MASTER THESIS

Leveraging the power of CSR:

the impact of food waste treatment claims on packaged foods on consumer attitudes and behavioural intentions

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26.11.2020

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Acknowledgements

The master thesis marks the end of my journey as a student. During this journey, I had the chance to learn a lot, develop as a person, live in four different cities in three different countries and meet incredible people. It now comes to an end.

I would like to thank my supervisors Dr. D. M. Yazan and Dr. L. Fraccascia, for their continuous support and constructive feedback during this last step as a student. I also appreciate the support of the over 300 participants in my survey and my friends and family for supporting me. I am now looking forward to the next chapter.

Abstract

Aim. The aim of this research was to analyse the impact of on-package food waste treatment claims on the consumer attitude and behavioural intentions toward the presented food company as well as to analyse how the awareness of the issue of food waste influences the consumer behaviour.

Method. A digital survey was structured and conducted with an online survey tool in order to measure the major constructs, regarding the attitude towards the company, the purchase intention, the willingness to pay premiums and the awareness of the issue of food waste. All participants were first randomly presented a fictitious food product with a description of a food waste treatment claim, and afterwards, they completed the questionnaire. The answers of 256 participants have been analysed.

Results. Food waste treatment claims were found to have a significant influence on the attitude towards the fictitious company in three out of four cases. The influence on the purchase intention was only measured to be significant in one case. On the contrary, we found a significant influence on the willingness to pay premiums for the products in all experimental conditions. A moderating effect of the awareness of food waste on the variables of interest was not approved in this research.

Conclusion. The results of this research demonstrated that descriptions, including the topic of food waste, can have a positive impact on consumers attitude and behavioural intentions. This offers empirical evidence that consumers see an additional benefit in buying products from companies that proactively engage in actions against food waste. Additionally, the coherence of sustainability strategies of companies was pointed out as a key element in creating competitive advantages, with the ease of understanding communication measures from a consumer perspective as an overall success factor.

Keywords: Food waste, food waste hierarchy, food waste strategies, on-package marketing, consumer attitude, purchase intention, willingness to pay premiums, awareness of food waste

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1 Introduction

Food waste is a global problem that affects all aspects of the triple bottom line, generating negative environmental externalities (Campoy-Muñoz, Cardenete, & Delgado, 2017), costing as much as three trillion dollars globally per year including social and environmental costs (Gustavsson, Cederberg, Sonesson, Van Otterdijk, & Meybeck, 2011), as well as the social issue of food products being wasted that could serve other peoples needs (Aschemann-Witzel, de Hooge, & Normann, 2016). Global drivers of food waste are increased trade with very distant partners, dietary changes towards products with less longevity and extending food supply chains in combination with urbanisation and a shrinking of the agricultural sector (Manzocco, Alongi, Sillani, & Nicoli, 2016). The combination of the increasing demand for food through a growing population with production capacities threatened by environmental degradation (Foley et al., 2011), increases the importance of solving the problem of food waste (Aschemann-Witzel et al., 2016). The issue of food waste has already triggered various calls for actions, as well as research, public, societal and private initiatives (Aschemann-Witzel et al., 2017). A reduction in waste would free up resources used for producing and handling the food and therefore benefit the environmental footprint and impact of greenhouse gas emissions of the food supply chain (Cuéllar & Webber, 2010; Thyberg & Tonjes, 2016). Gruber, Holweg, and Teller (2016) suggest making food waste a key priority of corporate social responsibility strategies.

This analysis focuses on the processing and packaging stage of the food supply chain, with an emphasis on food manufacturing companies. These companies transform "livestock and agricultural products into a diverse set of products for intermediate or final consumption by humans (or by animals as animal feed) and include all sorts of technical, trading and service activities related to storage and processing, packaging, transport, distribution of food and catering" (Martínez, 2010, p. 115). Magalhães, Ferreira, and Silva (2018) identified the main causes of food waste in this business area as technical inefficiencies, such as improper handling or poor packaging, management problems, for instance, overproduction or inadequate demand forecasting and intrinsic characteristics of the product, like the deterioration of products or non-conformance to specifications.

Managers of food manufacturing companies apply different strategies to cope with the problem of food waste. According to a study by the Politecnico di Milano, the most common measure for food manufactures is to deliver food that would otherwise go to waste to non-profit organizations and food banks (Muriana, 2017).

With consumers getting more aware of the impact of food production and consumption as well as the climate change problem (Gadema & Oglethorpe, 2011), corporate social responsibility (CSR) has a crucial role in improving the reputation and trust among those customers (Carroll & Shabana, 2010). The European Commission (2011) defines compliance with negotiated legislation and collective agreements between social partners as a basic requirement for CSR. Moreover, corporates should integrate consumer concerns, environmental, social and ethical human rights into their core strategy in cooperation with their respective stakeholders to maximise the creation of shared value and mitigate negative impacts (Commission, 2011).

Especially for the food sector with its high impact and strong dependence on natural, human and physical resources (Genier, Stamp, & Pfitzer, 2009) and the increasing recognition of social and environmental aspects of main stakeholders (Hartmann, 2011), CSR initiatives are actively developed and communicated (Maloni & Brown, 2006). CSR activities can be used to differentiate from the competition in the market (Vahdati, Mousavi, & Tajik, 2015), have the potential to influence consumer behaviour and can lead to rewards from stakeholders (Hartmann, 2011).

With the support of customers, companies can improve the chances to create a successful CSR strategy (Vitell, 2015) and due to many people striving towards reducing food waste (Jörissen, Priefer, & Bräutigam, 2015), this topic gains popularity.

To communicate CSR activities to consumers, companies mainly rely on the internet and the display in corporate reports (Wanderley, Lucian, Farache, & de Sousa Filho, 2008). Only a small segment of conscious consumers retrieves information from various sources to be highly informed about corporate activities. All other consumers, of whom many value social and ecological activities but are less informed, rely on information at the point of sale (Walther, Schenkel, & Schüssler, 2010).

To reach their consumers at the most critical moment of purchase (Chandon, 2013), companies can display the information on the food products depending on the type of packaging and label. It is a frequently used and important instrument to communicate with consumers (Stanton & Cook, 2019), can involve messages or claims in addition to the general information of the product (Biondi & Camanzi, 2020) and can lead to competitive advantages (Ballco, de-Magistris, & Caputo, 2019). Label information can raise awareness for the topic of food waste while also decreasing food waste at the household level (Watson & Meah, 2012). For the designing and planning of label and packaging information, studies point out the importance of involving

consumers in the process to afterwards trigger them to make a purchase or positively talk about the brand (Rundh, 2009). So far, many consumers claim that they do not receive sufficient information about the issue of food waste and that it is not well communicated on the product information (Manzocco et al., 2016; Tucker & Douglas, 2007). Only a limited number of articles focus on the research area of CSR information on packaged foods. One example is the study by Wei, Kim, Miao, Behnke, and Almanza (2018) in which they examined the effect of on-package CSR claims on the consumer perceptions of health benefits, taste and attitude as well as behavioural intentions toward the food company.

Despite the increasing interest in the area of food waste, there are still aspects hindering the implementation of further measures against food waste, like the complexity of food value chains (Topolansky Barbe, Von Dewitz, & Gonzalez Triay, 2017), or the belief that action against food waste and raising awareness about this topic might lead to reduced turnover and profits (Aschemann-Witzel et al., 2016). Managers need to balance public benefits and corporate profits when it comes to environmental investments (Orsato, 2006).

This research aims at increasing the understanding of consumer perceptions of the issue of food waste and support the implementation of further actions against food waste and increase the communication of these initiatives. The goal of this research is to analyse the impact of on-package food waste treatment claims on the consumer attitude and behavioural intentions toward the food company as well as to analyse the awareness of the issue of food waste. In this research food waste treatment claims are statements on how companies deal with the issue of food waste.

1.1 Central research question

A positive correlation between the communication of food waste measures and consumer attitude and behavioural intentions could motivate further activities against food waste. Moreover, a relation between environmental investments and competitive advantages is expected to incentivise industrial competition towards more ecologically sustainable practices (Orsato, 2006). In order to achieve the goal of this research, it was important to get an in-depth understanding of consumer knowledge, interests and perceptions of company strategies for dealing with food waste. As a consequence, the research question which was answered in this research was formulated as follows:

Research question: *"To what extent do food waste treatment claims on packaged foods influence consumer behaviour?"*

To answer this research question, four hypotheses regarding the consumer attitude toward the food company, the consumer purchase intention, the willingness to pay premiums and the general awareness of the topic of food waste have been tested. The research was carried out to gain a deeper understanding of consumer knowledge and attitudes towards the topic of food waste, as well as further information on consumer food purchasing and consumption behaviour.

This research is structured as follows. First, the contribution of this research to academic research and for practitioners in the field is explained. In the following section, the terms of food waste, food waste hierarchy, and the underlying assumptions used to derive the hypothesis for this research are clarified. Next, the survey method of a quantitative survey, as well as the pilot study, is presented, followed by a chapter elaborating on the results. This research is completed by a conclusion with a subsequent part, explaining the limitations of this work as well as future research paths and practical implications.

1.2 Theoretical and practical contribution

Since the early 2000s, the number of articles in the food waste research field increased, with a significant increase since 2015 (Cahyana12, Vanany, & Arvitrida). The theoretical contribution of this research is twofold for the research area of food waste. It contributes towards research on consumer insights into the awareness and perception of the issue of food waste, as well as towards research on the implications of the communication of food waste treatment claims.

With regard to consumer insights on the problem of food waste, several studies point out the need for additional research for understanding consumer interest in the topic, their perception and how to positively influence it (Aschemann-Witzel, De Hooge, Amani, Bech-Larsen, & Oostindjer, 2015; Richter & Bokelmann, 2016). Furthermore, Richter and Bokelmann (2016) state the future research direction of whether engaging with the subject of food waste can lead to competitive advantages. Willersinn, Mouron, Mack, and Siegrist (2017) underline the importance of evaluating the acceptance of consumers towards food waste measures and de Moraes, de Oliveira Costa, Pereira, da Silva, and Delai (2020) point out the research avenue of measuring the relation of consumer awareness and actions for education with a change in consumer consumption and purchasing patterns for waste reduction. This research will contribute to the literature on consumer insights by better understanding consumer perceptions

of food waste measures and therefore help towards a better understanding of the above mentioned research fields.

Regarding the communication of food waste treatment claims, Richter and Bokelmann (2016) formulate the benefit of using the food loss topic for advertising as a future research area, whereas environmental impacts, such as energy or water footprint are expected to have a positive impact on consumer purchase choices (Manzocco et al., 2016). Hartmann (2011) points out the lack of information for a clear answer on 'when, how and why' consumers are responding to corporate responsibility. Additional research is needed to better understand the impact of point of purchase CSR information on the food choice of consumers (Loose & Remaud, 2013) and a better understanding of consumer preferences regarding CSR would be of great value (Hartmann, 2011). This research contributes to the academic literature in getting insights on consumer reactions towards the communication of several food waste measures.

Moreover, the practical contributions of this research help improving organizational decision making. Managers are expected to focus their environmental actions on areas where they can gain competitive advantages and base their strategies on solid justifications (Orsato, 2006). Richter and Bokelmann (2016) analysed that companies do not see the potential competitive advantage of differentiating themselves from the competition by food waste reduction in the production process. They further state the importance of companies and governments communicating food waste actions to raise awareness (Richter & Bokelmann, 2016). This research improves strategic decision making by analysing consumer perceptions and behaviours associated with corporate food waste activities. This way, managers can base their strategies on consumer insights and adjust the food waste activities to gain a competitive advantage. Beyond that, the insights of this research can lead to the combination of food waste information on products, which "would provide a new definition of food quality that includes not only sensory and nutritional aspects but also the potential environmental and social impact of food products, with special attention to the issue of food loss and waste generation" (Manzocco et al., 2016, p. 10).

2 Theoretical Framework

2.1 Food waste and the food waste hierarchy

The term “food waste” is often used in combination with the term “food loss”, while food loss is referring to damaged or lost food in the early stages of the supply chain and food waste is referring to wasted food products ready for human consumption (Aschemann-Witzel et al., 2017). Other distinctions within the field of food waste are made in distinguishing avoidable, possibly or partly avoidable and unavoidable food waste (Manzocco et al., 2016; Scherhaufer, Schuller, & Leverenz, 2012) or distinctions between whether products are still suitable for human consumption or not (Buzby & Hyman, 2012; Kantor, Lipton, Manchester, & Oliveira, 1997). To cover all aspects and measures regarding food waste reduction in this study, the term “food waste” is used in compliance with the definition used by HLPE (2014, p. 22) as “food loss and waste” (FLW): “Food loss and waste (FLW) refers to a decrease, at all stages of the food chain from harvest to consumption in mass, of food that was originally intended for human consumption, regardless of the cause.”

Strategies to tackle the issue of food waste are numerous. The waste hierarchy, with its aim to identify management options that result in the best overall environmental outcome, is the world-wide principal waste management framework (Papargyropoulou, Lozano, Steinberger, Wright, & bin Ujang, 2014) clustering the strategies into groups. It has been introduced already in the 1970s by the European Parliament (European Parliament Council, 1975). Papargyropoulou et al. (2014) refer to Rasmussen et al. (2005), Porter (2002), and Price and Joseph (2000) by pointing out the criticism that arises due to the environmental focus of the waste hierarchy over economic factors. This has to be taken into consideration when applying the waste hierarchy for strategy selection.

In the interest of understanding the impact of different food waste strategies on the consumer, the food waste hierarchy was used in this research to select a diverse set of strategies for treating food waste as a food manufacturing company. One strategy out of each management option was selected for the final questionnaire, in order to consider strategies that have a low similarity.

In scientific literature, the management options of the waste hierarchy have been mentioned under various different names. Manzocco et al. (2016) listed the management options as ‘reduction’, ‘reuse’, ‘recycle’, ‘recovery’ and ‘disposal’. The United Nations Environment Programme and Food and Agriculture Organization of the United Nations (2014) listed the

options as ‘prevention’, ‘optimization’, ‘recycle’, ‘recovery’ and ‘disposal’ while Papargyropoulou et al. (2014) referred to ‘prevention’, ‘prepare for re-use’, ‘recycle’, ‘recovery’ and ‘disposal’.

In this study, the management options were named in accordance with the Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 (2008) as ‘prevention’, ‘preparing for re-use’, ‘recycling’, ‘other recovery’ (e.g. energy recovery) and ‘disposal’. The aim of this directive was to lay down measures “to protect the environment and human health by preventing or reducing the adverse impacts of the generation and management of waste and by reducing overall impacts of resource use and improving the efficiency of such use” (EC, 2008, p. 1). The management options can be seen in Figure 1.

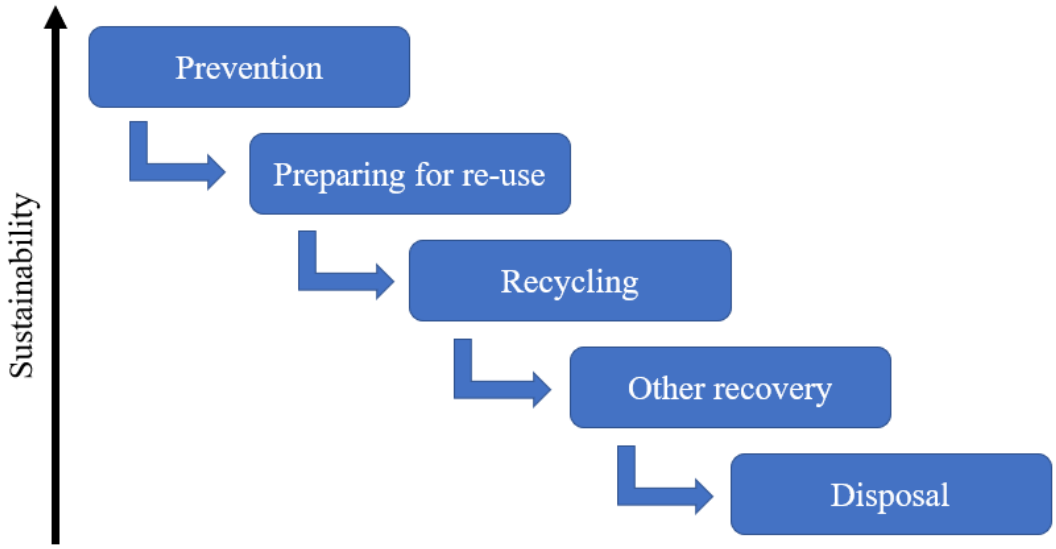


Figure 1: Management options of the waste hierarchy

Out of the five management options of the food waste hierarchy, ‘disposal’ represents the easiest and cheapest option. This management option was not a part of this study as it represents the least desirable management option, since the biodegradable organic material of the food waste does not return to its original state (Fehr, Calcado, & Romao, 2002) and is therefore solely wasted.

Due to the unspecific terms of the management options in the hierarchy, actors and institutions can interpret the options in different ways in order to comply with their strategy (Teigiserova, Hamelin, & Thomsen, 2020). This also led to the same strategies being listed under different management options in the scientific literature.

For example, the strategy of dealing with food waste with anaerobic digestion was part of the management option ‘recycling’ and ‘other recovery’ (Mourad, 2016; Papargyropoulou et al., 2014). Food donations to institutions and people in need were listed in all four management options, ‘prevention’, ‘preparing for re-use’, ‘recycling’ and ‘other recovery’ in different scientific sources (Manzocco et al., 2016; Mourad, 2016; Papargyropoulou et al., 2014; Schneider, 2013; United Nations Environment Programme & Food and Agriculture Organization of the United Nations, 2014). In a study conducted by Garrone, Melacini, Perego, and Sert (2016) the importance of food donations as a strategy for dealing with food waste was underlined by the result that all interviewed food manufacturers applied this strategy. Food donations were mostly listed in the second category, which is ‘preparing for re-use’ in this study and were therefore only included under this management option in the pilot study.

Waste sent to anaerobic digestion was stated in academic literature as both, a recycling strategy and a strategy of the management option ‘other recovery’ (Mourad, 2016; United Nations Environment Programme & Food and Agriculture Organization of the United Nations, 2014) and was in this study included in the management option ‘other recovery’ as it was more compliant with the applied definition.

Some strategies were formulated too general and are therefore not included, like the strategy to avoid surplus food generation, stated by Papargyropoulou et al. (2014).

Teigiserova et al. (2020) pointed out the problem that “recovery” and “recycling” are two separate categories but are often used interchangeably in the literature. The definition of food recovery used by Mourad (2016, p. 12), as “accessing ‘extra’, ‘excess’, or ‘wholesome food’, rarely called ‘waste’, at production, distribution, and consumption in order to bring it to people who need or want it” did not comply with the definition by the European Commission used in this study (EC, 2008). The proposed food waste recovery strategy of re-processing food, for example to jam with blemished products (Mourad, 2016), was therefore considered as a strategy in the management option of ‘recycling’ in this study with the other recovery options of Mourad (2016), not listed in the questionnaire of the study.

The findings of food waste strategies from academic literature, with regard to the management options of the food waste hierarchy, are presented in Table 1.

Table 1: Academic findings – strategies against food waste

Management Option	EC Definition (EC, 2008)	Strategies
Prevention	'Prevention' means measures taken before a substance, material or product has become waste, that reduce: (a) the quantity of waste, including through the re-use of products or the extension of the life span of products; (b) the adverse impacts of the generated waste on the environment and human health; or (c) the content of harmful substances in materials and products.	Major savings could be generated by improving adherence to market demand through statistical prediction (Manzocco et al., 2016) Processing losses could be minimized by modulating raw material selection and harmonizing stock supply with production cycles. (Manzocco et al., 2016) The application of novel technologies to extend the ingredient/product shelf life has been claimed to potentially reduce food loss and waste generated upon distribution and purchase. Among these technologies are innovative active/intelligent packaging and non-thermal decontamination techniques such as those based on electromagnetic (e.g. UV light, pulsed light), mechanic (e.g. ultrasounds, high pressure, high-pressure homogenization) or chemical stresses (e.g. ozone, non-thermal plasma) (Manzocco et al., 2016) [The framework conditions related to the generation of waste can be affected by] the use of planning measures, or other economic instruments promoting the efficient use of resources (EC, 2008) [The framework conditions related to the generation of waste can be affected by] the promotion of research and development into the area of achieving cleaner and less wasteful products and technologies and the dissemination and use of the results of such research and development. (EC, 2008) [The application] of eco-design (the systematic integration of environmental aspects into product design with the aim to improve the environmental performance of the product throughout its whole life cycle) (EC, 2008) The donation of edible food to social welfare services is a well-established food waste prevention measure which is implemented in several countries all over the world (Schneider, 2013)
Preparing for re-use	'Preparing for re-use' means checking, cleaning or repairing recovery operations, by which products or components of products that have become waste are prepared so that they can be re-used without any other preprocessing. 'Re-use' means any operation by which products or components that are not waste are used again for the same purpose for which they were conceived.	Modifying the production process and/or implementing production diversification, to allow potentially discarded material to re-enter in the production cycle as raw material or semi-finished product (Manzocco et al., 2016) Send to animal feed (United Nations Environment Programme & Food and Agriculture Organization of the United Nations, 2014) Redistribution to people (United Nations Environment Programme & Food and Agriculture Organization of the United Nations, 2014), re-use surplus food for human consumption for people affected by food poverty, through redistribution networks and food banks (Papargyropoulou et al., 2014), or donations made to non-profit organizations (Garrone et al., 2016)

Management Option	EC Definition (EC, 2008)	Strategies
Recycling	'Recycling' means any recovery operation by which waste materials are reprocessed into products, materials or substances whether for the original or other purposes. It includes the reprocessing of organic material but does not include energy recovery and the reprocessing into materials that are to be used as fuels or for backfilling operations.	Food donations (Manzocco et al., 2016) Food waste can also be transformed into valuable materials that can be used in some sectors (Garrone et al., 2016), for example in the nutraceutical and pharmaceutical industries (Mirabella, Castellani, & Sala, 2014) or industrial uses like chemicals or cosmetics (Mourad, 2016) Waste sent to anaerobic digestion (Mourad, 2016; United Nations Environment Programme & Food and Agriculture Organization of the United Nations, 2014) Recycle food waste into animal feed (Manzocco et al., 2016; Mourad, 2016; Papargyropoulou et al., 2014) Recycle food waste via composting (Manzocco et al., 2016; Mourad, 2016; Papargyropoulou et al., 2014; United Nations Environment Programme & Food and Agriculture Organization of the United Nations, 2014)
Other recovery	'Recovery' means any operation the principal result of which is waste serving a useful purpose by replacing other materials which would otherwise have been used to fulfil a particular function, or waste being prepared to fulfil that function, in the plant or in the wider economy.	Biofuel and bioenergy can be produced from losses by applying anaerobic digestion, pyrolysis and gasification, hydrothermal carbonization or incineration (Girotto, Alibardi, & Cossu, 2015). The residues from biofuels production can further be used as soil fertilizers (Manzocco et al., 2016; Notarnicola, Hayashi, Curran, & Huisingh, 2012) Incineration of waste with energy recovery (United Nations Environment Programme & Food and Agriculture Organization of the United Nations, 2014) Treat unavoidable food waste and recover energy: e.g. via anaerobic digestion (Papargyropoulou et al., 2014) Use principally as a fuel or other means to generate energy (EC, 2008) Food recovery involves accessing "extra," "excess," or "wholesome food" - rarely called "waste" - at production, distribution, and consumption in order to bring it to people who need or want it. Food recovery can involve gleaning unharvested produce on farms and at markets, re-processing food (for example, making jam with blemished products), or matching the supply of available extra food to the demands of food banks and charities (Mourad, 2016)

The presented findings from the literature were further included in the pilot study, which is explained in chapter 3.1.

2.2 Conceptual framework

Consumers have a large impact with the choice of consumption on the type of foods that are produced and also on the production methods, supporting different products and brands (Grunert, 2011). Cecchini, Torquati, and Chiorri (2018, p. 554) describe the post-modern consumer as driven by a "more responsible and exigent buyer behaviour, increasingly providing

attention to the ‘mode of production’ of food.” Nowadays, buying behaviour and food consumption choices include social, ethical, environmental as well as cultural point of views (Cecchini et al., 2018). Studies of German consumers show differences in purchasing habits based on environmental awareness (BMEL, 2014).

Wei et al. (2018) analysed the relationship between CSR claims on packaged foods on consumer inferences and found CSR claims to positively influence the consumer perception of health benefits, taste, attitude, and the behavioural intentions toward the food company. The inferences of consumers are often influenced by a cognitive bias where the evaluation of one attribute biases the perception of other attributes (Lee, Shimizu, Kniffin, & Wansink, 2013).

This research further analyses the influence of on-package CSR claims on consumer behaviour by analysing the impact of on-package food waste treatment claims. Consumer behaviour will be analysed regarding consumer attitude toward the food company, the purchase intentions regarding a studied food product and the willingness to pay premiums with the consumer awareness of the issue of food waste as a moderator in accordance with the conceptual framework, presented in Figure 2.

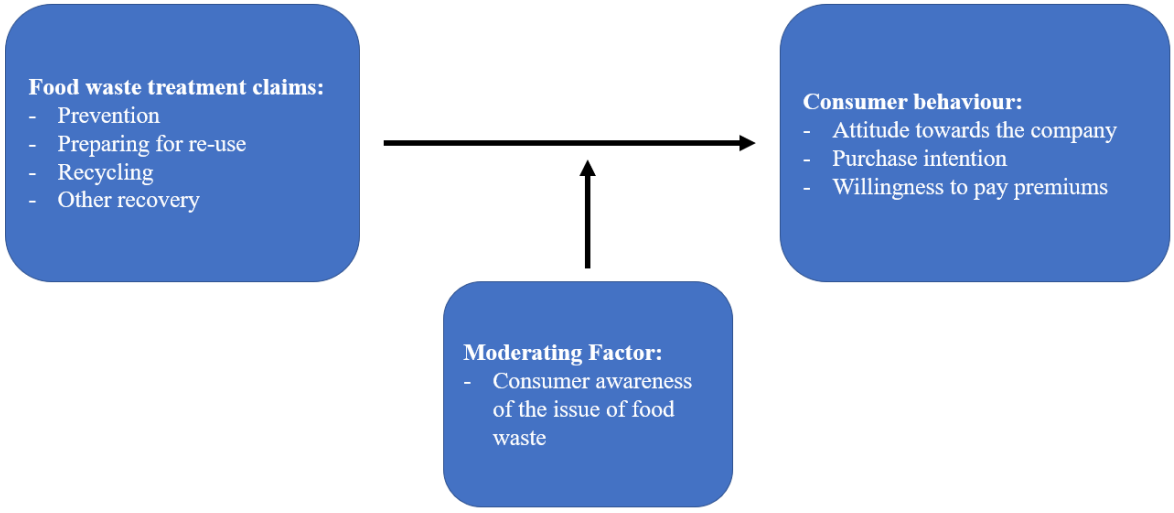


Figure 2: Conceptual framework

2.3 Attitude towards the company

The attitude of a consumer is the positive or negative feeling about an action in general and indicates the assessment of emotions and the interest or reluctance towards a specific idea or product (Kordnaeij, Askaripoor, & Bakhshizadeh, 2013). Therefore, attitude can be described as the cognitive and emotional overall assessment of a concept (Bem, 1970; Monirul & Han, 2012).

The spending patterns of many consumers show that they want brands to 'go green', believing in a better and healthier life for this and future generations (Yazdanifard & Mercy, 2011). If consumers can identify their own beliefs in the actions of a company, this is expected to influence positive attitudes towards this company and resulting positive behaviours (Lech, 2013).

With regard to CSR, researchers already pointed out a positive relationship between the CSR initiatives of a company and the attitude of their consumer towards respective companies (Sen, Bhattacharya, & Korschun, 2006; Trudel & Cotte, 2009; Vahdati et al., 2015). In their field study with a questionnaire about dairy products in Ahvaz, Vahdati et al. (2015) showed a positive and significant impact of CSR initiatives on the attitude of consumers. They tested and approved the impact of various dimensions of CSR, including "supporting employees, protecting the environment, moral responsibility, economic and humanitarian responsibility" (Vahdati et al., 2015, p. 840).

From a food industry value chain perspective, as food production necessarily involves the environment, employees and suppliers, safe production methods and ethical business practices, these characteristics are expected to translate into better food consumption in the eyes of consumers (Wei et al., 2018).

As food waste treatment is part of CSR, and the issue of food waste is connected to the triple bottom line of sustainability, consumer attitudes were expected to be positively impacted by food waste treatment claims, and therefore the first hypothesis (herinafter "**H**") was derived:

> ***H1.*** *There is a positive relationship between food waste treatment claims on packaged foods and consumer attitudes towards the company.*

2.4 Purchase intention

The frequently found motivation to behave more sustainably among consumers does not have to lead to actual sustainable buying behaviour, food choice and general consumption as previous studies suggested (Grunert, Hieke, & Wills, 2014; Krystallis, de Barcellos, Kügler, Verbeke, & Grunert, 2009; van Dam & van Trijp, 2013).

Prior studies had inconsistent findings regarding the relationship between CSR and financial outcomes for the companies, which therefore had to be further analyzed. While some researchers found a weak or no relationship between CSR and financial outcome (Sen et al. 2006), others found the potential of proactive CSR, which are ethical and discretionary activities that

exceed legal demands, to positively influence financial performance (Brown & Dacin, 1997; Y. Kim, 2017). The study of Y. Kim (2017) showed the positive intent of respondents to support and purchase from companies engaging in proactive CSR initiatives.

Despite the inconsistent findings, CSR initiatives are expected to have the potential to change consumer buying behaviour, rewarding and punishing companies based or their responsible or irresponsible activities (Trudel & Cotte, 2009), with market studies already in the early 90s indicating a positive effect of CSR on consumer behaviour (Davids, 1990). Moreover, according to consumer inference-making theory, if a company is perceived as responsible by a customer, the positive inference of products or services are likely to lead to a purchase intention (Lech, 2013).

For their study in the dairy industry, Vahdati et al. (2015) distinguished between a direct and an indirect impact of CSR on consumer buying behaviour through the attitude towards the company. The results of their study confirmed an indirect impact of CSR on consumer buying behaviour, while the direct impact of CSR has been rejected. Empirical findings support the effect of attitude as a precursor to the formation of a corporate image, favourable behavioural intentions and the establishment of relationships with stakeholders (Y. Kim, 2017). Jaafar, Lalp, and Naba (2012) pointed out to change the attitude first in order to change the behaviour.

In the study of Wei et al. (2018) the research was focused on the effect of CSR claims on consumer purchase intentions in comparison with products without CSR claims, which was confirmed by their results. Based on these discussions, a positive impact of food waste treatment claims on consumer purchase intentions was expected.

> ***H2.*** *The purchase intentions of consumers for packaged foods with food waste treatment claims is higher than the purchase intention for the products without food waste treatment claims.*

2.5 Willingness to pay premiums

Already in the 1990s, the growing environmental consciousness among consumers in western Europe and the United States of America was stated in academic literature (Curlo, 1999). In today's society in western Europe, environmental-conscious consumers can actively transfer their beliefs through purchases of environmentally friendly products into corresponding actions reducing their environmental footprint (Moser, 2016). Even though White et al. (2012) showed in their study, that consumer purchasing behaviour does not have to be in line with positive

attitudes towards certain food products, a positive willingness to pay for products with environmental, social and ethical certifications has been approved in several studies (Cecchini et al., 2018; Loose & Remaud, 2013). A significant proportion of consumers is willing to pay high premiums when purchasing environmentally friendly products compared to products that are not environmentally friendly or do not showcase this factor (Bernard & Bernard, 2009; Combris et al., 2012). Marette, Messéan, and Millet (2012) emphasize that organic labels are not enough for consumers and that additional, specific information about the product and the impact on the environment are needed to influence the product choice and willingness to pay premiums of consumers.

The results of Cecchini et al. (2018) point out a positive price premium compared to conventional products for products with an environmental certification of 13– 50% depending on the type of product and certification. The results for products with social and ethical certifications also showed a positive willingness to pay, with an increasing trend since the early 2000s (Cecchini et al., 2018). The findings of Wei et al. (2018) showed a higher willingness to pay premiums for packaged foods with CSR claims compared to food products without such claims. Sammer and Wüstenhagen (2006) point out a significant willingness to pay for products labelled with sustainability labels, indicating the awareness of consumers for the environmental impact of their purchases, advising companies to invest in research and development activities to further improve the environmental performance of their products.

The research about waste prevention-based labelling by Del Giudice, La Barbera, Vecchio, and Verneau (2016) presented a positive influence of labelling regarding waste prevention on the willingness to pay premiums for a food product. The findings were especially high when communication focused on the impact on the carbon footprint compared to communication regarding the water footprint (Del Giudice et al., 2016).

In accordance with these findings, a positive impact of on-package food waste treatment claims on the willingness to pay premiums of consumers for these products is expected.

> ***H3.*** *There is a higher willingness to pay premiums for packaged foods with food waste treatment claims compared to food products without food waste treatment claims.*

2.6 Awareness of food waste

Waste reduction is already a factor stimulating consumers to search for organic food (Kottala & Singh, 2015) and it is an important issue in the context of ethical consumption (Del Giudice et al., 2016). Crane and Matten (2007, p. 365) define ethical consumption as "the conscious and deliberate choice to make certain consumption choices due to personal and moral beliefs". As already stated in the literature, the topic of food waste could further contribute to defining ethical consumption as it involves both, social aspects as well as environmental factors (Del Giudice et al., 2016). With the consumption of "environmentally-friendly" or "green" products, consumers aim at optimizing environmental consequences and transfer their environmental concerns into corresponding actions (Moser, 2016). The concern about food waste can therefore influence the likelihood of consumers to modify their behaviour (Stefan, van Herpen, Tudoran, & Lähteenmäki, 2013).

With regard to studying renewable energy, Bang, Ellinger, Hadjimarcou, and Traichal (2000) emphasized that a higher willingness to pay premiums was found for consumers who were more concerned about the environment and their personal impact, compared to consumers who were less concerned.

Regarding the consumer-corporate identification, CSR initiatives can be useful to increase the identification of consumers with the food manufacturing company, which can lead to positive attitudes (Brown & Dacin, 1997) and favourable purchase intentions (Mohr & Webb, 2005).

A high level of identification, which refers to the self-perception of consumers, the perception of the company and the resulting psychological attachment (Du, Bhattacharya, & Sen, 2007) is expected to influence positive attitudes and behaviours towards the company (Lech, 2013).

Hartmann (2011) distinguishes between intrinsic rewards for consumers like improved self-esteem through the purchasing of products which is increased if the CSR area is of personal value and extrinsic rewards as for example social prestige, based on prior studies by Szmigin, Carrigan, and McEachern (2009) and Bénabou and Tirole (2010).

While environmental concern and awareness are expected to positively influence consumer attitudes and behaviour, the term of sustainability is abstract and can lead to consumers having difficulties to relate to it (Grunert et al., 2014). The study of Walther et al. (2010) showed that many German consumers are unaware of the precise meaning of CSR.

Based on these arguments, the awareness of consumers about the problem of food waste was used as a moderator in this study and was expected to positively influence the consumer behaviour in accordance with the conceptual framework (Figure 1).

> ***H4.*** *The consumer awareness of the issue of food waste has a positive effect on the studied influence of food waste treatment claims on packaged foods on consumer behaviour.*

3 Methodology

A survey was structured and conducted with the online survey tool “Qualtrics” in order to answer the research question. This methodology enables researches to collect quantitative data efficiently and to recruit large numbers with diverse backgrounds fast and easy (Wyatt, 2000). Self-completion questionnaires are one of the main social survey design instruments for gathering data and have the benefit to eliminate interviewer effects, for example, biases in answering the questions through the ethnicity, gender, or the social background of the interviewer (Bryman, 2012). In line with Topolansky Barbe et al. (2017), most answers were reported using a Likert-scale with graded answers to specify opinions and better understand the attitudes and interests of the participants.

The questionnaire was designed to measure the major constructs in accordance with the hypotheses, regarding the attitude towards the company, the purchase intention, the willingness to pay premiums and the awareness of the issue of food waste.

The survey was distributed via online channels and online survey communities like SurveyCircle, PollPool, Whatsapp, Facebook, E-Mail, Instagram and LinkedIn to reach a diverse set of participants.

The participants were randomly assigned to a questionnaire including a fictitious food product with a description about a food waste treatment claim out of one of the four management options ‘prevention’, ‘preparing for re-use’, ‘recycling’, ‘other recovery’. The description for the control group did not include a food waste treatment claim.

To formulate the food waste treatment claims, a pilot study was conducted. The participants were asked to rank the different strategies out of the management options, according to how they would want a food manufacturing company to prioritize their actions against food waste. The highest-ranked strategy out of each management option was then used for the final questionnaire. Additionally, participants were asked to list their five most frequently bought packaged groceries. This grocery was then used in the final questionnaire to present a fictitious food package with a fictitious company name, product name and a randomly assigned food waste treatment claim. For the control group, a typical consumer service information was included instead of the food waste treatment claim. Then, participants completed the final questionnaire. The constructs used to measure the factors of interest are presented in chapter 3.2.

3.1 Pilot study

The waste hierarchy, introduced in chapter 2.1, was applied for the pilot study in order to select a diverse set of strategies used by food manufacturing companies for treating food waste. One strategy out of each management option was selected for the final questionnaire. A personal selection of the strategies for this research would have created a bias in the research. Therefore, this pilot study was conducted to ask participants about how they would want a company to prioritize their efforts in treating food waste, ranking the strategies and afterwards including the highest-ranked strategy into further analysis.

Based on the literature review about the food waste hierarchy and different strategies for managing food waste as a food manufacturing company, a set of strategies were formulated. To improve readability and comprehensibility for the participants, some aspects have been summarized and explained in more detail. Out of the five management options of the food waste hierarchy "disposal" was not a part of this study. All formulations of the strategies are presented in Table 2.

The strategies found for 'other recovery' were mostly focused on recovering energy from food waste (for example, through generating biofuel and bioenergy from food waste). Therefore, the food waste treatment claim in the final questionnaire about 'other recovery' was focusing on energy recovery, with participants of the pilot study being only asked about strategies in the fields of ´prevention´, ´preparing for re-use´ and ´recycling´.

Table 2: Strategies included in the pilot study

Management Option	EC Definition (EC, 2008)	Strategies
Prevention	'Prevention' means measures taken before a substance, material or product has become waste, that reduce: (a) the quantity of waste, including through the re-use of products or the extension of the life span of products; (b) the adverse impacts of the generated waste on the environment and human health; or (c) the content of harmful substances in materials and products.	Preventing food waste by adapting production to market demand through statistical prediction and harmonizing stock supply with production cycles Preventing food waste by applying novel technologies, like innovative packaging and non-thermal decontamination techniques, to extend the ingredient/ product shelf life Preventing food waste through the promotion of research and development into the area of achieving cleaner and less wasteful products and technologies and the dissemination and use of the results Preventing food waste through the application of eco-design (the systematic integration of environmental aspects into product design with the aim to improve the environmental performance of the product throughout its whole life cycle

Management Option	EC Definition (EC, 2008)	Strategies
Preparing for re-use	'Preparing for re-use' means checking, cleaning or repairing recovery operations, by which products or components of products that have become waste are prepared so that they can be re-used without any other pre-processing. 'Re-use' means any operation by which products or components that are not waste are used again for the same purpose for which they were conceived.	Modifying the production process and/or implementing production diversification, to allow potentially discarded material to re-enter in the production cycle as raw material or semi-finished product Sending food waste to animal feed Redistribution to people, re-using surplus food for human consumption for people affected by food poverty, through redistribution networks and food banks, or donations made to non-profit organizations
Recycling	'Recycling' means any recovery operation by which waste materials are reprocessed into products, materials or substances whether for the original or other purposes. It includes the reprocessing of organic material but does not include energy recovery and the reprocessing into materials that are to be used as fuels or for backfilling operations.	Recycling food waste by transforming it into valuable materials that can be used in some sectors, for example, in the nutraceutical and pharmaceutical industries, or industrial uses like chemicals or cosmetics Recycling food waste into animal feed Recycling food waste via composting Recycling food waste by reprocessing food for human consumption (for example, making food products out of food waste)
Other recovery	'Recovery' means any operation the principal result of which is waste serving a useful purpose by replacing other materials which would otherwise have been used to fulfil a particular function, or waste being prepared to fulfil that function, in the plant or in the wider economy.	Recovery of biofuel and bioenergy from food waste, using residues from biofuel production as soil fertilizers

The participants were then asked to rank the strategies for each option. After ranking the strategies, the last question in the pilot study was about listing the five most frequently bought packaged groceries. All questions included in the pilot study can be found in Appendix I: Pilot Study.

Results: Pilot Study

The data of 52 participants of the pilot study was further analysed. The results showed that the strategy out of the management option 'prevention' that was ranked highest was: "Preventing food waste by adapting production to market demand through statistical prediction and harmonizing stock supply with production cycles." Out of the management option 'preparing for re-use', participants wanted food manufacturing companies to focus their efforts on: "Modifying the production process and/or implementing production diversification, to allow potentially discarded material to re-enter in the production cycle as raw material or semifinished product." The strategy of the management option 'recycling' that was ranked highest was: "Recycling

food waste by reprocessing food for human consumption (for example, making food products out of food waste)."

These three strategies, as well as the strategy out of the management option 'other recovery' were further included in the final questionnaire.

Regarding the most frequently bought packaged groceries, the most stated grocery was "pasta" (including the term "noodles") with 20 mentions followed by "cheese" (17 mentions) and "milk" (13 mentions). Even though only 35 participants answered this question, the food product "pasta" was included in the final questionnaire, as it is in line with the findings of various different websites, stating pasta as one of the most frequently bought groceries in Germany (Gerber, 2010; Herzner, 2013).

3.2 Questionnaire

The aim of the questionnaire, also previously referred to as "final questionnaire" in order to avoid confusion with the pilot study, was to test the hypothesis regarding the four factors of 'attitude towards the company', 'purchase intention', 'willingness to pay premiums' and 'food waste awareness'.

The outline of the questionnaire was created in accordance with the structure of a standardized questionnaire by Döring and Bortz (2016), started with the title of the questionnaire, followed by the instructions, the question blocks, statistical information, an option for feedback and closing remarks. In compliance with the regulations of the University of Twente, the questionnaire started with an opening statement, informing the participants about the study, risks associated with the study and that participation was voluntary with the possibility to withdraw from the research at any time.

The information about the aim of understanding the impact of food waste treatment claims on food packages was withheld and only given at the end of the survey to not affect the answers of the participants.

The survey was available in English and German for participants to answer in the language that they are most comfortable with. All texts and questions included in the English version of the final questionnaire can be found in Appendix II: Questionnaire.

To present the food waste treatment claims, a fictitious food package was designed under the name "Pastolli", using the design software Canva. The name was chosen in order to sound

similar to existing pasta producing companies but not violate any legal rights. A study by Barchiesi, Castellan, and Costa (2018) exploring the potential of packaging colour for conveying CSR to consumers, revealed that blue is the most attractive colour for food packages to convey CSR messages. Therefore, the package of the fictitious food company was also designed using mostly blue as a colour. An image of the food product used in the questionnaire is shown in Figure 3. The picture presented was the same in all versions of the questionnaire, only the description shown below all pictures changed according to the management option for treating food waste that the version of the questionnaire was focussing on.

Figure 3: Fictitious food product "Pastolli"

To ensure comparability between the descriptions of the strategies for treating food waste in the questionnaire, they were all formulated following the same structure. First, the problem of food waste was explained in one sentence to state the importance of the matter. Second, the strategy for treating food waste was formulated from the perspective of the company "Pastolli". Last, the participants were given the feeling of having an impact on this problem, by saying "thank you for supporting our actions, by choosing our products". All strategies are based on the findings of the pilot study and formulated as CSR claims, as presented in Table 3: Food waste treatment claims. For the control group, a general description of the ingredients and the description of how to prepare the pasta was presented, formulated based on existing food product descriptions.

Table 3: Food waste treatment claims

Management option	Description used in the questionnaire
Prevention	Pastolli Food waste is a global problem that affects all of us, generating high costs, negative environmental effects, as well as major social problems. At Pastolli, we minimize our food waste through the application of eco-design. This way, we design our products ecologically and directly integrate environmental aspects. Our aim is to improve the environmental performance of our products throughout its whole life cycle. We make our products more efficient, use fewer resources and generate less waste and emissions. Thank you for supporting our actions by choosing our products.
Preparing for re-use	Pastolli Food waste is a global problem that affects all of us, generating high costs, negative environmental effects, as well as major social problems. At Pastolli, surplus food does not go to waste. We redistribute our surplus food to people affected by food poverty, through redistribution networks and food banks, or donations made directly to non-profit organizations. Thank you for supporting our actions by choosing our products.
Recycling	Pastolli Food waste is a global problem that affects all of us, generating high costs, negative environmental effects, as well as major social problems. At Pastolli, surplus food does not go to waste. We reprocess our surplus food for human consumption. With our circular approach, we transform wastes or surplus ingredients, obtained during the manufacturing of other foods, into new food products under our high-quality standards. This way, we decrease the amount of food waste generated and improve our environmental performance. Thank you for supporting our actions by choosing our products.
Other recovery	Pastolli Food waste is a global problem that affects all of us, generating high costs, negative environmental effects, as well as major social problems. At Pastolli, surplus food does not go to waste. We turn it into energy! The food waste gets treated in order to produce biofuel and bioenergy from it. Residues from biofuels production can be further used as soil fertilizers. Thank you for supporting our actions by choosing our products.
None (Control Group)	Pastolli Pastolli spaghetti are made from durum wheat semolina from controlled production. To prepare the spaghetti, boil 80g per portion in 1 litre of boiling, slightly salted water (1 teaspoon = 5g of salt per 1 litre of water). After about 7 minutes, pour the spaghetti into a sieve and let it drain. Now just put it on a plate and serve with the sauce of your choice. Bon appetite!

In the main part of the questionnaire, the participants were then asked several questions to test the hypothesis of this research, using items from existing academic research articles.

To measure the attitude toward the food company, three items from Kozup, Creyer, and Burton (2003) were measured using a Likert scale.

All Likert scales were adapted to a five-point scale in order to make the results comparable and make it consistent throughout the questionnaire. A five-point Likert scale was recommended in previous literature to make it simple for participants to read all scale descriptors and increase response rate and response quality while reducing frustration levels (Dawes, 2008; Sheetal & Harsh, 2004).

The purchase intention was also assessed using three items from Kozup et al. (2003). The willingness to pay premiums was assessed, including three items from Perrini, Castaldo, Misani, and Tencati (2010) into the questionnaire. All three data measurements were previously included in the questionnaire by Wei et al. (2018) in a related field. The awareness of the participants of the issue of food waste was analysed measuring six items from Delley and Brunner (2017), using a five-point Likert scale, which were applied by Gjerris and Gaiani (2013) in the area of household food waste. Participants were asked to indicate the ease of understanding of the food waste treatment claim, using one item previously applied by Wei et al. (2018).

Based on prior studies by Raju, Lonial, and Mangold (2015), Chandon and Wansink (2007), Irmak, Vallen, and Robinson (2011) and Creyer (1997), that identified variables which have a significant effect on consumer inferences, Wei et al. (2018) included several items to measure the subjective nutrition knowledge of the participants, the nutrition involvement, participants diet restraint behaviours, participants perception of the importance of a firms CSR activities and the liking of food. These items were also included in this study as covariates to analyse their influence on consumer behaviour. All items are shown in Table 4.

The questionnaire also collected general demographic information such as gender, age, ethnicity, income and education. All items were available in English and German to ease the understanding for the participants.

Table 4: Items included in the questionnaire

Topic/ Construct	Question(s)	Scale	Operationalization	Source
Attitude toward the company	Now please compare the company Pastolli and the product shown to you with other products and companies represented in your supermarket. How would you describe your attitude towards Pastolli based only on the image and the description of the food product? Please give your first personal assessment using these three scales.	Likert	Very unfavourable (1) – Very favourable (5) Very bad (1) – Very good (5) Very negative (1) – Very positive (5)	Modified from Kozup et al. (2003)
Purchase intention	How likely is it that you would buy this food from Pastolli? Assuming that you were interested in buying pasta, would you be more likely or less likely to purchase Pastolli's pasta, given the information shown above? How probable is it that you would consider the purchase of this product, if you were interested in buying pasta?	Likert	Very unlikely (1) – very likely (5) Very unlikely (1) – very likely (5) Very unlikely (1) – very likely (5)	Modified from Kozup et al. (2003)
Willingness to pay premiums	Buying Pastolli's pasta seems smart to me even if it costs more than similar products. I am ready to pay a higher price for Pastolli's pasta than for similar products. I would still buy Pastolli's pasta if other brands reduced their prices.	Likert	Strongly disagree (1) - Strongly agree (5)	Modified from Perrini et al. (2010)
Manipulation	From your point of view, into which category would you classify Pastollis efforts?	Nominal	(1) Preventing food waste (2) Preparing for re-using food waste (3) Recycling food waste (4) Recovering food waste (5) None of the above	Modified from Wei et al. (2018)
Food waste awareness	In Germany, households are responsible for a great proportion of the food waste. Food waste is a big environmental issue. In Germany, the food waste generated by households has great financial consequences.* Food waste is an important social issue (e.g. hunger in the world). Foods are gifts of nature and have to be treated as such.** Foods are scarce over the world and should be consumed consciously.	Likert	Strongly disagree (1) – Strongly agree (5)	Modified from Delley and Brunner (2017) *Modified from Stefan et al. (2013) **Gjerris and Gaiani (2013)
Subjective nutrition knowledge	I know pretty much about nutrition. I do not feel very knowledgeable about nutrition. Among my circle of friends, I am one of the "experts" on nutrition. Compared to most other people, I know less about nutrition.	Likert	Strongly disagree (1) – Strongly agree (5)	Flynn and Goldsmith (1999)

Topic/ Construct	Question(s)	Scale	Operationalization	Source
Nutrition involvement	I pay close attention to nutrition information. It is important to me that nutrition information is available. I ignore nutrition information. I actively seek out nutrition information. Calorie levels influence what I eat.	Likert	Strongly disagree (1) – Strongly agree (5)	Chandon and Wansink (2007)
Diet restraint behaviours	I use food nutritional labels to make my food choices. I plan out what I am allowed to eat for the day. I have eaten foods that I don't prefer just because they are low in calories. I have been dieting to help control my weight. I would have eaten much differently if I had not been concerned about my weight.	Likert	Never (1) – Always (5)	Irmak et al. (2011); Martz, Sturgis, and Gustafson (1996)
Importance of a firms CSR activities	Whether a firm is socially responsible is important to me, making my decision what to buy. It bothers me to find out that a firm that I buy from has acted socially irresponsible. I care whether the companies whose products I buy have a reputation for socially responsible behaviour.	Likert	Strongly disagree (1) – Strongly agree (5)	Modified from Creyer (1997)
Liking of food	How much do you like eating pasta?	Likert	Dislike a great deal (1) – Like a great deal (5)	Modified from Raghunathan, Naylor, and Hoyer (2006)
Ease of understanding	How easy is the description about Pastolli to understand?	Likert	Not at all easy (1) – Very easy (5)	Modified from Wei et al. (2018)

Demographic information was collected mostly in accordance with a selection of the demographic questions published by Hughes, Camden, and Yangchen (2016), Lanfranchi, Calabrò, De Pascale, Fazio, and Giannetto (2016) and questions by Statistisches Bundesamt (2016), as presented in Table 5.

Table 5: Demographic information included in the questionnaire

Question	Answer options	Source
How do you currently describe your gender?	- Male - Female - Diverse	Modified from Hughes et al. (2016)
What is your age?	- Younger than 18 - Between 18 and 24 - Between 25 and 34 - Between 35 and 44 - Between 45 and 64 - 65 or older	Modified from Lanfranchi et al. (2016)
In which country do you currently reside?	[List of countries from the software Qualtrics]	Qualtrics
Do you have biological, foster, adopted or stepchildren?	- No - Yes	Modified from Hughes et al. (2016)
What is your current profession?	- I am employed or working (incl. trainees, persons on parental leave or part-time work) - I am performing basic military/community service - I am a pupil - I am a student - I am retired - I live from income from capital assets, rent or lease - I am a housewife or husband or care for children and/or people in need of care - I am unemployed - None of the above	Modified from Statistisches Bundesamt (2016)
What is your highest general school leaving certificate, vocational training or university degree?	- Graduation after a maximum of 7 years of schooling - Secondary or elementary school leaving certificate - Secondary school leaving certificate (German "Mittlere Reife") - Advanced technical college entrance qualification (German "Fachhochschulreife") - General or subject-related university entrance qualification (German "Abitur") - Apprenticeship or vocational training - Vocational school qualification (master craftsman, technician, or equivalent qualification) - University of applied sciences degree, a degree from a university or scientific college - PhD	Modified from Statistisches Bundesamt (2016)
What is your monthly net income?	- <1,000€ - €1,000 - €1,500 - €1,500 - €2,000 - €2,000 - €2,500 - €2,500 - €3,000 - Over €3,000	Self-designed

3.3 Analysis

To analyse the effects of the different food waste treatment claims on the "attitude towards the company", "purchase intention" and "willingness to pay premiums" of the participants the method of Univariate Analysis of Covariance (ANCOVA) was conducted.

The ANCOVA is a commonly used method for analysing and comparing changes between groups and is designed to control for covariates in the case of randomly assigned groups, as found in this research (Jamieson, 2004). It is widely applied for the analysis of quantitative data where the interest is focused on changes between experimental conditions and control groups, in a variety of fields, including education and psychology, but also with regard to food waste (Graham-Rowe, Jessop, & Sparks, 2019; Leppink, 2018). ANCOVA can be used to analyse whether there are significant differences between the means of two or more unrelated, randomly assigned groups, through comparison of the adjusted means of the variable of interest. Understanding the effects of the different conditions on the variable of interest using an ANCOVA was previously applied in other research focusing on the topic of CSR and food waste with the research design of quantitative surveys (Graham-Rowe et al., 2019; Wei et al., 2018).

As the ANCOVA only shows whether there is a significant difference between the groups or not, but does not directly show comparisons between the groups, a post hoc test was conducted. To make pairwise comparisons between the groups and analyse the significance, the Bonferroni post-hoc test was applied. The Bonferroni test has become a popular method and is commonly applied in similar researches with experimental contexts focusing on situations like the comparison of different groups at baseline or the analysis of relationships between variables (Armstrong, 2014; Streiner & Norman, 2011). The Bonferroni test was proposed in order to prevent the issue of the increasing likelihood of type I errors when the number of tests conducted increases (for example through comparing multiple groups with each other) (Armstrong, 2014).

Before the analysis, the scales of three items had to be reversed (NutKno_2, NutKno_4 and InvNut_3), because they were formulated in a way that negative answers showed agreement. This way, the number of the scale, which was a one and normally was the worst option, had to be changed to a five and vice versa. The same had to be done with number two and four. Therefore, these scales were conversed. They were renamed with the attached "_New" to distinguish from the original item and afterwards included in the factor analysis.

The factor analysis was used to uncover the underlying structure of the analysed concepts of 'attitude towards the company', 'purchase intention', 'willingness to pay premiums' and 'awareness of food waste', as well as the covariates of 'subjective nutrition knowledge' of the participants, the 'nutrition involvement', participants 'diet restraint behaviour' and the 'perception of the importance of a firms CSR activities'. The internal reliability was then evaluated by calculating the Cronbach's alpha coefficient for each factor.

All factors and items included in the analysis are presented in Table 6.

Table 6: Variables included in the analysis

Variable	Description	Formula
Attitude_ALL	Measures the attitude towards the food company.	Mean (Attitude_gb, Attitude_fuf, Attitude_pn)
PurchInt_ALL	Measures the purchase intention for the presented product.	Mean (PurchInt_1, PurchInt_2, PurchInt_3)
WillPay_ALL	Measures the willingness to pay premiums for the presented product.	Mean (WillPay_1, WillPay_2, WillPay_3)
FW_ALL	Measures the awareness of the issue of food waste.	Mean (FWGer_2, FWGer_3, FWGer_4, FWGer_5, FWGer_6)
NutKno_ALL	Measures the subjective nutrition knowledge of the participants.	Mean (NutKno_1, NutKno_2_New, NutKno_3, NutKno_4_New)
InvNut_ALL	Measures the involvement of nutrition information of the participants.	Mean (InvNut_1, InvNut_2, InvNut_3_New, InvNut_4)
Diet_ALL	Measures the diet restraint behaviours of the participants.	Mean (Diet_2, Diet_3, Diet_4, Diet_5)
CatManipulation	Measures the category in which participants would classify the shown information about food waste treatments.	-
EaseUnd	Measures the ease of understanding the presented information.	-
SosRes_ALL	Measures the importance of a firms social responsibility for participants.	Mean (SosRes_1, SosRes_2, SosRes_3)
Gender	Indicates the gender of the participants.	-
Age	Indicates the age group of participants.	-
Country	Indicates the country of residence of the participants.	-
Children	Indicates the number of children in the household of the participants.	-
Profession	Indicates the current profession of the participants.	-
SchoolDegree	Indicates the highest school leaving certificate, vocational training or university degree of the participants.	-
Income	Indicates the monthly net income per household of the participants.	-
Group_Nr	Indicates the version of the questionnaire that participants were assigned to.	-

In the analysis, the demographic information, as well as the items of subjective nutrition knowledge of the participants, the nutrition involvement, participants diet restraint behaviour, the perception of the importance of a firms CSR activities and the liking of food were used as

covariates to incorporate their potential influence on the variables of interest and test the impact of food waste treatment claims.

A two-way ANOVA was conducted for each of the three factors ‘attitude towards the company’, ‘purchase intention’, as well as ‘willingness to pay premiums’, including the factor ‘awareness of food waste’ in order to analyse the impact of the awareness of the issue of food waste as a moderator. The two-way ANOVA is a widely used statistical strategy for testing moderating effects (J.-S. Kim, Kaye, & Wright, 2001), and it was also already applied by other researches in the field of food waste and consumer research (Petit, Lunardo, & Rickard, 2020).

All analyses were performed within the IBM SPSS Statistics 26 environment.

4 Results

A total of 318 participants took part in the study. 60 questionnaires were excluded from further analysis to only include fully completed surveys. Two more questionnaires were excluded, because “diverse” was selected as gender, with two people being not representative. Therefore, the answers of 256 participants were further analysed. Due to the random distribution of participants between the groups and the exclusion of 62 surveys, the count of participants per group was between 46 (group 3 – ‘recycling’) and 55 (group 4 – ‘other recovery’) as presented in Table 7. Group 1 was the group with the food waste treatment out of the management option ‘prevention’ and group 2 was presented the claim out of the management option ‘preparing for re-use’.

Table 7: Group distribution

Group_Nr	Frequency	Percentage	Valid Percentage	Cumulated Percentage
1	52	20,3	20,3	20,3
2	50	19,5	19,5	39,8
4	46	18,0	18,0	57,8
4	55	21,5	21,5	79,3
5	53	20,7	20,7	100,0
Total	256	100,0	100,0	

To assess the feasibility of answering the questions related to the food product, and the description of the food waste treatment claim or the control group, the ease of understanding the description was tested with one question. The answers were ranked on a scale ranging from “very difficult” to “very easy”.

All means of the four groups that were presented different food waste treatment claims were above three and therefore on average participants perceived the ease of understanding the description as rather easy than difficult. The lowest mean was calculated for the group ‘prevention’ (mean=3,35), with a slightly higher mean for the groups ‘recycling’ (mean=3,48) and ‘other recovery’ (mean=3,60) and the highest mean out of the four descriptions with food waste treatment claims for the group ‘preparing for re-use’ (mean=4,04).

Compared to these four groups, the control group, which only included a basic product description, was the easiest for participants to understand (mean=4,09).

All means and standard deviations of the five different groups are presented in Table 8.

Table 8: Results – ease of understanding

Group_Nr	N	Minimum	Maximum	Mean	Std. Deviation
1	52	1	5	3,35	1,083
2	50	2	5	4,04	,727
3	46	1	5	3,48	1,169
4	55	1	5	3,60	,915
5	53	2	5	4,09	,838

All participants were asked to assign the description that they have read to one of the four management options of the waste hierarchy presented in chapter 2.1, “Prevention”, “Preparing for re-use”, “Recycling” and “Recovery” with the additional option “None of the above”.

Out of all participants in the four groups with food waste treatment claims, only around 30% chose the correct answer (60 out of 203). 29 out of 52 participants in the group ‘prevention’ chose the correct option, with the second most commonly chosen option being “None of the above” (12 out of 52). Only 7 out of 50 participants in the group ‘preparing for re-use’ chose the correct option with 32 participants voting for the option “Prevention”. In the group ‘recycling’ 16 out of 46 participants chose the correct option, and 17 chose the option “Prevention”. 8 out of 55 participants in the fourth group ‘other recovery’ chose this option, with 32 people choosing the option “Recycling”. In the control group, 41 out of 53 people chose the correct option “None of the above”, with nine people choosing “Prevention”.

4.1 Demographics

The gender distribution was almost equal, with slightly more female participants and a total of 134 female and 122 male participants. The most common age group were participants between 25 and 34, with a total of 50% of all participants. Four participants were aged 65 or older. The complete age distribution can be seen in Table 9.

Table 9: Results – age groups

Age group	Frequency	Percent
Younger than 18	7	2,7
Between 18 and 24	69	27,0
Between 25 and 34	128	50,0
Between 35 and 44	14	5,5
Between 45 and 64	34	13,3
65 or older	4	1,6

In the question about having children, out of the 256 participants, 204 indicated that they did not have biological, foster, adopted or stepchildren and 52 had children.

217 participants listed Germany as their current country of residency, which accumulated to 84.8% of all participants. The second most common country was Austria, with 4.3%. 91.8% of all participants came from the DACH region, which includes Germany, Austria and Switzerland. Five participants listed the Netherlands as their country of residency. The highest number of participants outside Europe came from the United States of America, with a total of 8 participants.

The distribution of income had two striking features. The first is a very low average income. Most of the participants listed themselves in the lowest income range. A total of 37.1% had a net income of less than €1000. The second-largest group was the second-lowest income level, with 19.9% of all participants in the income range between €1000 and €1500. The second striking feature was that the third largest group was the highest income group. 41 participants, which corresponds to 16%, had a net income of over 3000€.

Students and workers or employees (including trainees, persons on parental leave or part-time work) made up the two largest groups regarding profession with a cumulated percentage of 91,4%, with 118 people listed as working and 116 students. Only 6 participants were retired and two being unemployed with the remaining 14 participants distributed between the other categories.

Most frequently listed in the question about the highest obtained school leaving certificates were university of applied sciences degrees, degrees from universities or scientific colleges with a total number of 171 participants with corresponds to 66,8%. The second most frequently

mentioned school leaving certificate was the general or subject-related university entrance qualification (German “Abitur”) with 45 participants which corresponds to 17,6%. The complete lists of school leaving certificates, professions, income distribution, as well as countries of residence of the participants, can be found in *Appendix III*.

4.2 Covariates

The items used in the questionnaire to measure food waste awareness, subjective nutrition knowledge of the participants, diet restraint behaviours, nutrition involvement and the perception of the importance of a firms CSR activities were all previously applied by other researchers. The items applied by Creyer (1997), Irmak et al. (2011); Martz et al. (1996), Chandon and Wansink (2007), Flynn and Goldsmith (1999), Delley and Brunner (2017), Stefan et al. (2013) and Gjerris and Gaiani (2013) were then modified in the total number of items, wording or characteristics of the Likert-scale, to fit this research.

For assessing whether the modifications changed the functionality of the scales, the items were tested by means of exploratory factor analysis.

According to the methodology consulting of the Universität Zürich (2018), Kaiser, Meyer and Olkin (KMO) have developed a standard test procedure for the suitability of data for factor analysis ("Measure of Sampling Adequacy" (MSA)), in which the KMO value output by SPSS is a generalization of the MSA values for all variables together.

The Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO=.824) and the Bartlett test (Chi-square(190)=2316,384, p< .001) indicated that the variables are suitable for factor analysis. Therefore, a principal component analysis with Varimax rotation was performed. The number of factors was set to five, in accordance with the number of scales used for this research.

Table 10 shows the results of the Varimax rotation with Kaiser Normalization. In order to increase readability of this work, the items are not written as full texts, but numberd in accordance with the names of the variables presented in Table 6 in the order in which they are presented in the questionnaire (see Appendix II: Questionnaire). The loadings of the different factors are in accordance with the previous studies from where these items have been used before. The loadings for diet restraint behaviour vary between 0.773 and 0.860, the loadings for the involvement of nutrition information vary between 0.765 and 0.836, for nutrition knowledge the items vary between 0.703 and 0.828, for the perception of a firms CSR activities the loadings are between 0.810 and 0.820 and only for food waste awareness the items vary between 0.472 and 0.754.

Three cross-loadings were identified, of which two had a difference of above 0,2 between the highest loading and the cross-loading and were therefore included in the factor with the highest loading. One item of the scale for food waste awareness had the highest loading of 0,472 for the factor of food waste awareness, where it was previously used for in literature, but also a loading of 0,460 for the factor of perception of a firms CSR activities.

In the interest of deciding on whether the factor should be included in further analysis, Cronbach's Alpha was calculated. The Cronbach's Alpha was 0,730 for all five items included in the factor. Excluding the item with the cross-loading would have led to a decrease of Cronbach's Alpha to 0,682. Therefore, the item was included.

Table 10: Factor analysis – covariates

Item	Component 1	Component 2	Component 3	Component 4	Component 5
Diet_1	,860	,107	,033	-,007	,043
Diet_2	,827	,096	-,005	-,002	,013
Diet_3	,796	,184	-,048	-,023	-,084
Diet_4	,773	,166	,167	,009	,065
InvNut_1	,088	,836	,261	,040	,034
InvNut_2	,294	,809	,223	,021	,000
InvNut_3	,108	,790	,201	,144	-,002
InvNut_4	,244	,765	,360	,073	,007
NutKno_1	,105	,222	,828	,138	,051
NutKno_2	-,021	,224	,759	,054	,041
NutKno_3	,172	,167	,731	,051	-,009
NutKno_4	-,118	,248	,703	-,007	,063
SosRes_1	-,048	,104	,136	,820	,087
SosRes_2	-,100	,067	,027	,811	,239
SosRes_3	,066	,107	-,030	,810	,197
FW_1	,043	-,066	,092	,041	,754
FW_2	-,079	,137	-,102	,114	,754
FW_3	-,077	,080	-,005	,205	,750
FW_4	,175	-,114	,110	,312	,514
FW_5	,096	-,073	,215	,460	,472

For checking the internal reliability, Cronbach's Alpha was further calculated for all covariates and was above 0,8 for all factors including subjective nutrition knowledge (0,800), diet restraint behaviours (0,853), nutrition involvement (0,812) and the perception of the importance of a

firms CSR activities (0,812). Liking of food was measured in the questionnaire using only one item from Raghunathan et al. (2006).

The items were combined to factors, and the means of these factors including the standard deviation can be seen in Table 11, with NutKno_ALL as the factor for 'subjective nutrition knowledge', InvNut_ALL as the factor for 'nutrition involvement', Diet_ALL as the factor for 'diet restraint behaviour', FW_ALL as the factor for the 'awareness of food waste' and SosRes_ALL as the factor for the 'importance of a firms CSR activities'.

Table 11: Means and std. deviations – covariates

Covariate	N	Minimum	Maximum	Mean	Std. Deviation
NutKno_ALL	256	1,75	5,00	3,5332	,74713
InvNut_ALL	256	1,00	5,00	3,6357	,99503
Diet_ALL	256	1,00	5,00	2,3057	,96765
FW_ALL	256	1,80	5,00	4,1711	,61710
SosRes_ALL	256	1,00	5,00	3,9076	,76049
How much do you like eating pasta? - Liking of eating pasta	256	1	5	4,41	,817
Valid N (listwise)	256				

All factors except Diet_ALL were above 3,5 on a scale from 1 (being the worst) to 5 (being the best), with FW_ALL with the highest score (4,1711) and Diet_ALL the lowest score (2,3057).

All covariates were further included in the Univariate Analysis of Covariance (ANCOVA) and the two-way ANOVA to test the four hypotheses.

4.3 Hypotheses testing

The items used in the questionnaire to measure the attitude towards the company, consumer purchase intentions and the willingness to pay premiums, were all taken from studies by Kozup et al. (2003), Perrini et al. (2010) and Wei et al. (2018). Because the items were modified in the total number of items, wording or characteristics of the Likert-scale, to fit this research, explanatory factor analysis was conducted. This way, the loadings of the items regarding the three factors could be analysed.

The Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO=.887) and the Bartlett test (Chi-square (36) = 1580,739, p < .001) indicated that the variables were suitable for factor analysis. The principal component analysis with Varimax rotation was performed, with the number of factors set to three.

Table 12 shows the results of the Varimax rotation with Kaiser normalization. The loadings of the different factors are consistent with previous studies in which these items were already used. The loadings for the factor willingness to pay premiums towards the company vary between 0,811 and 0,872, the loadings for attitude towards the company are between 0,761 and 0,820 and the loadings for the factor purchase intention vary between 0,763 and 0,827. Six cross-loadings (loading >0,3 for at least 2 factors) were identified. All cross-loadings were at least 0,4 lower than the highest loading, and therefore all items were included in the factor with their respective highest loadings.

Table 12: Factor analysis – dependent variables

Item	Component 1	Component 2	Component 3
Willingness to pay premiums: I am ready to pay a higher price for Pastolli's pasta than for similar products.	,872	,244	,260
Willingness to pay premiums: I would still buy Pastolli's pasta if other brands reduced their prices.	,856	,149	,223
Willingness to pay premiums: Buying Pastolli's pasta seems smart to me even if it costs more than similar products.	,811	,302	,244
Attitude towards the company: How good or bad do you consider Pastolli?	,190	,820	,277
Attitude towards the company: How positive or negative do you consider Pastolli?	,315	,813	,295
Attitude towards the company: How favourable or unfavourable do you consider Pastolli?	,211	,761	,345
Purchase intention: How probable is it that you would consider the purchase of this product, if you were interested in buying pasta?	,252	,295	,827
Purchase intention: How likely is it that you would buy this food from Pastolli?	,221	,304	,770
Purchase intention: Assuming that you were interested in buying pasta, would you be more likely or less likely to purchase Pastolli's pasta, given the information shown above?	,325	,343	,763

Divided by the five groups of the survey ‘prevention’, ‘preparing for re-use’, ‘recycling’, ‘other recovery’ and the control group, the means and standard deviation were calculated for the three

factors ‘attitude towards the company’, ‘purchase intention’, and ‘willingness to pay premiums’. The results are presented in Table 13.

The means of the four different groups for the factor ‘attitude towards the company’ were all higher than the mean of the control group (3,1950), with the group ‘prevention’ with the lowest (3,4551) and the group ‘preparing for re-use’ with the highest mean (3,9333).

For the dependent variable of ‘purchase intention’, again all four groups had higher means than the control group (3,1950), wherein comparison between the groups with a food waste treatment claim, ‘prevention’ had the lowest mean (3,3910) and ‘preparing for re-use’ had the highest mean (3,7933).

All four groups with food waste treatment claims had higher means compared to the control group (2,2767), with the lowest mean for the group ‘prevention’ (3,0513) and the highest mean for the group ‘preparing for re-use’ (3,6600).

Table 13: Means and std. deviations – dependent variables

Dependent variables	Claim	Mean	Std. deviation
Attitude towards the company	Prevention	3,4551	,64686
	Preparing for re-use	3,9333	,73463
	Recycling	3,7971	,77133
	Other recovery	3,8485	,69926
	Control	3,1950	,63189
Purchase intention	Prevention	3,3910	,89228
	Preparing for re-use	3,7933	,81619
	Recycling	3,6087	1,00935
	Other recovery	3,6970	,82470
	Control	3,1950	,91855
Willingness to pay premiums	Prevention	3,0513	,9274
	Preparing for re-use	3,6600	,87932
	Recycling	3,2029	,90942
	Other recovery	3,4545	,86329
	Control	2,2767	,92850

To test the significance between the groups and include the influence of the covariates in the analysis, the hypotheses were further tested using the Univariate Analysis of Covariance (ANCOVA), including the Bonferroni post-hoc test for hypothesis one, two and three and the two-way ANOVA for hypothesis four.

4.3.1 Testing hypothesis 1: Attitude towards the company

The first hypothesis was “There is a positive relationship between food waste treatment claims on packaged foods and consumer attitudes towards the company.” First, the internal reliability of the factor ‘attitude towards the company’ was tested using Cronbach’s alpha coefficient, with a result of 0,865.

To include the factor ‘attitude towards the company’ in the ANCOVA, the data were tested for normality. Two tests were performed, one using the data of the factor and the second one using the residuals for the normality test. As presented in Figure 4 and Figure 5, the data points follow a normal distribution with slight deviations.

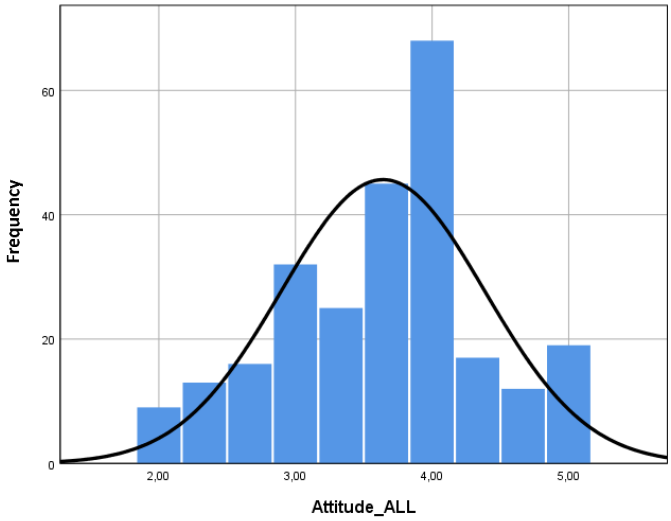


Figure 4: Attitude – normality test

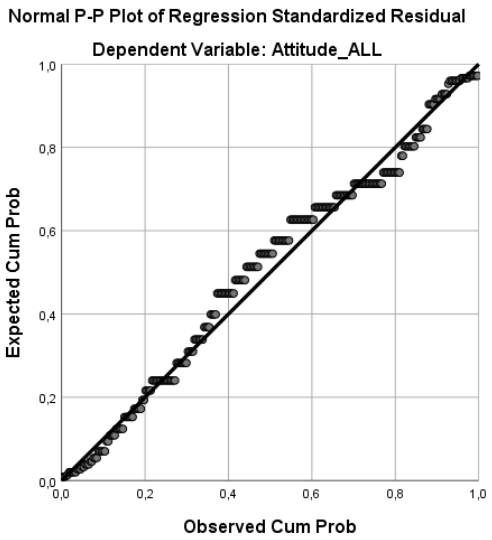


Figure 5: Attitude – normality rest (residuals)

We did not reject the null hypothesis of Levene's Test of Equality of Error Variances (F(4,251)=0.225, p=0.924). The used data met the homogeneity of variances assumption.

Comparing the estimated marginal means adjusted to the covariates ‘importance of a firms CSR activities’ (3,9076), ‘liking of food’ (4,41), ‘diet restraint behaviour’ (2,3057), ‘nutrition involvement’ (3,6357), ‘nutrition knowledge’ (3,5332), showed that the highest attitude towards the company was measured for participants of the group ‘preparing for re-use’ (mean=3,934). The second highest attitude was measured for the group ‘other recovery’ (mean=3,854), compared to the groups ‘recycling’ (mean=3,773), ‘prevention’ (mean=3,466) and the control group (mean=3,199).

The result of the ANCOVA showed a statistically significant difference between the groups in the test of between-subject effects after controlling for the included covariates of diet restraint behaviour, nutrition knowledge, the involvement of nutrition information, liking of food and perception of the importance of a firms CSR activities (F (4, 251) = 10,280, $p < .0005$).

Pairwise comparisons between the groups with regard to ‘attitude towards the company’ pointed out a significant difference at the 0,05 level in the means of the control group and the group ‘preparing for re-use’ (mean difference = -0,736, p<0,0005), between the control group and the group ‘recycling’ (mean difference = -0,575, p<0,0005) and between the control group and the group ‘other recovery’ (mean difference = -0,656, p<0,0005). Only between the control group and the group ‘preparing for re-use’ was no significant difference in the mean (mean difference=-0,267, p=0,492). The positive relationship between food waste treatment claims on packaged foods and consumer attitudes towards the company was confirmed for the claims out of three of the four groups, with the exception of the claim presented for the group ‘preparing for re-use’. Based on these results, food waste treatment claims out of the groups ‘preparing for re-use’, ‘recycling’ and ‘other recovery’ have a positive effect on the attitude towards the company of the consumers. Therefore, hypothesis one was partially confirmed.

All pairwise comparisons can be seen in Table 14. Significant mean differences are marked green and with a star. There was also a significant difference at the 0,05 level between the group ‘prevention’ and the group ‘preparing for re-use’ (mean difference = -0,468, p=0,007) as well as between the group ‘prevention’ and the group ‘other recovery’ (mean difference = -0,388, p=0,038).

Table 14: Pairwise comparisons – attitude towards the company

(I) Group_Nr	(J) Group_Nr	Mean Difference (I-J)	Std. Error	Sig.	95% Conf. Int.: lower bound	Upper bound
1	2	-,468*	,136	,007	-,852	-,084
	3	-,307	,140	,290	-,703	,089
	4	-,388*	,133	,038	-,765	-,012
	5	,267	,135	,492	-,116	,651
2	1	,468*	,136	,007	,084	,852
	3	,161	,141	1,000	-,238	,560
	4	,080	,134	1,000	-,300	,459
	5	,736*	,136	,000	,350	1,121
3	1	,307	,140	,290	-,089	,703
	2	-,161	,141	1,000	-,560	,238
	4	-,081	,138	1,000	-,473	,310
	5	,575*	,138	,000	,183	,966
4	1	,388*	,133	,038	,012	,765
	2	-,080	,134	1,000	-,459	,300
	3	,081	,138	1,000	-,310	,473
	5	,656*	,134	,000	,277	1,035
5	1	-,267	,135	,492	-,651	,116
	2	-,736*	,136	,000	-1,121	-,350
	3	-,575*	,138	,000	-,966	-,183
	4	-,656*	,134	,000	-1,035	-,277

4.3.2 Testing hypothesis 2: Purchase intention

The second hypothesis analysed the purchase intentions of consumers and was formulated as follows: “The purchase intentions of consumers for packaged foods with food waste treatment claims is higher than the purchase intention for the products without food waste treatment claims.” The internal reliability of the factor was tested using Cronbach’s alpha coefficient, with a result of 0,862.

Furthermore, the factor ‘purchase intention’ was tested for normality. As presented in Figure 6 and Figure 7, the data points approximately followed a normal distribution with a higher deviation on the scale at PurchInt_ALL=4. The analysis was continued.

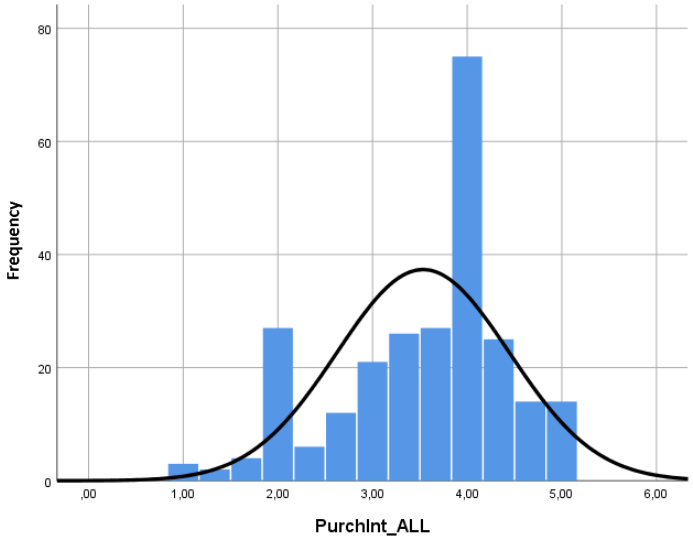


Figure 6: Normality – purchase intention

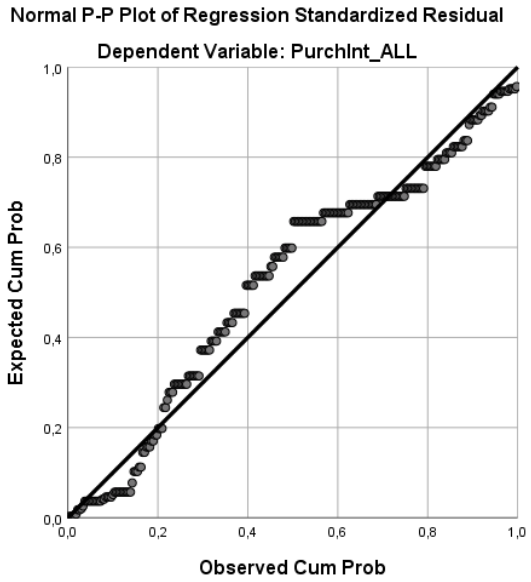


Figure 7: Normality – purchase intention (residuals)

The null hypothesis of Levene's Test of Equality of Error Variances (F(4,251) = 1,860, p = 0.118) was not rejected, as the used data met the homogeneity of variances assumption.

Comparing the estimated marginal means adjusted to the covariates ‘importance of a firms CSR activities’ (3,9076), ‘liking of food’ (4,41), ‘diet restraint behaviour’ (2,3057), ‘nutrition involvement’ (3,6357), ‘nutrition knowledge’ (3,5332), showed that the highest purchase intention was measured for participants of group ‘preparing for re-use’ (mean=3,789). The second highest attitude was measured for the group ‘other recovery’ (mean=3,692), compared to the groups ‘recycling’ (mean=3,589), ‘prevention’ (mean=3,407) and the control group (mean=3,206).

The ANCOVA further showed a statistically significant difference between the groups in the test of between-subject effects after again controlling for the included covariates of ‘diet restraint behaviour’, ‘nutrition knowledge’, ‘involvement of nutrition information’, ‘liking of food’ and ‘perception of the importance of a firms CSR activities’ ($F(4, 251) = 3{,}586$, $p = 0{,}007$).

In the next step, the groups were compared pairwise. The results for the comparisons between the groups with regard to ‘purchase intention’ pointed out a significant difference at the 0,05 level in the means of the control group and the group ‘preparing for re-use’ (mean difference=-0,583, p=0,010). The positive impact of food waste treatment claims on packaged foods on the purchase intention of consumers was confirmed for the claim out of the group ‘preparing for re-use’.

Between the control group and the other groups was no significant difference, with only the difference between the control group and the group ‘other recovery’ being close to the significance level (mean difference=-0,486, p=0,051). With only one out four food waste treatment claims resulting in a significant difference between the control group, the hypothesis was rejected.

All pairwise comparisons can be seen in Table 15. Significant mean differences are marked green and with a star.

Table 15: Pairwise comparisons – purchase intention

(I) Group_Nr	(J) Group_Nr	Mean Difference (I-J)	Std. Error	Sig.	95% Conf. Int.: lower bound	Upper bound
1	2	-,381	,174	,295	-,875	,112
	3	-,182	,180	1,000	-,691	,327
	4	-,285	,171	,965	-,769	,199
	5	,201	,174	1,000	-,291	,694
2	1	,381	,174	,295	-,112	,875
	3	,200	,181	1,000	-,313	,713
	4	,096	,172	1,000	-,391	,584
	5	,583*	,175	,010	,087	1,078
3	1	,182	,180	1,000	-,327	,691
	2	-,200	,181	1,000	-,713	,313
	4	-,103	,178	1,000	-,606	,400
	5	,383	,178	,320	-,120	,886
4	1	,285	,171	,965	-,199	,769
	2	-,096	,172	1,000	-,584	,391
	3	,103	,178	1,000	-,400	,606
	5	,486	,172	,051	-,001	,973
5	1	-,201	,174	1,000	-,694	,291
	2	-,583*	,175	,010	-1,078	-,087
	3	-,383	,178	,320	-,886	,120
	4	-,486	,172	,051	-,973	,001

4.3.3 Testing hypothesis 3: Willingness to pay premiums

The third hypothesis was: “There is a higher willingness to pay premiums for packaged foods with food waste treatment claims compared to food products without food waste treatment claims.” The internal reliability of the factor was tested using Cronbach’s alpha coefficient (Cronbach’s alpha=0,896).

The factor ‘willingness to pay premiums’ was tested for normality. Therefore, two tests were performed, one using the data of the factor and the second one using the residuals for the normality test. As presented in Figure 8 and Figure 9, the data points approximately followed a normal distribution.

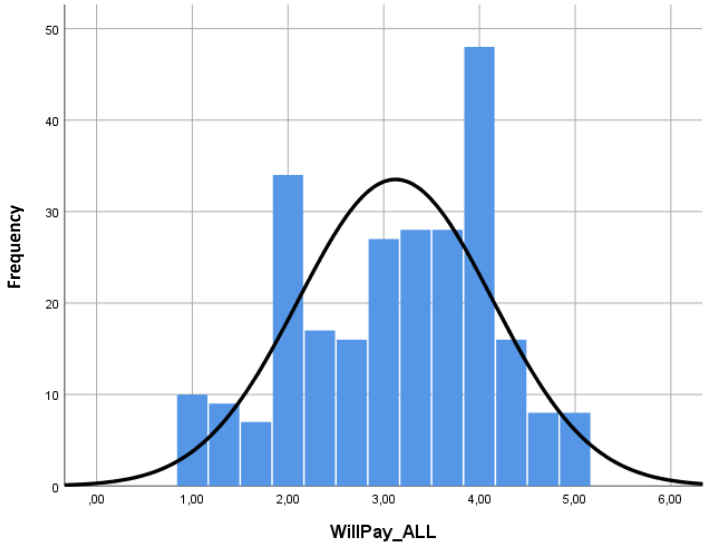


Figure 8: Normality – willingness to pay premiums

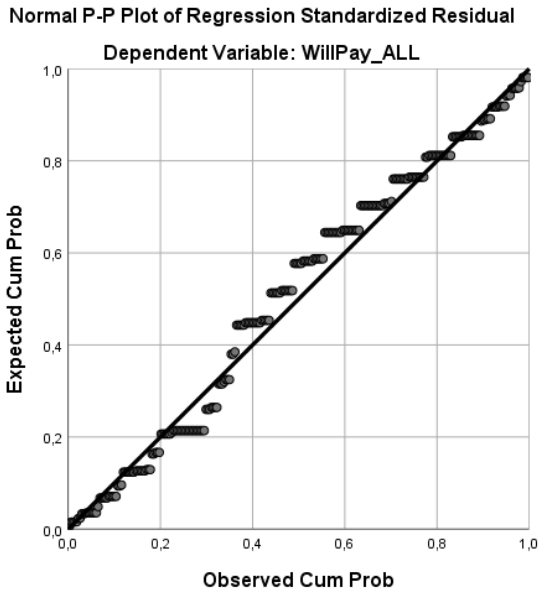


Figure 9: Normality – willingness to pay premiums (residuals)

We didn't reject the null hypothesis of Levene's Test of Equality of Error Variances (F(4,251) =2,026, p = 0.091), as the used data met the homogeneity of variances assumption.

The comparison of the estimated marginal means adjusted to the covariates 'importance of a firms CSR activities' (3,9076), 'liking of food' (4,41), 'diet restraint behaviour' (2,3057), 'nutrition involvement' (3,6357), 'nutrition knowledge' (3,5332), pointed out, that for all groups with food waste treatment claims the measured means were higher than the means of the control group. While all means decreased, comparing the means per group for the variables of 'purchase intention' and 'willingness to pay premiums', the means of the control group changed most drastically from 3,1950 measured for the dependent variable 'purchase intention', to 2,2767 for

the dependent variable ‘willingness to pay premiums’. The highest willingness to pay premiums was measured for participants of the group ‘preparing for re-use’ (mean=3,645). The second highest attitude was measured for the group ‘other recovery’ (mean=3,456), compared to the groups ‘recycling’ (mean=3,189), ‘prevention’ (mean=3,051) and the control group (mean=2,301).

The result of the ANCOVA showed a statistically significant difference between the groups in the test of between-subject effects after controlling for the included covariates of ‘diet restraint behaviour’, ‘nutrition knowledge’, ‘involvement of nutrition information’, ‘liking of food’ and ‘perception of the importance of a firms CSR activities’ ($F (4, 251) = 18,371$, $p < .0005$).

The pairwise comparisons between the groups with regard to the variable of ‘willingness to pay premiums’, pointed out a significant difference at the 0,05 level in the means of the control group and the group ‘prevention’ (mean difference = -0,750, p<0,0005), between the control group and the group ‘preparing for re-use’ (mean difference = -1,344, p<0,0005), between the control group and the group ‘recycling’ (mean difference = -0,888, p<0,0005) and between the control group and the group ‘other recovery’ (mean difference = -1,155, p<0,0005). Therefore, a positive impact of food waste treatment claims on packaged foods on the willingness to pay premiums of consumers for all groups with food waste treatment claims was pointed out in the results, and the hypothesis was confirmed.

All pairwise comparisons can be seen in Table 16: Pairwise comparisons – willingness to pay premiums. Significant mean differences are marked green and with a star. There also was a significant difference at the 0,05 level between the group ‘prevention’ and the group ‘preparing for re-use’ (mean difference = -0,594, p=0,006).

Table 16: Pairwise comparisons – willingness to pay premiums

(I) Group_Nr	(J) Group_Nr	Mean Difference (I-J)	Std. Error	Sig.	95% Conf. Int.: lower bound	Upper bound
1	2	-,594*	,171	,006	-1,078	-,110
	3	-,138	,176	1,000	-,637	,361
	4	-,405	,167	,162	-,880	,069
	5	,750*	,170	,000	,267	1,233
2	1	,594*	,171	,006	,110	1,078
	3	,456	,178	,108	-,047	,959
	4	,189	,169	1,000	-,289	,667
	5	1,344*	,172	,000	,858	1,830
3	1	,138	,176	1,000	-,361	,637

(I) Group_Nr	(J) Group_Nr	Mean Difference (I-J)	Std. Error	Sig.	95% Conf. Int.: lower bound	Upper bound
	2	-,456	,178	,108	-,959	,047
	4	-,267	,174	1,000	-,760	,226
	5	,888*	,174	,000	,395	1,382
4	1	,405	,167	,162	-,069	,880
	2	-,189	,169	1,000	-,667	,289
	3	,267	,174	1,000	-,226	,760
	5	1,155*	,169	,000	,678	1,633
5	1	-,750*	,170	,000	-1,233	-,267
	2	-1,344*	,172	,000	-1,830	-,858
	3	-,888*	,174	,000	-1,382	-,395
	4	-1,155*	,169	,000	-1,633	-,678

4.3.4 Testing hypothesis 4: Food waste awareness

The fourth hypothesis analysed the moderating effect of the awareness of food waste (Cronbach's alpha=0,730) of the participants: "The consumer awareness of the issue of food waste has a positive effect on the studied influence of food waste treatment claims on packaged foods on consumer behaviour."

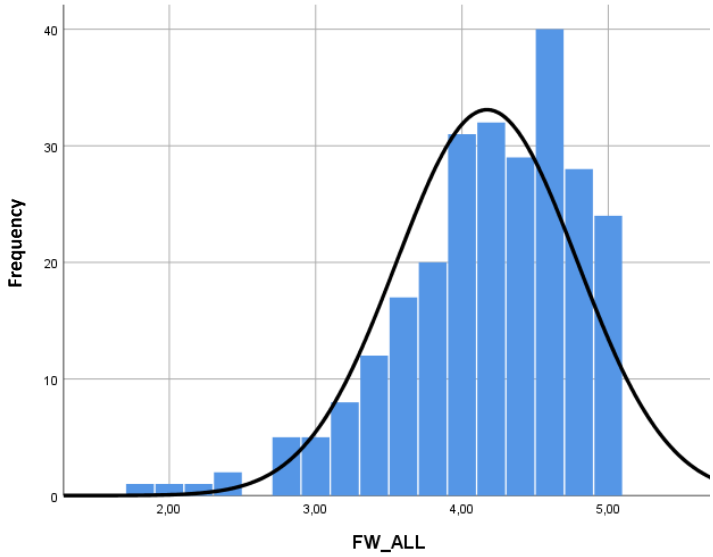


Figure 10: Normality – food waste awareness

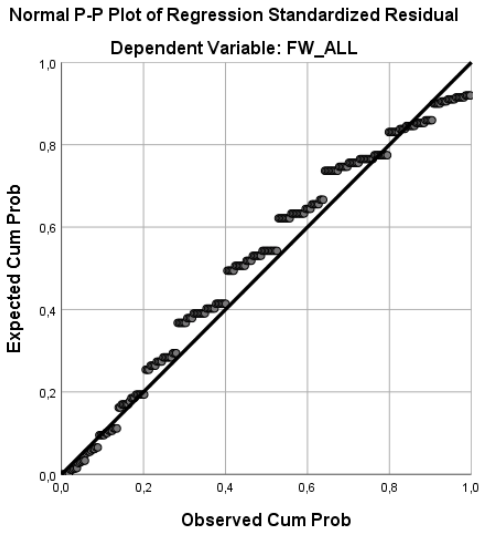


Figure 11: Normality – food waste awareness (residuals)

Two tests were performed to test the normality of the data and the residuals of the factor "awareness of food waste". As presented in Figure 10 and Figure 11, the data points followed a normal distribution, with a shift to the right side of the scale.

A two-way ANOVA with the dependent variable 'attitude towards the company' pointed out that even though the effect of the 'awareness of food waste' (F (15, 251) =2,032, *p*=0,015) and the group number (F (4,251)=8,996, p<0,0005) on the 'attitude towards the company' were significant, the interaction between the two factors and therefore the moderating effect of 'awareness of food waste' was not significant (F(42,251)=0,808, p=0,791). The test of between-subject effects can be seen in Table 17.

Table 17: Moderating effect – awareness of food waste on attitude towards the company

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	48,931a	61	,802	1,675	,004	,345
Intercept	1076,970	1	1076,970	2249,114	,000	,921
Group_Nr	17,232	4	4,308	8,996	,000	,156
FW_ALL	14,593	15	,973	2,032	,015	,136
Group_Nr * FW_ALL	16,252	42	,387	,808	,791	,149
Error	92,895	194	,479			
Total	3534,889	256				
Corrected Total	141,826	255				

a. R Squared = ,345 (Adjusted R Squared = ,139)

The results of the two-way ANOVA with the dependent variable 'purchase intention' are presented in Table 18. The analysis showed that the effects of the 'awareness of food waste' (F (15, 251) =2,082, *p*=0,012) and the group number (F (4,251)=3,394, p=0,010) on the 'purchase

intention' were significant. The interaction between the two factors and therefore, the moderating effect of 'awareness of food waste' was again not significant (F(42,251)=0,858, p=0,717).

Table 18: Moderating effect – awareness of food waste on purchase intention

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	64,470a	61	1,057	1,390	,048	,304
Intercept	1075,402	1	1075,402	1414,823	,000	,879
Group_Nr	10,320	4	2,580	3,394	,010	,065
FW_ALL	23,740	15	1,583	2,082	,012	,139
Group_Nr * FW_ALL	27,389	42	,652	,858	,717	,157
Error	147,459	194	,760			
Total	3408,889	256				
Corrected Total	211,929	255				

a. R Squared = ,304 (Adjusted R Squared = ,085)

Including the dependent variable 'willingness to pay premiums' in a two-way ANOVA showed that the effects of the 'awareness of food waste' (F (15, 251) =2,744, *p*=0,001) and the group number (F (4,251)=16,139, p<0,0005) on the 'willingness to pay premiums' were significant, but the interaction between the two factors and therefore the moderating effect of 'awareness of food waste' was not significant (F(42,251)=0,809, p=0,790). The results of the test of between-subject effects are presented in Table 19.

Table 19: Moderating effet – awareness of food waste on willingness to pay premiums

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	116,931a	61	1,917	2,544	,000	,444
Intercept	769,337	1	769,337	1021,210	,000	,840
Group_Nr	48,634	4	12,158	16,139	,000	,250
FW_ALL	31,008	15	2,067	2,744	,001	,175
Group_Nr * FW_ALL	25,589	42	,609	,809	,790	,149
Error	146,151	194	,753			
Total	2761,000	256				
Corrected Total	263,083	255				

a. R Squared = ,444 (Adjusted R Squared = ,270)

With no significant interaction between the group number and the factor 'awareness of food waste', the moderating effect of 'awareness of food waste' could not be confirmed. The profile plots attached in Appendix IV: Plots of moderating effect: 'awareness of food waste' visualize the analysis. The result of no significant moderation effect of the 'awareness of food waste' is demonstrated in the plots by an even distribution of the means under change of the values of the factor 'awareness of food waste'. Therefore, the fourth hypothesis was rejected.

5 Discussion

The global problem of food waste needs to be addressed simultaneously at all stages of the food supply chain. Increasing the understanding of the influences on consumer attitudes and behavioural intentions through the communication of food waste measures was the goal of this study, wherefore four hypotheses, including one hypothesis regarding the awareness of the issue of food waste were analysed.

The factor analysis regarding the three items 'attitude towards the company', 'purchase intention' and 'willingness to pay premiums' showed several cross-loadings between the factors. All items were matching with the factors that they were intended to measure, but many factors showed connections to the other factors as well. Prior studies by Jaafar et al. (2012) and Trudel and Cotte (2009) made the connection between these factors already a subject of discussion and stated the influence of the attitude on behavioural intentions, which can be a reason for the cross-loadings. What is more, purchase intention and willingness to pay premiums are already closely connected terms, both related to the act of purchasing. The factors were further analysed through the participation of a diverse set of consumers.

5.1 Participant information

Participants for this research were recruited using online channels like LinkedIn, Whatsapp, Facebook, as well as forums and communities for academic surveys. The choice of distribution channels led to a rather young participant group with most participants in the age group between 25 and 34. Only 4 participants in the age group over 65 were reached via these channels. As social media and social networks heavily rely on personal networks, the most common age group, as well as the country of residence, happened to match the researcher's personal attributes.

Based on the results of this study, the participants, on average, had a high awareness of the issue of food waste, a higher than average knowledge about nutrition, included nutrition information in their shopping behaviour, were not likely to have any diet restraint behaviour and put a high emphasis on the importance of a companies CSR activities. The product choice of pasta as the fictitious food product turned out to be very suitable, with participants indicating a very high liking of this food. The chosen fictitious food product was, therefore, very relatable for most of the participants, which increased the accuracy of the results.

Participants were asked to indicate first the ease of understanding of the respective description that was shown for each of the groups, and second, they were asked to assign this description to one of the management options in accordance with the food waste hierarchy. Regarding the ease of understanding, the results showed that the general description of the product, which was presented to participants in the control group was the easiest to understand. All descriptions regarding measures against food waste were more complex and therefore more difficult to understand, which was expected. On average, the ease of understanding was rated rather easy than difficult but showed differences between the groups. The group 'prevention' had the lowest mean, which might have been due to the concept of eco-design, that was presented in the description. All other description did not introduce new concepts. The second-lowest mean was measured for the group 'recycling', which included the term "circular approach" as the only description, that was not further specified. The mean ranked in the middle of the five groups was measured for the group 'other recovery', which included a technical description about the process, that "residues from biofuels production can be further used as soil fertilizers". Out of the four groups with food waste measures in their descriptions, the highest mean, that was almost as high as the control group was measured for the group 'preparing for re-use'. Here, no technical or scientific terms were used, as the description explained the process of food donations to charitable organizations.

Assigning the descriptions to a specific management option from the food waste hierarchy turned out to be a difficult task, with only 30% of all participants choosing the correct answer. The most chosen wrong answer was the option "prevention". This shows that for most participants avoiding food waste trough any of the measures explained in the description is understood as preventing food waste. Already in scientific literature, there are many differences between the terminology for grouping food waste measures (see chapter 2.1), which makes it even more complicated for participants of the survey without any background related to food waste research to be aware of the correct terms. This finding points out the need for a clear differentiation between the management options of the food waste hierarchy and the need for a resulting consistent terminology.

5.2 Attitude towards the company

The first hypothesis was formulated to analyze the impact of on-packaging food waste treatment claims on the attitude towards the company of the consumers. Comparing the means differentiated per group showed a higher mean for the dependent variable 'attitude towards the

company' for all four groups with food waste treatment claims, compared to the control group. This already indicated an influence of food waste treatment claims on food packaging on the consumer attitude towards the company. Pairwise comparisons pointed out a significant difference between the control group and the groups 'preparing for re-use', 'recycling' and 'other recovery', but not between the control group and the group 'prevention'. This might have been impacted by the lower ease of understanding for the description of the group 'prevention'. With the lowest mean out of the four groups with food waste treatment claims, participants might have had struggles understanding the impact of the described solution and its impact on food waste, and therefore this description had no significant impact on the attitude towards the company and performed worse than the other groups with food waste treatment claims.

Comparing the mean differences between the groups with food waste treatment claims, showed that the highest mean difference was measures between the control group and the group 'preparing for re-use'. It was again in line with the results of the ease of understanding, as the description of the group 'preparing for re-use' was the easiest for participants to understand out of the four groups with food waste treatment claims in the descriptions. This was a very interesting finding, as a direct influence of the understandability of the claims on the level of influences was not mentioned in any of the cited literature, but turned out to match the findings of this research. The second highest mean difference was measured between the control group and the group 'other recovery'. For both groups, 'preparing for re-use' and 'other recovery' a significant difference in the means was also measured in comparison with the group 'prevention', which underlines the importance of statements written clearly and easy to understand for all consumers.

With a significant influence of on-packaging food waste treatment claims on the attitude towards the company, the hypothesis was partially confirmed, and held true for statements with regard to 'preparing for re-use', 'recycling' and 'other recovery'. The findings of this research are in line with prior studies by Sen et al. (2006), Trudel and Cotte (2009) and Vahdati et al. (2015), who pointed out the positive impact of various dimensions of corporate social responsibility on the attitude of consumers. In their study, Vahdati et al. (2015) included social, environmental and moral aspects into corporate social responsibility and approved the impact on the consumer attitude. The results of this research demonstrate that a distinction between different food waste treatment claims is crucial, and the topic of food waste cannot be generalized. Significant differences between the groups of food waste treatment claims on the consumer

attitude show the importance of targeting the communication of actions against food waste to specific consumer groups, with regard to the food waste treatment claims presented on the food packages.

5.3 Purchase intention

Prior studies have analysed and approved the influence of the attitude of consumers on their desires, intentions and behaviour (Trudel & Cotte, 2009). Therefore, with a partially confirmed hypothesis about the influence of food waste treatment claims on consumer attitudes in three out of four cases, this was further expected to influence the behaviour of the consumers. The means of the dependent variable 'purchase intention' were again all higher for the groups with a food waste treatment claim compared to the control group and the ANCOVA pointed out a significant difference between the groups. In the pairwise comparisons, the significant difference between the control group and the group 'preparing for re-use' was demonstrated as the only significant difference. This finding was in line with hypothesis 1, where the impact of the food waste treatment claim from the management option 'preparing for re-use' on the dependent variable of 'attitude towards the company' also had the biggest difference in means.

The level of purchase intention for the control group was above the medium rating. This indicates the general buying intention of the participants, which can be a result of appealing packaging design or a tendency to give generally more positive answers of the participants. As a result, the differences between the groups with food waste treatment claims, except the group 'preparing for re-use', were not significant. The hypothesis of food waste treatment claims, in general, having a positive influence on the purchase behaviour of participants was rejected, but was approved for the influence of food waste treatment claims from the management option 'preparing for re-use'. In the study by Vahdati et al. (2015), a distinguishing between the direct and indirect impact of CSR on buying behaviour led to the approval only of the indirect impact through the attitude towards the company, which was also indicated in the results of this work. Other empirical studies by Jaafar et al. (2012), Y. Kim (2017), and Trudel and Cotte (2011) underline the effect of the attitude towards a company as a precursor of behavioural intentions, such as purchase intention. On the contrary, Wei et al. (2018) found a significant direct impact of CSR claims on food packages on the purchase intention of consumers.

A significant direct influence of food waste treatment claims was only analysed for one of the food waste treatment claims in this research. Jaafar et al. (2012) stated that in order to change the behaviour of consumers, the attitude should be changed first. Therefore, the positive impact

of food waste treatment claims on the attitude towards the company can have an impact on consumer buying behaviour in the future in the three groups where a significant impact was analysed.

5.4 Willingness to pay premiums

In line with the before mentioned literature, part of the behavioural intentions is also the willingness to pay premiums for specific products. The third hypothesis was, therefore formulated regarding the influence of food waste treatment claims on the willingness to pay premiums of consumers. A comparison of the measured means for 'willingness to pay premiums' distinguished by groups showed a large difference to the means for purchase intention. According to the results of this research, participants in the control group were not willing to pay premiums for the presented food product, participants in the group 'prevention' were neither more nor less willing to pay premiums and the three other groups with food waste treatment claims were on average willing to pay premiums for the presented food products.

A significant difference between all groups with descriptions about food waste measures and the control group was presented in the results. While all measured means decreased comparing the means measured for 'purchase intention' and 'willingness to pay premiums', the significant differences between the means increased from only one significant difference measured for 'purchase intention', to four significant differences between all groups with food waste descriptions and the control group for the dependent variable 'willingness to pay premiums'. Participants in the control group had a general purchase intention for the presented product, as it was intended to match commonly seen food products in supermarkets. On the contrary, the results for the willingness to pay premiums for participants in the control group showed a negative willingness to pay premiums for the fictitious food product and indicated that participants did not see a benefit in paying more for this product compared to similar products. The presence of food waste treatment claims in the description from all four groups significantly increased the willingness to pay of participants. This was a highly interesting finding, as it underlines the opinion of consumers that companies tackling the issue of food waste are worthy of support and that consumers are willing to back these actions even in the case of higher prices. This finding is in line with the work by Wei et al. (2018), where they approved the significant impact of on-package CSR claims on the willingness to pay premiums of consumers. This gave an indication that food waste treatment claims also might have a stronger impact on the general

purchase intention of consumers as measured in this research, as the significant impact on the willingness to pay premiums for a product incorporates a preceding purchase intention.

5.5 Food waste awareness

With the choice of green or environmentally friendly products, consumers are able to transfer their environmental concerns into actions aiming at reducing the environmental impact or even benefitting the environment (Moser, 2016). Hartmann (2011) refers to works by Szmigin et al. (2009), Bénabou and Tirole (2010) in stating that the intrinsic rewards as for the example the improved self-esteem after purchasing products from companies with a CSR record are especially high if the CSR area is of personal value to the consumer. Prior literature has documented the impact of consumer-corporate identification on consumer attitudes and behavioural intentions, with consumers tending to associate themselves with companies that act in a desirable way from their point of view (for example eco-friendly) (David, Kline, & Dai, 2005). In line with these studies, a moderating effect of the awareness of the issue of food waste on the 'attitude towards the company', 'purchase intention' and 'willingness to pay premiums' was expected, but not approved. The calculated mean for the 'awareness of food waste' was the second highest measured in the complete questionnaire after the question about 'liking of eating pasta'. The mean was higher than the measured mean of the 'importance of a firms CSR activities', whereas it was expected that CSR would be more important to consumers as it includes actions in various different fields and could therefore better match personal interests of a diverse group of participants.

These findings were not in line with the statement of Richter and Bokelmann (2016) referring to works by Monier et al. (2010), Parfitt, Barthel, and Macnaughton (2010), Gustavsson et al. (2011) and Scherhaufer et al. (2012) in pointing out the high importance of consumer education with regard to food waste, as the group responsible for the highest amount of waste generated along the food supply chain. One possible reason for this could have been the simplicity of the items measuring the awareness of the issue of food waste in the survey. Even though the items have been applied and approved in prior works, they were formulated rather broadly and did not require detailed knowledge about the topic. What is more, the items did not include statements with regard to food waste generated at food manufacturing companies, and other stages along the food supply chain except at the household level. On the other hand it is possible that the ongoing debate about the issue of food waste, including various reports and news in recent

times increased the education of consumers since Richter and Bokelmann (2016) conducted their work.

Based on the findings from this research, a moderating effect could not be approved, but reasons for this were indicated. Further analysis with more specific questions regarding consumer awareness towards the issue of food waste have to be conducted in order to fully understand whether there is a moderating effect or not.

5.6 General remarks

Following the questionnaire, one issue arose from the feedback of participants. The packaging used for the fictitious food product in the questionnaire was, based on the looks on the picture, made from plastic. It was not mentioned anywhere, whether the packaging material was eco-friendly or not, which led many participants to believe it was regular plastic packaging. Even though the issue of food waste was important for these participants, the plastic packaging of the presented food product was not appealing which negatively affected the answers given regarding 'attitude towards the company', 'purchase intention' and 'willingness to pay premiums'. Kotler and Keller (2006) indicated the importance of consistency in order to create and support a brand value that customers associate with a company. It has to be based on thoughts, feelings, images and believes, that are in line with each other in order to achieve competitive advantages (Kotler & Keller, 2006).

Sustainability is a complex term, where food waste is only one part of the concept. For a food manufacturing company that wants to be seen as a sustainable company with a resulting competitive advantage, tackling only one issue of sustainability might not be enough for cautious consumers. This finding indicates that the results of this research might have been even more significant if the image of the fictitious food product would have complied with state of the art eco-friendly food packaging.

The four presented measures for tackling the issue of food waste had different thematic backgrounds. While the measure described in the questionnaire of the group 'prevention' and 'other recovery' had a strong environmental focus, the measures from the groups 'preparing for re-use' and 'recycling' had a social focus. The only group, where a significant impact was found for all three aspects of 'attitude towards the company', 'purchase intention' and 'willingness to pay premiums' was the group 'preparing for re-use' with its strong social focus of food donations. Prior literature is divided with regard to comparing social and environmental claims and

the resulting effects. Loose and Remaud (2013) indicated a slightly higher willingness to pay for environmental CSR claims, compared to social CSR claims, whereas Wei et al. (2018) pointed out the lowest willingness to pay for environmental CSR claims. The finding of this research might be explained with regard to the statement by Grunert et al. (2014), that the complex and diffuse term of sustainability can lead to problems for consumers in relating to it. In this research, the ease of understanding measured for the group 'preparing for re-use' was the highest among all four groups with food waste treatment claims. This led to consumers being able to relate to the issue, resulting in a significant impact on all three factors of the hypothesis. The second highest levels of significance were measured for the group 'other recovery', which also had the second-highest level of 'ease of understanding'. The findings of the present study show a higher impact of the ease of understanding the descriptions on the impact on the attitude and behavioural intentions, than the level of environmental sustainability of the measures according to the food waste hierarchy.

The finding of the measure of food donations as the food waste measure with the most significant impacts on the variables is in line with current food waste treatment measures of food manufacturing companies. The results of a study of the Politecnico di Milano, focusing on Italian supply chain actors, showed that the delivery to non-profit organizations and food banks was applied by more than one-third of all food manufacturers (Muriana, 2017). Food donations were also the measure with the lowest emissions for the food products grilled chicken and bread in a study conducted by Eriksson, Strid, and Hansson (2015).

One important aspect of this research that has to be taken into consideration is the applicability and the degree of sustainability of the different presented strategies. The participants of this survey were at no point informed about the degree of environmental sustainability of the presented measure against food waste. While the measure presented for the group 'other recovery' showed a significant impact on the 'attitude towards the company' and the 'willingness to pay premiums', solutions from this group have lower environmental sustainability than all solutions from the groups 'recycling', 'preparing for re-use' and 'prevention', according to the food waste hierarchy. What is more, even though some measures show higher impacts on the attitude and behavioural intentions of consumers than others, not all solutions are always applicable for companies. To decrease food waste by applying the presented measure of food donations, food has to be fully safe for human health (Bilska, Wrzosek, Kołożyn-Krajewska, & Krajewski, 2016). Otherwise, the food has to be processed first. New food products made from food waste are a solution for this issue, as presented for the group 'recycling', but did not show such a

significant impact on consumers compared to the measure of food donations. Bhatt et al. (2018) see the key to commercializing these products in understanding and guiding the perceptions of consumers of such products, to increase the acceptance. Prior literature has pointed out the problem of consumer risk aversion and the perception of "unnaturalness" of these products which led to an aversion for novel, food-related technologies (Lusk, Schroeder, & Tonsor, 2014).

The findings of this research of an increased attitude and behavioural intentions towards food manufacturing companies that strategically apply and communicate food waste measures can also lead to another sustainable impact. Consumers are responsible for the highest amount of food losses in the food supply chain (Scherhaufer et al., 2012). Food recovery at this stage could result in a worthless activity, as the food is highly spread across households with little quantity, which makes a recovery economically unfeasible (Muriana, 2017). Aschemann-Witzel et al. (2016) conclude that most of the consumer-level food waste at the household level is a result of the internal motivation, attitudes and beliefs and food provisioning and handling capabilities of consumers. Increasing the communication of the importance of the topic of food waste as well as companies communicating their efforts to tackle this issue might have an educational impact on consumers, resulting in a more cautious dealing with food waste at the consumer level. Most of the food waste at the domestic level is avoidable (Beretta, Stoessel, Baier, & Hellweg, 2013) and creating awareness of the fact that food waste occurs at most of all households is a prerequisite for tackling this issue (Aschemann-Witzel et al., 2015).

One danger that arises in researching competitive advantages through sustainability is the topic of "greenwashing". It is referred to in the literature as a practice of companies to use the content for their marketing that promises environmental or social benefits which are unsubstantiated, exaggerating or misleading (Aggarwal & Kadyan, 2014; Dahl, 2010). According to Aggarwal and Kadyan (2014) companies adopt greenwashing practices to create a more environmental-friendly image of the company than it actually is, by means of marketing, monetary and time efforts in marketing their products as „green" rather than actively reducing the impact of their actions. Companies might use claims about tackling the issue of food waste without having actual strategies in place or exaggerate their actual efforts when communicating with customers.

While this is a risk for companies who are willing to put a lot of effort in reducing food waste, for losing their competitive advantage against companies who are only pretending to act sustainable, all communication regarding food waste increases consumer education and can therefore reduce the total amount of food waste occurring. What is more, it was pointed out in prior

literature, that firms communicating to act in a certain way, followed by actions that are not in line with this, create the perception of corporate hypocrisy and can lose customer trust (Wagner, Lutz, & Weitz, 2009). This is why the danger of greenwashing will not influence informed customers of sustainable products and can even negatively impact the business activities of companies adopting greenwashing practices.

6 Conclusion

The aim of this study was to deepen the understanding of the influence of communicating the topic of food waste on consumer attitudes and behavioural intentions. In detail, this study analysed the impact of communicating measures taken by food manufacturing companies against the issue of food waste, on food packaging and how this influences the consumers at the point of sale. The study was conducted to answer the research question: *"To what extent do food waste treatment claims on packaged foods influence the consumer behaviour?"* In the conducted quantitative survey, data was collected to answer the four hypotheses regarding the consumer attitude towards the company, the purchase intention of the consumers, the willingness to pay premiums and the moderating effect of consumers knowledge and awareness of the issue of food waste.

Prior literature has pointed out the need for an increased understanding of consumer interest and perception of the topic of food waste and how to influence this (Aschemann-Witzel et al., 2015; Richter & Bokelmann, 2016), as well as evaluating the acceptance of consumers towards different measures against food waste, stated by Willersinn et al. (2017). In this regard, packaging is a vital instrument in food marketing activities for communicating content to consumers, and it can trigger them to make purchases (Rundh, 2009).

The current state of food waste treatment has drastic impacts on climate change, with more than 95% of food waste ending at landfill sites, converting into greenhouse gasses (Melikoglu, Lin, & Webb, 2013). This food waste occurs in two different phases of the food system, with pre-consumption waste as part of the production, processing, distribution and retailing of food and post-consumption food waste as part of food consumption in households (Dorward, 2012). This study dealt with several measures of food manufacturing companies to reduce or prevent food waste and did not consider food waste at the household level.

In this survey, four different strategies for food manufacturing companies in dealing with the problem of food waste were introduced as a description to a fictitious food product. In comparison with the control group, the influences of these claims were then analysed. Vitell (2015) underlines the importance of this type of research, as it is crucial for companies to include consumers in the process of developing CSR strategies in order for them to be successful.

The results of this research demonstrated that descriptions, including the topic of food waste, can have a positive impact on consumers attitude and behavioural intentions. A positive influence on the attitude towards the company was found for most of the groups to which food waste

treatment claims where presented. Surprisingly, only one group showed a significant influence of the food waste description on the purchase intention of consumers. This might have been influenced by the generally rather high purchase intention also for the control group. On the contrary, the willingness to pay premiums was very low for the control group, while most of the participants in the groups with food waste treatment claims were willing to pay more for the presented product than for similar products. This result offers empirical evidence that consumers see an additional benefit in buying products from companies that proactively engage in actions against food waste. One key success factor was the ease of understanding the description, without the use of technical terms and unclear concepts. A positive influence of communicating food waste measures to consumers was found for all groups with food waste treatment claims. This, in turn, indicates a general purchase intention for all products with food waste treatment claims, which was not approved for all groups in this research and therefore left room for future analysis. The moderating effect of the awareness of the issue of food waste was rejected in this research. This might have been influenced by the very high average awareness of the participants of this study, which was either a result of a very informed group of participants or a result of the simplicity of the applied items to measure food waste awareness. Based on the results of this research, the strategy of donating food to charitable organizations had the biggest positive impact on the consumer attitude towards the company, as well as the purchase intention and willingness to pay premiums for products from these companies.

The coherence of sustainability strategies of companies was pointed out as a key element in creating competitive advantages. The plastic packaging in the picture of the fictitious food product negatively impacted the attitude towards the company as well as the behavioural intentions of several participants, as it did not show a general intention of the fictitious food company to be as sustainable as possible.

The results of this research demonstrate that the level of sustainability, according to the applied food waste hierarchy, is not in line with the resulting positive effect on consumers attitude, purchase intention and willingness to pay premiums. Furthermore, the application of the distinguishing by management option between several food waste measures showed to be non-intuitive for non-specialist participants.

While the food waste hierarchy was a suitable tool in this research for covering a broad selection of food waste treatment strategies, criticism has been made about the strong focus on environmental performance (e.g. Rasmussen et al., 2005; Porter, 2002; Price and Joseph, 2000), not taking economic and social aspects into consideration to the same extent. Especially as a

decision tool for managers practising in the field, a clear comparison with regard to economic and social factors would be of help in future studies. Furthermore, the different terms for the management options in the food waste hierarchy, the resulting differences in assigning strategies against food waste to the management options in academic literature and the problems for non-experts in the field to assign strategies to the management options showed, that further research in this regard is of high importance. A standardised approach would make research more comparable and would reduce the barriers for practical application of the food waste hierarchy.

In this study, only a limited number of strategies for food waste treatment was taken into consideration for this research. Significant differences between the strategies were identified in this research, which underlines the importance of distinguishing between the various strategies and points out the need for future research with regard to other strategies. The pilot study was a useful tool for avoiding a personal bias in selecting the strategies for this research but was not representative enough regarding the number of participants to make statements on consumer preferences.

The selection of the food product pasta was based on a limited number of participants and only represented one type of food. In the work by Wei et al. (2018), the researchers distinguished between essential and indulgent foods. Future research is needed to understand the impact of on-packaging food waste treatment claims comparing different food products with the same statements, to understand the role of the food product.

Packaging plays a vital role in presenting a product to consumers. The choice of packaging material for the fictitious food product was limited by the availability of suitable designs. A negative impact of the plastic packaging on consumer attitude towards the company and behavioural intentions of several participants was mentioned and limited the outcome of this study. A research by Tait et al. (2011), where participants were asked to rank different food labels on fruit in accordance with their importance for a purchasing decision, resulted in the highest importance for ‘waste’ labels. These labels were focusing on a production process reducing waste packaging and therefore using less natural resources (Tait et al., 2011). The importance of suitable packaging was again shown in this research and has to be taken into consideration for future works.

With the choice of an online survey distributed and advertised via online channels, only a limited number of participants were in the older age groups. For future studies, also personal

interviews, especially at the point of sale, would be of high relevance. This could, in turn, result in a better understanding of consumer behaviour regarding the information on food packaging, as this research was based on the assumption that consumers would read the whole description on a food package and not only base their food choice on prior experiences, price or packaging design. Moreover, differences in the ease of understanding were pointed out in this study, which might have negatively impacted the results of this work. For future research, a detailed description and education on the strategies can help prevent the lack of understanding.

Comparing the groups, including food waste treatment claims against the results of the control group led to an understanding of differences between the influence of the strategies. It is important to mention that based on these results, only assumptions can be based on why certain strategies scored better than others. To understand the underlying reasons for consumers to prefer one strategy over another, future research including personal interviews has to be conducted.

One last important limitation of this work has to be mentioned. While practitioners in this field can base their decision making on the different influences analyzed in this research, not all measures require the same resources to implement, and not all strategies always apply to every company.

To the best of my knowledge, there is a lack of research on consumer perceptions of food waste activities of food manufacturing companies. Most of the academic research focuses on the relationship between consumer perceptions and activities of retailers (Aschemann-Witzel et al., 2015; Hermsdorf, Rombach, & Bitsch, 2017; Topolansky Barbe et al., 2017). Rebuilding a grocery shopping situation where the choice of products and the underlying reasoning for consumers to choose specific products is more understandable would benefit everyone, academic research, food manufacturing companies planning their marketing strategies as well as retailers.

The results of this study demonstrated the potential of the communication of actions against food waste to consumers, to positively influence consumer attitudes towards the company and behavioural intentions. This is an important practical implication for food manufacturers, marketers, and policymakers. In prior research, packaging has shown to be an important instrument for marketing activities in the food industry. Nonetheless, the communication of actions against food waste should not only rely on this marketing channel but get increased beyond that to further impact consumer education on this topic and positively influence the standing of companies as sustainable businesses. Coherence between the activities of a food manufacturing

company in order to achieve a standing as a sustainable company is thereby crucial, which was underlined by the negative effect of plastic packaging in this research. Rundh (2009) argues that companies should include customers in developing successful packaging designs, in order to result in an increased purchase intention and reinforcement of the brand name, for which this study can serve as a basis. The high importance of the ease of understanding the descriptions used for food marketing was further pointed out in this work and should be considered for any marketing activity regarding the topic of food waste.

Companies can create competitive advantages from tackling the issue of food waste and communicating their efforts to consumers. Increasing the discourse about food waste and the communication of prevention and reduction measures can not only economically benefit companies but has a huge environmental impact. Increasing the education of consumers through communication about food waste will lead to tackling this important issue at many stages of the food supply chain simultaneously and accelerate the public discourse on countermeasures.

Appendix

Appendix I: Pilot Study

Start of Block: Introduction

Q2

Questionnaire on food waste management strategies

Hello,

my name is Philip Jonitz and I am happy that you are supporting me in this research study. This survey is part of my Master Thesis at the University of Twente, Netherlands and the Technical University of Berlin, Germany and you can contribute to it by filling in this questionnaire. It is anonymous and it will take less than 5 minutes to complete. Collected data will be used for scientific research in compliance with the legislation art. 13 of EU Regulation no. 679/2016 of 27.04.2016 and will be processed anonymously.

The aim of this study is to understand the judgement of the participants towards different management strategies for dealing with food waste. Food waste in this regard "refers to a decrease, at all stages of the food chain from harvest to consumption in mass, of food that was originally intended for human consumption, regardless of the cause". The presented strategies are all categorized in superordinate management options that will be explained beforehand.

This research focuses on food manufacturing companies. These companies transform "livestock and agricultural products into a diverse set of products for intermediate or final consumption by humans (or by animals as animal feed)".

Please read each question carefully and answer honestly (there are no right or wrong answers). Should you have any questions and/or comments, please contact me, Philip Jonitz at "p.jonitz@student.utwente.nl".

Thank you again and now you are ready to start!

End of Block: Introduction

Start of Block: Prevention

Q4 In the following part you are kindly requested to rank different food waste management strategies from the management option ‘Prevention’. According to the European Commission, prevention means "measures taken before a substance, material or product has become waste, that reduce: (a) the quantity of waste, including through the re-use of products or the extension of the life span of products; (b) the adverse impacts of the generated waste on the environment and human health; or (c) the content of harmful substances in materials and products".

Q5 **Please rank the strategies according to how you would want a food manufacturing company to prioritize their efforts. In order to do this, move the strategies using drag and drop and arrange them from 1 "highest priority" to 4 "lowest priority".**

_____ Preventing food waste by adapting production to market demand through statistical prediction and harmonizing stock supply with production cycles. (1)

_____ Preventing food waste by applying novel technologies, like innovative packaging and non-thermal decontamination techniques, to extend the ingredient/ product shelf life. (2)

_____ Preventing food waste through the promotion of research and development into the area of achieving cleaner and less wasteful products and technologies and the dissemination and use of the results. (3)

_____ Preventing food waste through the application of eco-design (the systematic integration of environmental aspects into product design with the aim to improve the environmental performance of the product throughout its whole life cycle. (4)

End of Block: Prevention

Start of Block: Preparing for re-use

Q7 In the following part you are kindly requested to rank different food waste management strategies from the management option ‘preparing for re-use’. According to the European Commission, preparing for re-use means checking, cleaning or repairing recovery operations, by which products or components of products that have become waste are prepared so that they can be re-used without any other pre-processing. ‘Re-use’ means any operation by which

products or components that are not waste are used again for the same purpose for which they were conceived

Q8 Please rank the strategies according to how you would want a food manufacturing company to prioritize their efforts. In order to do this, move the strategies using drag and drop and arrange them from 1 "highest priority" to 3 "lowest priority".

_____ Modifying the production process and/or implementing production diversification, to allow potentially discarded material to re-enter in the production cycle as raw material or semi-ifinished product. (1)

_____ Sending food waste to animal feed. (2)

_____ Redistribution to people, re-using surplus food for human consumption for people affected by food poverty, through redistribution networks and food banks, or donations made to non-profit organizations. (3)

End of Block: Preparing for re-use

Start of Block: Recycling

Q9 In the following part you are kindly requested to rank different food waste management strategies from the management option ‘Recycling’. According to the European Commission, recycling means any recovery operation by which waste materials are reprocessed into products, materials or substances whether for the original or other purposes. It includes the reprocessing of organic material but does not include energy recovery and the reprocessing into materials that are to be used as fuels or for backfilling operations

Q10 Please rank the strategies according to how you would want a food manufacturing company to prioritize their efforts. In order to do this, move the strategies using drag and drop and arrange them from 1 "highest priority" to 4 "lowest priority".

_____ Recycling food waste by transforming it into valuable materials that can be used in some sectors, for example in the nutraceutical and pharmaceutical industries, or industrial uses like chemicals or cosmetics. (1)

_____ Recycling food waste into animal feed. (2)

_____ Recycling food waste via composting. (3)

_____ Recycling food waste by reprocessing food for human consumption (for example, making food products out of food waste). (4)

End of Block: Recycling

Start of Block: Block 5

Q11 Please list your 5 most frequently bought packaged groceries:

_____

End of Block: Block 5

Appendix II: Questionnaire

Start of Block: Default Question Block

Q1 Hello,

my name is Philip Jonitz, I am a student at the University of Twente, Netherlands and the TU Berlin, Germany and I am happy that you are supporting me in this research study.

This survey is part of my Master Thesis and you can contribute to it by filling in this questionnaire. It is anonymous and it will take only around 7-10 minutes to complete.

This research is about understanding the judgement of consumers towards companies in the food industry based on desciptions on food packages. Furthermore, this research deals with the topic of food waste, referring to all food and non-edible parts of food that are removed from the

food supply chain for recovery or disposal. More details about the study will be given at the end of the survey.

All collected data will be used for scientific research in compliance with the legislation art. 13 of EU Regulation no. 679/2016 of 27.04.2016 and will be processed anonymously. I will not collect any sensitive data, your participation in this study is entirely voluntary and you can withdraw at any time.

Please read each question carefully and answer honestly (there are no right or wrong answers).

Should you have any questions and/or comments, please contact me at "p.jonitz@student.ut-wente.nl".

Feel free to forward the link of this questionnaire to your contacts. Thank you again for your support!

End of Block: Default Question Block

Start of Block: Pastolli - Prevention

Q45 **Instructions:** Please look at the picture of the food product, read the description below and afterwards go to the next page.

Q46

[PICTURE OF FICTIOUS FOOD PRODUCT – PASTOLLI]

Q47

Pastolli

Food waste is a global problem that affects all of us, generating high costs, negative environmental effects, as well as major social problems.At Pastolli, we minimize our food waste through the application of eco-design. This way, we design our products ecologically and directly integrate environmental aspects. Our aim is to improve the environmental performance of our products throughout its whole life cycle. We make our products more efficient, use fewer resources and generate less waste and emissions. Thank you for supporting our actions, by choosing our products.

End of Block: Pastolli - Prevention

Start of Block: Attitude toward the company

Q33

Now please compare the company Pastolli and the product shown to you with other products

and companies represented in your supermarket. How would you describe your attitude towards Pastolli based only on the image and the description of the food product? Please give your first personal assessment using these three scales.

1.

	Very bad (1)	Somewhat bad (2)	Neither good nor bad (3)	Somewhat good (4)	Very good (5)
How good or bad do you consider Pastolli? (1)	○	○	○	○	○

Q35 2.

	Very unfavorable (1)	Somewhat unfavorable (2)	Neither favorable nor unfavorable (3)	Somewhat favorable (4)	Very favorable (5)
How favorable or unfavorable do you consider Pastolli? (1)	○	○	○	○	○

Q34 3.

	Very negative (1)	Somewhat negative (2)	Neither positive nor negative (3)	Somewhat positive (4)	Very positive (5)
How positive or negative do you consider Pastolli? (1)	○	○	○	○	○

End of Block: Attitude toward the company

Start of Block: Purchase intention and willingness to pay premiums

Q3 Now you are in the situation of seeing this product in a supermarket.

	Very unlikely (1)	Somewhat unlikely (2)	Neither likely nor unlikely (3)	Somewhat likely (4)	Very likely (5)
How likely is it that you would buy this food from Pastolli? (1)	○	○	○	○	○

Assuming that you were interested in buying pasta, would you be more likely or less likely to purchase Pastolli's pasta, given the information shown above? (2)	○	○	○	○	○
How probable is it that you would consider the purchase of this product, if you were interested in buying pasta? (3)	○	○	○	○	○

Q6 The next statements are dealing with your willingness to pay.

	Strongly disagree (1)	Somewhat disagree (2)	Neither agree nor disagree (3)	Somewhat agree (4)	Strongly agree (5)
Buying Pastolli's pasta seems smart to me even if it costs more than similar products. (1)	○	○	○	○	○
I am ready to pay a higher price for Pastolli's pasta than for similar products. (2)	○	○	○	○	○
I would still buy Pastolli's pasta if other brands reduced their prices. (3)	○	○	○	○	○

End of Block: Purchase intention and willingness to pay premiums

Start of Block: Subjective nutrition knowledge

Q10 How would you rate your nutrition knowledge? Please tick the boxes below.

	Strongly disagree (1)	Somewhat disagree (2)	Neither agree nor disagree (3)	Somewhat agree (4)	Strongly agree (5)
I know pretty much about nutrition. (1)	○	○	○	○	○

I do not feel very knowledgeable about nutrition. (2)	○	○	○	○	○
Among my circle of friends, I am one of the "experts" on nutrition. (3)	○	○	○	○	○
Compared to most other people, I know less about nutrition. (4)	○	○	○	○	○

End of Block: Subjective nutrition knowledge

Start of Block: Nutrition involvement

Q11 The following statements deal with your involvement of nutrition information on food products.

	Strongly disagree (1)	Somewhat disagree (2)	Neither agree nor disagree (3)	Somewhat agree (4)	Strongly agree (5)
I pay close attention to nutrition information. (1)	○	○	○	○	○
It is important to me that nutrition information is available. (2)	○	○	○	○	○
I ignore nutrition information. (3)	○	○	○	○	○
I actively seek out nutrition information. (4)	○	○	○	○	○
Calorie levels influence what I eat. (5)	○	○	○	○	○

End of Block: Nutrition involvement

Start of Block: Diet restraint behaviours

Q12 Please indicate how accurate these statements fit with your diet restraint behaviour.

	Never (1)	Seldom (2)	Sometimes (3)	Frequently (4)	Always (5)
I use food nutritional labels to	○	○	○	○	○

make my food choices. (1)					
I plan out what I am allowed to eat for the day. (2)	○	○	○	○	○
I have eaten foods that I don't prefer just because they are low in calories. (3)	○	○	○	○	○
I have been dieting to help control my weight. (4)	○	○	○	○	○
I would have eaten much differently if I had not been concerned about my weight. (5)	○	○	○	○	○

End of Block: Diet restraint behaviours

Start of Block: Thank you half

Q23 Thank you for filling out over half of the questions already!

End of Block: Thank you half

Start of Block: Pastolli - Prevention 2

Q48 Now, to remind you of the image and description, both are shown again below.

Q49

[PICTURE OF FICTIOUS FOOD PRODUCT – PASTOLLI]

Q50

Pastolli

Food waste is a global problem that affects all of us, generating high costs, negative environmental effects, as well as major social problems. At Pastolli, we minimize our food waste through the application of eco-design. This way, we design our products ecologically and directly integrate environmental aspects. Our aim is to improve the environmental performance of our products throughout its whole life cycle. We make our products more efficient, use fewer resources and generate less waste and emissions. Thank you for supporting our actions, by choosing our products.

End of Block: Pastolli - Prevention 2

Start of Block: Pastolli - Preparing for re-use

Q51 **Instructions:** Please look at the picture of the food product, read the desription below and afterwards go to the next page.

Q52

[PICTURE OF FICTIOUS FOOD PRODUCT – PASTOLLI]

Q53

Pastolli

Food waste is a global problem that affects all of us, generating high costs, negative environmental effects, as well as major social problems. At Pastolli, surplus food does not go to waste. We redistribute our surplus food to people affected by food poverty, through redistribution networks and food banks, or donations made directly to non-profit organizations. Thank you for supporting our actions, by choosing our products.

End of Block: Pastolli - Preparing for re-use

Start of Block: Pastolli - Preparing for reuse 2

Q54 Now, to remind you of the image and description, both are shown again below.

Q55

[PICTURE OF FICTIOUS FOOD PRODUCT – PASTOLLI]

Q56

Pastolli

Food waste is a global problem that affects all of us, generating high costs, negative environmental effects, as well as major social problems. At Pastolli, surplus food does not go to waste. We redistribute our surplus food to people affected by food poverty, through redistribution networks and food banks, or donations made directly to non-profit organizations. Thank you for supporting our actions, by choosing our products.

End of Block: Pastolli - Preparing for reuse 2

Start of Block: Pastolli - Recycling

Q57 **Instructions:** Please look at the picture of the food product, read the desription below and afterwards go to the next page.

Q58

[PICTURE OF FICTIOUS FOOD PRODUCT – PASTOLLI]

Q59

Pastolli

Food waste is a global problem that affects all of us, generating high costs, negative environmental effects, as well as major social problems. At Pastolli, surplus food does not go to waste. We reprocess our surplus food for human consumption. With our circular approach we transforms wastes or surplus ingredients, obtained during the manufacturing of other foods, into new food products under our high quality standards. This way, we decrease the amount of food waste generated and improve our environmental performance. Thank you for supporting our actions, by choosing our products.

End of Block: Pastolli - Recycling

Start of Block: Pastolli - Recycling 2

Q60 Now, to remind you of the image and description, both are shown again below.

Q61

[PICTURE OF FICTIOUS FOOD PRODUCT – PASTOLLI]

Q62

Pastolli

Food waste is a global problem that affects all of us, generating high costs, negative environmental effects, as well as major social problems. At Pastolli, surplus food does not go to waste. We reprocess our surplus food for human consumption. With our circular approach we transforms wastes or surplus ingredients, obtained during the manufacturing of other foods, into new food products under our high quality standards. This way, we decrease the amount of food waste generated and improve our environmental performance. Thank you for supporting our actions, by choosing our products.

End of Block: Pastolli - Recycling 2

Start of Block: Pastolli - Recovery

Q30 **Instructions:** Please look at the picture of the food product, read the desription below and afterwards go to the next page.

Q31

[PICTURE OF FICTIOUS FOOD PRODUCT – PASTOLLI]

Q32 **Pastolli** Food waste is a global problem that affects all of us, generating high costs, negative environmental effects, as well as major social problems. At Pastolli, surplus food does not go to waste. We turn it into energy! The food waste gets treated in order to produce biofuel and bioenergy from it. Residues from biofuels production can be further used as soil fertilizers. Thank you for supporting our actions, by choosing our products.

End of Block: Pastolli - Recovery

Start of Block: Pastolli - Recovery 2

Q33 Now, to remind you of the image and description, both are shown again below.

Q34

[PICTURE OF FICTIOUS FOOD PRODUCT – PASTOLLI]

Q35

Pastolli

Food waste is a global problem that affects all of us, generating high costs, negative environmental effects, as well as major social problems. At Pastolli, surplus food does not go to waste. We turn it into energy! The food waste gets treated in order to produce biofuel and bioenergy from it. Residues from biofuels production can be further used as soil fertilizers. Thank you for supporting our actions, by choosing our products.

End of Block: Pastolli - Recovery 2

Start of Block: Pastolli - Control Group

Q63 **Instructions:** Please look at the picture of the food product, read the description below and afterwards go to the next page.

Q64

[PICTURE OF FICTIOUS FOOD PRODUCT – PASTOLLI]

Q65

Pastolli

Pastolli spaghetti are made from durum wheat semolina from controlled production. To prepare the spaghetti, boil 80g per portion in 1 litre of boiling, slightly salted water (1 teaspoon = 5g of salt per 1 litre of water). After about 7 minutes, pour the spaghetti into a sieve and let it drain. Now just put it on a plate and serve with the sauce of your choice. Bon appetite!

End of Block: Pastolli - Control Group

Start of Block: Pastolli - Control Group 2

Q66 Now, to remind you of the image and description, both are shown again below.

Q67

[PICTURE OF FICTIOUS FOOD PRODUCT – PASTOLLI]

Q68

Pastolli

Pastolli spaghetti are made from durum wheat semolina from controlled production. To prepare the spaghetti, boil 80g per portion in 1 litre of boiling, slightly salted water (1 teaspoon = 5g of salt per 1 litre of water). After about 7 minutes, pour the spaghetti into a sieve and let it drain. Now just put it on a plate and serve with the sauce of your choice. Bon appetite!

End of Block: Pastolli - Control Group 2

Start of Block: Liking of food, waste hierachy management option and ease of understanding.

Q14 How much do you like eating pasta?

	Dislike a great deal (1)	Dislike somewhat (2)	Neither like nor dislike (3)	Like somewhat (4)	Like a great deal (5)
Liking of eating pasta (1)	○	○	○	○	○

Q7 From your point of view, into which category would you classify Pastollis efforts?

- ○ Preventing food waste (1)
- ○ Preparing for re-using food waste (2)
- ○ Recycling food waste (3)
- ○ Recovering food waste (4)
- ○ None of the above (5)

Q9 How easy is the description about Pastolli to understand?

Very difficult (1)	Somewhat difficult (2)	Neither easy nor difficult (3)	Somewhat easy (4)	Very easy (5)

Ease of understanding the description (1)	○	○	○	○	○

End of Block: Liking of food, waste hierachy management option and ease of understanding.

Start of Block: Food waste awareness

Q8 The following statements deal with the topic of food waste in Germany and globally.

	Strongly disagree (1)	Somewhat disagree (2)	Neither agree nor disagree (3)	Somewhat agree (4)	Strongly agree (5)
In Germany, households are responsible for a great portion of the food waste. (1)	○	○	○	○	○
Food waste is a big environmental issue. (2)	○	○	○	○	○
In Germany, the food waste generated by households has great financial consequences. (3)	○	○	○	○	○

Food waste is an important social issue (e.g. hunger in the world). (4)	○	○	○	○	○
Foods are gifts of nature and have to be treated as such. (5)	○	○	○	○	○
Foods are scarce over the world and should be consumed consciously. (6)	○	○	○	○	○

End of Block: Food waste awareness

Start of Block: Importance of a firms CSR activities

Q28 These last statements deal with a firms social responsibility. Social responsibility stands for making positive contributions to society, including economic, social, and environmental aspects, and reducing negative effects.

	Strongly disagree (1)	Somewhat disagree (2)	Neither agree nor disagree (3)	Somewhat agree (4)	Strongly agree (5)
Whether a firm is socially responsible is important to me	○	○	○	○	○

making my decision what to buy. (1)					
It bothers me to find out that a firm that I buy from has acted socially irresponsible. (2)	○	○	○	○	○
I care whether the companies whose products I buy have a reputation for socially responsible behavior. (3)	○	○	○	○	○

End of Block: Importance of a firms CSR activities

Start of Block: Participant information on demographic questions

Q24 This is already the end of the topic specific questions. Lastly, you are asked general demographic questions. Remember - all data will be anonymised, you are not asked for your name or e-mail at any point in this questionnaire. Thank you for your support!

End of Block: Participant information on demographic questions

Start of Block: Demographic information

Q15 How would you currently describe your gender?

- ○ Male (1)
- ○ Female (2)
- ○ Diverse (3)

Q16 What is your age?

- ○ Younger than 18 (1)
- ○ Between 18 and 24 (2)
- ○ Between 25 and 34 (3)
- ○ Between 35 and 44 (4)
- ○ Between 45 and 64 (5)
- ○ 65 or older (6)

Q30 In which country do you currently reside?

▼ Germany (65) ... Zimbabwe (1357)

Q18 Do you have biological, foster, adopted or stepchildren?

- ○ No (1)
- ○ Yes (2)

Q21 What is your current profession?

- ○ I am employed or working (incl. trainees, persons on parental leave or part-time work) (1)
- ○ I am performing basic military/ community service (2)
- ○ I am a pupil (3)
- ○ I am a student (4)
- ○ I am retired (5)
- ○ I live from income from capital assets, rent or lease (6)

- ○ I am a housewife or househusband or care for children and/ or people in need of care (7)
- ○ I am unemployed (8)
- ○ None of the above (9)

Q22 What is you highest school leaving certificate, vocational training or university degree?

- ○ Graduation after maximum 7 years of schooling (1)
- ○ Secondary or elementary school leaving certificate (2)
- ○ Advanced technical college entrance qualification (German "Fachhochschulreife") (3)
- ○ General or subject-related university entrance qualification (German "Abitur") (4)
- ○ Apprenticeship or vocational training (5)
- ○ Vocational school qualification (master craftsman, technician, or equicalent qualification) (6)
- ○ University of applied sciences degree, degree from a university or scientific college (7)
- ○ PhD (8)
- ○ None of the above (9)

Q23 What is your monthly net income?

- ○ < 1,000€ (1)
- ○ €1,000 - €1,500 (2)
- ○ €1,500 - €2,000 (3)
- ○ €2,000 - €2,500 (4)
- ○ €2,500 - €3,000 (5)
- ○ over €3,000 (6)

End of Block: Demographic information

Appendix III: Demographics

List of Countries

		Frequency	Percent	Valid Percentage	Cumulated Percent
Valid	Australia	1	,4	,4	,4
	Austria	11	4,3	4,3	4,7
	Belgium	1	,4	,4	5,1
	China	1	,4	,4	5,5
	Germany	217	84,8	84,8	90,2
	Italy	1	,4	,4	90,6
	Japan	1	,4	,4	91,0
	Netherlands	5	2,0	2,0	93,0
	Poland	1	,4	,4	93,4
	Sweden	1	,4	,4	93,8
	Switzerland	7	2,7	2,7	96,5
	United Kingdom of Great Britain and Northern Ireland	1	,4	,4	96,9
	United States of America	8	3,1	3,1	100,0
	Total	256	100,0	100,0	

What is your monthly net income?

		Frequency	Percent	Valid Percent	Cumulated Percent
Valid	< 1,000€	95	37,1	37,1	37,1
	€1,000 - €1,500	51	19,9	19,9	57,0
	€1,500 - €2,000	29	11,3	11,3	68,4
	€2,000 - €2,500	24	9,4	9,4	77,7
	€2,500 - €3,000	16	6,3	6,3	84,0
	over €3,000	41	16,0	16,0	100,0
	Total	256	100,0	100,0	

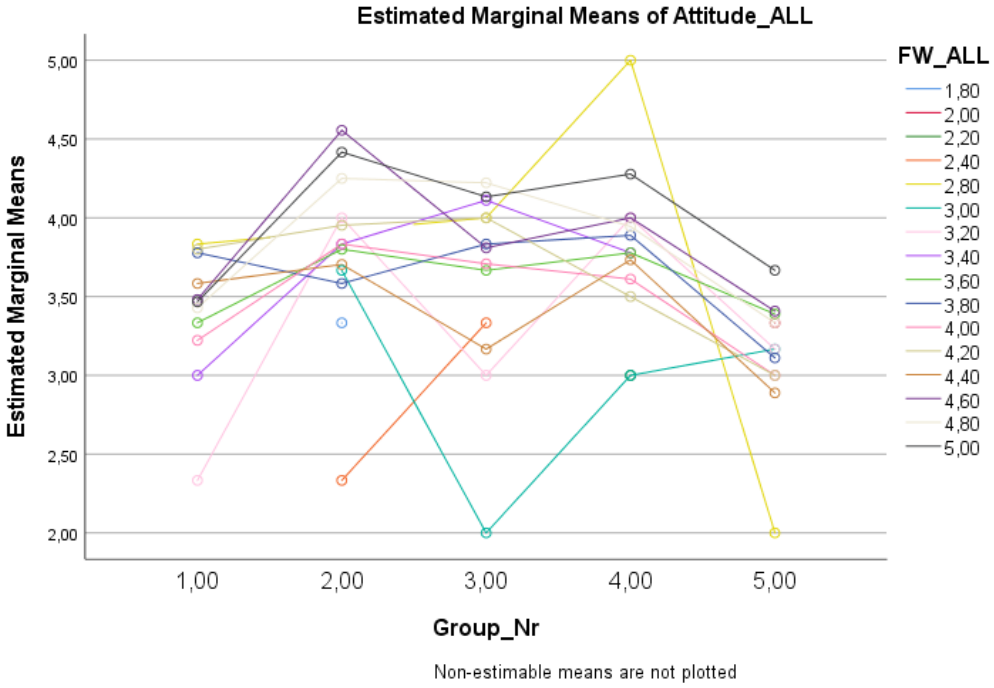
What is your current profession?

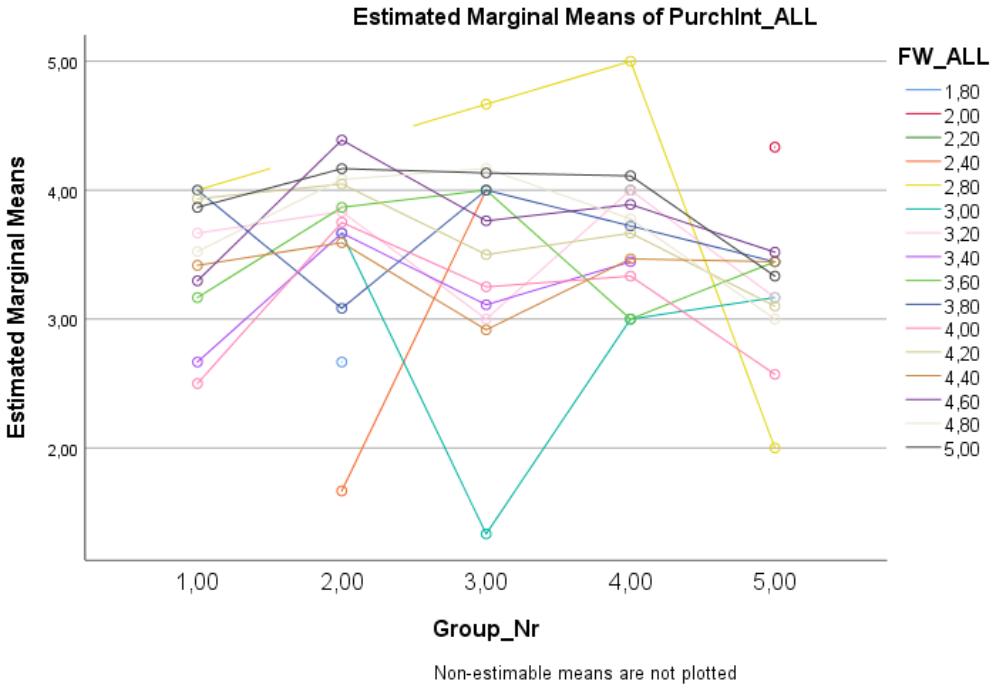
		Frequency	Percent	Valid Percent	Cumulated Percent
Valid	I am employed or working (incl. trainees, persons on parental leave or part-time work)	118	46,1	46,1	46,1
	I am a pupil	8	3,1	3,1	49,2
	I am a student	116	45,3	45,3	94,5
	I am retired	6	2,3	2,3	96,9
	I live from income from capital assets, rent or lease	2	,8	,8	97,7
	I am a housewife or househusband or care for children and/ or people in need of care	1	,4	,4	98,0
	I am unemployed	2	,8	,8	98,8
	None of the above	3	1,2	1,2	100,0
	Total	256	100,0	100,0	

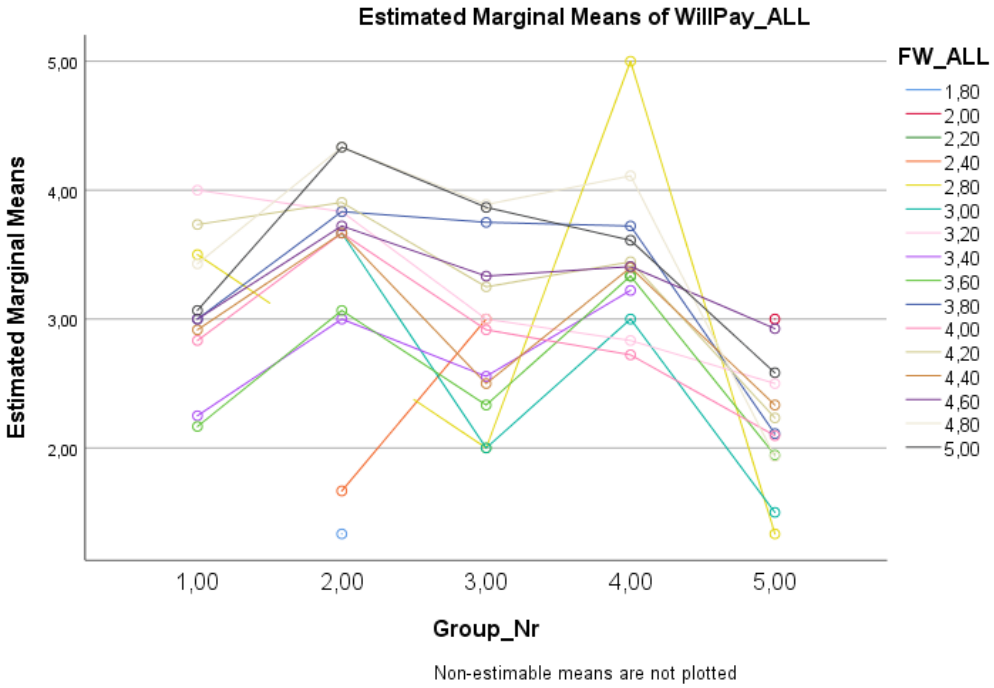
What is you highest school leaving certificate, vocational training or university degree?

		Frequency	Percent	Valid Percent	Cumulated Percent
Valid	Graduation after maximum 7 years of schooling	2	,8	,8	,8
	Secondary or elementary school leaving certificate	7	2,7	2,7	3,5
	Advanced technical college entrance qualification (German "Fachhochschul-reife")	3	1,2	1,2	4,7
	General or subject-related university entrance qualification (German "Abitur")	45	17,6	17,6	22,3
	Apprenticeship or vocational training	8	3,1	3,1	25,4
	Vocational school qualification (master craftsman, technician, or equicalent qualification)	5	2,0	2,0	27,3
	University of applied sciences degree, degree from a university or scientific college	171	66,8	66,8	94,1
	PhD	7	2,7	2,7	96,9
	None of the above	8	3,1	3,1	100,0
	Total	256	100,0	100,0	

Appendix IV: Plots of moderating effect: ‘awareness of food waste’






Estimated Marginal Means of WillPay_ALL
Estimated Marginal Means
5,00
4,00
3,00
2,00
1,00
2,00
3,00
4,00
5,00
Group_Nr
FW_ALL
1,80
2,00
2,20
2,40
2,80
3,00
3,20
3,40
3,60
3,80
4,00
4,20
4,40
4,60
4,80
5,00
Non-estimable means are not plotted

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