

Meal kit: a box to a cleaner environment?

How do meal kits influence food waste at the consumer level and how is this moderated by the provider type, environmental knowledge, price consciousness, and quality aspects?

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Abstract

These days, there is still a concern about the amount of food that is discarded in households. The literature around food waste, however, mainly focuses on the impact on the environment, social and monetary issues of food waste rather than the consumer behavior. One possible way to reduce the food waste is the introduction of meal kits. The purpose of this research is providing more insight in avoidable food waste in relationship with meal kits. Furthermore, this study extends existing literature by investigating a moderating role for type of provider, environmental knowledge, price consciousness, and quality aspects in the relationship between meal kits and food waste. This study made use of a food waste diary among 40 respondents, where people had to keep track of how much food was discarded during dinner for seven days. The data was analysed using the linear regression technique. The results showed a significant negative effect for meal kits and a marginally significant effect for type of provider in relation to perceived food waste. However, there were no significant effects found for the other moderators. This research concludes with providing theoretical and managerial implications and suggestions for future research are provided.

Key words

Food waste, meal kits, type of provider, environmental knowledge, price consciousness, quality aspects

Preface

I want to start the thesis by taking a moment to thank everyone who helped me during this process. My friends and family who supported me, especially at times when I was having a really hard time finding the focus to finish my thesis. Furthermore, I would like to thank my supervisor Marleen Hermans who was always available to help me regardless the type of question I asked. In addition, I would like to thank Jasper, my classmate. The cooperation we had was really great and I could not think of a better partner.

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H1. Introduction

1.1 Food waste

Each year an abundance of still edible food is thrown away by consumers. While most of the people do not think about the environmental consequences of food waste or do not believe that the impact of food waste is bad for the environment (Graham-Rowe, Jessop, and Sparks, 2014), it does not mean that they do not exist. First, food waste in households is causing around 1.5% of the total annual greenhouse gas emissions of the average consumer. Only in 2019, 34kg of food was wasted per person in the Netherlands (Milieucentraal, 2019). Second, as the global population is expected to grow in the upcoming years, there should be an emphasis on reduction of food waste strategies to prevent a global food shortage (Godfray, et al., 2010a). Next to this, unnecessary food waste is costing households a lot of money on annual basis. These negative consequences of food waste require more care about means to resolve the food waste problems. The body of literature around food waste mainly focuses on estimating the amount of food waste and its consequences, in terms of the impact on the environment, social and monetary issues, rather than consumer behavior towards food waste (Stancu et al., 2016). The most applicable way to deal with food waste is via prevention at the consumption level. In the continuation of this thesis, the focus is on avoidable food waste, referring to: “discarding foods which people believe are inedible, although they are still safe to eat” (Visschers, Wickli and Siegrist, 2016, p.1).

1.2 Meal kits

A possible solution that could lead into a reduction in food waste and where not much research has been conducted yet, is the introduction of meal kits. The meal kit industry is rapidly emerging and has the potential to transform the current food industry, due to their characteristics (e.g. delivered at home, fresh ingredients, and pre-portioned). A meal kit is a box containing a recipe and its ingredients, which are pre-portioned and often individually-packaged (Heard et al., 2019). Their target group is middle class consumers with a busy lifestyle, but who still want to eat proper quality food without the hassle of doing grocery shopping themselves (Khan and Sowards, 2018). Meal kits can be seen as an alternative for traditional cooking, as consumers do not have to buy their fresh ingredients at the supermarket, but they are delivered on their doorstep. Moreover, the experience of cooking their meals at home, is still provided. The market of the meal kit industry in the United States was estimated around 1.5 billion dollar in 2016 (Wilson, Steingoltz and Craigwell-Graham, 2017). The Nielsen Company (2018) stated that 25% of the total consumers in the U.S. would consider buying a meal kit in the upcoming six

months. In the Netherlands the total market of the meal kit industry was estimated around 225 million euros in 2016 (DistriFood, 2016). The success of meal kits by HelloFresh has led to supermarkets also starting to offer meal kits. In 2016, the market share of HelloFresh was 70%, while the Allerhande box from Albert Heijn, which was fairly new at that time, already had a market share of 14%. Other notable examples of meal kit services are: BlueApron, Streekbox, and Marley Spoon. Although the number of visitors on the websites of the three biggest meal kits providers (HelloFresh, Marley Spoon and Allerhande box) in January 2018 increased by more than 60 percent compared to the average monthly visit in 2017 (DistriFood, 2018), the meal kit industry is changing. Meal kits offered by grocery stores are currently diminishing the sales of delivery service meal kits (Meijssen and Te Pas, 2018). Furthermore, Marley Spoon, for example, has abandoned its subscription model, as well as, the “box”, referring to the box in which the products were found. The reason for discontinuing the subscription model was that Marley Spoon wanted to be more competitive relative to the Allerhande box of Albert Heijn. According to Marley Spoon, nowadays they provide meal kits without the kit. Marley Spoon has been collaborating with PostNL, in terms of delivery services. Instead of meal kits, they currently have bags which are delivered directly to your home by PostNL (Stil, 2018). The reasoning behind this idea was to prevent as much food waste as possible and also reduce packaging as much as possible (Stil, 2018). There is still a discrepancy between the perceived environmental impact of meal kits and the actual environmental impact of meal kits (Heard et al., 2019). Consumers tend to have a negative attitude towards the environmental impact of meal kits, due to their concerns on the amount of packaging needed for a meal kit (Stein, 2017; Watson and Meah, 2013). Nevertheless, the expectation is that the meal kit industry will continue to increase with new trends for 2020 such as: more vegetarian choices, even more choices in dieting recipes, focus on sustainability, more proactive and faster cooking time (Maaltijdbox.org, 2019).

1.3 Predicting the effect of cooking with a meal kit on level of food waste

Due to the success of meal kits, researchers have become more interested in this subject in recent years (Heard et al., 2019). These studies mainly address the environmental impact of meal kits, such as energy use, transportation costs and packaging (Heard et al., 2019; Gee, et al., 2019). The conclusion of these two articles is that meal kits have the tools to have a more positive environmental impact than grocery meals. In other words, the abovementioned articles focus more on the whole supply chain, rather than the last stage “the consumer”. Despite these promising outcomes of Heard et al (2019) and Gee et al. (2019), we lack knowledge on

how meal kits could affect avoidable food waste at the consumer level. Meal kits have the potential for food waste reduction, because of the subscription model and pre-portioned packaging. In the research of Belavina et al. (2017), they have investigated the effect of the subscription model on online groceries. They have found that the subscription model incentivizes smaller and more frequent grocery orders, reducing food waste. In other words, incorporating a subscription model into online groceries reduces more food waste. As meal kits could be purchased online by delivery service providers, the potential that meal kits could reduce food waste is imminent. If delivery service meal kits indeed reduce food waste, similar to online groceries in general, will be further investigated in this study. Additionally, the subscription model of a meal kit could replace a consumers' trip to the grocery and therefore the potential for impulse purchases in the grocery store (Graham-Rowe et al., 2014). Next to delivery service providers, there are the grocery store providers for meal kits. As this is a fairly new area, this study will dive into the potential differences in effect for the two providers of meal kits on food waste. More specifically, a comparison will be made between cooking with a meal kit in the grocery store versus delivery service (online). Furthermore, when the relationship between meal kits and food waste is being investigated, it is expected that other factors, such as consumer characteristics, also have to be taken into account, because they could influence this relationship. No research yet has been conducted in incorporating consumer characteristics potentially influencing the relationship between cooking with a meal kit and food waste. Therefore, this study will take those consumer characteristics into account trying to fill the gap and gain more insights in variables that could potentially positively or negatively influence the relationship between meal kits and food waste. The consumer characteristics in this study will be: environmental knowledge, price consciousness, and quality aspects, as they all have proven to influence food waste behavior to some extent (Williams et al. 2012; Mallinson et al., 2016; Mavrakis 2014; Mirosa et al., 2016). Therefore, the proposed overall research question is: *How do meal kits influence food waste at the consumer level and how is this moderated by the provider type, environmental knowledge, price consciousness, and quality aspects?*

1.4 Research objectives

This study will add to existing literature in three ways. First, while previous research mainly focuses on the environmental impact of food waste, this research aims at providing more insights in avoidable food waste in a potential relationship with meal kits. More research on prevention of food loss is very important, due to the increasing concerns about the environment

in society and the harmful effects food waste could cause. Prevention of avoidable food waste has the highest potential at the consumer level, as this is the most suitable and convenient way in dealing with the food waste problems. Therefore, investigating the relationship between perceived food waste behavior and meal kits is very important. Second, as the grocery meal kit industry is slowly overtaking the delivery service meal kits, this study contributes to existing literature by further investigating the potential differences in effect of the meal kit provider as a moderator influencing the relationship between meal kits and food waste. Third, this study contributes to a deeper understanding of the relationship between meal kits and food waste by incorporating environmental knowledge, price consciousness, and quality aspects (consumer characteristics) as moderators potentially influencing this relationship.

Additionally, for marketing managers this study provides them valuable insights on how to potentially employ meal kits in their advertising strategies in creating a more sustainable world, due to potential benefits in reducing food waste behavior at the consumer level. To be more specific, the quality aspects could be used for segmentation purposes and to guide the advertising strategies. It could be possible that there are, for example, differences in importance of health or taste in food, for different consumer groups. Marketeers could therefore segment these different groups and employ different advertising strategies that are specifically intended for these groups.

1.5 Research outline

This study will continue in chapter two by providing a literature review and conceptual framework on what is known about food waste, meal kits, the relationship between food waste & meal kits, the type of providers, environmental knowledge, price consciousness, quality aspects, and an overarching conceptual model. In chapter three the methodology will be explained, including the research strategy and manner of data collection. In chapter four the main results will be presented. In chapter five the results will be discussed, including theoretical and managerial implications, as well as limitations and areas for future research.

H2. Theoretical framework

2.1: Literature review

2.1.1 Food waste

Food waste has severe negative impacts on the environment. It affects natural resources, availability of food in developing countries and food waste generates greenhouse gas emissions (Stuart, 2009). Moreover, these greenhouse gas emissions do not only occur in the food waste stage, but in every stage of the food supply chain. This implies that the environmental impact of food production and consumption is even more substantial when food is wasted through the processing of the waste (Scherhauser et al., 2018). Griffin, Sobal and Lyson (2009) have argued that consumers are the biggest contributor to the total amount of food waste generated. Parfitt, Barthel and Macnaughton (2010) have confirmed this statement and call for more attention towards the prevention of food waste in the last stages of the food supply chain.

Food waste prevention is perceived as one of the most promising means to accomplish the goal of environmental impact savings (Stancu et al., 2016) Therefore, more and more research regarding the topic of food waste has been conducted in the last few years. Multiple researchers have found opportunities that could lead to a reduction of food waste. For example, reducing overstock or reducing the portion sizes served in restaurants could have a positive effect on food waste (Niles et al., 2018). Furthermore, to reduce food waste, one has to change consumers' perception about food and food waste (Schanes et al., 2016). Other arguments for food waste reduction involve complex customer behaviors at different levels (Blanke, 2015). For example, teaching consumers about new recipes including (over-) ripe fruit or teaching consumers about the concept of food sharing.

Despite the attention for food waste, that does not mean that the puzzle around the nature of consumer household food waste has been solved (Hanssen, Syversen and Sto, 2016; Roodhuyzen et al., 2017). Little is known about fundamental factors that could help explain reasons for household food waste behavior. Additionally, until 2013, there were only a handful of studies that focus on the relationship between household food waste and consumer behavior (Stefan et al., 2013). However, in the years thereafter, more research has been conducted regarding this relationship. Mallinson, Russel and Barker (2016) have found that household size, packaging format and price-awareness all influence household food waste behavior. Stancu et al. (2016) and Stefan et al. (2013) have found that planning and shopping routines are important predictors for household food waste behavior. Their results have shown that planning routines negatively correlate with food waste and that shopping routines positively correlate

with food waste. In addition, price consciousness and impulse buying have been proven to be good antecedents in predicting household food waste (Mallinson et al., 2016; Porpino, Parente and Wansink, 2015). Another way to gain more insight, regarding food waste behavior, is by incorporating the Schwartz value theory. This theory has a strong foundation, as it has been supported with empirical data in over 60 countries (Duran, 2009). The first of very few studies linking Schwartz' value theory to food waste behavior, is the study of Miroso, Munro and Mangan-Walker (2016). According to Schwartz (2012), values are used to characterize consumers, and to clarify the motivational foundations for certain behavior. As the level of importance per value could differ per person, this theory includes different actions that arise among individuals (Schwartz and Blisky, 1990). Three of the most important values from this theory, which have been investigated in relationship with food waste, are: universalism, power, and hedonism (Miroso et al., 2016). Other studies, regarding explaining household food waste, most of the times use the theory of planned behavior (Aschermann-Witzel et al., 2015), as it explains the willingness to behave in a certain manner. In this study, the emphasis is on perceived food waste, as it is quite difficult to measure the exact amount of food waste. Multiple studies have already proven promising results when measuring food waste as perceived food waste (Stefan et al., 2012; Stancu et al., 2016). More specifically, these studies provide a more in-depth view on consumers' food waste behavior.

2.1.2 Convenience food

There has been an increasing demand for convenience food products in the last decade, due to the hectic lifestyle of many people and the developments of new technological equipment, such as the microwave (Buckley, Cowan and McCarthy, 2007). However, defining convenience can be very complex, as convenience is a multifaceted concept (Warde, 1999; Jaeger and Meiselman, 2004; Marquis, 2005). Convenience could indicate the ease with which a product is obtained, prepared or eaten. In most studies regarding traditional convenience, researchers have been investigating the context of convenience using the single dimension time. This is however not the only important dimension, as minimizing physical and mental energy are just as important (Darian and Cohen, 1995). Therefore, the following definition of convenience food will be used "products that help consumers save time and to minimize both physical and mental effort required in three stages: food preparation, consumption, and clean-up" (Candel, 2001; Darian and Cohen, 1995). According to Brunner, Van der Horst and Siegrist (2010), convenience food products could be divided into four different groups: highly processed food (e.g., ready meal in a can), moderately processed food (e.g., sandwich), single components (e.g.,

marinated food), and salads (e.g., cut and washed salad). One particular interesting topic in the convenience food industry are the drivers of convenience food. Research regarding this topic of the drivers of convenience food have started in the 1970s, with researching the link between employment status of the wife and purchase of convenience products (Becker, 1965). In the following years more drivers of convenience food were identified. Candel (2001) has found that convenience orientation was negatively correlated with cooking enjoyment, household size, having children, and positively correlated with role overload and working status. Candel (2001) also has tried to investigate actual behavior and found a positively related relationship between convenience orientation and the use of convenience food. Other drivers of convenience food are: lifestyle factors as time pressure and value for money (Buckley et al., 2007), and price (Swoboda and Morschett, 2001). Brunner et al. (2010) added three additional drivers to the long list: concern about naturalness, nutrition knowledge, and cooking skills. All three drivers are negatively related to convenience food.

2.1.3 Meal kits

Convenience food has multiple interfaces with meal kits, such as saving time in collecting all the different ingredients in the grocery store, pre-portioned, and their ease of use. Despite these interfaces with convenience food, meal kits cannot specifically be characterized as convenience food. Meal kits possess several distinctive characteristics, such as they do not necessarily save time in cooking, compared to convenience food. Next to this, meal kits require a certain level of cooking skills and in general meal kits are perceived as healthier and contain fresher ingredients than convenience food products (Grocerydive, 2017). Therefore, this study acknowledges meal kits as a different category than convenience food. Moreover, it also implies that the results, from research conducted on convenience food products, do not apply to meal kits.

The existing studies, with regard to meal kits, focus on the environmental impact, in terms of how the food is supplied, how they set up the supply chains, and how the food is processed and packaged (Schmeiser, 2017). The study of Gee et al. (2019) focuses on comparing meal kit delivery systems versus conventional grocery shopping, in terms of energy requirements. They account for food waste, but they look at the bigger picture, in terms of energy benefits. When the term energy is mentioned, it refers to processes, such as transportation or packaging, which require a certain amount of energy. The goal is to save as much energy as possible, as it has environmental benefits. Gee et al. (2019) argue that the energy benefits per-meal, for a meal kit, become less significant throughout the week, as meal

kits only supply for a couple of days, so consumers still need to go the grocery store for additional products for the rest of the week. This displays the importance of consumer-specific factors like food waste and shopping habits, to dampen the negative environmental impact. Heard et al. (2019) focus on the life cycle environmental impact of both meal kits and grocery store products. They compared the life cycle environmental impact of products in a meal kit and products in a grocery store to investigate whether the extra amount of packaging in meal kits is offset by its potential positive effect on food waste. The general findings of both studies are similar, except for the relative importance of packaging. Gee et al. (2019) argued that packaging could play a deciding role in relative per meal energy use, in contrast to the findings of Heard et al. (2019).

As mentioned earlier, due to the success of the delivery meal kit industry, grocery stores have started offering meal kits as well. The main difference between these two providers is that for the grocery store meal kits people still need to go to the grocery store, as opposed to delivery meal kits which are delivered on the door step. The latest developments in the grocery meal kit industry have ensured that their meal kits can also be delivered at home. For convenience reasons however, we define grocery store meal kits as “meal kits that consumers buy in a grocery store”. Additionally, the size of the meal kit is not taken into account. In other words, the size of the meal kit is a constant factor. For example, the difference between a soup package or a more extensive meal is not considered. The main difference between the two providers could further be explained by incorporating planned behaviour and impulse buying. Planned behavior in this specific situation refers to the subscription model of delivery meal kits. However, a small side note is that Marley Spoon, for example, no longer necessarily uses subscription models. The subscription model ensures consumers to make decisions about what to eat days in advance. While, impulse buying is a sudden and immediate purchase with no intentions to fulfil a specific buying task (Beatty and Ferrell, 1998, p,170). In terms of purchasing a grocery store meal kit, consumers could decide what to eat on the day itself. This would then refer to impulse buying. However, to nuance this statement, it could be that consumers put their grocery store meal kit on their weekly shopping list.

2.2 Conceptual framework

2.2.1 Explaining conceptual model

The relationship between cooking with a meal kit and food waste has not been a widely researched topic. In this study, our focus is on perceived food waste. One study, which specifically focuses on comparing cooking with a meal kit versus cooking with ingredients form

the grocery store in relation to food waste, is the study of BSR (Business for Social Responsibility) (Peters, 2016). They have surveyed 2000 customers from the delivery service Blue Apron, compared to USDA food waste stats for the same ingredients. They have found that only 7.6% was wasted using the meal kit, compared to the 23.9% wasted using grocery store products. Despite these findings, this cannot be seen as a valid academic contribution, due to their nature of research. Reason for this is “the numbers are not exact – surveys being imperfect and the USDA stats are averages” (Peters, 2016, p.1). However, the potential that meal kits indeed lead to less food waste is imminent, as this research was reviewed and “agreed that it was as accurate as it could be based on available data” (Peters, 2016, p.2). This will therefore be proposed as the main effect in this study.

In terms of meal kit characteristics, there are little to no differences between the two providers (delivery service versus grocery service) as mentioned before. Both meal kits of the providers possess pre portioned packaged products with corresponding instructions on how to prepare the meal. However, the main difference between the two providers (planned versus impulse buying) could serve as the basis for the potential difference in effect. Therefore, the variable type of provider will be the first moderator in this study.

In order to explain the remaining moderators, we incorporate the Schwartz’ value theory. The remaining moderators have been carefully selected, as they all link to different values of the Schwartz’ value theory. As mentioned before, the most important values from this theory, which have been investigated in relationship with food waste, are: universalism, power, and hedonism (Miroso et al., 2016). Moreover, we know from existing literature, that consumer characteristics are important variables that could affect the relationship between cooking with a meal kit and perceived food waste. Therefore, we translate the three abovementioned values to three suitable consumer characteristics. The specific value from the Schwartz’ value theory has been matched with the corresponding consumer characteristic, as both concepts have a large overlap. More concretely, the way of thinking, derived from the specific value, corresponds to the associated consumer characteristic. People with a high extent of universalism tend to be very knowledgeable about the environment (Miroso et al., 2016). People with a high extent of power aim to control their resources (for example food and corresponding waste) while preserving their wealth (Miroso et al., 2016). People with a high extent of hedonism perceive the quality of their meal and the corresponding enjoyment of their food as important (Miroso et al., 2016). Therefore, in this study, universalism is captured by environmental knowledge, power is captured by price consciousness, and hedonism is captured by quality aspects. From

these variables above, we have derived the conceptual model. Figure 1 below presents the conceptual model with all derived hypotheses from the model.

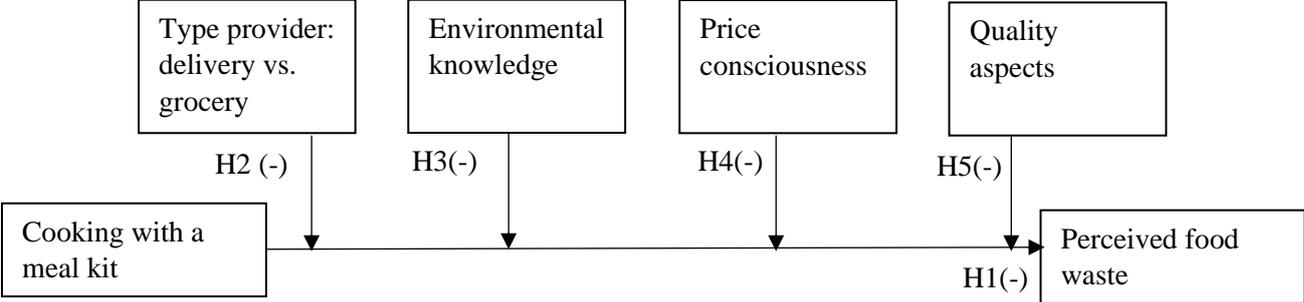


Figure 1: Conceptual model

2.2.2 Cooking with meal kits and perceived food waste

Heard et al. (2019) have argued that meal kits have the potential to reduce food waste, due to their pre-portioning products. They do not, however, investigate whether the statement of BSR (Business for Social Responsibility) (Peters, 2016) is indeed correct. Additionally, it is expected that a meal kit could contain some elements that a consumer does not need or does not like and therefore will be discarded. One could argue that this will result in food waste. This statement is, however, not completely in accordance with the definition of food waste used in this study, as food waste in this study refers to a persons´ believe that a piece of food is inedible and therefore will be discarded. However, if some elements are discarded while still being edible, it is still food waste. One study that actually has tried to investigate the relationship between meal kits and food waste, is the study of BSR (Peters, 2016). They have found that meal kits indeed could reduce food waste. The underlying reason why meal kits could reduce food waste and why traditional cooking might lead to more food waste is because of mistakes in estimation of food portions. Multiple studies have indicated that consumers cannot correctly estimate portion sizes of frequently used consumer food products (Guthrie, 1984; Blake, Guthrie and Smickiklas-Wright, 1989; Rapp, Dubbert and Buttross, 1986; Bingham, 1987). In other words, consumers often overestimate themselves when it comes to portion sizes. As a result, this could lead to a higher amount of food waste. As abovementioned, products in a meal kit are pre-portioned and could therefore result in less food waste. Therefore, we propose the following hypothesis:

H1: Cooking with a meal kit has a negative effect on consumers’ perceived food waste

2.2.3 Type provider (Delivery service vs grocery service)

As the main difference between the providers could be explained by incorporating planned behavior versus impulse buying, this could serve as the basis for difference in effect. On one hand, one could argue that it is expected that grocery store meal kits lead to less food waste, because consumers can choose what they want to eat on the day itself, as opposed to the subscription model from delivery meal kits. This has the potential to reduce more food waste than delivery service meal kits. This line of reasoning stems from, consumers have to decide what to eat days in advance and therefore when the day has arrived, the consumer may feel less likely to enjoy the meal as planned. Due to this planned behavior, in the form a subscription model, consumers may have to eat certain food products they do not like and therefore will be discarded, while still being edible. As mentioned before, this kind of food waste does not conform completely with the used definition of food waste in this study. However, attention will also be paid to this. On the other hand, using the impulse buying behavior theory (e.g., Parfitt et al., 2010; Porpino et al., 2015), one could argue that delivery meal kits have the potential to reduce more food waste than grocery meal kits. This is because consumers could decide they want to purchase a meal kit in the grocery store on the spot. Impulse buying behavior has already proven its value as one of the antecedents of food waste and delivery meal kits could therefore reduce more food waste, as opposed to perhaps impulse buying of a grocery meal kit (Porpino et al., 2015). It is expected that the impact of impulse buying, as opposed to the planned behavior of a subscription model is stronger. This is because the food category is perceived with low personal involvement and consumers choices are often impulsive (Botonaki and Mattas, 2010). We argue that, in this study, the impulse buying related to grocery store meal kits will serve as a moderator, next to the planned behavior related to delivery service meal kits. More specifically, we expect that the effect of impulse buying is stronger than the effect of planned behavior related to cooking with a meal kit. Therefore, we propose the following hypothesis:

H2: Delivery service meal kits stronger negatively moderates the relationship between cooking with a meal kit and their perceived food waste than grocery store meal kits.

2.2.4 Environmental knowledge

An eminent factor influencing green behavior is environmental knowledge. In this study, environmental knowledge can be defined as the individuals' knowledge about the environment and collective/individual responsibilities necessary for sustainable development (Fryxell and Lo, 2003). Environmental knowledge leads to eco-friendly behavior (Peattie, 2010; Scott and Vigar-Ellis 2014). Moreover, environmental knowledge also influences the purchase intention

of eco-friendly products (Rokicka, 2002; Wang, Liu and Qi, 2014). In most studies, environmental knowledge is conceptualized as having a direct effect on green behavior. Fraj-Andres and Martinez-Salinas (2007), however, were one of the first to measure environmental knowledge as a moderator in the relationship between green attitude and green behavior. They have found a positive significant effect for this relationship. In other words, the existence of environmental knowledge was a significant moderator and thus increased the effect of attitude on ecological behavior (Fraj-Andres and Martinez-Salinas, 2007). In general, when environmental knowledge is taken into account, there will be a positive effect for environmental knowledge on either green attitude or green behavior.

However, when the concept of environmental knowledge is seen from a different angle, it could lead to scepticism, to some extent. According to Kahan (2012), when findings of sustainable nature are reported factually, people tend to have sceptical attitudes towards the knowledge. Additionally, in terms of meal kits, environmental knowledge can be ambiguous at moments. People with a high level of environmental knowledge understand the potential of meal kits reducing food waste, but at the same time are sceptical towards the amount of packaging needed for the individual products in a meal kit (Williams et al., 2012). However, this study looks at perceived food waste behavior, instead of amount of packaging in a meal kit. Therefore, the environmental knowledge, regarding the consequences of the amount of packaging, is less important. As a result, in this study environmental knowledge is seen as having a positive influence on ecological behavior, for example food waste behavior. In the study of Williams et al. (2012), environmental knowledge served as an antecedent of food waste. However, we argue that in this study environmental knowledge is best suited as a moderating variable, as in the study of Fraj-Andres and Martinez-Salinas (2007). More specially, we expect that the level of environmental knowledge of the consumer will influence the relationship between meal kit and food waste behavior. Therefore, we propose the following hypothesis:

H3: environmental knowledge negatively moderates the relationship between cooking with a meal kit and their perceived food waste

2.2.5 Price consciousness

Consumers measure the price relating to the value for money a product gives (De Boer et al., 2004). In other words, getting the most out of the product per kilogram (Williams et al., 2012). Despite the rich body of literature around price consciousness, little research has been conducted between price consciousness and food waste. One study that has researched this

potential relationship, is the study of Williams et al. (2012). They have found that when in households the price is important, they wasted less food than households where price is not that important. The cause of this could be because of better planning ability or higher cost awareness. The study of Mallinson et al. (2016) has confirmed the notion of price consciousness of people having an influence on the level of food waste. In their study, they have found that the traditional consumer is the most price-conscious and casual consumers being the least price-conscious, resulting in more food waste. In both studies, however, price consciousness is measured as having a direct effect on food waste. Nonetheless, there are studies where price consciousness has been measured as a moderating variable (Kukar-Kinney, Walters and MacKenzie, 2007; Chang and Wong, 2018). Kukar-Kinney et al. (2007) have found a moderating effect for price consciousness on the relationship between consumer responses towards different types of price-matching characteristics (i.e., refund depth and length). Chang and Wong (2018) have found a moderating effect for price consciousness for consumers' psychological reactance to loyalty programs. More specifically, they have found that the negative effect of psychological reactance on loyalty programs for higher price conscious people. Although the research areas of both Kukar-Kinney et al. (2007) and Chang and Wong (2018) are different than the research area of this study (food waste), we argue that in this study price consciousness is best suited as a moderating variable as well. In other words, we argue that the level of price consciousness of consumers will influence the relationship between purchasing and cooking with a meal kit and their food waste behavior. More specifically, the impact of price consciousness would decrease the relationship between cooking with a meal kit and perceived food waste, because the most value will be gained from the meal kit if less food is discarded. Therefore, the following hypothesis is proposed:

H4: price consciousness of consumers negatively moderates the relationship cooking with a meal kit and their perceived food waste

2.2.6 Quality aspects

One of the drivers of food waste is the lifestyle of people, as the everyday practices of people influences important food waste practices (Hebrok and Boks, 2017). Furthermore, one of the dimensions of food-related lifestyle is the quality aspects. It refers to the benefits of a product, such as health, taste, organic and freshness. Additionally, it also includes novelty, which tries to determine whether the consumer likes trying new foods (De Boer et al., 2004). The value that is attached to the quality aspects of a food product, depends on the type of consumer (Ryan et al., 2008). For instance, the moderate food consumer scores an average in their attitude

towards the quality aspects: taste, freshness, and novelty. They do, however find the health aspects of their food important. This group is mainly between 35 and 64 years old and most likely have a partner. The uninvolved consumer does not care about the quality aspects of their food. This group consists mainly of young male people. The enthusiastic consumer, however is very interested in the quality aspects of their food. Another type of consumer, is the consumer with a high perceived value of hedonism. This group is very interested in the quality aspects: novelty and taste. In other words, different types of consumers possess different points of views on the quality aspects of their food. If consumers perceive the quality aspects of their food as important, it could have an effect on the level of food waste.

In the study of Mavrakis (2014), it was argued that, among other things, novelty value may determine certain disposal decisions. Furthermore, when food has a high perceived value, for example by being new and interesting, by being made by a loved one, or when it requires a lot of work and effort, it possesses higher levels of preserving food and lower levels of discarding food. Moreover, the study of Miroso et al. (2016) have found some additional evidence of the influence of some quality aspects related to food waste behavior. They argued that, if consumers with a high hedonism value were not enjoying their meal or did not gain a certain amount of pleasure out of it, they were more inclined to throw their food away. This is linked to the quality aspect: taste. Or in other words, this hedonism value is linked to “not liking the flavour/taste”. They further argued that, when consumers did like the flavour, more pleasure was gained from the meal resulting in less food waste. This shows how important taste of food could be for consumers in relationship to potential food waste. Another important quality aspect that could be linked to food waste is healthiness. Consumers who are healthy orientated want to choose, create and explore their actions related to food products (Miroso et al., 2016). This could, for example mean meals higher in protein, or smaller portions. It has already been proven that smaller portion sizes lead to less food waste (Kallbekken and Saelen, 2013). Although the aforementioned findings have found evidence for a direct effect of quality aspects resulting in less food waste, we expect a moderating effect for quality aspect in this study. More specifically, we argue that the quality aspects influence the relationship between a meal kit and food waste behavior. For example, when more pleasure is gained during the cooking process and the food requires time and effort, then the impact of these quality aspects would decrease the relationship between cooking with a meal kit and perceived food waste. Therefore, the following hypothesis is presented:

H5: quality aspect of the food negatively moderates the relationship between cooking with a meal kit and their perceived food waste

2.2.7 Demographic variables

Next to the variables in the conceptual model, three additional control variables are taken into account, to control for potential confounding effects. The first control variable is age. It has been proven that age could play a role in the amount of food wasted. Younger people are more inclined to produce more food waste than older people (Stefan et al., 2013; Visschers et al., 2016). The second control variable is household size. It has been proven that larger households produce more food waste than smaller households (Visschers et al., 2016). The third and last control variable is gender. Men tend to waste more food than women (Visschers et al., 2016). Or in other words, women claim to avoid food waste more than men (Betz et al., 2014).

H3. Methodology

3.1 Research and sampling design

The aim of this study is to investigate the relationship between cooking with a meal kit and perceived food waste of consumers, in order to increase the explanatory power of meal kits influencing food waste behavior. In other words, if a meal kit indeed leads to less food waste. A quantitative approach has been used to investigate this relationship. A quantitative method is most applicable, when numerical material is being used for the purpose of obtaining scientific insights (Field, 2013). As this study tries to measure the perceived food waste of consumers, a food waste diary is implemented. A food diary has been chosen, as it has already proven its value in relationship to measuring food waste behavior (Williams et al., 2012). A food waste diary means tracking the amount of avoidable food wasted within a certain time frame. This is therefore a well suited approach to measure the effect of cooking with a meal kit and people's perceived food waste.

As this study focuses on meal kits and perceived food waste, everybody with sufficient cooking skills to prepare a meal kit could have been included. Therefore, everyone above 18 years old, who purchases and cooks with a meal kit, would have been a potential valid contributor to this study. This age limit has been chosen, as this is a reasonable age where people are able to cook a somewhat decent meal. In addition, this could be an age where respondents are responsible for cooking in their household, for example students (Stefan et al., 2012). Furthermore, in terms of the procedure, it was important to give people a pre announcement about food waste. This manner had some disadvantages. For example, people could be biased and give predominantly socially desirable answers. However, in this study it was necessary to give people a pre announcement, because when people were not given a heads up, this could result in unreliable data, due to not being aware of the amount of food wasted in their household (Van Herpen et al., 2019). The sampling method that has been used in this study was convenience sampling, which means using one's own network. This has been chosen because the researchers did not have the time and resources to perform a random sampling method. Information obtained from a convenience sample could still provide fairly significant insights and being an useful source in explanatory research, as this study is (Swanson and Holton, 2005, p. 51). In terms of the sampling size, we have argued that a minimum of 30 respondents will be sufficient. This has been based on prior research conducted by Williams et al. (2012), regarding a food diary and food waste. Their study incorporated 60 respondents divided into two groups. As we only have investigated one group and had limited resources and time, we therefore have argued that 30 respondents were the most suitable. Additionally, we have argued that to take

part in this study, people had to purchase and cook with a meal kit (either delivery meal kit or grocery meal kit) at least one time per week, during their participation. They could decide when they would purchase a meal kit themselves, within a timeframe of three weeks. To make sure the respondents had purchased at least one meal kit within those three weeks, the respondents were asked beforehand if they intended to purchase and cook with a meal kit in the upcoming three weeks. Next to this, it should also be explicitly reported that when the term cooking with a meal kit is being mentioned, we talk about dinner. In other words, consumers had to use the meal kit for dinner and not for lunch. In addition, we preferred people who already have cooked with a meal kit over people who have never cooked with a meal kit before. This is due to avoiding misunderstandings about the concept of cooking with a meal kit and therefore the results will not be biased.

3.2 Operationalization

The food waste diary consist of three parts. In the first part, the households were given instructions on how to measure their food waste in a form of a pre announcement. In the second part, questions about the other variables in this study were posed once per week and respondents were asked to score these questions on a 7-point Likert scale ('completely disagree' – 'completely agree') In the third part, the respondents were asked to report their avoidable food waste on a daily basis using a 5- point scale. Bones, peels, and food leftovers for pets were not included in this study, in accordance with Williams et al. (2012). Questions related to the moderators in this study were asked only once, however questions related to food waste behavior, were asked every day. The questions related to the moderating variables are easier to answer and do not require a lot of thinking, as people, for example, unconsciously think about prices are quality aspects of their food every day. Therefore posing the moderator variable questions first, rather than the food waste question, will encourage the respondent more to finish the questionnaire/food diary. The food diary also consisted of questions from a fellow researcher. Because his questions could have biased our joint dependent variable (food waste), those questions were posed after the food waste question. The list of variables with corresponding indicators can be found in Appendix A. Furthermore, the operationalization of the variables can be found in Table 1. As a consequence of the food diary questions being asked in Dutch, only Dutch people could participate in this study. All questions originated from English literature and therefore had to be translated to Dutch. Furthermore, to check the validity of the translated questions, the questions had to be back-translated from Dutch to English. Moreover, the back translation method prevents possible deviations in translating the questions

(Su and Parham, 2002). The full food diary with pre-announcement can be found in Appendix B.

Variable	Definition	Items	Cronbach's alpha
<i>Cooking with a meal kit</i>		1 item, yes or no question (dummy)	
<i>Type provider</i>	The difference between grocery stores and delivery services in supplying a meal kit	1 item with two options (dummy)	
<i>Environmental knowledge (Mostafa, 2007)</i>	individuals' knowledge about the environment and collective/individual responsibilities necessary for sustainable development	5 items on 7-point Likert scale	0.78
<i>Price consciousness (Mallinson et al., 2016)</i>	getting the most out of the product per kilogram	5 items on 7-point Likert scale	0.77
<i>Quality aspects (Ryan et al., 2008)</i>	the benefits of a product, such as health, taste, organic and freshness	15 items on 7-point Likert scale	0.70
<i>Perceived food waste (Stefan et al., 2012)</i>	discarding food of that people believe are inedible, although they are still safe to eat	1 item on 5-point scale (hardly any – more than 50%)	0.85

Table 1: The operationalization of the variables

3.2.1 Cooking with a meal kit

This variable has been measured on 1 item containing a yes or no question. If the answer was yes, a follow-up question was proposed, regarding which type of provider provided the meal kit. The question was asked every day within a timeframe of one week. The variable cooking with a meal kit has been transformed to a dummy variable with 0 = no and 1 = yes.

3.2.2 Type provider

The first moderator is the type of provider. This could be delivery service provider or grocery store provider. This was the follow-up question after the question of cooking with a meal kit was proposed. The moderator has been measured on 1 item containing the question where consumers have bought their meal kit: delivery service or grocery store. The question was asked every day within a timeframe of one week. A dummy variable was created with 0 = meal kit from the grocery store and 1 = meal kit from delivery service.

3.2.3 Environmental knowledge

The second moderator in this study was environmental knowledge. Environmental knowledge has been measured as perceived environmental knowledge, as the actual knowledge of the respondents has not been asked for. The actual environmental knowledge does not matter in this study, because it is more important how one's perceived knowledge influences the relationship between a meal kit and one's food waste behavior. A 7-point Likert scale consisting of 5 items has been used, ranging from 'completely disagree' to 'completely agree' from the study of Mostafa (2007). The questions have been asked on a weekly basis.

3.2.4 Price consciousness

The third moderator was price consciousness. In this study, price consciousness was measured using a 7-point Likert scale with 5 items ranging from 'completely disagree' to 'completely agree' from the study of Mallinson et al. (2016). The questions have been asked on a weekly basis.

3.2.5 Quality aspects

The fourth moderator was quality aspects. The quality aspects consists of five dimensions: health, novelty, organic, taste, and freshness. In total, 15 items divided over the five dimensions have been tested on a 7-point Likert scale ranging from 'completely disagree' to 'completely agree' from the study of Ryan et al. (2008). The questions have been asked on a weekly basis.

3.2.6 Perceived food waste

The dependent variable was food waste. It has been measured as perceived food waste, as it is quite difficult to measure the exact amount of food wasted. In addition, it is expected that people are more willing to participate in a study where they have to fill in questions ranging from 1 to 7, than weighing out their food leftovers every day. The perceived food waste was measured at the end of each day, using a 5-point scale: hardly any (1), less than 10% (2), between 10% and 25% (3), between 25% and 50% (4), more than 50% (5) from the study of Stefan et al. (2013). Even though the dependent variable has an ordinal level, it has been measured as a continuous

variable. It has been treated as such, to take part in the regression analysis. As mentioned above, bones, peels, and food leftovers were excluded in this study. Furthermore, if people freeze their food for longer preservation, it has been excluded in this study, due to limited time resources. In addition, if food had been preserved in the fridge for consumption at a later stage (few days later) it was included. Respondents were then asked to complete the food diary on the same day that the leftovers were eaten or discarded. Clear instructions, regarding the preservation of food, were given in the introduction of the food diary. Furthermore, because the food waste was self-reported, it could result in biased estimations of the total amount of food waste. Therefore, the self-reported food waste will be a limitation in this study.

3.2.7 Centring the moderators

To analyse the moderating variables environmental knowledge, price consciousness, and quality aspects, they first had to be transformed into mean centred variables to calculate their possible interaction effect with the independent variable

3.3 Pre-test

The most recent version of the food waste diary was sent to four people (who did not participate in the actual study) for pretesting. After completing the food waste diary questions, they were asked to give their opinion on the questions, in terms of language, sentence structure and clarity, or other odd things they might come across. From these four participants in the pre-test, several small adjustments have been made, in regard to the design of the food waste diary. In addition to these small adjustments in the design, there were some slightly bigger unclarities, regarding waste itself and what it may or may not include as food waste. These feedback points have been taken into account and adjusted in the definitive food waste diary.

3.4 Data analysis strategy

The data collected from the food diaries was transferred to SPSS for further analysis. To analyse the collected data, the linear regression technique has been used. This technique is suitable for various reasons. First, two questions have been treated as dummy variables. The remaining questions were answered on a 7- or 5- point scale, so all of these variables were of metric scale. Therefore, potential linear relationships can be found. Second, linear regression analysis can be used when one wants to analyse the relationship between one dependent variable and multiple independent variables (Hair et al., 2010). In other words, it is a dependence technique analysing how the dependent variable changes under the influence of variances in independent variables. The corresponding formula is: $PFW_{it} = \beta_0 + \beta_1 MK_{it} + \beta_2 TP_{it} + \beta_3 (MK_{it} \times TP_{it}) + \beta_4 EK_i + \beta_5 (MK_{it} \times EK_i) + \beta_6 PC_i + \beta_7 (MK_{it} \times PC_i) + \beta_8 QA_i + \beta_9 (MK_{it} \times QA_i) + \varepsilon_{it}$

With Perceived food waste (PFW), meal kit (MK), type of provider (TP), environmental knowledge (EK), price consciousness (PC), and quality aspects (QA). The first regression analysis was conducted to predict the effect of cooking with a meal kit on perceived food waste. In other words, whether a meal kit would result in more or less food waste than cooking in a traditional manner. Additionally, the regression analysis also calculated the possible effect of environmental knowledge, price consciousness, and quality aspects on the relationship between cooking with a meal kit and perceived food waste. Because the moderator “type of provider” is fairly similar to the independent variable, in terms of data, it was not possible to calculate both variables in relationship to perceived food waste using the same regression analysis, due to collinearity issues. Therefore, a different regression analysis was calculated solely based on predicting the moderator “type of provider”, in relationship to perceived food waste.

3.5 Research Ethics

The data collected in this research was collected in an ethical manner, due to ensuring the respondents anonymity and confidentially. All of the respondents have received a personal email containing a link to the food diary. However, after receiving the data list, we as researchers could not see which food diary belonged to which person. Therefore, anonymity has been established. Furthermore, the respondents participated completely voluntarily and could have withdrawn at any given time . The only two issues that could have occurred was that the answers provided by the respondents might be socially desirable, as the questions were about their own behavior, in regard to a social subject. In addition, some respondents had forgotten to keep the food diary up to date, so they quickly filled in an x numbers of days in a row. It should be mentioned that the researcher warned them about this and asked them to think carefully about what they have been discarding in the previous days, before the filled in the food diary.

H4. Results

In this chapter the results are presented and the hypotheses will be answered.

4.1 Sample description

Of the total of 48 participants, 40 have completed the food diary (N=40). Therefore, the 8 participants that did not complete the food diary are assigned to missing data. The 40 participants together have contributed to 280 days of data regarding their way of cooking and their corresponding food waste. Of the participants 18 (45%) were male and 22 (55%) were female. Among the participants, the average age was 35 years with 21 years being the youngest and 75 years being the oldest. In regard to education, the mean education level is a Bachelor's degree at the university. Table 2 below lists the continuous variables with corresponding means, standard deviation, and their minimum and maximum.

	N	Minimum	Maximum	Mean	Std. Deviation
Environmental knowledge	40	1.14	4.57	3.25	0.79
Price consciousness	40	2.14	4.57	3.57	0.58
Quality aspects	40	2.60	6.27	4.92	0.82
Perceived food Waste	280	1	4	1.63	0.79

Table 2: Descriptive statistics continuous variables

4.2 Assumptions

Before the results can be interpreted, the assumptions for linear regression analysis have to be met first. To check the linearity and homoscedasticity of the regression model a scatterplot was created (see Appendix C) based on the standard residuals, or errors, and the standardized predicted values of the dependent variable based on the model. The data does not look skewed and no systematic relationship can be derived between what the model predicts and the errors in the model. In addition, polynomial terms of the independent variables were added to the model and those variables were not significant. These polynomial terms were added to test linearity. Therefore, the assumptions of linearity and homoscedasticity have been met. The plots of the assumptions can be found in Appendix C. To check the assumption of the normality of the residuals' distribution, we looked at the histogram and the P-P Plot, which can also be found in Appendix C. In addition, when this assumption is checked, using the Kolmogorov-Smirnov test ($D(280) = .327, p < .01$) and the Shapiro-Wilk test ($D(280) = .749, p < .01$) (see Appendix C), the dependent variable (perceived food waste) is not normally distributed. Because of the

fact that the dependent variable is essentially an ordinal variable, but in this study it has been treated as a continuous variable, in addition to the large amount of observations, we argue that the Kolmogorov-Smirnov and the Shapiro-Wilks test are not of great importance in this case. In this study, the histogram and P-P Plot are more important determinants for normality and according to the histogram and P-P Plot, the assumption of normality has been met. The final assumption that has to be met is the assumption of multicollinearity. When looking at the Pearson correlation matrix (see Appendix C), the highest significant correlation is between environmental knowledge and quality aspects ($r = .476$, $p < 0.01$) which is a moderate linear relationship. Furthermore, all tolerance values are above .20 and the VIF scores are under 10. In addition, A Durbin-Watson test was conducted which had a value of 1.819. Therefore, the error terms are not correlated, so this assumption is also met, as shown in Table 3. Also see Appendix C for the multicollinearity matrix to support the assumption. Next to these assumptions, we also checked for possible outliers. According to the casewise diagnostics (see appendix C), there are four cases which are possible outliers. We argue, however, that these cases do not have to be removed. These outliers may come from the fact that the dependent variable is from an ordinal level, but is treated as a continuous variable.

4.3 Regression analysis independent variable + the moderators without type of provider

The regression analysis was found to be significant ($F(7,272) = 2.563$, $p = .014$), with an adjusted R^2 of .038. In other words, 3.8% of the variance in food waste has been explained by the independent variable and corresponding moderators. As expected in *H1*, cooking with a meal kit has a negative effect on food waste ($\beta = -.364$, $p < .01$). This can be further explored by looking at the coefficient of the variable cooking with a meal kit. The variable meal kit ($\beta = -.364$) has a negative effect on perceived food waste. The negative B value in this case implies that cooking with a meal kit leads to less perceived food waste than cooking in a traditional manner. In contrast to *H3*, *H4*, and *H5* environmental knowledge ($\beta = .049$, $p = .738$) price consciousness ($\beta = -.191$, $p = .295$), and quality aspects ($\beta = -.120$, $p = .369$) do not strengthen the relationship between cooking with a meal kit and the perceived food waste. To check whether age, gender, and household size could play a role between the independent variable and dependent variable, they were added to the regression model (see Table 3). The adjusted R^2 however, did not improve and no potential significant relationships regarding the control variables and independent/dependent variables were found. Furthermore, no changes in significance of the independent variable and moderators has been found when adding control variables.

	Unstandardized coefficients		Sig.	Collinearity statistics	
	B	Std. Error		Tolerance	VIF
Constant	1.961	.222	.000		
Cooking with meal kit	-.364	.098	.000	.990	1.010
Environmental knowledge	.012	.089	.894	.438	2.284
Price consciousness	.099	.107	.926	.609	1.641
Quality aspects	.083	.087	.342	.483	2.068
Cooking with meal kit*Price consciousness	-.191	.182	.295	.554	1.804
Cooking with meal kit* Environmental knowledge	.049	.146	.738	.438	2.281
Cooking with meal kit*Quality aspects	-.120	.133	.369	.528	1.893
Gender	-.160	.109	.143		
Age	-.005	.003	.121		
Household size	.014	.050	.777		

Note: Dependent variable is perceived food waste

Table 3: Coefficients table

4.4 Regression analysis of the moderator type of provider

To test the impact of provider, only the days in which participants have been cooking with a meal kit were included (N= 97). The regression analysis was found to be not significant ($F(4,93)$, $p = .0293$), with an adjusted R^2 of .010. In other words, 1.8% of the variance in food waste has been explained by the moderator “type of provider”. In contrast to $H2$, the type of provider delivery service ($\beta = -.264$, $p = .089$) does not strengthen the relationship between cooking with a meal kit and the perceived food waste, using an alpha of .05. However, because the p-value of type of provider is .089 and when we would implement an alpha of .10, then the type of provider would be significant and $H2$ is supported. However, the alpha level of .10 is not the most accurate and there is a larger chance that the null hypothesis is incorrectly rejected. Therefore, the type of provider is marginal significant and $H2$ is partially supported. This can be further explored by looking at the coefficient of the variable type of provider, as seen in Table 4. The variable type of provider ($\beta = -.264$) has a negative effect on perceived food waste. More specifically, the negative impact of delivery service meal kits is stronger than the impact of grocery store meal kits in relation with perceived food waste.

	Unstandardized		Sig.
	Coefficients		
	B	Std. Error	
Constant	1.969	.581	.001
Provider Delivery	-.264	.154	.089
Environmental knowledge	.181	.108	.097
Price consciousness	-.115	.138	.408
Quality aspects	-.136	.094	.152

Note: Dependent variable is perceived food waste and the baseline is provider grocery store
Table 4: Coefficients table

Table 5 below lists all the hypotheses with their conclusion whether they are supported or not.

	Hypothesis	Conclusion
H1	Cooking with a meal kit has a negative effect on perceived food waste	supported
H2	Delivery service meal kits stronger negatively moderates the relationship between cooking with a meal kit and perceived food waste than grocery store meal kits.	Marginally supported
H3	environmental knowledge negatively moderates the relationship between cooking with a meal kit and perceived food waste	not supported
H4	price consciousness of consumers negatively moderates the relationship between cooking with a meal kit and perceived food waste	not supported
H5	quality aspect of the food negatively moderates the relationship between cooking with a meal kit and perceived food waste	not supported

Table 5: Hypotheses with their outcome

H5 Discussion

5.1 Theoretical implications

The purpose of this research was threefold. First, providing insight in avoidable food waste in relationship to consumers' perceived food waste. Second, investigating whether delivery service meal kits lead to less perceived food waste than grocery store meal kits in the form of a moderating variable. Third, investigating whether consumer characteristics (environmental knowledge, price consciousness, and quality aspects) could serve as a moderator in the relationship between cooking with a meal kit and perceived food waste.

The results showed that cooking with a meal kit, compared to traditional cooking, results in less perceived food waste. Therefore, this research contributes to existing literature by supporting earlier findings (e.g., Peters, 2016), regarding cooking with a meal kit and level of perceived food waste. More specifically, if consumers cook with a meal kit compared to cooking in a traditional manner, their perceived food waste is less. There was, however, a lot of unexplained variance, according to the regression analysis. This implies that cooking with a meal kit is indeed a predictor of the perceived food waste of consumers, but there is still a gap that needs to be filled with other factors to increase the predictive power of perceived food waste.

Furthermore, the results showed a marginal negative effect for the impact of delivery service meal kits compared to grocery store meal kits on the relationship between cooking with a meal kit and perceived food waste. This confirms, to some extent, the statement of earlier findings (e.g., Botanaki and Mattas, 2010; Porpino et al., 2015), that the effect of impulse buying behavior is stronger than the effect of planned behavior on the relationship between cooking with a meal kit and perceived food waste. In other words, consumers who cook with a delivery service meal kit have less perceived food waste than consumers who cook with a grocery store meal kit. However, impulse buying versus planned behavior could also explain why there is only a marginal negative effect and not a strong effect. Due to planned behavior, in the form a subscription model, consumers have to decide what to eat days in advance. As a result, they may less enjoy certain food items as planned and will therefore be discarded, while still being edible (Porpino, 2016). Another possible explanation for not finding a strong effect may come from the study of Ilyuk (2018). According to this study, products that are bought via an online channel (in this study this would be delivery service meal kits) possess lower perceptions of purchase effort resulting in diminishing experiences of psychological ownership. This could boost the intention of discarding food, rather than consuming the food. To be more specific, in this study, delivery service meal kits are bought via an online channel and could

therefore have the characteristics of lower experiences in psychological ownership. As a result, higher levels of discarding food, compared to the grocery store meal kits bought in the supermarket. This might explain the finding of a marginal effect.

By contrast, in this study, no effect is found indicating that environmental knowledge has a negative impact on the relationship between cooking with a meal kit and perceived food waste (Fraj-Anders and Martinez-Salinas, 2007). Maybe consumers believe that their behavior will not have a profound impact on the environment and therefore will not engage in this kind of behavior. In other words, consumers might not see the negative consequences of discarding food in relation to the environment. Or consumers understand the potential of meal kits reducing food waste, but at the same time be sceptical towards the amount of packaging needed for the individual products in a meal kit (Williams et al., 2012) and the way the findings are reported (Kahan, 2012). As a result, these effects both emerge and cancel each other out. Another argument could be, that the actual knowledge has not been tested, but consumers' perceived knowledge about the environment. Therefore it is difficult to investigate the actual impact of environmental knowledge, in the relationship between cooking with a meal kit and perceived food waste.

Moreover, the results of this study contrast with earlier findings that price consciousness of consumers negatively moderates the relationship between cooking with a meal kit and perceived food waste (Williams et al., 2012). One possible explanation for this could be the type of consumer that took part in this study. According to Mallinson et al. (2016) there is a difference among types of consumers related to price consciousness. The traditional consumer is the most price-conscious and casual consumers are the least price-conscious, resulting in more perceived food waste. It is possible that, in this study, a larger part of the respondents are characterized more as casual consumers and therefore not being very price consciousness. This could explain why the results in this study, regarding price consciousness, do not influence the relationship between cooking with a meal kit and their perceived food waste significantly.

Finally, the results of this study provided no evidence for a moderating effect of quality on the relationship between cooking with a meal kit and perceived food waste. This is in contrast with (Hebrok and Boks, 2017; Miroso et al., 2016). One quality aspect that was an important predictor for less perceived food waste was novelty (Mavrakis, 2014). There is, however, a possibility that consumers are cooking with a meal kit mainly based on convenience reasons and therefore novelty or trying new recipes are being neglected, and as a result there is a larger amount of perceived food waste. In addition, as the average age was 35, it could be that the

respondent was exhausted from their workday and did not want to cook something fancy, but instead quickly wanted to prepare the meal from the meal kit and therefore neglected the taste of the meal (Candel, 2001). In other words, when the convenience of consumers is more important than the taste or trying out new recipes no significant effect could be found for the quality aspects as moderator in the relationship between cooking with a meal kit and perceived food waste.

The findings of previous studies stated that environmental knowledge, price consciousness, and quality aspects all have a direct effect on food waste. This study, however, posit that incorporating these variables as moderators do not have the ability in further explaining the relationship between cooking with a meal kit and perceived food waste.

5.2 Managerial and policy implications

As this study showed a significant negative effect for cooking with a meal kit and consumers' perceived food waste, marketing managers could incorporate this finding in their advertising strategies. If marketing managers want to increase green consumer behavior - in this study this refers to reducing food waste - they could argue in their commercials that cooking with a meal kit is better for the environment compared to traditional cooking. Therefore, marketing managers could highlight the impact a consumer can contribute to a more sustainable world by cooking with a meal kit. More specifically, this is especially interesting for delivery service providers (such as HelloFresh or Marley Spoon), as delivery service meal kits have lower levels of perceived food waste compared to grocery store meal kits. However, marketing managers have to be careful how they frame their advertisements, considering the fact that environmental knowledge has no effect on the relationship between cooking with a meal kit and perceived food waste. Additionally, their advertisements should not emphasis on quality aspects of the meal kit such as taste, freshness, and health, for the same reason as for environmental knowledge. Moreover, as this study showed no effect for price consciousness on the relationship between cooking with a meal kit and perceived food waste, marketing managers should not focus on the economic benefits of cooking with a meal kit.

5.3 Limitations and future research

In this study there are several limitations that could be improved and new areas emerged for future research. First, in this study, the actual environmental knowledge and the actual food waste behavior have not been measured, as these variables were self-reported. Therefore, for future research, it would be interesting to compare the actual food waste with the perceived food waste, because this may deviate from the self-reported food waste of the respondents and

therefore not reflect the right image of the actual amount of food waste. No studies have been conducted, comparing the perceived and actual food waste, to this date. In addition, the actual environmental knowledge may deviate from the perceived knowledge of the participants. Therefore, in future research, it would be attractive to measure the actual environmental knowledge. Only then the respondents who actually have knowledge about the environment would score high, and as a result, this might enhance this moderator (environmental knowledge) in the relationship between cooking with a meal kit and perceived food waste.

Second, in terms of the design of the study, there are only 40 respondents and this might not reflect a good image, compared to the whole population. In addition, the participants were not evenly distributed in terms of age. Therefore, the findings in this study can only say something for few age categories. This could affect the results, because it is possible that certain age categories have other preferences and interests for meal kits and the way they think of food waste. Furthermore, consumers sometimes freeze their leftovers and eat them, for example next week. In this specific situation, this is not seen as food waste, while in theory this could happen. Additionally, it could be that some respondents normally do not cook with a meal kit. However, maybe the respondent wanted to participate in the study out of kindness and therefore occasionally bought a meal kit that week. This could affect the results, because buying a meal kit for the first time might be exciting, new, and they want to execute the cooking process as good as possible. This is the opposite of respondents who buy a meal kit regularly and may not enjoy the process as much as before. Despite the first and second limitation, this study provides first insights on how cooking with a meal kit could lead to lower levels of perceived food waste. In addition, the study provides first insights on the potential role of environmental knowledge as a moderator in the relationship between cooking with a meal kit and perceived food waste. In terms of future research, it would be interesting to reflect a larger part of the population. Moreover, it is also interesting to investigate the motives of consumers for cooking with a meal kit compared to traditional cooking or the reasons why consumers are discarding food.

Third, one of the assumptions of regression analysis is the independent error assumption. However, in this study we did not control for clustered error terms using the repeated measures. Therefore, the error terms are technically correlated in this study (Field, 2013). Furthermore, the dependent variable is essentially from an ordinal level. In this study, however, it has been treated as a continuous variable. To increase the validity of this study, future research should control for the potential clustered error terms. In addition, to prevent problems checking the assumptions, using an ordinal dependent variable, future research could conduct an ordinal logistic regression analysis, in order to increase the validity.

Fourth, in this study an overarching theory (the Schwartz value theory) has been incorporated to explain the intended moderators, i.e., environmental knowledge, price consciousness, and quality aspects. Instead of using the three original values of the Schwartz value theory, this study employed these three values, to explain why the moderators have been selected. Therefore, it was only an assumption, that there was a link between the three values and used consumer characteristics. Despite this limitation, this study does provide first insights on why the selected moderators could have similarities with the Schwartz value theory. For future research, an interesting venue could be investigating whether the values of Schwartz are indeed complementary to the used moderators or if they conflict, in the context of food waste behavior.

Last, in recent months, the world has been dominated by the corona virus. This has affected the obtaining of valuable data in some way. In addition, the Allerhande box had announced that they stopped offering their meal kit for an indefinite period of time, due to the corona virus. Therefore, it was harder to find consumers who buy a meal kit from the grocery store.

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Appendix A: Food diary questions

Cooking with a meal kit

1. Heeft u vandaag met een maaltijdbox (supermarkt of bezorgservice) gekookt?

Type provider

1. Welke variant maaltijdbox betrof dit?

Environmental knowledge (Mostafa, 2007)

1. I know that I buy products and packages that are environmentally safe.
2. I know more about recycling than the average person.
3. I know how to select products and packages that reduce the amount of waste ending up in landfills.
4. I understand the environmental phrases and symbols on product package.
5. I am very knowledgeable about environmental issues.

Price consciousness (Mallinson et al., 2016)

1. It is important to me that I get quality for money
2. I compare prices between various brands of the same product in order to get the best value for money
3. I notice price changes in products I regularly buy
4. I always check prices, even on small items
5. I always try to get the best quality for the best price

Quality aspects (Ryan et al., 2008)

Health

1. I prefer to buy natural products, i.e. products without preservatives.
2. To me the naturalness of the food that I buy is an important quality.
3. I try to avoid food products with additives

Novelty

1. I love to try recipes from foreign countries.
2. I like to try new foods that I have never tasted before.
3. Well-known recipes are indeed the best.

Organic products

1. I always buy organically grown food products if I have the opportunity.

2. I make a point of using natural or ecological food products.
3. I don't mind paying a premium for ecological products.

Taste

1. I find taste in food products important.
2. When cooking, I first and foremost consider the taste.
3. It is important to choose food products for their nutritional value rather than for their taste.

Freshness

1. I prefer fresh products to canned or frozen products.
2. It is important to me that food products are fresh.
3. I prefer to buy meat and vegetables fresh rather than pre-packed.

Food waste (Stefan et al., 2012)

1. How much food would you say that you throw away of what you buy for dinner?

Appendix B

Beste deelnemer,

Bedankt voor uw deelname aan dit onderzoek. Uw tijd en moeite worden zeer op prijs gesteld. De studie wordt uitgevoerd in het kader van onze master thesis aan de Radboud Universiteit Nijmegen. Alle antwoorden worden uitsluitend voor dit onderzoek gebruikt. Uw deelname is volledig anoniem en u kunt op ieder moment besluiten om te stoppen.

Dit onderzoek zal gaan kijken naar hoe u omgaat met uw avondeten, wat door u thuis is bereid en geconsumeerd. Bereiding kan plaatsvinden op de volgende drie manieren:

- **Traditioneel:** koken met losse ingrediënten, gekocht bij een fysieke supermarkt (het online bestellen en thuisbezorgen van uw boodschappen valt hier niet onder).
- **Maaltijdbox supermarkt:** koken met voorverpakte ongesneden ingrediënten van precieze porties in een box met recept, gekocht bij een fysieke supermarkt.
- **Maaltijdbox bezorgservice:** doos bestaande uit een recept, ingrediënten die voor geportioneerd zijn en vaak individueel verpakt.

Voor dit onderzoek is het belangrijk dat u, gedurende één week lang, goed in de gaten houdt of u avondeten (of gedeelten daarvan) weggooit. Elke avond, om 19:00, ontvangt u een vragenlijst hierover in uw mailbox. We willen u vragen om deze vragenlijst dezelfde avond nog in te vullen. Echter, mocht u restjes hebben die u op een later moment nog van plan bent op te gaan eten, dan kunt u de vragenlijst invullen op het moment dat deze restjes opgegeten zijn of uiteindelijk toch weggegooid. Vul dan wel de vragenlijst in van de avond waarop de restjes oorspronkelijk zijn bereid. U bent vrij om tussen X en X zelf één week uit te kiezen waarin u dagelijks (achtereenvolgens) deze vragenlijst invult. De vragenlijst bestaat uit vragen die eenmaal beantwoord dienen te worden (± 5 minuten) en dagelijkse vragen over de voedselverspilling zelf (\pm zeven keer 2 minuten).

Het gaat in dit onderzoek om al het avondeten wat u uiteindelijk weggegooid. Echter, dit avondeten moet wel bereid zijn op één van bovenstaande manieren.

Wat valt wél onder het weggooien van voedsel? Een verlopen houdbaarheidsdatum, verspilling, weggooien op de composthoop.

Wat valt níet onder het weggooien van voedsel? Voeden aan een huisdier, onvermijdbare resten zoals botten, schillen, pitten, stronken, invriezen van voedsel

We willen u vragen om de hoeveelheid voedsel dat u weggegooid te noteren als een percentage van de totale maaltijd die u heeft bereid. Mocht u nog vragen hebben over het onderzoek, kunt u altijd met een van ons contact opnemen.

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Vriendelijke groet,

Jasper Veenkamp & Bas Simons

De volgende vragen graag eenmaal aan het **begin** van uw meetweek beantwoorden

In hoeverre bent u het eens met de volgende stellingen? (1 = helemaal mee oneens, 7= helemaal mee eens)

1. Ik weet dat ik producten en verpakkingen koop die milieuvriendelijk zijn
2. Ik weet meer af van recycling dan de gemiddelde persoon

3. Ik weet hoe ik producten en verpakkingen moet selecteren die de hoeveelheid afval op stortplaatsen doet verminderen
4. Ik begrijp de milieutermen en symbolen op de productverpakking
5. Ik ben zeer goed geïnformeerd over de milieuproblemen

In hoeverre bent u het eens met de volgende stellingen? (1 = helemaal mee oneens, 7= helemaal mee eens)

1. Ik vind het belangrijk dat ik kwaliteit voor mijn geld krijg
2. Ik vergelijk prijzen tussen verschillende merken van hetzelfde product om de beste prijs-kwaliteitverhouding te krijgen
3. Ik merk prijsveranderingen in producten die ik regelmatig koop
4. Ik kijk altijd naar de prijs, zelfs voor kleine artikelen
5. Ik probeer altijd de beste kwaliteit voor de beste prijs te krijgen

In hoeverre bent u het eens met de volgende stellingen? (1 = helemaal mee oneens, 7= helemaal mee eens)

1. Ik koop liever natuurlijke producten, d.w.z. producten zonder conserveermiddelen
2. De natuurlijkheid van het eten dat ik koop, is voor mij een belangrijke kwaliteit
3. Ik probeer voedingsmiddelen met additieven te vermijden
4. Ik houd ervan om nieuwe recepten uit andere landen te proberen
5. Ik probeer graag nieuw eten dat ik nog nooit eerder heb geproefd
6. Bekende recepten zijn inderdaad de beste
7. Ik koop altijd biologisch geteelde voedselproducten als ik de kans heb
8. Ik vind het belangrijk om natuurlijke of ecologische producten te gebruiken
9. Ik vind het niet erg om iets extra's te betalen voor ecologische producten
10. Ik vind smaak in voedingsmiddelen belangrijk
11. Bij het koken houd ik vooral rekening met de smaak
12. Het is belangrijk om voedselproducten te kiezen voor hun voedingswaarde in plaats van voor hun smaak
13. Ik geef de voorkeur aan verse producten boven ingeblikt of bevroren
14. Het is voor mij belangrijk dat voedselproducten vers zijn
15. Ik koop liever vlees en groente vers dan voorverpakt

Wat is uw hoogst genoten opleiding?

- Basisschool en middelbare school
- Middelbaar beroepsonderwijs (MBO)
- Hoger beroepsonderwijs (HBO)
- Bachelor (Universiteit)
- Master (Universiteit)
- Doctoraat (Universiteit)
- Overig

Wat is de grootte van uw huishouden?

- 1 persoon
- 2 personen
- 3 personen
- 4 of meer personen

Wat is uw geslacht?

- Man
- Vrouw
- Anders

De volgende vragen graag **dagelijks** beantwoorden

Heeft u vandaag met een maaltijdbox (supermarkt of bezorgservice) gekookt?

- Ja
- Nee

(Indien ja) Welke variant maaltijdbox betrof dit?

- Supermarkt
- Bezorgservice

De volgende vraag staat in het kader van voedselverspilling.

Op een schaal van 1 tot 5 (1= helemaal niet, 2= minder dan 10%, 3= tussen de 10 % en 25%, 4= tussen de 25% en 50%, 5= meer dan 50%)

1. Hoeveel voedsel zou je zeggen dat je weggooit van wat je koopt voor het avondeten?

De volgende vragen graag **eenmaal** aan het **eind** van uw meetweek beantwoorden

In hoeverre bent u het eens met de volgende stellingen? (1 = helemaal mee oneens, 7= helemaal mee eens)

Het weggooien van voedsel vind ik niet fijn omdat..

1. Het is geldverspilling
2. Het is verspilling van kwaliteitsvol voedsel
3. Het zorgt ervoor dat ik mij schuldig voel
4. Het is slecht voor het milieu
5. Ik het mij niet kan veroorloven
6. Het is vies of laat de prullenbak stinken
7. Het geeft mij het gevoel dat ik mijn tijd heb verspild
8. Het geeft mij het gevoel dat ik niet goed heb gepland/ingeschat

In hoeverre bent u het eens met de volgende stellingen? (1 = helemaal mee oneens, 7= helemaal mee eens)

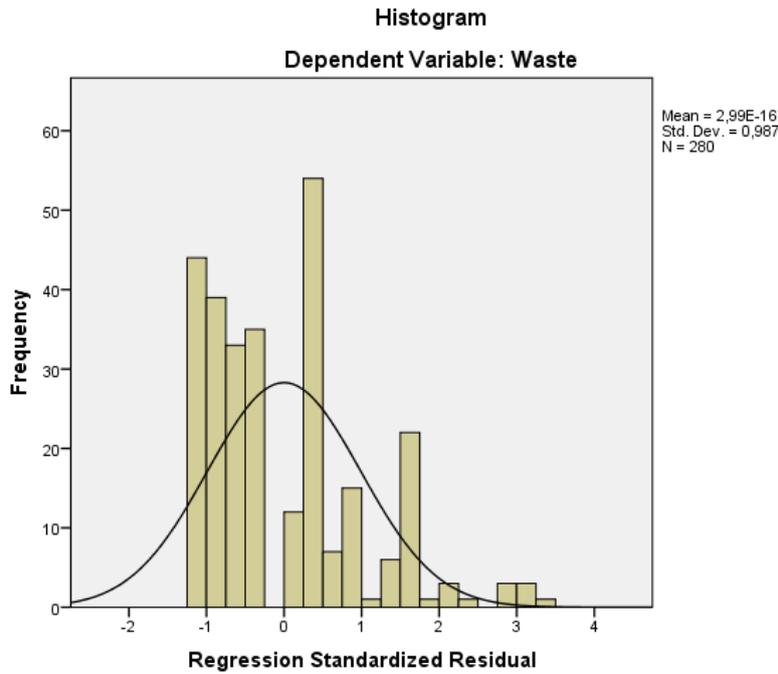
1. Ik ervaar een gevoel van schuld wanneer ik eten weggooi omdat veel mensen in de wereld niet over eetbaar voedsel beschikken
2. Om een gevoel van schuld te verminderen, ga ik er zorgvuldig voor zorgen dat ik voortaan actief let op het weggooien van voedsel

Hoe vaak participeert u in de volgende routines? (1= nooit, 7=altijd)

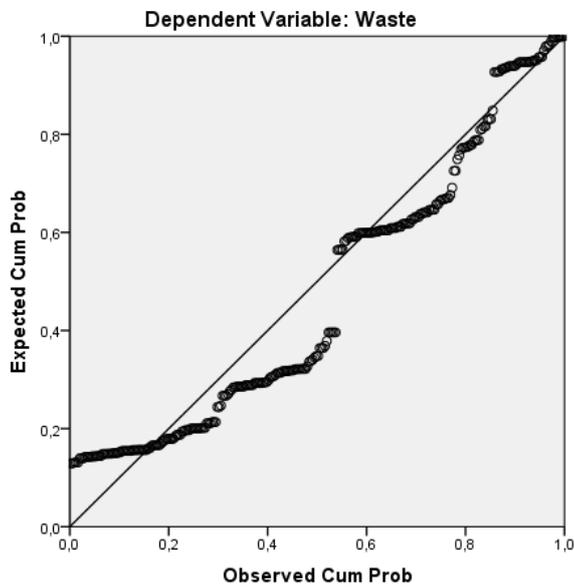
1. Het maken van boodschappenlijstje voordat je naar de supermarkt gaat
2. Het controleren van je voedselvoorraad voordat je naar de supermarkt gaat
3. Het vooruit plannen van maaltijden voor de komende paar dagen
4. Het kopen van teveel eten (meer dan je eigenlijk nodig hebt) wanneer je naar de supermarkt gaat?
5. Het kopen van voedsel wat je niet voornemens was om te kopen?
6. Het meestal kopen van grotere hoeveelheden voedsel wanneer de prijs daalt
7. Het proberen om minder voedsel te kopen om zo voedselverspilling te minimaliseren

Appendix C Assumptions regression analysis

Normality:



Normal P-P Plot of Regression Standardized Residual

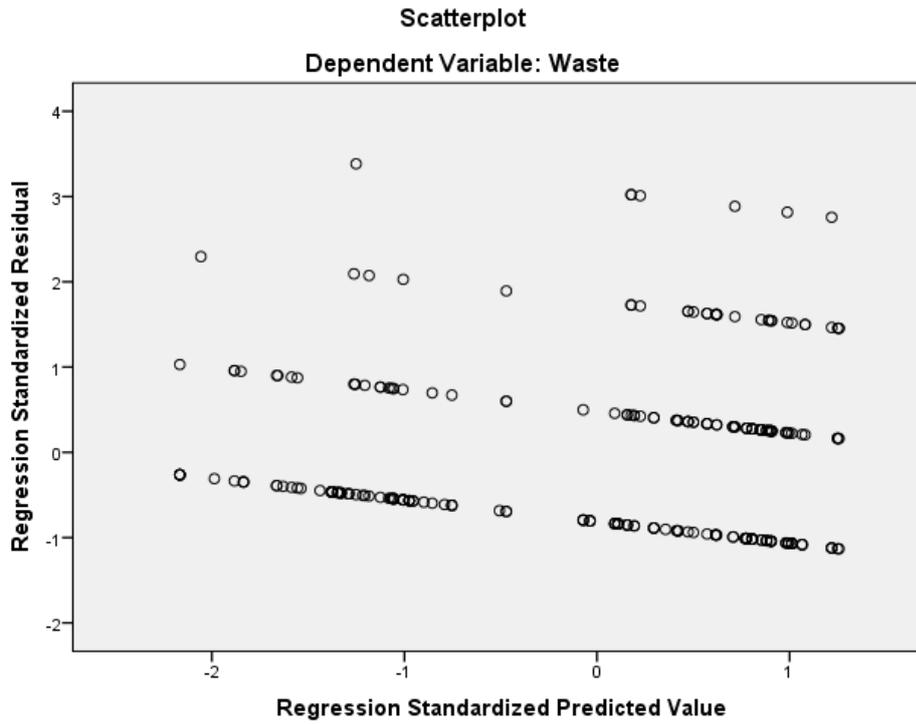


Tests of Normality

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Waste	,327	280	,000	,749	280	,000

a. Lilliefors Significance Correction

Linearity and homoscedasticity:



Multicollinearity

Collinearity Diagnostics^a

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions							
				(Constant)	c_EnvKnowledge	c_PriceCon	c_QualAspects	InteractieKoken_PPrice	InteractieKoken_EnvKn	InteractieKoken_QualAs	DummyKoken
1	1	2,642	1,000	,00	,04	,03	,03	,03	,04	,03	,00
	2	1,581	1,293	,20	,00	,01	,00	,00	,00	,00	,19
	3	1,399	1,374	,00	,00	,11	,09	,11	,00	,08	,00
	4	,767	1,855	,00	,15	,13	,07	,04	,16	,10	,00
	5	,653	2,011	,00	,15	,09	,12	,06	,13	,19	,01
	6	,405	2,554	,79	,00	,00	,00	,00	,00	,00	,79
	7	,364	2,692	,00	,00	,54	,19	,63	,02	,14	,00
	8	,188	3,745	,00	,66	,09	,51	,13	,65	,46	,00

a. Dependent Variable: Waste

Correlations

		DummyKoken	EnvKnowledgeav	PriceConavg	Qualavg	Waste
DummyKoken	Pearson Correlation	1	-,049	-,048	-,074	-,225**
	Sig. (2-tailed)		,412	,423	,218	,000
	N	319	280	280	280	280
EnvKnowledgeav	Pearson Correlation	-,049	1	,317**	,476**	,073
	Sig. (2-tailed)	,412		,000	,000	,225
	N	280	280	280	280	280
PriceConavg	Pearson Correlation	-,048	,317**	1	,114	,067
	Sig. (2-tailed)	,423	,000		,056	,262
	N	280	280	280	280	280
Qualavg	Pearson Correlation	-,074	,476**	,114	1	,015
	Sig. (2-tailed)	,218	,000	,056		,799
	N	280	280	280	280	280
Waste	Pearson Correlation	-,225**	,073	,067	,015	1
	Sig. (2-tailed)	,000	,225	,262	,799	
	N	280	280	280	280	280

** . Correlation is significant at the 0.01 level (2-tailed).

Casewise Diagnostics^a

Case Number	Std. Residual	Waste	Predicted Value	Residual
169	3,010	4	1,67	2,327
208	3,384	4	1,38	2,617
271	3,022	4	1,66	2,337
273	3,022	4	1,66	2,337

a. Dependent Variable: Waste