste more (Visschers et al., 2014). Besides the gender, the age of respondents appears to play an important role in differences of food waste between

households. Age has been one important driver of food waste, with younger people wasting more food than older people (Quested et al., 2013; Hamilton et al., 2005). With the increase of the age the measured food waste decreased, with people above 70 produced almost no food waste in Australia (Hamilton et al., 2005). In the UK older people significantly had a lower level of food waste (Quested, et al., 2013). Older people have experienced times of food shortages, such as during the World War II. This offers an explanation for differences between in age groups.

Another factor that appeared to influence the amount of food waste among household is whether children are part of the household. A survey about food waste found that more than half of the families with children indicated they wasted more food due to the children (Wrap, 2007a). The eating patterns of children shift constantly and preferences of kids and teenagers are not similar over time (Jörrissen et al., 2015; Evans, 2012). Furthermore, parents reported difficulties in estimating how much food children would eat (Evans, 2011). Besides that, shopping trips with children are often resulting in the purchasing of unnecessary products (Wrap, 2007a). Therefore children are an important source of food waste in household. In that line of reasoning, households with children are expected to waste more food. Some studies indicate that the employment status of people is associated with different levels of food waste (Cecere et al., 2014). Employed people are expected to produce more food waste. The employed people are feeling that there is less time to worry about food waste (Qi & Roe, 2016). People that are not in the labour force tend to spend more time worrying about food waste and look for possible ways to reduce their food waste. Finally, the educational level of respondents is likely to influence food waste behaviour. Research found a correlation between food waste and the educational level of respondents (Schneider, 2008).

2.7 Hypotheses and conceptual model

The theory of waste aversion explains that people with a dislike towards waste are not willing to participate in the disposal of a product. People can be waste aversive due to an aversion towards unused utility, monetary waste or the environmental consequences of waste. If this is waste aversion is applied on food waste, a higher level of waste aversion leads to an increase in food waste reducing behaviour. In other words waste aversion leads to a reduction in food waste.

H1: Waste aversion negatively affects food waste

The theory on interpersonal behaviour suggests that emotions are a strong driver of behaviour. Therefore emotions are playing an important role when the effect of waste aversion on food

waste behaviour is measured. As the theory already suggests negative emotions should act as impetus for food waste. Therefore, it can be argued that negative emotions negatively influence food waste behaviour. For the positive emotions the opposite is expected to happen. The experience of a positive emotions is likely to act as a motivator of a certain behaviour instead of an impetus. Therefore the presence of positive emotions postively affects food waste behaviour.

H2A: The presence of negative emotions negatively affects food waste

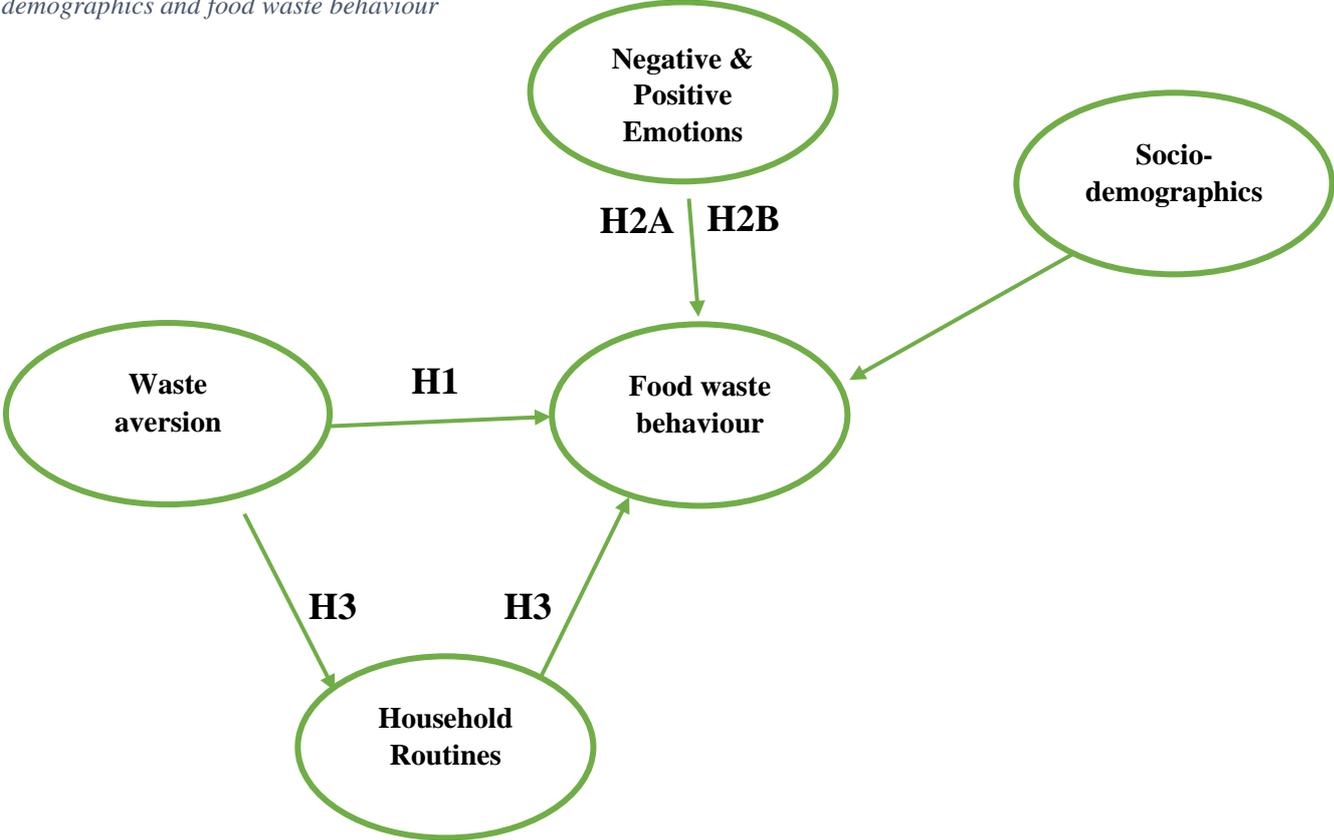
H2B: The presence of postive emotions postively affects food waste

Besides a direct effect of waste aversion on food waste behaviour, waste aversion is expected to also have an indirect effect. People who are waste averse, are converting this aversion into a more frequent usage of household routine, which enables them to reduce food waste. Therefore, waste aversion indirectly affects food waste behavior through routinised behavior. Waste aversion leads to a more frequent usage of routines, which eventually lead to food waste reducing behaviour.

H3: Waste aversion negatively and indirectly affects food waste

Visualizing the above mentioned hypotheses in combination with the effect of socio-demographic factors results in the following conceptual displayed in Figure 1.

Figure 1: Conceptual model of the relationship between waste aversion, emotions, household routines, socio-demographics and food waste behaviour



3. Methodology

In this section the methodology for investigating the hypothesis from chapter 2 is explained. First of all, the survey that is used is explained. The participants, design and socio-demographic characteristics are discussed. After that, the measurements for each of the variables used to investigate the hypotheses, are explained. Finally the methods for analysing the data, which was obtained by the survey, are explained. The methods that are being used are; the linear regression analysis, the logistic regression analysis, the Cronbach's alpha, a confirmatory factor analysis and lastly the structural equation modelling technique.

3.1 Participants and design

The data collection for this research is performed by having respondents complete a survey. This survey was constructed with Qualtrics software. The collection phase of the questionnaire was between 23th of May until 29th of May at three supermarket locations in Nijmegen. The city of Nijmegen is located in the south-east of the Netherlands and has approximately 173.000 inhabitants. Each day, except for Saturday and Sunday, surveys were collected between 10:00-13:00 and 15:00-18:00. The three supermarkets, Albert Hein, Jumbo and Coop, were located in three different districts in Nijmegen, namely Nijmegen-Oost, Nijmegen-West and Bottendaal. The respondents did not receive any rewards for their participation in the survey. Respondents were asked to participate in a survey for a research at the Radboud University Nijmegen after they had finished their groceries. The survey had no specific target group, as the goal of the survey was to get a representative sample of respondents. With an anonymous link the participants started the questionnaire, which ensures the anonymity of the survey. A total of 202 respondents participated and completed the survey. When collecting the surveys, several individuals refused to take part in the research. This should be taken into consideration when analysing the data, as it could be that a specific group of people refuses to take part in a survey. Due to time limitations it was not possible to collect specifics of the individuals that refused to participate (i.e. for example whether these individuals were mainly male or female, old or young etc.). Furthermore, the rate at which new people were leaving supermarkets was so high, that it was not possible to note the characteristics of those individuals.

3.1.1 Socio-demographic characteristics

The socio-demographic characteristics of the respondents are summarised and shown in *Table 2* below. Slightly more female respondents participated in the questionnaire (55.45%) compared to the males (43.56%). Furthermore, two of the respondents could not identify themselves as either male or female. Those respondents are categorised as 'different' (0.99%). The city of

Nijmegen in total has a more equal distribution of females (51.6%) and males (48.4%). The sample shows a reasonable representation of Nijmegen regarding genders. Stefan et al., (2013) attributes a higher response rate of women compared to man in food related studies as common, as they are more willing to answer such questions. The young and middle aged groups (respectively 17-24 and 25-54) are representing the largest share of the respondents (respectively 44.06% and 39.61%). This means that the respondents are overrepresented by young people, which has two simple explanations. First of all, two out of three locations were located in popular student areas (Nijmegen Bottendaal and Nijmegen-Oost). Secondly, students seemed to be more helpful in participating in the questionnaire, where elderly often rejected the participation.

Only a small number of households appeared to have children (11.88%). This can be explained due to the large share of young people participating in the questionnaire. Education was measured regarding the intellectual ability, based on the study they followed or had finished. The largest share of the respondents had a higher intellectual ability (VWO or university) followed by respondents with a medium intellectual ability (HAVO or University of applied science) and the smallest share of respondents had a lower intellectual ability (Elementary school, VMBO or secondary vocational education). The working situation of respondents was measured as being employed (part-time or full-time) or being unemployed (unemployed, pensioner or student). It has to be noted that 43.07% of the total sample were students, which could influence the outcomes of the analyses. Lastly, the three locations that represented a different supermarket and a different neighbourhood in Nijmegen are practically equally distributed.

Table 2: Socio-demographic characteristics of the sample (N=202)

Variable	Sample (%)
Gender	
Male	43.56%
Female	55.45%
Different	0.99%
Age	
Young Age	44.06%
Medium Age	39.61%
Old Age	16.34%
Children	
Yes	88.12%
No	11.88%

Education

Lower intellectual ability	14.37%
Medium intellectual ability	40.60%
Higher intellectual ability	45.05%

Working situation

Employed	46.04%
Unemployed	53.97%

Supermarket

Albert Hein	32.18%
Coop	34.65%
Jumbo	33.17%

3.1.2 Questionnaire construction

The survey was developed in Dutch. However, several items and questions were originally in English and had to be translated. The final survey was checked by multiple native Dutch individuals to ensure wrong translation from English and the use of correct Dutch grammar. The survey is the main instrument for collecting individual data in a survey research (Trobia, 2011). Using a set of predetermined questions, better known as items, variables were measured. According to the survey method there are four primary requirements (Trobia, 2011). The foundation of a should be based on a body of theoretical knowledge regarding the research topic. Besides that, the chosen operationalization of the hypotheses has to be valid and reliable. Thirdly, there should either be experience in writing a survey or a good repertoires of published repertoires (Francis, et al., 2004; Ajzen I. , 2002; Russel, William Young, Unsworth, & Robinson, 2017). Lastly, there should be some knowledge of the targeted population, to what extent is the population able to accurately respond to the questionnaire questions. Besides the general requirements, the survey itself consists of three parts: the cover letter, instruction and the main body (finishing with a word of thanks for participating in the questionnaire) (Trobia, 2011). The cover letter, main body and word of thanks can be found in appendix A, which contains the complete survey.

3.2 Measurements

The survey contained questions and items measuring the variables that were explained in the theoretical section of this research. These variables are **self-reported food waste** (quantity and frequency), **waste aversion**, **emotions**, **food related household routines** and **socio-demographic factors**. The use of close-ended questions makes it possible to generate a large amount of information in a short time (Holyk, 2011). To measure the individual responses on the waste aversion index and the household routines, a 7-point Likert scale is being used. It is

a measurement that consists of multiple items (i.e. questions) on which the respondent can answer according to a 7 point scale (Brill, 2011). Although the 5-point Likert scale is the traditional scale to use, some authors argue that the scale with the highest reliability is the 7-point scale (Symonds, 1924). All of the questions and items for each of the measured variables can be found in Appendix A2.

3.2.1 Food waste behaviour

The most important variable to measure, the dependent variable, is the self-reported food waste. First of all, the quantity of wasting food in household is measured. The **waste quantity** of respondents was measured with the following (translated) question: “How much fruits and vegetables do you throw away in a week on average?”. The answer options of respondents were made on a 5-point scale (e.g. 1 = Nothing, 2 = One piece of fruit or vegetable, 3 = More than one piece, but less than half of the fruit and vegetables, 4 = More than half of the food, but not all, 5 = Everything). Based on past research the frequency of wasting food is a good second way to estimate self-reported food waste behaviour (Russell et al., 2017). The **waste frequency** of respondents is measured with the following (translated) question: “How often is food thrown away in your household on average in a week?”. The answer options of respondents were made on a 6-point scale (1 = Never, 2 = Rarely, 3 = Sometimes, 4 = Frequently, 5 = Often, 6 = Always). In the analysis the main measure for food waste behaviour is the quantity of food waste. However as a robustness check the frequency of food waste in household is also used as independent variable. Furthermore, waste quantity and waste frequency are compared with each other to see whether there are inconsistencies (i.e. respondents who indicate to have a waste quantity of ‘nothing’, but also state that they have a waste frequency higher than ‘never’).

3.2.2 Waste aversion

Waste aversion is measured by a set of statements that measure the extent to which people have a natural dislike towards waste. This set of statements is adopted from earlier research that created this waste aversion index (Meza, Fessner, & Reyniers 2015). The original waste aversion index consists out of a set of 10 statements that each measure to some extent waste aversion. The original set of statements is slightly transformed as two statements are left out. Each of the statements waste aversion in different areas of waste. However, three out of the statements were related to waste in the field of food waste. The reason that this research leaves out two of these statements is that a waste aversion index should measure waste aversion in general. If too many statements are focussed on one specific side of waste, the index can become blurred. Therefore, two out from those three original statements regarding food

waste are left out. Altogether, a set of 8 statements remains that measures waste aversion. Respondents are asked to give their level of agreement upon these statements. Respondents were asked to show their level of agreement, using a 7-point Likert scale (1 = Totally agree, ... 4= Neither agree, nor disagree, ... 7 = Totally disagree).

3.2.3 Emotions

To measure the variable **emotion**, single items are used to measure emotional influences of respondents. These items were drawn based on previous research (Stefan et al., 2013; Quested et al., 2013; Russel et al., 2017). Respondents were asked: "Imagine the last time you threw away food. What words best describe your feeling at that moment?". The respondents were asked to tick one or more of the boxes. They had the opportunity to tick a box that represented positive emotions (proud, optimistic, content and relaxed), negative emotions (guilty, anxious and frustrated) or no emotions (none). Each of the emotions are dummy coded as being present (dummy code is 1) or being absent (dummy code is 0).

3.2.4 Household routines

To measure the **routinised household behaviours**, every step of the process is translated into a set of items. This results in an overview of the household food-related routines of the respondents. Routines in the planning, provisioning, storing, preparing and consuming process are being measured. Those five routines are included in the analysis as control variables, because past literature has already showed their importance in predicting food waste behaviour. For this measurement a 7 point Likert scale is being used at which respondents could indicate to what extent they performed each of these task (1 = Never, ... 7 = Almost always). The items for each of the five routines are adopted from the consumer food management process model (Geffen, Herpen, & Trijp, 2016). **Planning** and **provisioning** routines were both measured with three items representing behaviours of the respondents. The **storing** and **preparing** routines were both measured with four items representing the behaviour of respondents. The **consuming** routines were measured with two items. The whole set of items can be found in the Appendix A2. The items measuring planning, provisioning and consuming routines were adopted from past research (Stancu et al., 2016). The items for storing and preparing were created based on the model (Geffen et al., 2016) and on past literature (Stefan et al., 2013; Farr-Wharton et al., 2014; Parizeau et al., 2015; Abeliotis et al., 2014; Graham-Rowe et al., 2014; Stancu et al., 2016).

3.3 Data analysis

This subsection of the methodology is devoted to the process of analysing the data that is produced by the survey. The hypotheses from section 2.7 are tested in the analyses. To explore the hypotheses, multiple analyses are conducted. Multiple analyses are conducted as it increases the validity and reliability of the outcomes (Hair et al., 2014). First of all, the descriptive statistics are discussed. Besides that, the dependent variable, food waste behaviour, is discussed in more detail. Finally, several analyses are conducted: the Cronbach's α , a linear regression analysis, a logistics regression analysis, a confirmatory factor analysis and a structural equation model.

3.3.1 Cronbach's α

The Cronbach's α is used to measure the internal consistency of multiple items. The Cronbach's alpha is a reliability coefficient constructed by Cronbach (1951). This measure can be seen as an unbiased estimate for the generalizability of set of multiple items. As the averages of the items are used for the linear and logistic regression analysis, the Cronbach's alpha is a good indicator. If the reliability coefficient is meeting a certain value, there is a logical ground for taking the averages of items. This is necessary for the variables **waste aversion** and **household routines**, as those are measured using multiple items. Conducting a Cronbach's alpha test is important as it measures the extent to which all the items are measuring the same concept or construct (Tavakol & Dennick, 2011). The coefficient can obtain a value between 0 and 1. The higher the value of this coefficient the higher the internal consistency of the observed items, thus the internal reliability of the construct (Hair et al., 2014; Gilbert and Churchill). The rule of thumb for this construct reliability test is that an alpha between .5 and .6 is poor, between .6 and .7 is questionable, between .7 and .8 is acceptable and a value of $>.8$ is good or excellent. Every value of value below .5 is seen as unacceptable. The Cronbach's alpha has also the value for the combined food waste behaviour (measured by waste quantity and waste frequency). This combined value is not used for the linear regression model nor the logistic regression model. It is only necessary for the last analyses, the structural equation modelling, as that technique requires a dependent variable that is constructed out of at least two observed variables.

3.3.2 Regression analysis

After conducting the Cronbach's alpha the averages of the items for waste aversion and the household routines are calculated. The averages or summations of items scales reduces measurement errors, while retaining the multiple aspects of each single measurement (Hair et al., 2014). With these averages, a linear regression analysis is conducted to test the hypotheses. The regression analysis predicts the significant influence of independent variables on the values

of the dependent variable (Hair et al., 2014). When conducting a regression analysis, several assumptions should be taken into account. The assumptions of multicollinearity, normality and heteroscedasticity.. The regression analyses are conducted with robust standard errors, to take care of heteroscedasticity. The dependent variable that is tested is waste quantity and the independent variables are waste aversion and emotions. Furthermore the main effect is controlled for the influence of each of the five household routines. Besides that, waste frequency is also used as a dependent variable as a robustness test. Three main regression analyses are conducted. The first regression uses only waste quantity (dependent variable) and waste aversion, the second regression adds emotions and the third regression adds household routines and socio-demographic factors. Besides the main regression analyses, several robustness regression are conducted. The first robustness test is a regression without the outliers, the second one uses waste frequency as dependent variable and the third one uses summations instead of averages.

3.3.3 Logistic regression analysis

As a follow-up on the linear regression model, a logistic regression model is used. For this analysis the dependent variable, food waste quantity, is transformed. People are categorised as either being a person that wastes or a person who does not. This means that the dependent variable is transformed to a dichotomous variable.. Food waste in households is measuring something in the private domain of people. Therefore, it is possible that there might be a difference between people either qualifying as being a food waster or not. To analyse this, a logistic regression analysis is conducted. This analysis is used in occasions in which the dependent variable is categorical (Dayton, 1992). The logistic regression analysis measures the probabilities that a person is either wasting food (outcome of $Y=1$) or not (outcome of $Y = 0$).. Similar to the linear regression, the logistic regression analysis is conducted in similar forms: using waste aversion as only variable, adding emotions to this model, and finally using adding all other variables.

3.3.4 Confirmatory factor analysis and structural equation modelling

As last analysis in this research the so called Structural equation modelling (Henceforth, SEM) is used. SEM is a general technique of modelling that is often used in the behavioural sciences (Hox & Bechger, 1988). . This model gives the possibility to measure whether waste aversion has an indirect effect on food waste through the household routines. Therefore, SEM conducts an analysis that measures the direct and indirect effect of waste aversion on food waste. This enables this research to give a more sophisticated view on the role of waste aversion in food

waste behaviour. . This technique combines factor analysis with a regression or path analysis. The advantage of SEM over a normal multiple regression model, is that SEM is able to specify and estimate more complicated path models, with the possibility of variables intervening between the independent and dependent variables, as well as with latent factors (Hox & Bechger, 1988). The dependent variable in this analyses differs from the one used in the linear and logistic regression. For a structural equation model it is necessary that the dependent variable is a latent variable, in order to get structural relations. Therefore, waste quantity and waste frequency are combined as one latent variable; food waste behaviour.

The first step in creating a structural equation model is to perform a factor analysis. There are two different possible factor analyses, the exploratory factor analysis (henceforth: EFA) and confirmatory factor analysis (henceforth: CFA) (Brown, 2006). The EFA is driven by data and explores what the underlying factor is, without imposing a pre-determined structure (Hair et al., 2014). The CFA is different on this characteristic from the EFA, as the CFA has a pre-determined structure, supported by a theoretical foundation. This means that the observed variables are structured, based on the theory, in a specific way, and the factor analysis tries to confirm this structure by analysing the construct validity. In contrast to the Cronbach's alpha test, the CFA has multiple construct validity that are being tested. This CFA results in factor loading of the observed variables and test the goodness of fit of the conceptual model. Other assessments that were conducted are the discriminant validity and convergent validity (Anderson & Gerbing, 1988; Hair et al., 2014).

Finally, a SEM is performed to measure the significance between independent and dependent variables. Both direct and indirect effects are measured with SEM. The SEM measures the significance of each of the independent variables on the dependent variable (directly and indirectly) as well as the significance of the complete model. It is a more valid tool than regression as it build on CFA. It examines both dependent and independent variables at the same time, and also corrects for the measurement error (Hair et al., 2014).

To indicate whether the models of the CFA and SEM are reliable, the goodness of fit indices are observed. According to Kline (2005), the Chi-square test, RMSEA (Root means standardised errors of approximation), TLI (Tucker-Lewis index), CFI (Comparative fit index), and SRMR (Standardised root means squared residual) should be used as indicators for a good model of fit. The Chi-squared statistics evaluates the fit of the data to the model (Rasch, 1980). However, this statistic is not reliable if a large sample size is used. Therefore the RMSEA is also measured, which adjust for a larger sample size. The SRRM measures the differences between residuals of the sample covariance matrix and covariance model (Hooper, Coughan,

& Mullen, 2008). If this value is close to 0, the model fits well. Lastly, the TLI and CFI are fit indices, that compare the model to a baseline model. It test whether all variables are uncorrelated with each other (Hooper et al., 2008). Values above 0.9 indicate that the model fits well.

4. Results

This section shows the results of the analyses that are performed. First of all, a quick look on the descriptive statistics is given, with special attention to the self-reported food waste. After that, a Cronbach's alpha is measured to estimate the internal reliability of items and see whether it is reliable to average several item scores. Afterwards, the outcomes of the linear regression analysis are shown and interpreted. Besides that, a logistic regression analysis is performed, using a binominal dependent variable for food waste. This dependent variable is a dummy that indicates whether respondents either waste food or not. Finally, a structural equation model is created. This model is used as it is able to capture indirect effects between multiple variables. The first step in this analysis is to perform a confirmatory factor analysis. The CFA measures the significance for the relation between the items and the latent variable. The goodness of fit of the complete model indicates whether the model is reliable. The second and also the last step of the SEM is to test the significance of the structural model, explaining the significance of both direct as well as indirect relations between variables.

4.1 Descriptive statistics

In *Table 3* on the next page, all variables are shown. Except waste quantity and waste frequency, all other variables are created by averaging the scores on the relevant items. With a mean of 1.94 for *waste quantity*, respondents indicate they only waste a little. A score of 2 (out of 5) for *waste quantity*, indicates that respondents waste 1 piece of fruit or vegetable in a week. A mean below this value indicates that people waste less than one piece of fruit or vegetable on average (Standard deviation=.74, Median=2.00). The *waste frequency* of fruits or vegetables is somewhat higher. A mean of 3.0 indicates that people throw away fruits and vegetable at a frequency rate of 'sometimes'. *Table 2*, shows a peaked distribution for waste frequency (Kurtosis = 3.03). This means that people score on average more in the middle in of the scale, compared to a normal distributed variable.

The higher the score on the waste aversion index, the more waste averse people are. *Table 2* shows that the respondents are on average waste averse, because the mean of this sample (Mean=4,59) is above the middle score of 4. For the routines people could respond on a scale ranging from 'never' to 'always'. If the score is exactly in the middle (i.e. 4), it means that routines are used in 50% of the times they could have been used. *Planning routines* were used in slightly more than half the time (Mean=4.39). For interpreting the provisioning routines, special caution should be taken. The *provisioning routines* were measured by items that negatively affect food waste. The items were measuring; impulsive purchases, promotional purchases and the purchase of advantage packages. This means that a lower score on these

routines should, according to the theory, results in lower food waste. These *provisioning routines* were used less than half of the time (Mean=3.91). *Storing routines* were used very frequently in households (Mean=5.55). Preparing routines were also frequently used in households (Mean=4.92). The consuming routines were used most frequent of all household routines, meaning that people store and eat their leftovers most of the times (Mean=5.80).

Table 3: Descriptive statistics of the variables (N=202)

Variable	SD*	Mean	Median	Skewness	Kurtosis
Waste quantity	.74	1.94	2.00	.25	2.29
Waste frequency	1.08	3.00	3.00	.45	3.03
Waste Aversion	1.10	4.59	4.75	.61	2.79
Planning Routines	1.60	4.39	4.33	-0.02	2.01
Provisioning Routines	1.19	3.91	4.00	.29	2.58
Storing Routines	1.00	5.55	5.75	-.54	2.91
Preparing Routines	1.03	4.92	5.00	-.26	2.64
Consuming Routines	1.27	5.80	6.00	-1.14	4.22

* SD = Standard deviation

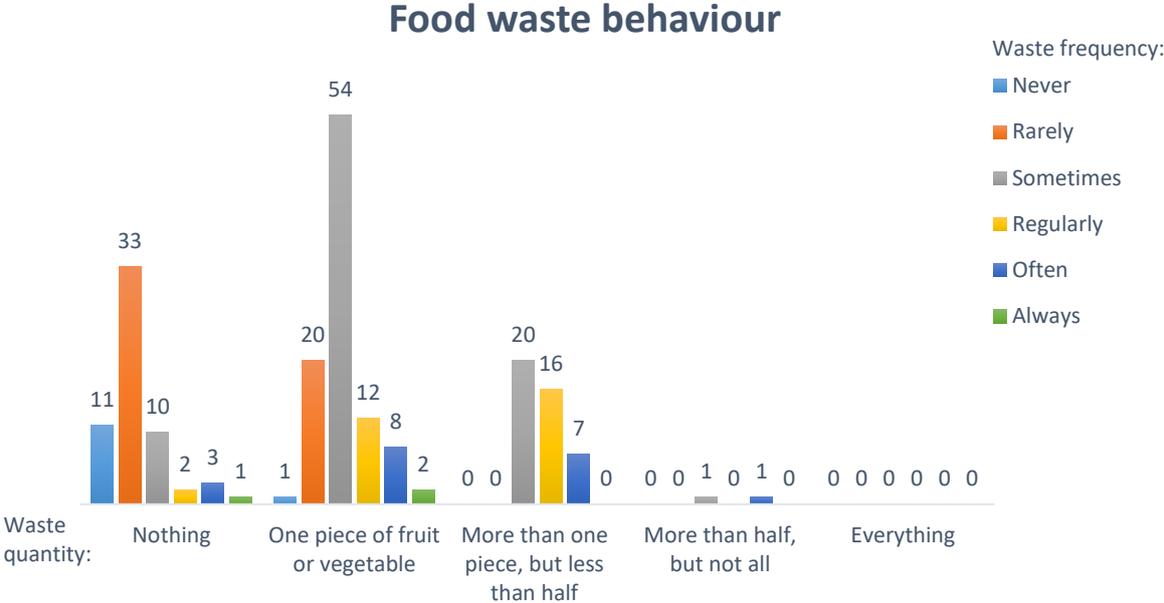
A Jarque-Bera test is conducted to test whether the variables have a normal distribution. According to the test, preparing and provisioning routines are not normally distributed. However, with a sample size of more than 200, the assumption of a normal distribution is cancelled out (Hair et al., 2014). Furthermore, if those variables are transformed, complications arise regarding the interpretation of the findings. Therefore, no transformation are used to improve the normality of the variables.

4.1.1 Self-reported Food waste behaviour

Special attention is given with regard to the dependent variable, self-reported food waste behaviour. This variable is measured by the amount of fruits and vegetables that are wasted by a household in an average week. As an extra check the frequency at which households waste fruits and vegetables is also measured. When both measures are analysed, interesting but questionable results appear, which are shown in *Graph 1* below (for the raw data look at Appendix A1). Out of the whole sample, 60 respondents (29,7%) indicated that in an average week ‘nothing’ is wasted, regarding the waste quantity. With that in mind, it is interesting to see what the waste frequency for those 60 respondents is. A logical expectation is a frequency of wasting of ‘never’, as their quantity of waste is ‘nothing’. However, *Graph 1* indicates a discrepancy when analysing both measures. It is somehow peculiar that only 11 respondents indicated their frequency was ‘never’ when having a waste quantity of ‘nothing’. The other 49, who indicated they throw ‘nothing’ away, appeared to have a higher frequency rate than ‘never’.

This actually means that people do not waste anything, but they do this at a frequency rate of, for example, ‘sometimes’. These strange results are discussed later on in the discussion section, as the suggestion is awakened that there is something wrong with one or both of the variables.

Graph 1: Food waste behaviour



4.2 Internal consistency

As earlier noted, to test whether it is reliable to either average or summarise multiple items into one variable, there should be at least some internal reliability between the items. To measure this, the Cronbach’s alpha is used. Table 4, on the next page, show the results of this Cronbach’s alpha for each of the seven constructs. If the construct has a high internal correlation, the reliability of these constructs is high (Hair et al., 2014; Gilbert and Churchill, 1979), which means that it makes sense to average these items. Keep in mind that food waste behaviour is only used as dependent variable in the CFA and SEM. In the other analyses waste quantity is used as dependent variable. In order to be reliable, the Cronbach’s alpha has to have a certain value. The internal reliability is highly reliable if $\alpha > .8$. However a threshold of $\alpha > .7$ is still reliable, where a threshold level of $\alpha > .6$ is already questionable (Hair et al., 2014). Consuming routines have a high internal reliability ($\alpha = .82$). Planning routines and waste aversion show a reliable Cronbach’s alpha (respectively $\alpha = .71$ and $\alpha = .78$). However, the other variables appear have rather questionable internal reliability, whereby shopping routines even score “poor” ($\alpha = .54$) (Hair et al., 2014). Although some latent variables show a low internal reliability, none of the Cronbach’s alpha score below the acceptability threshold level of $> .5$. Some constructs appear to have a low reliability coefficient, but that does not immediately

indicate that it attenuate the validity of it (Schmitt, 1996) Therefore, all variables are accepted. The averages of the items are used in the regression analyses and latent variables are created for the SEM. Although, everything is accepted, variables with a low Cronbach's alpha are taken into consideration when examining the results.

Table 4: Survey items per construct, including the internal reliability (Cronbach), mean of the construct as well as mean and standard deviation per item

	Mean	Standard deviation	α if deleted
Waste Aversion (Cronbach's alpha=0.78, Average Mean=4.59)			
"Ik lees altijd een boek uit dat ik heb gekocht, zelfs als ik het geen leuk boek vindt" *	3.86	1.85	.77
"Wanneer ik een parfum of aftershave cadeau krijg dat ik niet lekker vind, gebruik ik het toch." *	4.10	1.61	.77
"Ik vervang mijn mobiel zodra er een nieuwe versie uit is." *	5.08	1.99	.78
"Ik bewaar overgebleven eten om het later nog op te eten" *	5.52	1.59	.76
"Ik koop liever een huis dan er een te huren aangezien het anders weggegooid geld is." *	4.54	1.78	.75
"Wanneer ik mij inschrijf bij een sportclub voor een vast bedrag en daar zoveel als mogelijk kan sporten, zou ik dat doen om alles uit het vaste bedrag te halen." *	4.33	1.66	.77
"Ik loop weg bij een film in de bioscoop als ik de film niet leuk vindt" *	4.55	1.53	.74
"Ik vind het idee van uitgebreide garanties fijn, omdat je je geld niet verliest als er iets kapot gaat."*	4.75	1.88	.78
<i>Scale: 1. Totally agree ..., 7. Totally disagree</i>			
Food waste behaviour (Cronbach's alpha=.62)			
Hoeveel groente en fruit wordt er in uw huishouden gemiddeld in een week weggegooid?	1.94	0.74	
<i>Scale: 1. Nothing ..., 5. Everything</i>			
Hoe vaak denkt u dat er groente en fruit in uw huishouden gemiddeld in een week wordt weggegooid?	3.0	1.08	
<i>Scale: 1. Never ..., 6. Always</i>			
Planning routines (Cronbach's alpha=.71, Average Mean=4.39)			
Ik controleer de voorraad in het huis voordat ik boodschappen ga doen	5.32	1.70	.70
Ik maak een boodschappenlijst voordat ik boodschappen ga doen	4.2	2.21	.57
Ik plan van te voren in wat ik ga eten de komende dagen	3.66	2.09	.58
Provisioning routines (Cronbach's alpha=.54, Average Mean=3.92)			
Ik koop producten die in de aanbieding zijn, ook al heb ik deze niet nodig	3.56	1.71	.43
Ik doe impulsieve aankopen	3.9	1.63	.38
Ik koop producten in een voordeelverpakking omdat dit goedkoper is	4.29	1.60	.50
Storing routines (Cronbach's alpha=.62, Average Mean=5.55)			
Ik sla mijn voedsel op de meest optimale plek op (bijvoorbeeld de koelkast, vriezer, etc.)	6.02	1.11	.60
Ik zorg er voor dat mijn voedsel geordend wordt opgeslagen zodat ik gemakkelijk kan zien wat en hoeveel ik nog heb.	5.02	1.60	.53
Ik kan goed inschatten wanneer voedsel nog in orde is en wanneer niet	5.61	1.32	.47
Het verschil tussen 'ten minste houdbaar tot' (THT) en te gebruiken tot (TGT) is duidelijk voor mij	5.55	1.75	.59
Preparing routines (Cronbach's alpha=.61, Average Mean=4.93)			
Ik ben creatief in het bedenken van maaltijden met producten die nog in huis liggen	5.22	1.52	.53
Ik kook precies de hoeveelheid die nodig is	4.42	1.61	.56
Ik knoei tijdens het koken*	4.43	1.6	.58
Ik laat eten aanbranden tijdens het koken*	5.63	1.33	.49
Consuming routines (Cronbach's alpha=.82, Average Mean=5.8)			
Als er eten over is bewaar ik dit	5.97	1.22	
Restjes van de vorige keer eet ik later op	5.63	1.52	
<i>Scale for all routines: 1. Never ..., 7. Almost always</i>			

* Items were reversed coded in order to be in line with the other items (for waste aversion all items were reverse coded, which means a higher score on each items, means being more waste aversive)

4.3 Linear regression analysis

In this section the outcomes of the linear regression analysis are discussed. Several different analyses are conducted in order to measure the effect of waste aversion on food waste behaviour. First of all, the main analysis is conducted, which are shown in *Table 5* on the next page. Model 1 regresses aversion on waste quantity, model 2 includes the emotions and model 3 adds the household routines and socio-demographic factors. The output of the robustness tests are shown in *Table 12* and *Table 13*, in Appendix C1 & C2. Model 4 uses the summation of the items, instead of the averages. Model 5 uses waste frequency as dependent variable, instead of waste quantity. Last of all, model 6 excludes the outliers from the main regression. In the methodology section several choices are made regarding summation or averaging and quantity or frequency. The robustness test are included to see whether these choices have an effect on the outcomes of the analysis. The structure of this section is as follows; first the main effect of waste aversion on food waste behaviour is discussed, then the role of emotions and household routines are examined, finally the effect of socio-demographic factors are explained.

4.2.1 Waste aversion

The results of the main regression analysis are shown in *Table 5*, on the next page. Although the coefficients have the expected negative sign, all three regression analyses show no significant effect of *waste aversion on food waste quantity*. The coefficient of waste aversion decreases as other variables and factors are included, which means that some of the coefficient of waste aversion in Model 1, is explained by variables included in the two following models. To conclude: hypothesis 1 is rejected, waste aversion does not have a direct negative effect on food waste behaviour. To estimate the reliability of this outcome three robustness test are performed. The results can be found in *Table 12* and *Table 13*, in Appendix C1 & C2. Model 4 shows the results for the analysis in which summations of the scores are used instead of the averages. The effect of waste aversion remains significant, while the value of the coefficient increases. This increase can be explained due to the fact that the values for summation are higher than the values for the averages of the scores. The second robustness test, Model 5, uses waste frequency as dependent variable. This appears to have no effect on the insignificance of waste aversion. The value for the coefficient has increased with more than 50% compared to Model 3. An explanation for this increase is that waste frequency is measured on a 6-point scale, while waste quantity is measured on a 5-point scale. Lastly, Model 6 excludes the outliers from the sample. Waste aversion remains insignificant, while the value of the coefficient is four times as high compared to the main regression, model 3.

Table 5: Main regression results of the relationship between waste aversion and food waste quantity

Food waste behavior	Model 1: Waste quantity	Model 2: Waste quantity + emotions	Model 3: Waste quantity + routines
Aversion	-0.0730 (-1.41)	-0.0662 (-1.23)	-0.0243 (-0.48)
Guilty		0.178 (1.53)	0.143 (1.22)
Proud		-0.756** (-2.20)	0.0507 (0.12)
Optimistic		-0.197 (-0.39)	-0.675 (-1.28)
Anxious		0.369** (2.13)	0.339* (1.80)
Frustrated		0.124 (1.01)	0.117 (1.00)
Quiet		-0.0169 (-0.09)	-0.122 (-0.60)
Satisfied		0.0818 (0.25)	-0.176 (-0.44)
Planning routines			-0.0167 (-0.46)
Provisioning routines			0.0968* (1.72)
Storing routines			-0.0652 (-1.05)
Preparing routines			0.0815 (1.16)
Consuming routines			-0.0983** (-2.07)
Male			0.172 (1.65)
Different ⁺			0.903*** (5.66)
Medium age			-0.265* (-1.81)
Older age			-0.245 (-1.07)
Coop			0.166 (1.17)
Jumbo			0.0387 (0.30)
Medium intellectual ability			0.0916 (0.49)
Higher intellectual ability			0.186 (1.01)
Employed			0.224 (1.53)
Children			0.347* (1.89)
Constant	2.271*** (9.19)	2.109*** (7.43)	1.914*** (3.59)
<i>N</i>	202	202	202

statistics in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

⁺ Only two respondents in this category

The regressions have estimations of standard errors that are robust in order to meet assumptions about heteroscedasticity

4.2.2 Emotions

The role of *emotions* is also investigated and is shown in table 5, model 2 and 3. Anxiety appears to have a positive significant relation, even when other control variables are included. This means that the presence of the emotion anxiety increases the food waste quantity in households. This outcome is the opposite of what hypothesis 2A states, which expected a negative effect. The negative effect was expected as the presence of a negative emotion would act as a motivational impetus to decrease food waste (Russel et al., 2017). The found results can be interpreted in a way that a negative emotions is a consequence of wasting food. The coefficient for the effect of anxiety on food waste quantity is 0.339. This indicates that the presence of the negative emotion anxiety increases the food waste quantity with almost a half point on a 5-point scale (on which waste quantity is measured). In the robustness models anxiety remains significant. Therefore, it is can be stated that anxiety is a reliable predictor of food waste behaviour.

In the robustness models other emotions appear to be significant. In model 5, satisfied and guilt appears to have a positive effect on waste frequency. In model 6 frustrated appears to have a positive effect and optimistic a negative effect on food waste quantity. First of all, it must be said that most emotions are not observed that much. This could explain that even with small changes, like the robustness models, differences in significant and insignificant emotions might appear. Furthermore, the only significant emotion in all models (main and robustness) is anxiety. The other emotions that appeared to be significant only in some of the models could be explaining food waste behaviour, but are not very reliable. Although the explanatory power of those emotions is not reliable, some explanations for the effects are given. Guilt is positively affecting waste frequency, which means that the presence of guilt increases the frequency at which people waste food. This effect can be explained in the same way as was done with anxiety. A possible explanation for the positive effect of satisfied on waste frequency is that people who waste more frequently are doing this because they expect to feel satisfied afterwards. The positive effect of the presence of frustration on food waste quantity can be explained as an emotion that appears after food is wasted. For the negative effect of optimistic on food waste quantity there is no reasonable explanation. However, it is important to note once more, only the effect of anxiety is robust. The other emotions only appeared to be significant in one of the models, therefore outcomes and explanation are not reliable.

4.2.3 Control variables

In model 3 the household routines are included in the main analysis. Only two out of the five control variables appears to be significantly influencing food waste quantity; provisioning

routines ($\alpha < 0.10$) and consuming routines ($\alpha < 0.05$). Frequently using consuming routines leads to food waste reducing behaviour, while frequently using provisioning routines leads to food waste increasing behaviour. These outcomes remain significant in the robustness models. However, three of those household routines are not significant, which is not in line with the theory and past research. A possible explanation for the insignificant effect of preparing and storing routines is that those items were based on theoretical grounds. These sets of items were not adopted as a whole from other research. This explanation does not count for planning routines as that set of items was one-on-one adopted from earlier research. While collecting the questionnaires a conversation was held with the respondents. Some of them stated that they did not use a shopping list or plan meals in advance. However those people also stated that they were very committed to the environment, which motivated them not to waste food. This could explain the insignificant outcome for planning routines.

4.2.4 Socio-demographics

The effect of the socio-demographics on food waste quantity are shown in model 3, *Table 5*. Most of them appear to have no significant effect, which is the opposite of what theory suggests. Males do not appear to waste more compared to the female reference group. One explanation is that male respondents are living with a female person. Although a man responds in the survey, the food waste behaviour in the household could be a result of the actions of the female. This could explain why there is no significant difference between male and females. The gender category 'Different' appears to significantly waste more than females. However, only two respondents stated they have the gender 'different', which means that the results are not reliable. The age of respondents suggests that medium-aged people waste less compared to the young-aged reference group. However the old-aged people do not show a significantly lower food waste. An explanation for this is that the group of old-aged compared to young-aged is much smaller. Besides that when outliers were excluded from the analysis, the old-aged group appears to waste less than the reference group. The locational effect of the survey did not show any significant outcome, compared to the reference group (Albert Hein). The intellectual ability of respondents also shows no significant effect on food waste behaviour. Respondents with a low intellectual ability indicate a lower income, which could explain that a low amount of food is wasted. On the other hand, respondents with a higher intellectual abilities are on average more committed to environmental issues, which could explain their food waste. So, both groups, for different reasons, could have a similar food waste behaviour. Being employed or not indicates no significant difference. A simple explanation for this is that students fall under the heading unemployed. However, they could also have a busy life, like the employed, due to study related

tasks and side jobs. Lastly, the effect of the presence of children in the household is in line with the theory.

4.2.5 Overview of the results

None of the linear regression analyses supported the hypothesis 1. Therefore the conclusion from these results is that waste aversion does not affect food waste behaviour. Besides that, the effect of negative emotions only showed limited significance. Anxiety was the only robust negative emotions with a significant effect. However, this effect was the opposite of what theory suggested. Therefore, hypothesis 2A is rejected. This unexpected sign of the coefficients for negative emotions can be interpreted in a way that negative emotions are a consequence not a motivational impetus of food waste behaviour. Positive emotions only showed significance in the robustness test, but do to some extent support hypothesis 2B. Positive emotions work as a motivator for food waste behaviour. From the control variables only two showed the expected effect. The socio-demographics explained only to some extent differences in food waste quantity.

4.3 Logistic regression analysis

The linear regression analysis did not support hypothesis 1. One of the explanations for this results is, that the measurement of the dependent variable is questionable. Self-reported food waste is not the same as the actual food waste. Food waste is a sensitive topic and is considered as being socially undesirable (Hermsdorf, Rombach, & Bitsch, 2017). Therefore, the possibility exists that respondents gave a socially responsible answer, which could give a sugar-coated image of their food waste. This part of the analysis is transforming the dependent variable in a dummy variable to look at food waste in a different way. The dummy variable is created to differentiate between people who do and do not waste food. This distribution is made, because from a psychological point of view it can be argued that people differ based on this differences. People are either reporting that they waste food or not. This creates the possibility to run a logistic regression with a binominal dependent variable of food waste. The results from the logistic regression analysis can be found in the *Table 6*, on the next page. The logistics regression is built up in a similar way as the linear regression model. Because this analysis can be seen as a robustness test for the results found in the linear regression, no extra robustness test are performed on the logistic regression. Instead of the coefficients, the odds ratios are shown, because those are easier to interpret.

Table 6: Logistic regression results on the relation between waste aversion and the probability of either wasting food or not

Probability of wasting? Yes=1 No=0	Model : Logit regression simple model (Odds ratio)	Model : Waste aversion + emotions Odds ratio	Model : Logit regression Odds ratio
Waste aversion	0.863 (-1.02)	0.873 (-0.88)	0.982 (-0.11)
Guilty		1.988* (1.86)	1.927 (1.52)
Proud ⁺		1 Omitted	1 Omitted
Optimistic		0.275 (-1.02)	0.602* (-1.94)
Anxious		7.421* (1.86)	11.509** (2.10)
Frustrated		1.981 (1.62)	1.873 (1.29)
Quiet		1.105 (0.19)	0.574 (-0.90)
Satisfied		1.770 (0.47)	0.580 (-0.39)
Planning Routines			1.139 (1.05)
Provisioning Routines			1.341 (1.64)
Storing Routines			0.838 (-0.81)
Preparing Routines			1.021 (0.09)
Consuming Routines			0.602*** (-2.69)
Male			2.738** (2.35)
Different ⁺⁺			1 empty
Medium Age			0.774 (-0.53)
Older age			0.382 (-1.60)
Coop			1.206 (0.39)
Jumbo			1.073 (0.15)
Medium intellectual ability			2.424 (1.61)
Higher intellectual ability			3.016** (2.04)
Employed			1.611 (1.08)
Children			2.672 (1.55)
Constant	4.700*** (2.24)	2.579 (1.23)	3.894 (0.75)
<i>N</i>	198	198	198

t statistics in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

⁺ Variable is omitted as it predicts failure perfectly

⁺⁺ Variable is empty as it predicts success perfectly

4.3.1 Logistic regression results

The effect of waste aversion on the probability that a person wastes food or not appears to be insignificant in all three logistic regressions. This means that similar to the linear regression analysis waste aversion is not a predictor of food waste behaviour. Despite being insignificant, the odds ratio shows the right value, as a value below 1 indicates that there is a negative effect. The emotion proud is omitted from the analysis as proud predicts failure perfectly. In other words, when the emotion proud was present, the respondent always appeared to have no food waste. Important to note for this result is that the emotion proud only was present twice in the whole sample. Furthermore, similar to the linear regression results, anxiety is a significant predictor. Anxious was present in 13 cases of the sample, out of them 12 appeared to waste food, which explains the high odds ratio. The odds of wasting food are 11.5 times higher when the emotion anxious is present. This result strengthens the results from the linear regression. Anxiety is not a motivational impetus but is measured as a consequence of food waste. The role of emotions is also quite similar to the results found in the linear regression analysis. Anxiety appears to be a positive significant predictor. Besides anxiety, optimism also appears to be a significant predictor. However, optimistic was only measured four times in the whole sample, so the results are not reliable. The results could be purely random, because of the low observations.

From the control variables only consuming routines is a significant predictor of the probability that someone is wasting food or not. The odds of wasting food are 6 to 10 when consuming routines are used frequently. This indicates, similar to the results from the regression analysis, that a frequent usage of consuming routines results in a decrease in food waste. All the other routines are not found to be significant, however it can be noted that the provisioning routines just fall outside the significance interval ($\alpha < 0.10$). From the socio-demographic factors only the higher intellectual ability appears to be a significant predictor compared to their references group (lower intellectual ability). The odds ratio shows that respondents with a higher intellectual ability are three times more likely to waste food compared to respondents with a lower intellectual ability. This is actually the opposite of what the theory expected. The other socio-demographic factors are not significant. Furthermore, the observations for the gender class 'different' are excluded from the analysis. The gender class different was a perfectly successful predictor of food waste. In other words, the two respondents who fall in the gender class 'different' were both wasting food.

4.4 Confirmatory Factor Analysis

A confirmatory factor analysis is conducted, before the indirect effect can be measured. To perform a correct confirmatory factor analysis one assumption, regarding the sample size, has to be fulfilled. The general rule of thumb for confirmatory factor analysis is $N > 200$. Sample sizes below this rule of thumb underestimate the model and are not recommended (Kline, 2005). This research has a sample size of 202 so there are no problems with this assumption.

Consequently, a CFA is executed. The factor analysis is conducted to measure to what extent the items predict the latent variable correctly as is suggested in the theory. The factor loadings, estimated by the CFA are shown in *Table 7* below. Each item has a certain pattern of response that is associated with the latent variable, which is measured by the factor loading. The factor loadings estimates the association with the underlying latent variable and varies between 0 and 1, if standardised. Hair et al., (2014) uses a rule of thumb for the factor loadings in combination with the sample size of the research. A factor loading has to have a certain value for a given sample size in order to have practical significance. For a sample size of approximately 200 respondents, the factor loadings have to be > 0.4 . If the output of the CFA is investigated, one factor loading appears to have a value below the level of having a practical significance. This is the third item for *provisioning routines*. Therefore, this item is excluded from the analysis, which is visualised with a strikethrough in *Table 7*. The significance of each of the factor loadings is also measured with a CFA. These results can be found in Appendix D, *Table 14*. All items appear to be significant estimates of the latent variable.

4.4.1 Construct validity

Besides measuring the factor loadings, the average variance extracted (AVE) and composite reliability (CR) are measured. AVE measures the discriminant validity, while CR measures the convergent validity both of which fall within domain of construct validity. The use of both measures is important to validate the constructs (Campbell & Fiske, 1959). The discriminant validity tests whether measurements that are supposed to be unrelated are actually not related. The convergent validity measures whether constructs that are supposed to be related, are in fact related (Paul Peter, 1981).

The threshold values for those measures are > 0.5 (AVE) and > 0.7 (CR) (Hair et al., 2014). The *Consuming routines* reach those values, *planning routines* fail to match the AVE threshold and *food waste behaviour* is close to both thresholds. The other latent variables are not able to reach the thresholds, not even close. These validity measurements are important as it evaluates the validity of a set of items. However, it does not consequently mean that low

scores on these tests indicate a poor measurement (Borsboom, Mellenbergh & van Heerden, 2004). It does not immediately mean that measures should be excluded because of the a below the thresholds. Therefore no latent variables are excluded from the CFA. More important is the goodness of fit of the model, as this takes into account measurement errors (which are a consequence of low CR and AVE).

Table 7: Confirmatory Factor analysis, including the factor loadings of each item, and the average variance extracted and composite reliability of the latent variables (N=202)

	Factor		
	Loadings	AVE	CR
Waste Aversion		.33	.79
"Ik lees altijd een boek uit dat ik heb gekocht, zelfs als ik het geen leuk boek vindt" *	.47		
"Wanneer ik een parfum of aftershave cadeau krijg dat ik niet lekker vind, gebruik ik het toch." *	.48		
"Ik vervang mijn mobiel zodra er een nieuwe versie uit is." *	.41		
"Ik bewaar overgebleven eten om het later nog op te eten" *	.56		
"Ik koop liever een huis dan er een te huren aangezien het anders weggegooid geld is."*	.63		
"Wanneer ik mij inschrijf bij een sportclub voor een vast bedrag en daar zoveel als mogelijk kan sporten, zou ik dat doen om alles uit het vaste bedrag te halen." *	.48		
"Ik loop weg bij een film in de bioscoop als ik de film niet leuk vindt" *	.71		
"Ik vind het idee van uitgebreide garanties fijn, omdat je je geld niet verliest als er iets kapot gaat." *	.77		
<i>Scale: 1. Totally agree ..., 7. Totally disagree</i>			
Food waste behaviour		.49	.66
Hoeveel groente en fruit wordt er in uw huishouden gemiddeld in een week weggegooid?	.66		
<i>Scale: 1. Nothing ..., 5. Everything</i>			
Hoe vaak denkt u dat er groente en fruit in uw huishouden gemiddeld in een week wordt weggegooid?	.74		
<i>Scale: 1. Never ..., 6. Always</i>			
Planning routines		.47	.72
Ik controleer de voorraad in het huis voordat ik boodschappen ga doen	.61		
Ik maak een boodschappenlijst voordat ik boodschappen ga doen	.74		
Ik plan van te voren in wat ik ga eten de komende dagen	.69		
Provisioning routines		.30	.54
Ik koop producten die in de aanbieding zijn, ook al heb ik deze niet nodig	.45		
Ik doe impulsieve aankopen	.77		
Ik koop producten in een voordeelverpakking omdat dit goedkoper is	.34		
Storing routines		.31	.64
Ik sla mijn voedsel op de meest optimale plek op (bijvoorbeeld de koelkast, vriezer, etc.)	.45		
Ik zorg er voor dat mijn voedsel geordend wordt opgeslagen zodat ik gemakkelijk kan zien wat en hoeveel ik nog heb.	.65		
Ik kan goed inschatten wanneer voedsel nog in orde is en wanneer niet	.63		
Het verschil tussen 'ten minste houdbaar tot' (THT) en te gebruiken tot (TGT) is duidelijk voor mij	.47		
Preparing routines		.29	.61
Ik ben creatief in het bedenken van maaltijden met producten die nog in huis liggen	.54		
Ik kook precies de hoeveelheid die nodig is	.6		
Ik knoei tijdens het koken*	.44		
Ik laat eten aanbranden tijdens het koken*	.55		
Consuming routines		.71	.83
Als er eten over is bewaar ik dit	.9		
Restjes van de vorige keer eet ik later op	.79		
<i>Scale for all routines: 1. Never ..., 7. Almost always</i>			

* Items were reversed coded in order to be in line with the other items

4.4.2 Goodness of fit

The goodness of fit of the model is shown below in *Table 8*. The overall model appears to have a good model of fit. The RMSEA and SRMR are within the thresholds level and the CFI and TLI are also within the thresholds level. Due to the fact that the model shows good fit, the SEM analysis can be conducted.

Table 8: Goodness of fit indices of the confirmatory factor analysis

Measurement	Observed Measure	Threshold level
Chi-Square (X^2)	344.147	-
CFI (Comparative fit Index)	0.919	>0.9
TLI (Tucker-Lewis Index)	0.903	>0.9
RMSEA (Root mean squared error of approximation)	0.043	<0.08
PC close	0.856	>0.05
SRMR (Standardised root means squared residual)	0.061	<0.08
Respondents	N=202	

4.5 Structural Equation Modelling

The structural equation model is conducted to measure the direct and indirect effects of waste aversion on food waste behaviour. This analysis focusses purely on the direct and indirect effect of waste aversion on food waste behaviour. Therefore, socio-demographics and emotions are not taken into account. The results of the SEM can be found in *Table 9*, on the next page. No significant direct effect of waste aversion on food waste behaviour is found in the analysis. This confirms earlier found results in section 4.1 and 4.2. Three structural relations are found to be significant. Similar to the linear regression analysis consuming routines and provisioning routines significantly affect food waste behaviour (at a 10% significance level). The sign of the coefficients are also similar to the outcomes of the linear regression model. A frequent use of consuming routines (i.e. storing leftovers and eating leftover) results in lower food waste. The exact effect is hard to understand as the latent variable food waste behaviour is constructed out of waste frequency and waste quantity. The frequent use of provisioning routines leads to an increase in food waste behaviour. As the construct reliability of food waste behaviour, measure by frequency and quantity, is acceptable, it can be stated that higher usage of consuming routines lead to a decrease in the quantity and/or frequency of food waste. For provisioning routines the opposite holds.

The most interesting part is when the effect of waste aversion on the household routines is observed. This could result in indirect effects of waste aversion on food waste behaviour. This results in a significant relation between waste aversion and consuming routines. This significant effect means that there is indirect effect of waste aversion on food waste behaviour.

The stronger the dislike towards waste, the more they use consuming routines. This seems very reasonable as the consuming routines are measured by the way they treat leftovers in their households. From that point of view, it seems logical that people with a higher waste aversion handle their leftovers in another way than people with a lower waste aversion.

To conclude, waste aversion indirectly affects food waste behaviour, which supports hypothesis 3. The more waste averse a person is, the more likely it is that consuming routines are used more frequently. Consequently, frequently using consuming routines leads to a lower waste of food (in terms of frequency and/or quantity). So no direct effects are found, but the SEM indicate that there is an indirect way in which waste aversion leads to lower food waste in household.

Table 9: Structural equation modelling results showing the significance of the direct and indirect effects

Structural Relation	Structural Equation Modelling
Planning Routines	0.057
← Waste aversion	(0.54)
Provisioning Routines	-0.102
← Waste aversion	(-1.30)
Storing Routines	0.782
← Waste aversion	(1.36)
Preparing Routines	0.079
← Waste aversion	(0.94)
Consuming Routines	0.472***
← Waste aversion	(3.88)
Structural effect on Food waste behaviour	
Waste Aversion	0.020 (0.30)
Planning Routines	0.106 (0.83)
Provisioning Routines	0.363* (1.90)
Storing Routines	-0.249 (-0.66)
Preparing Routines	0.143 (0.55)
Consuming Routines	-0.121* (-1.69)
<i>N</i>	202

t statistics in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Coefficients are unstandardised

4.5.1 Goodness of fit

Besides that, a quick look at the goodness of fit of the SEM is necessary to see whether results are likely to be correct. The results of the goodness of fit indices can be found on the next page, *Table 10*. All but one indices are within the threshold margins, only the SRMR is equal to the threshold. This indicates that there is a good model of fit, so results described above are reliable.

Table 10: Goodness of fit indices of the structural equation model

Measurement	Observed Measure	Threshold level
Chi-Square (X^2)	350.921	-
CFI (Comparative fit index)	0.917	>0.9
TLI (Tucker-Lewis index)	0.903	>0.9
RMSEA (Root mean squared error of approximation)	0.042	<0.08
PC close	0.908	>0.05
SRMR (Standardised root means squared residual)	0.080	<0.08
Respondents	N=202	

5. Discussion

In this section the whole research is discussed. The expectations of the theory are compared to the outcomes of the analyses conducted. The results are also compared to past literature and odd findings are explained. The limitations of this research and the consequences that it entails are explained. Finally, the implications of this research for future research are described.

5.1 Theoretical Implications

This study examined the effect of waste aversion on food waste behaviour in households. Based on the concept of waste aversion, several analyses were conducted to measure this effect. All three different analyses (linear regression, logistic regression and SEM) found no significant results of this expected effect. Although, no significant results were found, this is the first research relating waste aversion to food waste. This indicates that there is still a necessity to discover this field further.

Similar to the main effect, the expected effect of emotions, household routines and socio-demographics, were not found in most cases. The planning, storing and preparing routines, which were expected to affect food waste behaviour, were not found to be significant in neither one of the analysis. Furthermore, there were no significant differences between respondents going to different supermarkets, differences based on gender or based on the employment status. This is not in line with results found in past research, as is described in section 2.6.

When examining the results from the SEM, to measure indirect effects, one interesting finding appears. Waste aversion has an indirect effect on food waste behaviour, through consuming routines, therefore this partly support *hypothesis 3*. Waste aversion affects consuming routines in an expected way. The more aversion a person has towards waste, the more frequent usage of consuming routines. This then leads to a decrease in food waste behaviour (i.e. a decrease in waste quantity and/or waste frequency).

5.2 Waste aversion

This research tried to explain food waste behaviour at household by using another concept than past literature did. The emphasis in past research on the theory of planned behaviour raised an important question; do people actually plan food waste? The planning of food waste seems illogical and therefore this research used a new concept for explaining differences in food waste behaviour; waste aversion. A person's dislike towards waste was expected to explain differences in food waste behaviour. People with a higher aversion towards waste were expected to waste less. In contrast to the theory, no evidence has been found that supports this

hypothesis. To look for alternative explanations some suggestions are made.

First of all, a common problem for studies about food waste behaviour, is that it is hard to measure food waste. Measuring food waste within households, would require a researcher to have access to the private domains of respondents. Therefore, most of the times this is not possible. Instead of measuring actual food waste, it is measured as self-reported food waste. The consequences could be that people are more likely to give socially desirable answers, which could blur the results. This is due to the fact that the topic of food waste is a sensitive topic and is in general seen as socially undesirable (Hermsdorf, Rombach, & Bitsch, 2017).

Secondly, it is possible that waste aversion is not affecting food waste behaviour at all. Waste aversion is measured on a broad scale, using several aspects of waste. This simply means that the waste aversion index is a broad measurement of someone's dislike towards waste, while food waste behaviour is a very specific field of waste. Food waste is not similar to other fields of waste which could explain the insignificant effect. Food waste is also caused by concerns on health issues, that can be caused by spoiled consumables. People throw away food, because they are concerned with the health of themselves and others in the household. This could explain that also waste averse people are inclined to throw away food because of safety matters. This could affect the effect of waste aversion on food waste.

Thirdly, the questionnaire was conducted in a period in which temperature was high. The quality and life time of food and vegetables decreases at a higher rate in times in which temperature is high. Therefore, people are more often faced with moldy and/or decayed products. This means that even waste averse people may report high quantities of food waste, due to environmental circumstances.

Lastly, the strength and power of the waste aversion index is reason to doubt. De Meza et al., (2015) created this index based on 10 statements on which respondents had to react with their level of agreement. Although the article of de Meza et al., (2015) was published in an economic journal (Economics Letters), the index has not been used in other research. This could indicate that others think that the index is questionable. The reasons for adopting the statements in the index are not explained, neither is the validity of the index. The Cronbach's alpha of 0.78 for the waste aversion index indicates a high internal reliability, but questions remain regarding the argumentation behind the construct of the index.

5.3 Limitations

In this section of the discussion, the limitations of this research are explained. First of all, it must be noted that the dependent variable is measured by self-reported data. Waste quantity

and waste frequency were measured by simply asking them for the total amount that is wasted and the frequency rate at which this was wasted. This limits the strength of the data, as self-reported data is hard to verify independently. The responses of people have to be taken at face value. This limitation is hard to overcome, as food is waste in the private domain. Therefore, measuring the actual quantity of food waste in households was not possible within the scope of this research.

Secondly, using only 8 out of the 10 statements of the original waste aversion index, developed by de Meza et al., (2015), is a serious limitation of the research. At first, it seemed logical to adjust the waste aversion index to only 8 items, to minimise the effect of waste aversion in the specific domain of food waste. However, in retrospect, it could have influenced the outcomes of the waste aversion index. These two statements could have been influenced the results in terms of having a significant or insignificant relation between waste aversion and food waste behaviour.

Besides that, the collection of the survey brings up one important limitation of this research. As the collection of survey was performed by myself, respondents appeared to misinterpret statements of the waste aversion index. This occurred, for example, with the statement that measures the extent to which people prefer house ownership to a the renting of a home. Some of the respondents, thinking out loud, stated that they had a renting home, so they prefer a renting home. However, if you have something, it does not immediately mean that you prefer this to another possible position. Therefore, the waste aversion index could be blurred by these misinterpretations.

Moreover, almost half of the respondents appeared to be student. Having such a large type of people in your sample, could affect the outcome of the analyses. The reason for this high share of students is that students are more assistive for fellow students. The fact that such a large share of the respondents is a student is a big limitation to the research as the results are affected by it.

Furthermore, it must be noted that Nijmegen is a city that is committed to the environmental issues of our time. Not for nothing, Nijmegen has been awarded as European Green Capital of 2018. This means that the possibility exists that citizens from Nijmegen are, by definition, very aware of the environmental burden of food waste regardless of waste aversion. This fact, could have an impact on the results and therefore counts as limitation of this research.

Lastly, some of the validity measurements appeared to be low. The Cronbach's alpha, as well as the AVE, CR and factor loadings have several values that are indicating unreliability..

The questions that arise with a low alpha is to what extent the several items that are taken together, actually measure the same thing. Furthermore, the low factor loadings indicate the correlation between the observed score and latent score. Low factor loadings therefore indicate a low correlation. This means, like the Cronbach's alpha, that some items are not measuring the same thing. To conclude, the reliability and validity issues make the outcome of the analyses questionable.

5.4 Future research

The main findings of this study are that waste aversion does not affect food waste behaviour in households. This is in contrast to what the theory expects about the role of waste aversion, as theory suggests that waste aversion plays an important role in food waste behaviour (Zanoli, 2016). Attention for the possible role of waste aversion has not been encountered so far. Therefore future research is necessary to investigate waste aversion in more detail.

One serious issue that should be taken into account in future research is the impact of socially desirable answers given by respondents. Measuring food waste by actually weighting the food that is wasted seems to be a costly and time-consuming method, but it helps in estimating true food waste. Therefore, a research that has the capabilities to perform such method to measure food waste is more likely to find reliable results, because the subjectivity is taken out of the estimation process.

Furthermore, the way in which waste aversion is measured can be changed. This research used ten statements in order to create a waste aversion index. These statements show the stated preferences of people. The problem with stated preferences is that people respond in a non-committal way. However, this does not immediately mean that they also act in accordance with those stated preferences. Therefore, it is more interesting to conduct experiments in which waste aversion of several participants is measured. This creates a measurement of waste aversion that is based on real actions of people. If food waste of those participants is measured, the relation between waste aversion and food waste behaviour can be measured in a different and more reliable manner.

Lastly, future research should focus on the three different types of waste aversion. As the theory suggested, people can have an aversion towards money based on three reasons. An aversion towards unused utility, the monetary waste and the environmental consequences of the waste. People that fall in different categories of waste aversion are likely to also have other differences. These differences should be further investigated. It is possible that each of the categories show different food waste behaviour.

6. Conclusion

This research has tried to find an answer on the question *What is the role of waste aversion in explaining differences in food waste behaviour?* By using several methods of analysis a robust answer for this question is formed.

All three of the analyses showed no significant direct effect from waste aversion on food waste behaviour in households. This means that hypothesis 1 is rejected. For the hypothesis 2A and 2B mixed effects are found. On top of that, this is only significant in some of the analyses. Therefore, hypothesis 2A and 2B are also rejected. Considering the fact that this is the first research that relates those two factors with each other, the results from this research should be seen as a start for new research. Especially given the fact that the SEM showed an indirect effect of waste aversion on food waste behaviour. Through consumer routines, waste aversion appeared to affect food waste behaviour. This actually supports hypothesis 3.

Even an indirect effect of waste aversion should be considered as an important finding, as more waste averse people are tended to use more routines that are related to a decrease in food waste. Creating more awareness of waste in general could alter people to become more waste averse. This could eventually lead to a decrease in food waste through a more frequent use of household routines.

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8. Appendix

Appendix A: Survey

Food waste behaviour

Beste supermarkt bezoeker,

Deze vragenlijst is een onderdeel van een onderzoek naar voedselverspilling binnen huishoudens. Voor mijn studie gedragseconomie breng ik in kaart wat de verschillende factoren zijn die een invloed hebben op het verspillen van voedsel. Deze vragenlijst zal expliciet gaan over het weggooien van **groente** en **fruit**.

Het invullen van de vragenlijst zal ongeveer **5 minuten** duren. **Dit is een onderzoek vanuit de Radboud Universiteit. Alle gegevens zullen anoniem worden opgeslagen en alleen voor wetenschappelijke doeleinden worden gebruikt! De gegevens zullen verder ook NIET met derden worden gedeeld.**

Alvast bedankt voor uw tijd!

Q1 In welke mate bent u verantwoordelijk voor het huishouden?

- Volledige verantwoordelijkheid (1)
- Gedeelde verantwoordelijkheid (2)
- Geen verantwoordelijkheid (3)

Skip To: End of Survey If In welke mate bent u verantwoordelijk voor het huishouden? = Geen verantwoordelijkheid

Q2 Geef bij onderstaande stellingen aan in welke mate u het er mee eens bent . Mocht de stelling niet van toepassing zijn op u dan kunt u de vraag open laten. U kunt kiezen in welke mate u het met de stelling eens bent beginnend van helemaal mee oneens (helemaal links) tot en met helemaal mee

	Helemaal mee eens (1)	Mee eens (2)	Gedeeltelijk mee eens (3)	Niet mee eens en niet mee oneens (4)	Gedeeltelijk mee oneens (5)	Mee oneens (6)	Helemaal mee oneens (7)
"Ik lees altijd een boek uit dat ik heb gekocht, zelfs als ik het geen leuk boek vindt" (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
"Wanneer ik een parfum of aftershave dat ik cadeau krijg niet lekker vind, gebruik ik het toch" (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
"Ik vervang mijn mobiel zodra er een nieuwe versie uit is." (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

“Ik bewaar
overgebleven eten om
het later nog op te eten”
(4)

"Ik koop liever een huis
dan er een te huren
aangezien het huis je
bezit wordt wanneer je
de hypotheek afgelost"
(5)

“Wanneer ik mij
inschrijf bij een
sportclub voor een vast
bedrag en daar zoveel
als mogelijk kan
sporten, zou ik dat doen
om alles uit het vaste
bedrag te halen.” (6)

"Ik loop weg uit een
bioscoop als ik de film
niet leuk vindt" (7)

"Ik vind het idee van
uitgebreide garanties
fijn, omdat je je geld
niet verliest als er iets
kapot gaat (10)

oneens (helemaal rechts)

Q36 Gooit u wel eens voedsel weg?

- Ja, dagelijks (1)
- Ja, meerdere dagen per week (4)
- Ja, wekelijks (5)
- Ja, maandelijks (6)
- Nee, nooit (2)

Skip To: Q4 If Gooit u wel eens voedsel weg? = Nee, nooit

Q3 Zou u uw voedselverspilling willen verminderen? Kruist u aan wat het beste op u van toepassing is.

- Nee, het kost mij anders te veel tijd (3)
- Nee, daar heb ik geen zin in (13)
- Nee, andere reden: (6) _____
- Ja, omdat het zonde is om iets weg te gooien (10)
- Ja, omdat het geldverspilling is (8)
- Ja, omdat dit slecht voor het milieu is (9)
- Ja, andere reden: (12) _____

Q4 Denkt u alstublieft aan de laatste keer dat u voedsel verspilde. Welke van de volgende woorden beschrijven het beste hoe u zich toen voelde?

- Schuldig (1)
- Trots (2)
- Bezorgd (9)
- Optimistisch (10)
- Gefrustreerd (11)
- Rustig (12)
- Tevreden (13)
- Geen (14)

Q5 Denkt u aan een doorsnee week in uw huishouden. Hoeveel groente en fruit wordt er in uw huishouden gemiddeld in een week weggegooid?

- Niets (1)
- Een stuk groente of fruit (2)
- Meer dan een stuk, maar minder dan de helft van alle groente en fruit (5)
- Meer dan de helft van alle groente en fruit, maar niet alles (3)
- Alles (4)

Q6 Denkt u aan een doorsnee week in uw huishouden. Hoe vaak denkt u dat er groente en fruit wordt weggegooid in uw huishouden?

	Nooit (1)	Zelden (2)	Soms (3)	Regelmatig (4)	Vaak (5)	Altijd (6)
(Q6_1)	<input type="radio"/>					

Q7 Bent u verantwoordelijk voor het doen van de boodschappen?

- Ja, meestal (1)
- Ja, soms (4)
- Nee (5)

Skip To: Q12 If Bent u verantwoordelijk voor het doen van de boodschappen? = Nee

Q8 Het komende gedeelte van de vragenlijst zal gaan over een aantal stappen in het proces van voedselverspilling. Het proces kijkt naar de stappen tussen het moment dat het voedsel wordt aangeschaft tot het moment dat het voedsel wordt weggegooid/opgegeten. Geef u aan in welke mate u dit doet aan de hand van een 7 punten schaal die loopt van altijd tot nooit

Q9 De volgende stellingen gaan over het plannen van de boodschappen.

	Nooit (1)	(2)	(3)	(4)	(5)	(6)	Vrijwel altijd (7)
Ik controleer de voorraad in het huis voordat ik boodschappen ga doen (1)	<input type="radio"/>						
Ik maak een boodschappenlijst voordat ik boodschappen ga doen (2)	<input type="radio"/>						
Ik plan van te voren in wat ik ga eten de komende dagen (3)	<input type="radio"/>						

Q10 De volgende stellingen gaan over het doen van de boodschappen.

	Nooit (1)	(2)	(3)	(4)	(5)	(6)	Vrijwel altijd (7)
Ik koop producten die in de aanbieding zijn, ook al heb ik deze niet nodig (1)	<input type="radio"/>						
Ik doe impulsieve aankopen (2)	<input type="radio"/>						
Ik koop producten in een voordeelverpakking omdat dit goedkoper is (3)	<input type="radio"/>						

Q11 De volgende vragen gaan over het opslaan van het voedsel in uw huishouden.

	Nooit (1)	(2)	(3)	(4)	(5)	(6)	Vrijwel altijd (7)
Ik sla mijn voedsel op de meest optimale plek op (bijvoorbeeld de koelkast, vriezer, etc.) (1)	<input type="radio"/>						
Ik zorg er voor dat mijn voedsel geordend wordt opgeslagen zodat ik gemakkelijk kan zien wat en hoeveel ik er nog heb. (2)	<input type="radio"/>						
Ik kan goed inschatten wanneer voedsel nog in orde is en wanneer niet (3)	<input type="radio"/>						
Het verschil tussen 'ten minste houdbaar tot' (THT) en te gebruiken tot (TGT) is duidelijk voor mij (4)	<input type="radio"/>						

Q12 Kookt u wel eens in de week?

- Ja, meestal (1)
- Ja, soms (2)
- Nee, nooit (4)

Skip To: End of Block If Kookt u wel eens in de week? = Nee, nooit

Q13 De volgende stellingen hebben betrekking tot het bereiden van het eten.

	Nooit (1)	(2)	(3)	(4)	(5)	(6)	Vrijwel Altijd (7)
Ik ben creatief in het bedenken van maaltijden met producten die nog in huis liggen (1)	<input type="radio"/>						
Ik kook precies de hoeveelheid die nodig is (2)	<input type="radio"/>						
Ik knoei tijdens het koken (3)	<input type="radio"/>						
Ik laat eten aanbranden tijdens het koken (4)	<input type="radio"/>						

Q14 De volgende stellingen hebben betrekking tot het nuttigen van eten. Geef u aan in welke mate u dit doet aan de hand van een 7 punten schaal (Altijd-Nooit)

	Nooit (1)	(2)	(3)	(4)	(5)	(6)	Vrijwel altijd (7)
Als er eten over is bewaar ik dit (1)	<input type="radio"/>						
Restjes van de vorige keer eet ik later op (2)	<input type="radio"/>						

Q14B In welke mate vindt u het vervelend om twee keer dezelfde maaltijd te eten, omdat dit nog over is van een vorige keer.

- Erg vervelend (1)
- Vervelend (2)
- Neutraal (3)
- Niet vervelend (4)
- Helemaal niet vervelend (5)

Q15 De volgende vragen gaan over uw verwachtingen met betrekking tot voedselverspilling

Q16 Geeft u zo goed mogelijk aan in welke mate de volgende stellingen overeen komen met u zelf.

	Helemaal mee eens (8)	Mee eens (9)	Gedeeltelijk mee eens (10)	Niet mee eens en niet mee oneens (11)	Gedeeltelijk mee oneens (12)	Mee oneens (13)	Helemaal mee oneens (14)
Als ik boodschappen doe verwacht ik al dat een deel van de etenswaren weggegooid zal worden (8)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q18 Wat is uw geslacht?

- Man (1)
- Vrouw (2)
- Anders (3)

Q19 Wat is uw leeftijd

- 17-24 (1)
- 25-34 (2)
- 35-44 (3)
- 45-54 (4)
- 55-64 (5)
- 65+ (6)

Q20 Uit hoeveel personen bestaat uw huishouden

- 1 persoon (1)
- 2 personen (2)
- 3-4 personen (3)
- 5 of meer personen (4)

Q21 Hoeveel kinderen onder de 18 jaar zijn er aanwezig in uw huishouden

- 0 (1)
- 1 (4)
- 2 (5)
- 3 (6)
- 4 (7)
- 5 of meer (8)

Q22 Wat is uw hoogst voltooide opleiding?

- Basisschool (1)
- VMBO (2)
- HAVO (3)
- VWO (4)
- Middelbaar beroepsonderwijs (MBO) (5)
- Hoger beroepsonderwijs (HBO) (6)
- Bachelor Wetenschappelijk onderwijs (WO) (7)
- Master Wetenschappelijk onderwijs (WO) (8)

Q23 Wat is uw huidige werksituatie

- Full-time werkende (1)
- Part-time werkende (2)
- Werkloos (3)
- Student (4)
- Pensioengerechtigde (5)

Q24 Zou u kunnen aankruisen welke van de volgende groente en fruit u zojuist heeft aangeschaft

- Asperges (1)
- Aubergine (2)

- Bloemkool (3)
- Broccoli (4)
- Champignons (5)
- Courgette (6)
- Sperziebonen (7)
- Paprika (8)
- Prei (9)
- Snijbonen (10)
- Spinazie (11)
- Spruitjes (12)
- Tomaat (13)
- Witlof (14)
- Ui (15)
- Wortels (16)
- Aardbeien (17)
- Appels (19)
- Avocado (20)
- Banaan (21)
- Citroen (23)
- Druiven (24)
- Kersen (25)
- Kiwi (26)

- Mango (27)
 - Meloen (28)
 - Nectarines (29)
 - Peer (30)
 - Perziken (31)
 - Pruimen (32)
 - Sinaasappel (33)
 - Komkommer (34)
 - sla (35)
 - bessen (36)
-

Voor het vervolg van het onderzoek ben ik zeer benieuwd naar wat er de komende week bij u gebeurt qua voedselverspilling. Ik zou het daarom op prijs stellen om u binnen een week terug te bellen voor een kort telefoongesprek. Hier zou ik dan een aantal vragen aan u willen stellen. Mocht u hier geen interesse in hebben is dat geen probleem. U kunt hieronder uw telefoonnummer invoeren. Het gesprek zal wederom **anoniem** zijn en er zal zeer discreet mee om worden gegaan. De informatie zal niet met derden worden gedeeld.

Einde van de vragenlijst. Ik wil u hartelijk bedanken voor het deelnemen aan dit onderzoek. Uw gegevens zullen discreet worden behandeld en niet met andere worden gedeeld. Mocht u geïnteresseerd zijn in de uitkomsten van mijn onderzoek dan kunt u hier beneden uw email invoeren. Op basis van de resultaten kunt u bijvoorbeeld kijken hoe u zelf uw voedselverspilling kan verminderen.

Een fijne dag nog!

Mocht u benieuwd zijn naar de resultaten van het onderzoek en daarnaast een inzicht krijgen in welke stappen u kunnen helpen in het verminderen van uw voedselverspilling dan kunt u hieronder uw emailadres achterlaten.

Appendix B: Inspection waste quantity and waste frequency

Table 11: Tabulation of Waste quantity and Waste frequency

Waste Quantity	Waste Frequency						Total
	Never	Rarely	Sometimes	Regularly	Often	Always	
Nothing	11	33	10	2	3	1	60
One piece of fruit or vegetable	1	20	54	12	8	2	97
More than one piece, but less than half	0	0	20	16	7	0	43
More than half, but not all	0	0	1	0	1	0	2
Everything	0	0	0	0	0	0	0
Total	12	53	85	30	19	3	

Appendix C1: Robustness test for the linear regression analysis

Table 12: Robustness regression, summations instead of averages of the items

Food waste behavior	Model 5: Summation
Waste aversion (Sum)	-0.00303 (-0.48)
Guilty	0.143 (1.22)
Proud	0.0507 (0.12)
Optimistic	-0.675 (-1.28)
Anxious	0.339* (1.80)
Frustrated	0.117 (1.00)
Quiet	-0.122 (-0.60)
Satisfied	-0.176 (-0.44)
Planning routines (sum)	-0.00558 (-0.46)
Provisioning routines (sum)	0.0323* (1.72)
Storing routines (sum)	-0.0163 (-1.05)
Preparing routines (sum)	0.0204 (1.16)
Consuming routines (sum)	-0.0492** (-2.07)
Male	0.172 (1.65)
Different ⁺	0.903*** (5.66)
Medium age	-0.265* (-1.81)
Older age	-0.245 (-1.07)
Coop	0.166 (1.17)
Jumbo	0.0387 (0.30)
Medium intellectual ability	0.0916 (0.49)
Higher intellectual ability	0.186 (1.01)
Employed	0.224
Children	0.347* (1.89)
Constant	1.914*** (3.59)
<i>N</i>	202

t statistics in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

⁺ Only two respondents in this category

The regressions have estimations of standard errors that are robust in order to meet assumptions about heteroscedasticity

Appendix C2: Robustness test of the linear regression analysis

Table 13: Robustness regression, waste frequency (as dependent variable) and excluding the outliers

Food waste behavior	Model 3: Waste Frequency	Model 4: Outliers exclusion
Aversion	0.0374 (0.56)	0.0121 (0.26)
Guilty	0.404** (2.13)	0.153 (1.39)
Proud	0.424 (0.49)	0.153 (0.59)
Optimistic	0.416 (0.53)	-0.920*** (-4.25)
Anxious	0.480* (1.82)	0.354* (1.94)
Frustrated	0.0993 (0.53)	0.206* (1.90)
Quiet	0.0542 (0.25)	-0.145 (-0.86)
Satisfied	1.730*** (3.85)	-0.0462 (-0.19)
Planning routines	0.0199 (0.42)	-0.0298 (-0.90)
Provisioning routines	0.107 (1.27)	0.103* (1.97)
Storing routines	-0.0597 (-0.71)	-0.0237 (-0.42)
Preparing routines	0.0475 (0.51)	0.0519 (0.81)
Consuming routines	-0.103* (-1.76)	-0.144*** (-3.52)
Male	0.145 (0.93)	0.130 (1.31)
Different ⁺	1.360** (2.16)	0.816*** (5.53)
Medium age	-0.607*** (-2.73)	-0.192 (-1.38)
Older age	-0.988*** (-3.82)	-0.359* (-1.85)
Coop	0.140 (0.70)	0.195 (1.57)
Jumbo	0.0141 (0.07)	0.154 (1.25)
Medium intellectual ability	-0.267 (-0.99)	0.152 (0.89)
Higher intellectual ability	-0.165 (-0.64)	0.193 (1.11)
Employed	0.429** (2.31)	0.160 (1.26)
Children	0.247 (1.09)	0.150 (0.97)
Constant	2.937*** (3.89)	1.932*** (3.80)
<i>N</i>	202	191

t statistics in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

⁺ Only two respondents in this category

The regressions have estimations of standard errors that are robust in order to meet assumptions about heteroscedasticity

Appendix D: Confirmatory factor analysis

Table 14: Complete output of the confirmatory factor analysis

Measurement	Confirmatory Factor Analysis
WA1	1
→ Waste aversion	(Constrained)
WA2	0.908 ^{***}
→ Waste aversion	(5.11)
WA3	0.919 ^{***}
→ Waste aversion	(4.50)
WA4	0.946 ^{***}
→ Waste aversion	(5.09)
WA5	1.272 ^{***}
→ Waste aversion	(25.65)
WA6	0.902 ^{***}
→ Waste aversion	(4.85)
WA7	1.235 ^{***}
→ Waste aversion	(6.12)
WA8	1.625 ^{***}
→ Waste aversion	(6.16)
Planning1	1
→ Planning Routines	(Constrained)
Planning2	1.556 ^{***}
→ Planning Routines	(6.42)
Planning3	1.405 ^{***}
→ Planning Routines	(6.46)
Provisioning1	1
→ Provisioning Routines	(Constrained)
Provisioning2	1.756 ^{***}
→ Provisioning Routines	(3.61)
Provisioning3	0.732 ^{***}
→ Provisioning Routines	(3.49)
Storing1	1
→ Storing Routines	(Constrained)
Storing2	2.167 ^{***}
→ Storing Routines	(4.93)
Storing3	1.410 ^{***}
→ Storing Routines	(4.67)
Storing4	1.122 ^{***}
→ Storing Routines	(3.28)
Preparing1	1
→ Preparing Routines	(Constrained)
Preparing2	1.295 ^{***}
→ Preparing Routines	(5.00)
Preparing3	.943 ^{***}
→ Preparing Routines	(4.31)
Preparing4	0.919 ^{***}
→ Preparing Routines	(4.88)
Consuming1	1
→ Consuming Routines	(Constrained)
Consuming2	1.082 ^{***}
→ Consuming Routines	(7.17)
Waste quantity	1
→ Waste Behaviour	(Constrained)
Waste frequency	1.672 ^{***}
→ Waste Behaviour	(3.93)
<i>N</i>	202

t statistics in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Coefficients are unstandardised