Master Thesis

Traditional cooking vs grocery store meal kits; a quantitative comparison of generated food waste using a food waste diary

Are grocery store meal kits able to minimize consumer food waste?

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Abstract

Grocery store meal kits, as a relatively new method of cooking, became popular in the last couple of years. These meal kits are bought in-store, include pre-portioned ingredients together with a recipe, and differ from traditional cooking in the way how meals are planned, bought, and cooked. Food preparation showed to significantly influence food waste generation, moreover, consumers are the biggest contributor to the total amount of food waste. The objective of this study was to investigate whether and how grocery store meal kits influence food waste generation, compared to food waste generation by a traditional method of cooking. 33 Dutch households used a food waste diary to report their food waste for seven days long. Data was analysed using Multiple Regression Analysis. Results showed that cooking with a grocery store meal kit negatively impacts food waste generation. Planning routines, shopping routines, and cooking skills did not significantly impact the strength of this relationship. These results are the first academic indication that grocery store meal kits assist in reducing food waste at the consumer level. Grocery store managers may use these insights in their communication on how customers can help in minimizing food waste.

Keywords: grocery store meal kits, traditional cooking, food waste, planning routines, shopping routines, cooking skills

Preface

For the reader, this preface is just the start of reading the thesis. For me as the author, writing this section is the finish of an intensive but interesting period of studying the concept of grocery store meal kits. In the autumn of 2019, my search for a thesis topic in retail and sustainability started. The topic of meal kits perfectly combined these two interests. I would first like to thank Dr. M. Hermans for the great supervisory, her expertise in the field of retail challenged and motivated me a lot. Also, thanks to all respondents who joined the study by reporting their food waste for seven days long and Bas Simons for the pleasant cooperation in this process of data gathering. Last but not least, I would like to thank my lovely friends, roommates, and family for supporting me during the last six months, especially in times of COVID-19.

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Table of contents

1. Introduction

Due to advanced technologies and market developments, retail business actors adapt their strategies continuously (Kumar et al., 2017). In line with this, the Dutch National Institute for Public Health and the Environment demonstrates that Dutch people's lifestyle is changing; people allocate less time for cooking and more people opt for healthy and sustainable food (Geurts et al., 2017). Additionally, a need for convenience food products emerged from the way people used to live (Brunner et al., 2010). Convenience food products are defined by Brunner et al. (2010) as: "Those that help consumers minimize time as well as physical and mental effort required for food preparation, consumption, and cleanup" (p. 498) (Candel, 2001; Darian & Cohen, 1995). This trend is apparent in The Netherlands as well, where convenience food has increasingly grown in popularity among Dutch consumers (Entree, 2019) and is one of the main boosting categories (Fitch Solutions, 2019). Recent figures confirm the popularity in Europe; the total revenue is €55,640 million and the market is likely to grow by 2,4% to 2023 (Statista, 2020). For the Netherlands, the total revenue is €1,529 million, and the market is expected to grow by 1,4% to 2023 (Statista, 2020a).

1.1   Meal kits

Meal kits, e.g. provided by the delivery service Blue Apron, are a form of convenience food (Peters, 2016) and are defined by Heard et al. (2019) as "Ingredients for cooking a meal that are pre-portioned, packaged, and delivered to a consumer's residence'' (p. 189). Meal kits are an alternative to a more traditional method of cooking, which is defined by Heard et al. (2019) as "Preparing meals from ingredients purchased at a grocery store'' (p. 189). Middagsfrid started delivering meal kits at consumer's homes back in 2007 in Sweden (Middagsfrid, 2020), De Krat claims to be the first in The Netherlands in 2010 (De Krat, 2020). However, Albert Heijn introduced another variant of meal kits in 2013 (Hielkema, 2018). These grocery store meal kits (GSMK) can be bought in-store and via online grocery store shopping. These GSMK are usually called 'verspakketten' in Dutch and became increasingly popular. Research by Motivaction (Hielkema, 2018) showed that in 2018 a third of the Dutch households bought a meal kit occasionally, almost half of the Dutch households bought a meal kit for soup. Furthermore, the research showed that GSMK are usually not prepared daily. Albert Heijn and Lidl are the first market leaders with respect to GSMK (Meijsen & Te Pas, 2018). At the end of 2019, Jumbo noticed GSMK sales rising significantly (Van Rijswijck, 2019). In total, the sales of GSMK increased by almost 40% in 2019 (Van Rijswijck, 2020) and the revenue has

risen from €6 million in 2014 to €26,3 million in 2016 (Rensen, 2018). GSMK even negatively impact the popularity of meal kits provided by delivery services (Meijsen & Te Pas, 2018). Therefore, although two variants of meal kits do exist, GSMK are the main focus in this study.

1.2   Food waste

Prior research showed the capabilities of delivery service meal kits in reducing the impact on the whole supply chain (Heard et al., 2019; Gee et al., 2019) and in reducing the amount of food waste (Peters, 2016). Dutch grocery store and market leader Albert Heijn suggest that GSMK also provides this food reducing capability (Albert Heijn, 2020). Since consumers are the ones who add the most to the total bulk of wasted food (Griffin et al., 2009), prevention in the last stage of the supply chain at the consumer level is essential. This can be confirmed by the fact that households are the main contributor (53%) to Europe's food waste (Stenmarck et al., 2016) and The Netherlands (60,2%) (Van Dooren et al., 2019). Globally about one-third (±1.3 billion tons/year) of person consumption-food is wasted (Gustavsson et al., 2011). In The Netherlands, 34,3 kg/person/year of solid food is wasted by households in 2019. This is a downward trend in comparison to 2016 (-17%) and 2010 (-29%). More in detail, in particular leftovers and vegetables, fruit & garden (VFG) are wasted (Van Dooren, 2019a). Another research, from 2016, shows more alarming results. This research (CREM Waste Management, 2017) found that 62,2 kg of food is wasted by Dutch residents. However, 32,7 kg of this waste could be avoided and 4,3 kg of this amount consisted of food prepared by themselves. The Dutch Ministry of Agriculture, Nature and Food Quality has the objective to half the amount of wasted food in 2030 in comparison to 2015 (Van Dooren, 2019a).

1.3   Contributions

Prior research showed that the effects along the full supply chain on environmental issues (e.g. global warming) are limited for delivery service meal kits (Heard et al, 2019), delivery service meal kits require less transit and retail energy usage (Gee et al., 2019) and delivery service meal kits are able to reduce food waste (Peters, 2016). However, the research by Peters (2016) has several limitations as the study is not academic and only has measured the effect of the Blue Apron meal kits only. Importantly, no scientific research exists on particular GSMK and their influence on food waste. This is a problem since food preparation seems to have a considerable share in generating food waste (CREM Waste Management, 2017) and GSMK are considered to be a relatively new and increasingly popular method of cooking in The

Netherlands. Secondly, a deeper insight into the last stage of the supply chain, at the consumer/household level, is needed. The introduction as stated above showed that reducing the amount of food waste at this level is crucial (Griffin et al., 2009) and that there is room for improvement, i.e., certain amounts of waste could have been avoided (CREM Waste Management, 2017). In general, avoidance of food waste has pro-environmental opportunities (Gentil et al., 2011; Matsuda et al., 2012) and processing food waste even damages the environment (Scherhaufer et al, 2018). Dutch grocery stores, suppliers of GSMK, have a key position in the context of this topic since they can influence consumer behavior by offering small portions of food (Janssen & Van de Hei, 2018).

Although product attributes of the two variants of meal kits overlap, it cannot be assumed that findings on delivery service meal kits directly apply for GSMK. These two variants of meal kits differ especially in the way how food is planned and bought. More in detail, the meal kits are supplied differently. Business magazines seem to refer especially to in-store buying of grocery meal kits (Marlisa, 2019; Rabobank, 2019). An inspection of the website of the Dutch market leader Hellofresh (AGF, 2019), shows that ordering and changing a delivery service meal kit is to be done online (Hellofresh, 2019). GSMK are also provided by supermarkets online. However, only 4% of the total grocery store revenue is created via online channels (Rabobank, 2019). Although this percentage is expected to grow in the coming years (Rabobank, 2019), at the moment of writing this master thesis the online channel for grocery store shopping is just a niche. These results suggest that delivery services meal kits are sold through the online channel, whereas GSMK are sold offline. The purchase channel (online vs. offline) seems to influence the generation of food waste; research showed that buying food online increases the likelihood of food waste generation (Ilyuk, 2018). Also, factors such as impulse buying are relevant. A consumer is exposed to a bulk of products in a physical grocery store, whereas suppliers of delivery service meal kits mainly focus on their core product. Impulse buying is identified as one of the main contributory factors that lead to wasting food (Parfitt et al., 2010). Furthermore, there is a discrepancy in how meals are planned. Delivery service meal kits are usually supplied once for a whole week, while GSMK are supplied for a single meal. This suggests that GSMK are more flexible in nature.

1.4   Objectives

This study has the objective to investigate whether and how GSMK influence food waste generation, compared to food waste that is generated by a traditional method of cooking.

Furthermore, this study is aimed to provide a deeper insight into the generation of food waste at the last stage of the supply chain, at the consumer/household level. No scientific research exists yet on the topic of GSMK, this study is a first academic attempt on this topic. Therefore, studying particular the concept of food waste generation by GSMK will be the main focus. GSMK seems to be a unique concept and is distinguished from a traditional method of cooking in how meals are planned, ingredients are bought in-store, and dinner is prepared by the consumer. Prior research (Ganglbauer et al., 2013) showed that these factors are also related to the generation of food waste itself. Therefore, this study not only investigates whether GSMK influence food waste generation, but also how factors such as planning routines, shopping routines, and cooking skills may influence the strength of this relationship. This study will provide managers working in retail insights in food waste generation by GSMK versus traditional cooking. Furthermore, this allows study them to advise consumers under what conditions GSMK are useful in the context of reducing food waste generation. To conclude, the central question of this study is: how does cooking with a grocery store meal kit influences consumer food waste generation, compared to food waste generated by a traditional method of cooking?

1.5 Outline

Now that the area of interest and objectives of this study are introduced, the relevant literature on food waste, convenience food, and meal kits will be analysed in the second chapter. A framework will then be developed and hypotheses will be formulated in the third chapter, while afterward in the fourth chapter the method of gathering and processing data will be described. Furthermore, the last chapter consists of the implications and limitations of this study, along with suggestions for future research.

2. Literature review

2.1 Food waste

There is worldwide attention in the literature on the generation of food waste, predicting and avoiding it, and consumer behavior towards it (Stefan et al., 2013; Stancu et al., 2016; Ghinea & Ghiuta, 2019; Graham-Rowe et al., 2015; Quested, 2013). The concept of food waste can be defined as: "Excess ingredients that are not used for the prepared meal or subsequent meals, as well as uneaten portions of the meal that are discarded" (Heard et al., 2019, p. 191). Multiple studies measured the concept of (household) food waste before, these are useful since GSMK are intended to be prepared at consumer's home.

Several studies focused on drivers and how to avoid food waste, especially household food waste. Janssens et al. (2019) found that, due to Dutch consumer shopping behavior (e.g. certain routines), more food is being wasted and a higher intention of reducing food waste does not directly result in minimizing food waste. The role of routines is also present in two other studies. First, Stancu et al. (2016) focused on the determinants and found perceived behavioral control, shopping routines, and using leftovers again as the leading factors towards wasted food. Second, a study on preventing food waste, showed that planning routines (e.g. checking the stock), and shopping routines (e.g. purchasing more food than needed) can forecast the amount of food being wasted by customers (Stefan et al., 2013). Furthermore, food waste occurs due to the behavior of various people in a household (Van Dooren et al., 2019). Another study, among a young sample, found that the date of expiration is the central explanation of why they act in wasting food (Ghinea & Ghiuta, 2019). Quested et al. (2013) studied the behavior towards wasting food and concluded that different interacting actions and their contextual factors can boost the bulk of wasted food. A study on household food waste across several European countries found socio-demographics leading to different amounts of food waste, e.g. gender, age, and education level (Secondi et al, 2015).

The above studies mainly focused on the food that is perceived to be wasted by consumers. These studies used a Likert-scale to let consumer self-report their food waste as a percentage of their total dinner being prepared (Stefan et al., 2013; Stancu et al., 2016; Janssens et al, 2019). However, these studies focus on food waste behavior in general, e.g. amount of food waste in a normal week as in Stefan et al. (2013). All of them noticed that self-reporting has some limitations, e.g. wrong evaluation of the actual amount of food that is wasted (Stefan et al., 2013; Stancu et al., 2016; Janssens et al., 2019). Food waste has not been measured daily,

which might be an explanation for this statement. No specific reasons for still choosing this questionnaire method by the above studies are given. However, a second method to measure food waste was found in the literature. A study on household food waste and packaging used a food waste diary and let participants weigh their food waste for seven days (Williams et al. 2012). This study shows that a certain food waste diary is a more precise way to measure the food that is actually wasted. Also, a study that compared methods to measure food waste, found that people report less food waste in a questionnaire compared to a waste diary (Giordano et al., 2019). The main differences between these two methods are the intensity (weekly vs daily) and reporting method (self-reporting based on a Likert-scale vs using a physical scale to weigh food waste).

Furthermore, food waste does not appear suddenly, several tasks before serving the final meal are likely to be related. A qualitative practical-oriented study on concerns around food waste showed that food waste occurs due to several unified activities (Ganglbauer et al., 2013). These activities are *shopping*, which exists of the planning of groceries to buy and the activity of shopping itself, *food management in the household,* which exists of storing the food, cooking the food, and the usage of available ingredients and *gardening,* which exists of planting of foods.

2.2   Convenience food

People's changing lifestyles, such as changing household sizes and technological modernization, have led to the introduction of convenience food (Buckley et al., 2007). According to Warde (1999), convenience food can be seen as a reaction to difficulties in people's temporal daily life scheduling. Furthermore, convenience food is linked to a lack of time available and the fact that people are not always in the right place. However, following another definition, not only the time-aspect seems to be important: "Food products as those that help consumers minimize time as well as physical and mental effort required for food preparation, consumption, and cleanup." (Brunner et al., 2010, p. 498). The study of Swoboda and Morschett (2001) also confirms this by linking convenience food to be convenient in buying, simple to arrange, small portions, and direct and fast consumption. According to these studies, convenience food seems to be a broad concept. However, looking in more detail at the items in the study of Brunner et al. (2010), convenience food is mostly referred to eat-ready (frozen) meals and components, fast-food and sliced salads and thereby focussing on direct consumption. One study linked convenience food particularly to food waste. Mallinson et al.

(2016) investigated convenience food among a young target group and found that food waste correlates with buying convenience food. Furthermore, the study reflects the role of cooking skills, planning, time invested in cooking, and the size of a household. The study also found that dissolution dinner time leads to more dependence on convenience food. Looking at the items used in this study, it can be seen that they are mostly referred to as 'eat ready meals', 'go out for a meal', 'takeaway', 'ready meal in can', 'meat already crumbled'. This closely matches the above items used by Brunner et al. (2010) and confirms that convenience food seems to have a major focus on direct consumption.

2.3   Meal kits

Meal kits are a rising method of preparing food and have the ability to limit the amount of household food waste (Heard et al., 2019). As mentioned earlier, there are two variants of meal kits: meal kits which are delivered at home (delivery service meal kits), followed a couple of years later by the introduction of meal kits which can be bought in a physical grocery store, namely GSMK. There are some differences between these two variants. The crucial difference is the delivery part and is recognized in the following definition of meal kits by Heard et al. (2019): "Meal kits contain ingredients for cooking a meal that are pre-portioned, packaged, and delivered to a consumer's residence" (p. 189). The final part is not applicable for GSMK, since these are intended to be purchased in-store, so a shorter phrase of Heard et al. (2019) will fit better as definition to continue with: "Meal kits contain ingredients for cooking a meal that are pre-portioned and packaged" (p. 189). Furthermore, the article (Heard et al., 2019) identified the role of an attached recipe and the subscription in delivery service meal kits. GSMK do provide a recipe, however, no subscription is needed which makes them a bit more flexible. In addition, delivery service meal kits provide ingredients and several recipes in a box for one complete week, where GSMK are packaged for actually one meal. Focusing on the recipes of Dutch delivery service meal kit market leader HelloFresh and Dutch grocery store market leader Albert Heijn, Hellofresh offers a wider range of and more comprehensive recipes to choose from. These facts demonstrate that the conditions under with the meal kits are offered do differ: the way of facilitating, flexibility, size of the box, and range/comprehensiveness of recipes. According to the definition of Heard et al. (2019) as stated above, the concept itself of meal kits in the general overlap.

Inspecting the assortment of the three grocery stores mentioned in the introduction (Albert Heijn, Lidl, and Jumbo), the offered vegetables in GSMK are regularly unsliced and

the variants can be divided into 'soups' and 'meals' for dinner. Combining these facts to the elements of meal kits above, this study will include meal kits for soup and meals for dinner, with unsliced pre-portioned ingredients, supplied in a box with a recipe in a physical grocery store. Every form of cooking that is not linked to these elements, will be assessed as traditional cooking. This matches the definition of Heard et al. (2019): "Preparing meals from ingredients purchased at a grocery store." (p. 189), who assess delivery service meal kits as a substitute to a traditional form of cooking. The definition seems to refer to the preparation of individual ingredients that are not pre-packed. Furthermore, a study of Gee et al. (2019) on meal kits defines the counterpart of delivery service meal kits as "The same meal made from groceries" (p. 2). Also, the introduction showed that online grocery store shopping can be seen as a niche. Therefore, this research will only focus on GSMK bought in a physical grocery store.

The question is: are meal kits a form of convenience food as clarified above? From the perspective of time and ingredients, this can be true because both convenience food and meal kits include pre-portioned ingredients which are time-saving. However, looking at the items of Mallinson et al. (2016) and Brunner et al. (2010), convenience food seems to have a major focus on direct consumption. This is not the case for meal kits: meals are not ready to eat, only minor changes on ingredients have been made. The time-saving aspect of meal kits comes from the fact that ingredients are pre-packaged and pre-portioned together with a recipe, it seems that the time-saving aspect of convenience food arises especially from the 'eat-ready'-aspect. In addition, Warde (1997) argues that convenience food leads to less responsibility in cooking. Meal kits do reduce the responsibility of buying the ingredients because the selection is outsourced to the retailer. However, in cooking the meal the responsibility has just reduced limitedly since only the recipe helps you to not fail in the process. For these reasons, this study will not treat meal kits as a form of convenience food. The above analysis suggests that meal kits created a whole new category, especially because of the increasing popularity in the last couple of years and the distinction that is made to eat-ready-meals in calculating revenue figures (Rensen, 2018). Furthermore, convenience food will not fall in the scope of this study and therefore not be assessed as traditional cooking, since the eat-ready-aspect do not match the definitions of Heard et al. (2019) and Gee et al. (2019) who explicitly refer to the preparation of the meal. Food that only needs to be heated, e.g. in a microwave, will also be evaluated as convenience food in this study.

GSMK are a relatively new method of grocery store cooking, therefore no academic studies exist on this topic. However, the literature on delivery service meal kits will be useful since the concept of GSMK in general, except for how the meal kits are supplied, do correspond

to the concept of delivery service meal kits. A study on the energy usage of delivery service meal kits and a traditional way of shopping groceries (Gee et al., 2019) found that although the decreasing energy use of delivery service meal kits because of lower transportation, meal-kits need more packaging and relates to negative effects of certain consumer shopping behavior. However, these results depend on consumers, e.g. their habits and place where they live. Heard et al. (2019) studied delivery service meal kits and regular grocery store food products along the full supply chain. The result was a bit surprising; delivery service meal kits showed fewer impact on environmental issues.

2.4   Framework & conceptual model

The introduction and literature review showed that GSMK are a relatively new and popular method of cooking. GSMK seems to gain even more market share in the near future since delivery service meal kits are losing ground (Meijsen & Te Pas, 2018). In addition, more attention to reducing food waste is needed, especially at the consumer level according to the results by Griffin et al. (2009), in order to achieve the objective to half the total bulk of food waste in The Netherlands (Van Dooren, 2019a). Since GSMK are an alternative to traditional cooking, a comparison of generated food waste is necessary in order to determine whether explicit GSMK are able to minimize consumer food waste. Therefore, the concept of food waste will be assessed as: 'perceived food waste of GSMK, compared to perceived food waste of traditional cooking'. Although packaging has been identified as a downside of meal kits (Gee et al., 2019), this study will exclusively focus on food waste generation in the last stage of the supply chain, where consumers are involved. The main argument is that no academic research exists on food waste generation by GSMK, studying the concept of food waste generation at the consumer level is therefore the primary step to be taken in order to achieve above Dutch objective.

Furthermore, the study of Ganglbauer et al. (2013) suggests that cooking a meal consists of three main activities: planning the meal, shopping for the meal, and preparing the meal. Consumers may have certain *planning routines* and *shopping routines* before and during grocery store shopping. Additionally, *cooking skills* are likely to reflect consumer's ability in storing the food, the creativity in using ingredients (or reuse leftovers) in meals, and succeeding in the cooking process itself. Since GSMK provides all vegetables needed, gardening seems to be not related to the current study. While the research of Ganglbauer et al. (2013) refers to

direct effects on food waste, some features of GSMK give reasons to believe that these instead moderate the relationship between cooking with a GSMK and food waste.
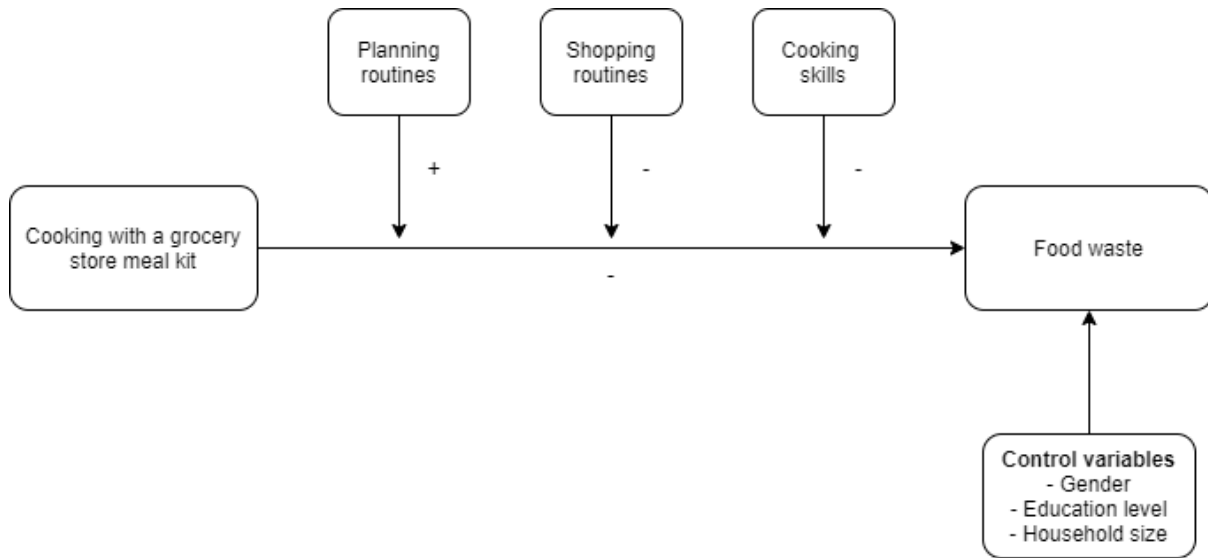

Figure 1: conceptual model

Food waste generated by cooking with a grocery store meal kit, compared to food waste generated by traditional cooking

The literature showed that delivery service meal kits provide several environmental advantages in comparison to a regular grocery store shopping (Gee et al., 2019; Heard et al., 2019), studied from broad (full supply chain) perspective including energy requirements and food waste. In a more narrow view, exclusively focusing on food waste in the last stages of the supply chain, Peters (2016) found that delivery service meal kits actually are able to reduce food waste. A non-commercial organization measured both the packaging process and consumer behavior. The amount of food before and after preparing the meal kits was measured and a survey was distributed to 2000 customers. Together, the results reveal that Blue Apron and consumers wasted 62% less food in comparison to grocery store shopping for the same recipe. Although findings on delivery service meal kits cannot be directly copied for GSMK since the variants of meal kits differ in how food is planned and bought, the product attributes itself showed to overlap. This gives the first indication that both GSMK and delivery service meal kits are able to reduce food waste. Furthermore, one of the product attributes in a GSMK are the pre-portioned ingredients. Quested et al. (2011) found that packages including precise amounts of food help in a strategy to minimize food waste. Another product attribute in a GSMK is the attached recipe. A study by Quested et al. (2013) noticed that recipes can support in creating

13

awareness for food waste reduction. These results confirm the indication above and therefore suggest that GSMK are able to minimize food waste compared to traditional cooking.

H1: cooking with a GSMK has a negative effect on food waste, compared to food waste generated via traditional cooking.

Planning routines

Several studies found direct effects for the role of planning routines, e.g. Stefan et al. (2013) in the avoidance of food waste. Planning routines, defined as "Planning of shopping and meals" (Stefan et al., 2013, p. 376) refer to activities before visiting the grocery store, e.g. thinking about what to buy by checking the stock, making notes about what to buy and planning dinners in advance (Stefan et al., 2013). Planning routines in the purchase stage are important since for a number of people it may avoid the wrong estimation of the inventory, which could result in buying more food than actual needed (Chandon & Wansink, 2006). Furthermore, Bell et al. (2011) found that a broad objective when shopping (which implies limited planning activities) leads to buying products that were not planned to buy. So, if consumers have certain planning routines, less food is being wasted (Bell et al., 2011; Stefan et al., 2013; Chandon & Wansink, 2006).

However, the literature review showed that one of the main benefits of GSMK is that almost all ingredients are already pre-packaged. Just a few ingredients might be excluded in the GSMK, e.g. fresh meat. On the one hand, planning routines aspects of thinking about what to buy and making notes seem therefore to be less needed in cooking with a GSMK. On the other hand, the planning of dinners in advance may still be present, since GSMK provides ingredients for just one meal.

The above findings suggest planning routines to play a less important role in cooking with a GSMK compared to traditional cooking. From a food waste perspective, having planning routines when traditional cooking will probably cut back food waste stronger compared to having planning routines when cooking with a GSMK. This implies planning routines to operate as a positive moderating variable in current research.

H2: Planning routines positively moderates the effect of cooking with a GSMK on food waste.

Shopping routines

Several studies found direct effects on the role of shopping routines, e.g. Soorani and Ahmadvand (2019) studied a person's food managing behaviors to cut back food waste. Shopping routines, which are frequently followed in the buying phase (Maubach et al., 2009), can be defined as "Excess purchasing of food" (Stefan et al., 2013, p. 176). These routines, compared to earlier mentioned planning routines, refer to activities in the store, e.g. purchasing more food than needed or food that was not planned to buy (Stefan et al., 2013). So a higher level of shopping routines, correspond to purchasing more food. A study by Evans (2012) found that people do buy more food in-store than they actually need. According to the literature, these shopping routines impact food waste: impulse buying is identified as a factor in wasting food (Parfitt et al, 2010) and Stefan et al. (2013) found that if consumers have certain shopping routines, more food is being wasted.

However, the introduction and literature review showed that GSMK match the changing lifestyle where consumers allocate less time for cooking (Geurts et al., 2017). Since ingredients are already pre-packaged in a GSMK, consumers are likely to allocate a lower time for doing groceries. A study on the effect of shopping time and store environment on buying behavior (Park et al., 1989) found that store-communication is more effective when consumers are not short on time for doing groceries. According to the study, this results in more items bought in an impulse. Furthermore, the ingredients in the GSMK are combined into one product, which leads to the purchase of less grocery store items when cooking with a GSMK. A shopping trip for a high amount of grocery store items leads to more impulse buying since a consumer is revealed to more product promotions (Kollat & Willett, 1967).

The above findings suggest that consumers with higher levels of shopping routines can reduce food waste even more when cooking with a GSMK compared to traditional cooking. Also, consumers with lower levels of shopping routines are already in control of their shopping and therefore likely to less benefit from a GSMK in the view of food waste reduction. This implies shopping routines to operate as a negative moderating variable in current research.

H3: Shopping routines negatively moderates the effect of cooking with a GSMK on food waste.

Cooking skills

Several studies found direct effects for the role of cooking skills, e.g. a qualitative study of Graham-Rowe et al. (2014) on positive and negative factors in cutting back household food waste in the UK. Cooking skills can be defined as "The ability to prepare different foods."

(Hartmann et al., 2013, p. 129). The study mentioned above showed that people who were convinced to have skills in cooking food and storing were more capable to minimize food what is being wasted (Graham-Rowe et al., 2014). Similar, according to Papargyropoulou et al. (2014), lacking skills in preparing food is one of the triggers of food waste. One explanation for these findings might be that consumers with higher levels of cooking skills, do have more knowledge on how to prepare the right portions, minimize the risk of failing in the cooking-process itself, e.g. how to avoid burning, and how to reuse leftovers. These findings suggest that, for traditional cooking, cooking skills are essential in cutting back food waste.

However, the literature review showed that the uniqueness of GSMK comes from the combination of pre-portioned ingredients together with a recipe. These elements are likely to help the consumer in preparing the meal as intended, to not fail in the cooking process itself, and to generate as little as possible leftovers and waste. Therefore, although basic cooking skills are needed, it is likely that consumers with lower levels of cooking skills are still able to prepare a tasty meal and minimize waste.

The above findings suggest that having certain cooking skills is less essential in preparing a meal with a GSMK compared to traditional cooking. Consumers with higher levels of cooking skills and cooking with a GSMK will probably reduce even more food waste compared to traditional cooking. This can be explained by the fact that not only their cooking skills support this consumer in avoiding waste or failing in the cooking process, but also the pre-portioned ingredients and attached recipe in the GSMK. For the same reason, consumers with lower levels of cooking skills will probably have a higher chance of failing in the cooking process, and with that generating waste, in traditional cooking compared to cooking with a GSMK. This implies cooking skills to operate as a negative moderating variable in current research.

H4: Cooking skills negatively moderates the effect of cooking with a GSMK on food waste.

Control variables

Three variables will function as control variables, since the literature review showed that contextual factors and socio-demographics are likely to influence food waste generation (Quested et al., 2013; Secondi et al., 2015). Specifically, women may be stronger focused on and put more effort into performing waste reducing-behavior than men (Secondi et al., 2015; Barr, 2007). A similar result was found for consumers leaving school at a young age (Secondi et al., 2015). This suggests that education level is a determinant of food waste, which is

confirmed in the study of Van Dooren et al. (2019). Furthermore, the study of Koivupuro et al. (2012) indicates that more food is being wasted in bigger households.

3. Methodology

This quantitative study investigates whether and how cooking with a GSMK is able to minimize consumer food waste generation waste compared to traditional cooking.

3.1 Research design

A quantitative approach was applicable since this study measured the food waste performance of different methods of cooking and numeric values were used (Field, 2013). By quantifying, food that was wasted by consumers could easily be reported within predetermined boundaries. In this way, vague and multi interpretable such as 'a bit', 'almost nothing', and 'quite a big part' are avoided. For reporting food waste, a food waste diary is used. A food waste diary is a method to report the amount of wasted food and a certain reason for wasting (Williams et al., 2012). This method has been used before in a study on a person's drivers for household food waste and packaging (Williams et al., 2012). However, since this study was a first academic attempt on the topic of GSMK, the focus was exclusively on the relationship between GSMK and food waste and factors that might influence the strength of the relationship. So, elements of packaging and consumer reasons for wasting behavior are not included. Although, this method was still useful since it was able to capture a person's daily food waste over a period of time and test for moderating effects.

3.2 Sampling

Selection criteria

Four criteria are followed in selecting respondents. For a start, only respondents who have prepared a GSMK before are invited to participate. In this way, results would not be biased by respondents who waste due to misunderstanding the concept of cooking with a GSMK. Second, preferably respondents who prepare a GSMK regularly (e.g. once a week) are selected. To reflect this in the outcomes, respondents are asked to prepare at least once a GSMK in their measurement week. Third, respondents needed to have at least a bit of experience with cooking. It could be expected that someone in a mature life period, does have some experience. Therefore, a minimum age of 18 years old has been applied. Fourth, people who possessed detailed information on the objective of the research are not invited since these people might have changed their behavior. The pre-announcement, later explained in this chapter, has set boundaries on what a respondent was permitted to know about the study.

Selection

Searching for respondents is initially to be done via the researcher's network. This is a form of convenience sampling, a non-probability method, which leads to limitations in generalizing the results (Sekaran & Bougie, 2016). However, as mentioned earlier, the current study is the first academic attempt on the topic of GSMK. According to Sekaran & Boogie (2016), convenience sampling is an appropriate technique to gather some first knowledge in a limited time. In addition to the researcher's network, some respondents are found via the network of people who already joined the study, due to their enthusiasm.

Pre-announcement

Research found that people are just limitedly aware of their household wasting behavior (Ventour, 2008; Giordano et al., 2019). Increasing the noticeability of food waste for consumers, via a pre-announcement, will result in more valid and reliable outcomes (Van Herpen et al., 2019). However, this pre-announcement might result in respondents changing their food waste behavior, even after highlighting that they shouldn't change this (Van Herpen et al., 2019). For this reason, respondents in current research are just minimal introduced to the topic. The pre-announcement, based on Van Herpen et al. (2019), did include an instruction for consumers to be focused on their food waste, when to report their food waste, and what can exactly be seen as food waste. In this way, consumers were more aware of the food that is being wasted, but the likelihood of changing their regular behavior remained limited. The pre-announcement is incorporated in the food waste diary introduction (see appendix B).

Size

Prior research using a food waste diary (Williams et al., 2012) included 61 households, which were divided into two groups: thirty households with educated knowledge about environmental concerns and 31 households without educated knowledge. The current research also contains a distinction: respondents cooking with a GSMK compared to respondents cooking traditional. Although, due to the selection criteria set, one respondent was able to gather data for both methods of cooking. Therefore, the sample size of around one group in the study of Williams et al. (2012) was sufficient: ±30 households who prepared at least once a GSMK in their measurement week.

Duration

The research of Williams et al. (2012) let households measure their food waste one week long

19

and let them be able to choose their measurement week by themselves in a time-frame of two months. Due to the limited time available, current research on GSMK and food waste had a time-frame of three weeks (between 22 April and 12 May 2020), wherein respondents could choose by themself one week for reporting their food waste. Ideally, respondents cooked seven days consecutively. However, convenience food falls outside the scope of this study. Likely is that respondents may decide to consume occasionally food that directly can be consumed or food that only needs to be heated, e.g. (frozen) pizza. Therefore, respondents were allowed to ´pause´ there measurement week on these days in order to still have seven days of food waste measuring.

3.3   Operationalization

A combination of two methods in literature to measure food waste has been applied: measuring food waste by self-reporting as in Stefan et al. (2013), Stancu et al. (2016) and Janssens et al. (2019), using a food waste diary on daily basis as in Williams et al. (2012). Applying this combination, the limitation of wrong evaluation in self-reporting has been solved by reporting food waste daily instead of reporting regular food waste behavior. In this way, respondents were more likely to remember what exactly has been thrown away and therefore the reported amounts of food waste were more accurate. The food waste diary has captured these amounts.

The food waste diary is operationalized in cooperation with a colleague master-student investigating a similar topic of interest. Therefore, delivery services meal kits have also been incorporated as a method of cooking, such as several items investigating variables that are not relevant in current research. Furthermore, the food waste diary consisted of items investigating feelings of guilt. However, this variable has not been included in the final conceptual model. A full copy of the food waste diary can be found in appendix B. In this copy, items related to the colleague master-student and items on a feeling of guilt are excluded to avoid disorientation.

The food waste diary

The food waste diary consisted of several segments, based on Williams et al. (2012). First, respondents were introduced to the topic and research goal of the study. Second, respondents were pre-announced based on Van Herpen et al. (2019) and provided with examples of what belongs to food waste. Third, respondents were explained how to fill in the food waste diary and how to report their waste. Furthermore, respondents were reminded to stick to guidelines

related to the recent Corona-pandemic. Fourth, the food waste diary started by asking questions about cooking skills and some socio-demographics. Fifth, food that actually was being wasted could be reported daily. Sixth, questions on planning routines and shopping routines were asked. These items are shown at the end of the measurement week since they were likely to influence consumer behavior.

Reporting the waste

Daily reporting of food waste consisted of the method of cooking (GSMK, delivery service meal kit, traditional), and the corresponding amount of food waste. Furthermore, as mentioned, respondents were explained what actually belongs to food waste. Unavoidable waste (Williams et al., 2012), e.g. bones, and waste given to pets were excluded. Also, leftovers that are frozen after a meal have been excluded, since the expiration date probably would exceed the duration of this research.

Language

This research focussed on The Netherlands, therefore, questions were asked in Dutch to avoid misinterpretations. For validity reasons, questions have been back-translated afterward (Sekaran & Bougie, 2016).

Scales

In appendix A, an overview of the variables, items, and scales can be found. Variables not relevant for this study or variables excluded from the further analysis are excluded in this overview. Scales were retrieved from prior research for validation and reliability reasons. The criteria for selecting these scales was a >0.8 Cronbach's Alpha (if available) in prior research, which accounts for the reliability of the scale. However, this study is the first academic attempt on the topic of GSMK. Therefore, an exception is made for two items with a Cronbach's Alpha of >0.5, which is accepted by some studies in an early phase of a study (Field, 2013). Furthermore, 5-point Likert-scale items were transformed into 7-point Likert-scale items, since those scales facilitate a higher change to fit the respondent's objective reality (Joshi et al., 2015).

Distribution

The software Qualtrics was used to operationalize the food waste diary. To start, respondents did receive a personal link via email, which was invisible for the researchers for privacy-

reasons. The software provided respondents the opportunity to save their progress and continue at a later moment. So, respondents were able to reuse the same link on the next day to report their food waste. Respondents are instructed to report their food waste on the same evening, to ensure they precisely remembered what had been thrown away.

The software provided data if the respondent started or finished the food waste diary. Progress is continuously managed via an Excel-sheet and reminders are sent to respondents who did not start the food waste diary yet. Furthermore, the researcher kept in touch with the respondents to ensure everything was clear to them and to ask if they enjoyed working on this study.

Variables

Cooking with a grocery store meal kit (independent variable)

Before reporting the food waste, respondents have been asked how today's meal is prepared: GSMK, delivery service meal kit, or traditional.

Food waste (dependent variable)

A study (Stefan et al., 2013) on avoidable food waste, measured the amount of wasted food as a percentage of the total meal being prepared. The scale runs from "Hardly any" to "more than a half ". This scale was later also used in research on determinants of food waste by Stancu et al. (2016). Cronbach's Alpha (=0.85) in the Stancu et al. (2016) study was sufficient. Food waste has been measured daily in current research.

The scale used by Stefan et al. (2013) is ordinal in nature, while multiple regression analysis do not allow categorical variables (Field, 2013). Therefore, this variable has been processed as a metrically scaled continuous variable. This was applicable since an increase in the ordinal scale by Stefan et al. (2013) equals an increase in reported food waste. A downside is that it leads to limitations in interpreting the strength of the effects since the intervals between the scores are not equal. According to Liddell and Kruschke (2018), a bulk of articles showed to process ordinally measured scales in models intended for metrically measured scales. However, the article highlight it may lead to problems like the distribution of data and interpretation. Though, the fact that studies using the scale (Stefan et al., 2013; Stancu et al., 2016) are well-respected in the field of household food waste, outweigh these limitations. Furthermore, the study is a first academic attempt on the topic of GSMK, so the primary objective is to investigate the positive or negative direction of the effect rather than the specific strength.

Planning routines (moderating variable)

Stefan et al. (2013) measured this variable with three items: preparing a shopping list, inspecting the stock, and planning dinners in advance. A 7-point Likert-scale, which runs from 'never' to 'always', was used. Cronbach's Alpha (=0.80) in the Stefan et al. (2013) study was sufficient. The above study (Stefan et al., 2013) operationalized planning routines as a consumer characteristic since the variable was not related to one specific shopping trip. Therefore, this variable has been measured once.

Shopping routines (moderating variable)

Stefan et al. (2013) used two items based on prior research, focusing on buying an overload of food (Lyndhurst, 2007) and buying food that was not planned (Exodus, 2007). Furthermore, this variable consisted of items regarding buying more food when the price drops and buying less food to minimize waste (Soorani and Ahmadvand, 2019). A 7-point Likert-scale, which runs from 'never' to 'always', was used and Cronbach's Alpha (=0.88, = 0.612) was sufficient in the studies of Stefan et al. (2013) and Soorani and Ahmadvand (2013). On the base of the same arguments above (see planning routines), shopping routines have been measured once.

Cooking skills (moderating variable)

Hartmann et al. (2013) measured cooking skills using seven items. These items focus on the competence to cook a range of foods and ingredients and how respondents perceive their skills in cooking. A 7-point Likert-scale, which runs from 'strongly disagree' to 'strongly agree', was used and Cronbach's Alpha (=0.91) was sufficient in the study of Hartmann et al. (2013).

Control variables

Three other variables have been measured to act as a control variable in the model: education level (Janssens et al., 2019), household size (Koivupuro et al., 2012, p. 185) and gender (Secondi et al., 2015). In the question about gender, the option 'other' has been added to meet respondents who didn't identify themself as men or women. Furthermore, respondents are asked to report their age.

Data analysis strategy

Data has been analysed using the software SPSS. A multiple regression analysis (Hair et al., 2014) is a dependence technique and has been applied for analysing the relationship between

GSMK and food waste, compared to traditional cooking. The method was applicable because there is only one dependent variable: food waste. However, since this method does not accept categorical variables (Field, 2013), dummy variables are created for 'GSMK-cooking' (when zero, then the respondent did prepare dinner traditional), gender, education level, and household size. The purpose of applying this method is to know whether food waste can be predicted by cooking a GSMK, compared to traditional cooking. The following equation has been applied. In this equation, *i* represents the participant, *t* the day, b0 the intercept, and *e* the prediction error. The equation controlled for the effects of gender, education level, and household size. Note: respondents gathered data for several days, which is likely to impact the independence of the error term. However, this study does not take this into account.

$$\text{Food waste}_{it} = \beta_0 + \beta_1\ \text{GSMK-cooking}_{it} + \beta_2\ \text{Planning routines}_i + \beta_3\ \text{Shopping routines}_i + \beta_4\ \text{Cooking skills}_i + \beta_5\ \text{Gender}_i + \beta_6\ \text{Education level}_i + \beta_7\ \text{Household size}_i + \beta_8\ \text{GSMK-cooking}_{it} * \text{Planning routines}_i + \beta_9\ \text{GSMK-cooking}_{it} * \text{shopping routines}_i + \beta_{10}\ \text{GSMK-cooking}_{it} * \text{Cooking skills}_i + \varepsilon_{it}$$

Research ethics

This study has been conducted following ethical principles (Smith, 2003). *First*, even data has been gathered in cooperation, this thesis is written individually. Therefore, authorship belongs to Master-student Jasper Veenkamp. *Second*, participants are mainly selected from the researcher's network, so a personal relationship existed. However, the communication style was professional and formal. Additionally, respondents participated voluntarily since they were able to cancel their measurements at every moment. Moreover, respondents were not forced to answer the questions, but the software did remind respondents if they (forgot) to fill in the question. *Third*, respondents are informed accurately about the goal of the research, the duration, their ability to quit their participation, their anonymity, how to get in contact with the researchers, and instructions on how to participate. *Fourth*, the diary ensured anonymity since the software didn't relate the outcomes to a specific person. This anonymity did reduce potential social desirability (Van Herpen et al., 2019). Also, data has been processed confidentially. *Fifth*, the researcher was aware of the general ethical guidelines (e.g. Sekaran & Bougie, 2016) and did have access to in-depth resources on ethical issues. *Finally*, insights into the outcomes and implications are publicly available and provided to respondents on request. Dutch grocery stores will be pro-actively contacted with research outcomes and managerial implications in order to advise consumers in avoiding food waste.

Pre-test

For validity-reasons, filling in the food waste diary has been tested among four persons who didn't participate in the actual study. The main question was: are the items clear and correct interpretable? Based on their feedback, some adjustments have been made. Clarifications in the final food waste diary are implemented on what actually belongs to food waste, the difference between GSMK (Dutch: maaltijdpakket/verspakket) and delivery service meal kits (Dutch: maaltijdbox) including example suppliers, how to deal with reporting food that already has been prepared on another day, how to deal with freezing leftovers and how to deal with food that is ready-to-consume.

COVID-19

Fortunately, the recent COVID-19 pandemic didn't had an adverse impact on data collection, e.g. no issues in supplying the meal kit stock in grocery stores were noticed. On the contrary, a lot of respondents worked from home and therefore had some extra time available for reporting their waste. Moreover, they showed to enjoy working on this study, especially in times of COVID-19.

4. Results

Results are aimed to show the effect of GSMK on food waste generation, compared to food waste generated by traditional cooking. Furthermore, results will show whether planning routines, shopping routines, and cooking skills moderate this effect.

4.1 Sample

In total, 48 respondents participated in the research. Data was gathered in cooperation with a colleague master-student, which leads to 15 respondents who only prepared dinner with a delivery service meal kit or traditional. These respondents have been excluded since cooking once with a GSMK was one of the selection requirements in this study. Another reason for excluding these respondents is that the introduction showed that GSMK are usually not prepared daily (Hielkema, 2018). A sample including respondents cooking both with a GSMK and traditional is, therefore, more representative. Furthermore, 8 respondents met the above selection requirements but did also prepare dinner with a delivery service meal kit in their measurement week. Reported days of food waste by this method of cooking are not relevant for answering the central question in the current study and have therefore been excluded from further analysis. The final sample consists of 33 respondents, who in total did report 218 days of food waste. According to Hair et al. (2014), each IV needs at least five observations for generalizability reasons. Current research consists of 4 IV's (excluding the interaction terms) and 218 observations (each day is one observation), so this criterion has been met. In total, 62 meals (28,4%) are prepared with a GSMK and 156 meals (71,6%) in a traditional way. The sample consists of 15 males and 18 females, who are on average 35 years old (minimum 21, maximum 75), are mainly high educated (Applied sciences or University), and live for the most part in a one- or two-persons household. Table 1 shows the descriptive statistics for all the variables in the model.

Unfortunately, the software didn't provide data on the time respondents filled in (parts of) the diary. Therefore, it could not be checked if respondents actually filled in the diary the same evening. Although, the software did show that three of the thirty-three respondents spent an unusually short time on filling in the diary. However, the results are fully anonymized, so it could not be checked if they had certain valid reasons for this. Due to the personal nature of this study (respondents are mainly gathered via the researchers' network, which implies trustiness) and the low number of 'suspected' respondents, this data has been preserved in the analysis.

	N	Minimum	Maximum	Mean	Std. Deviation
Food waste	218	1	4	1,67	,803
GSMK-cooking	218	0	1	,28	,452
Planning routines	218	2,33	7,00	4,9878	1,13946
Shopping routines	218	1,50	6,00	3,9232	,92308
Cooking skills	218	1,67	6,83	5,3624	1,29324
Education level (Elementary and Secondary school)	218	,00	1,00	,0321	,17670
Education level (Middle-level applied education MBO)	218	,00	,00	,0000	,00000
Education level (Associate degree)	218	,00	1,00	,4541	,49904
Education level (Bachelor's degree)	218	,00	1,00	,1514	,35924
Education level (Master's degree)	218	,00	1,00	,3073	,46245
Education level (Doctorate degree)	218	,00	1,00	,0229	,15004
Education level (other)	218	,00	1,00	,0321	,17670
Gender (male)	218	0	1	,44	,498
Household size (1 person)	218	,00	1,00	,3486	,47763
Household size (2 persons)	218	,00	1,00	,4495	,49859
Household size (3 persons)	218	,00	1,00	,0780	,26876
Household size (4+ persons)	218	,00	1,00	,1239	,33017

Table 1: descriptive statistics

4.2 Assumptions & overall model fit

First, some variables needed to be re-coded. Three moderating variables (cooking skills, planning routines, and shopping routines) were measured via multiple Likert-scale items, therefore, these are transformed into one variable presenting the respondents' mean-score. To calculate a correct mean score on shopping routines, the fourth item of shopping routines needed to be reversed first. After reversing, the Cronbach's Alpha of the scale was still sufficient in current research at the minimum level for an early phase of research (>0.5), as

explained in the previous chapter. Later, three independent variables (cooking skills, planning routines, shopping routines) were mean-centered, at least to decrease the multicollinearity risk of single correlations and coefficients (Iacobucci et al., 2016).

Prior to interpreting the multiple regression analysis, five assumptions (Field, 2013) had to be met: additivity and linearity, independent errors, homoscedasticity, normal distribution of errors, and IVs are not correlated to variables that are excluded in the model. The scatterplot (see appendix C, figure 2) does not show a clear pattern, the residuals are wide-spread. Therefore, the first assumption has been met. The Durbin-Watson test (see appendix C, table 4) found a value of 1.973, which is >1 and <3 and represents independence (Field, 2013). However, respondents gathered multiple days of food waste, which theoretically implies the error terms are not fully independent. Therefore, the second assumption has only technically been met in order to run the regression model. The scatterplot (see appendix C, figure 2) showed a constant variance of the residuals and no clear shape. So, the third assumption has been met too. According to the Histogram (see appendix C, figure 3) and Kolmogorov-Smirnov ($D(.218) = .309$, $p < .05$) (see appendix C, table 3), there is indication of non-normality. This may be explained by the dependent variable, which originally is more of ordinal nature. This variable is likely to disrupt assumptions regarding the distribution of the regression model (Liddell & Kruschke, 2018). However, just one outlier outside 3 standard deviations has been found, there is no indication that something big is going wrong in the model. Also, no inaccuracies have been found in the data of this outlier and therefore this outlier been preserved to maintain a correct representation of the sample. Moreover, the dots in the P-P plot (see appendix C, figure 4) in general follow the line. Therefore, the fourth assumption has been met. The VIF-scores are <10 and the tolerance-scores are >0.2 (see appendix C, table 5), which shows there are no concerns on multicollinearity (Bowerman & O'Connell, 1990; Myers, 1990; Menard, 1995). Furthermore, according to the correlation matrix (see appendix C, table 6), no IV's have correlations >.07. So, the fifth and last assumption has been met.

After running the multiple regression analysis, the F-test (see appendix C, table 7) appeared to be significant ($F_{(16, 201)} = 2.850$, $p. < .05$), which concluded that the IV's leads to a variance change in the DV. Furthermore, the R square (see appendix C, table 3) showed that 18,5% of the variance in food waste is expounded by the IV´s in this model ($R^2 = .185$). This percentage

is quite low, which may impact generalizability. Also, some other factors, which are not included in this model, seem to influence the amount of food that is being wasted.

4.3 Statistical results

	Hypothesized effect	β	Std. Error	Sig.	Hypothesis supported
Constant		1,793	,118	,000	
GSMK-cooking	*Negative*	-,297	,115	,011	*Yes*
Planning routines		-,203	,074	,006	
Shopping routines		,147	,077	,059	
Cooking skills		-,001	,057	,990	
Interaction planning routines x GSMK-cooking	*Positive*	,169	,107	,115	*No*
Interaction shopping routines x GSMK-cooking	*Negative*	-,188	,143	,190	*No*
Interaction cooking skills x GSMK-cooking	*Negative*	-,137	,093	,141	*No*
Education level (Elementary and Secondary school)		,190	,374	,612	
Education level (Bachelor's degree)		,506	,177	,005	
Education level (Master's degree)		,406	,158	,011	
Education level (Doctorate degree)		,187	,374	,617	
Education level (other)		-,141	,425	,741	
Gender (male)		-,289	,167	,085	
Household size (1 person)		-,365	,152	,017	
Household size (3 persons)		,550	,294	,063	
Household size (4+ persons)		-,203	,206	,324	

Table 2: Coefficients (unstandardized)

As expected in the first hypothesis, cooking with a GSMK has a significant negative influence on food waste (β = -.295, p < .05). So, respondents cooking with a GSMK generate less food waste compared to respondents cooking traditional. Therefore, *H1 is supported*. The interaction

effects of planning routines (β = .169, p > .10), shopping routines (β = -.188, p > .10), and cooking skills (β = -.137, p > .10) showed to be non-significant. These variables do not statistically impact the strength of the relationship between cooking with a GSMK and food waste. So, the *second, third, and fourth hypothesis are not supported*. Interesting are the significant direct effects of planning routines (β = -.203, p < .05) Bachelor's degree (β = .506, p < .05), Master's degree (β = .406, p < .05), and single households (β = -.365, p < .05). So, respondents having a Bachelor or Master's degree reported more food waste and respondents having planning routines or living in a single household reported less food waste. An overview of the hypotheses and outcomes can be found in table 2.

4.4   Additional results

During the measurement period, several respondents criticized the portion-size in the GSMK via personal contact with the researcher. First, the advised portions were considered as inaccurate. E.g. a 4-persons meal might be just enough for two persons. Second, GSMK usually consist of multiple portions. Therefore, this critique suggests that single households were more required to carefully storage their leftovers in order to reuse them.

5. Discussion

This chapter will discuss the implications of the results on the current body of relevant literature and how managers may practically use them to advise consumers in minimizing their waste. Furthermore, limitations are being reflected on and future research suggestions are given.

5.1 Theoretical implications

The main point of interest in this study was to compare consumer food waste generation by GSMK to food generation by traditional cooking. The first hypothesis stated that GSMK are negatively related to food waste generation compared to traditional cooking. As expected, this hypothesis has been accepted and is the first academic indication that GSMK positively assists in reducing consumer food waste. This outcome is a meaningful contribution to the literature on consumer and household food waste prevention since consumers showed to have the highest share in food waste generation (Griffin et al., 2009). Furthermore, it adds to existing knowledge on the concept of meal kits in general. Both Gee et al. (2019) and Heard et al. (2019) studied a wider view of environmental consequences by delivery service meal kits, e.g. including transit and energy use. The current research confirms that particular food waste prevention by meal kits is a significant benefit of this concept to the environment. This is in line with non-scientific research by Peters (2016) on food waste generation by delivery service meal kits. Moreover, following studies by Quested et al. (2011) and Quested et al. (2013), the pre-portioned ingredients and attached recipe in GSMK seems to be a reasonable explanation for this main outcome.

Ganglbauer et al. (2013) showed that multiple unified activities are related to food waste generation and, due to how GSMK differ in planning, shopping, and cooking a meal, might act as moderating factors in current research. The second hypothesis stated that planning routines positively moderates the relationship between cooking with a GSMK and food waste. However, this hypothesis has been rejected. A reasonable explanation for this is, although consumers using a shopping list are less flexible in doing their groceries (Thomas & Garland, 2004), Thomas and Garland (1996) showed that 93% do not purchase following their shopping list. Therefore, consumers who planned their shopping accurately, might not really have been in control of their shopping. The third hypothesis stated that shopping routines negatively moderates the relationship between cooking with a GSMK and food waste. Similarly, this hypothesis has been rejected. A reasonable explanation for this is that it was unknown in the current study whether purchasing a GSMK and traditional cooking ingredients was part of a

complete weekly shopping trip or a single shopping trip particular for those items. This may be relevant for the moderating role of shopping routines since shopping more frequently leads to an increase in food costs (Blaylock, 1989), which suggests that shopping frequency might also result in purchasing more food than needed. The fourth hypothesis stated that cooking skills negatively moderate the relationship between cooking with a GSMK and food waste. This hypothesis has also been rejected. This may be explained by the theory that people are not always aware of lacking skills and thereby overestimate in evaluating them (Kruger & Dunning, 1999). Interestingly, significant direct effects of planning routines and education level bachelor's degree and master's degree as control variables were found, which adds to existing studies (e.g. Bell et al., 2011; Secondi et al., 2015) showing the role of planning routines and level of education in the generation of food waste.

The central question of the study was: how does cooking with a grocery store meal kit influences consumer food waste generation, compared to food waste generated by a traditional method of cooking? Outcomes showed that cooking with a GSMK generates less food waste compared to traditional cooking. There is no evidence that planning routines, shopping routines, and cooking skills influence the strength of this relationship. Although the model controlled for gender, education level, and household size, the R-square showed that several other factors outside the model are also likely to influence food waste generation of GSMK compared to traditional cooking. This is consistent with the research by Quested et al. (2013) who argued that various complex factors are related to food waste.

5.2   Managerial and policy implications

This study provides grocery store managers a first insight into how the method of cooking can help in reducing food waste. In general, cooking with a GSMK supports in minimizing food waste compared to traditional cooking. This knowledge can first be used by grocery store managers in developing their strategy on the topic of sustainability. Since GSMK showed to provide sustainability advantages by reducing food waste, grocery stores may decide to offer a wider assortment of these GSMK in the future. Second, grocery stores may use this knowledge in their communication on how customers can contribute to the reduction of food waste. However, no interaction effects in the model were significant. Therefore, this communication should initially be focused on customers on a group-level. So, no personal advice (e.g. using an algorithm), can be provided in communication to customers.

There are some remarks. First, GSMK includes pre-portioned ingredients, which seems to be one of the reasons why it can minimize food waste. However, GSMK are pre-packaged, so consumers are not able to make adjustments to the ingredients, e.g. consumers might be allergic to certain vegetables or already have onion and garlic at home. Second, critique by respondents suggests that portion sizes were not accurate and single households are more needed to store their leftovers. Offering smaller portion sizes in GSMK may decrease the risk that leftovers are still wasted in the end due to wrong storage and improving the accuracy of portions sizes may help consumers in estimating the quantity of food needed. Third, at the moment, GSMK are usually not prepared daily. Keeping the assortment of GSMK attractive may be a way to improve this. For example, following food-trends and offering a wider range of recipes may improve the use-intensity. Applying and improving the above insights in grocery stores (policies) may increase the food waste reducing power of GSMK even more in the future.

Furthermore, this study showed that Dutch people spend less time in preparing food (Geurts et al., 2017). GSMK do perfectly fit this lifestyle since the meal kits are easy to prepare and time-saving. However, in the spring of 2020, the COVID-19 pandemic interrupted people's ongoing lifestyle. At the moment of writing this master thesis, there is a first indication that a large group of people might work from home, at least a couple of days a week. Even when the pandemic is over. If this scenario occurs, people will likely spend more time at home. The question is, however: do GSMK in the outlined scenario still fit people's lifestyles? Are people still spend less time preparing food when more time is becoming available?

5.3   Limitations and future research suggestions

This study has several limitations. First, although preferably respondents who regularly prepare a GSMK were selected and only respondents who both prepared their dinners with a GSMK and with traditional cooking were included in the analysis, it remains unguaranteed whether the measurement week represents a normal week food preparation. Therefore, future research should study food waste over a longer period wherein respondents are not asked to prepare at least once a GSMK. Moreover, a longer measurement period may also capture more insights into leftovers that are conserved in the freezer. Second, respondents might have applied both traditional cooking and cooking with a GSMK on the same day, e.g. soup-meal kit as a side dish. So, future research should measure food waste generation by GSMK in more detail. Future research may then also capture which parts of the meal are exactly wasted, what people's

motivations are for wasting behavior as in Williams et al. (2012) and how food is exactly stored as in Soorani & Ahmadvand (2019) since critique by respondents in current study suggests that single households are more likely to have GSMK-leftovers and therefore need to storage them. These factors may be studied as interaction effects to be able to advise specific groups of consumers on what method of cooking is the best in the view of minimizing food waste. Third, food waste is just a single factor in sustainability. Future research may also include the impact of package material used for GSMK. Fourth, food waste has been self-reported by respondents, which is identified as a limitation before in Stefan et al. (2013), Stancu et al. (2016), and Janssens et al. (2019). Future research may provide respondents with a scale in order to precisely weigh their amount of food waste. Fifth, this study did not include ready-to-eat convenience food items and it remains unclear which variant of meal kit (GSMK vs delivery service meal kits) is the best in minimizing food waste at consumer level compared to traditional cooking. Future research therefore may compare these two variants of meal kits and include the influence of eat-ready convenience food items. Sixth, this study holds some statistical and methodological limitations. Selecting respondents was done via convenience sampling in researchers' own network, a non-probability method, and the limited R square suggest that some factors outside the model are relevant too. Also, the assumption of independent error terms was technically sufficient, which was crucial for running the regression model. However, theoretically, the independence of error terms is questionable since respondents gathered data for multiple days. Furthermore, the (original) ordinal nature of the dependent variable seems to have led to some disruptions in normality and for the same reason, the specific strength of the main-effect is unknown. Also, cooking with a GSMK, might have influenced food waste generation the next day(s). The current research did not include the impact of time. Based on the methodological limitations as described above, the generalizability of the outcomes is limited. Future research may improve these methodological limitations in order to generate more specific and generalizable outcomes, e.g. by using a probability sampling method outside researchers own network, studying food waste over a longer period of time and provide insight in the impact of time, developing a new continuous scale in order to improve the normality of the model and interpret the strength of the relationship, and taking the multiple observations by respondents into account for the assumption of the independence of error terms. However, measuring the concept of food waste is complex and no scientific research did exist on particular GSMK yet. Despite the above limitations, this study provides the first academic indication that GSMK can minimize consumer food waste in comparison to traditional cooking.

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Appendix A: overview variables, items and scales

Variable	Definition	Items (English, Dutch translation in food waste diary)	Scales	Cronbach's Alpha in prior research
Food waste (DV) - *daily measuring*	"Excess ingredients that are not used for the prepared meal or subsequent meals, as well as uneaten portions of the meal that are discarded." **(Heard et al., 2019, p. 191)**	How much food do you think you have been thrown away of the ingredients you bought to prepare the meal? *Based on* **(Stefan et al., 2013)**	"Hardly any **(1)**, less than a tenth (less than 10%) **(2)**, more than a tenth but less than a quarter (between 10% and 25%) **(3)**, more than a quarter but less than a half (between 25% and 50%) **(4)**, more than a half (more than 50%) **(5)** " **(Stancu et al., 2016, p. 12; Stefan et al., 2013)**	0.85
Cooking with a grocery store meal kit (IV) - *daily measuring*	Meal kits for soup and meals for dinner, with unsliced pre-portioned ingredients, supplied in a box with recipe in a physical grocery store.	How did you prepare the meal you've eaten today?	Grocery store meal kit Delivery service meal kit Traditional	NA

Planning routines - *weekly measuring*	"Planning of shopping and meals" **(Stefan et al., 2013, p. 376)**	"How frequently do you make a list of the food you want to buy prior to your shopping trip? How frequently do you check your food inventories prior to your shopping trip? How often do you plan your meals, in advance, for several days ahead?" **(Stefan et al., 2013, p. 377)**	Likert-scale: " 'never' **(1)** to 'always' " **(7)** **(Stefan et al., 2013, p. 377)**	0.80
Shopping routines - *weekly measuring*	"Excess purchasing of food." **(Stefan et al., 2013, p. 176)**	"How frequently would you say that you buy too much food (more than you need or can eat) when you go shopping?" "How frequently would you say that you buy food items that you did not intend to buy?" **(Stefan et al., 2013,**	Likert-scale: " 'never' (1) to 'always' (7) " **(Stefan et al., 2013, p. 377)**	0.88

				0.612
		p. 377; **Exodus, 2007)** "We usually buy higher amounts of food when the food price drops. To minimize waste, we try to buy smaller amounts of food." **(Soorani & Ahmadvand, 2019, p. 154)**	Likert-scale: " 'strongly disagree' (1) to 'strongly agree' (5) " **(Soorani & Ahmadvand, 2019, p. 153).** *In this research a 7-point Likert-scale from never to always.*	
Cooking skills - *weekly measuring*	"The ability to pre-pare different foods." **(Hartmann et al., 2013, p. 129)**	"I consider my cooking skills as sufficient. I am able to prepare a hot meal without a recipe. I am able to prepare gratin. I am able to prepare soup. I am able to prepare sauce.	Likert-scale: 'strongly disagree' (1) to 'strongly agree' (7)	0.91

		I am able to bake cake. I am able to bake bread.” **(Hartmann et al., 2013, p. 126)**		45
Education level	NA	What is your highest degree of education?	“Elementary and Secondary school Middle-level applied education (MBO) Associate degree Bachelor's degree Masters' degree Doctorate degree Other” **(Janssens et al., 2019, p. 16)**	NA
Gender	NA	What is your gender?	“Male Female” **(Secondi et al., 2015, p. 35)** Other	NA
Household size	NA	What is the size of the household you live in?	“1 person 2 persons 3 person 4+ persons” **(Koivupuro et al., 2012, p. 185).**	NA
Age	NA	What is your age?	NA	

Appendix B: food waste diary (Dutch)

Beste deelnemer,

Bedankt voor het meewerken 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 en zijn volledig anoniem. U kunt op ieder moment besluiten om te stoppen.

<u>Over het onderzoek</u>

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).

● **Maaltijdpakket supermarkt (ook wel genoemd: verspakket):** koken met voorverpakte ongesneden ingrediënten van precieze porties in een box met recept, gekocht bij een fysieke supermarkt. Dit mogen alle soorten maaltijden zijn, dus bijvoorbeeld ook soep.

● **Maaltijdbox bezorgservice:** doos bestaande uit een recept, ingrediënten die voor geportioneerd zijn en vaak individueel verpakt. Bijvoorbeeld: HelloFresh of Marley Spoon.

Voor dit onderzoek is het belangrijk dat u, gedurende één week lang, goed in de gaten houdt of u avondeten (of gedeelten daarvan) weggooit. We willen u vragen om dit vervolgens dezelfde avond te noteren via deze vragenlijst. Mocht u op een dag een maaltijd eten die u niet zelf heeft klaargemaakt, dan kunt u de volgende dag weer beginnen bij de dag welke u nog niet heeft ingevuld. Op deze manier heeft u in totaal 7 meetdagen.

Wat valt wél onder het weggooien van voedsel? Verspilling (bijvoorbeeld het weggooien van voedsel dat u teveel heeft gekookt of het weggooien van ingrediënten die u niet heeft gebruikt), een verlopen houdbaarheidsdatum, 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.

Wanneer u op **'volgende'** klikt, zullen we u meer vertellen over het onderzoeksproces.

<u>Wat wordt er van u verwacht in het onderzoeksproces?</u>

Stap 1: U bent vrij om tussen **22 april 2020** en **12 mei 2020** zelf één week uit te kiezen waarin u dagelijks (achtereenvolgend) deze vragenlijst invult. We willen u vragen om in uw gekozen week minimaal één keer met een maaltijdpakket van de supermarkt **of** een maaltijdbox van een bezorgservice te koken.

Stap 2: De vragenlijst start met een aantal algemene vragen die u direct kunt beantwoorden, dit hoeft u maar één keer te doen (± 4 minuten). Graag na het beantwoorden op 'volgende' klikken, zodat uw antwoorden worden opgeslagen.

Stap 3: Vervolgens start u met het meten van (eventuele) voedselverspilling (± 2 minuten per dag). Nadat u heeft gegeten kunt u de link die u heeft gekregen er bij pakken en de meting van de desbetreffende dag invullen. Vergeet niet om elke dag na het beantwoorden van de vragen op 'volgende' te klikken. Vervolgens kunt u de webpagina sluiten en de volgende dag via **dezelfde link** weer verdergaan, de vragenlijst start dan automatisch op de volgende meetdag.

Stap 4: Nadat u zeven dagen lang (eventuele) voedselverspilling heeft bijgehouden, eindigt de vragenlijst met een aantal laatste algemene vragen (± 3 minuten). Na het beantwoorden van deze vragen kunt u weer op 'volgende' klikken en is het onderzoek afgerond.

<u>Coronavirus</u>

Gezien de huidige situatie rondom het coronavirus, willen we u vragen om bij een bezoek aan een supermarkt de richtlijnen van het RIVM aan te houden en de maatregelen van de desbetreffende winkel te volgen.

<u>Vragen</u>

Mocht u nog vragen hebben over het onderzoek, dan kunt u altijd met een van ons contact opnemen via mail, een WhatsApp-bericht of telefoon.

Met vriendelijke groet,

Jasper Veenkamp: jasper.veenkamp@student.ru.nl - 0638249428
Bas Simons: s.simons@student.ru.nl - 0655588936

Wanneer u op **'volgende'** klikt, zal het onderzoek beginnen.

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

1. Ik beschouw mijn kookvaardigheden als voldoende.
2. Ik heb de vaardigheden om een warme maaltijd te bereiden zonder een recept.
3. Ik heb de vaardigheden om een gratin (aardappel ovenschotel) te bereiden.
4. Ik heb de vaardigheden om een soep te bereiden.
5. Ik heb de vaardigheden om een cake te bakken.
6. Ik heb de vaardigheden om een brood te bakken.

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

Wat is uw leeftijd?

…..

U bevindt zich nu op de vragenlijst van **meetdag 1.** *Mocht u vandaag een maaltijd hebben gegeten welke u niet zelf heeft klaargemaakt, dan morgen op deze dag weer beginnen.*

De maaltijd die u vandaag heeft gegeten, hoe heeft u deze klaargemaakt?

- Maaltijdpakket supermarkt
- Maaltijdbox bezorgservice
- Traditioneel

De volgende vraag staat in het kader van voedselverspilling. We willen u vragen om de hoeveelheid voedsel dat u (mogelijk) heeft weggegooid te noteren als een percentage van wat u heeft gekocht om de maaltijd te bereiden.

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

1. **Hoeveel voedsel zou u zeggen dat u heeft weggegooid van wat u heeft gekocht om de maaltijd te bereiden?**

U bent nu klaar met meetdag 1. Nadat u op **'volgende'** heeft geklikt, kunt u morgen via dezelfde link weer verder met meetdag 2.

U bevindt zich nu op de vragenlijst van **meetdag 2.** *Mocht u vandaag een maaltijd hebben gegeten welke u niet zelf heeft klaargemaakt, dan morgen op deze dag weer beginnen.*

De maaltijd die u vandaag heeft gegeten, hoe heeft u deze klaargemaakt?

- Maaltijdpakket supermarkt
- Maaltijdbox bezorgservice
- Traditioneel

De volgende vraag staat in het kader van voedselverspilling. We willen u vragen om de hoeveelheid voedsel dat u (mogelijk) heeft weggegooid te noteren als een percentage van wat u heeft gekocht om de maaltijd te bereiden.

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

2. **Hoeveel voedsel zou u zeggen dat u heeft weggegooid van wat u heeft gekocht om de maaltijd te bereiden?**

U bent nu klaar met meetdag 2. Nadat u op **'volgende'** heeft geklikt, kunt u morgen via dezelfde link weer verder met meetdag 3.

U bevindt zich nu op de vragenlijst van **meetdag 3.** *Mocht u vandaag een maaltijd hebben gegeten welke u niet zelf heeft klaargemaakt, dan morgen op deze dag weer beginnen.*

De maaltijd die u vandaag heeft gegeten, hoe heeft u deze klaargemaakt?

- Maaltijdpakket supermarkt
- Maaltijdbox bezorgservice
- Traditioneel

De volgende vraag staat in het kader van voedselverspilling. We willen u vragen om de hoeveelheid voedsel dat u (mogelijk) heeft weggegooid te noteren als een percentage van wat u heeft gekocht om de maaltijd te bereiden.

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

3. **Hoeveel voedsel zou u zeggen dat u heeft weggegooid van wat u heeft gekocht om de maaltijd te bereiden?**

U bent nu klaar met meetdag 3. Nadat u op **'volgende'** heeft geklikt, kunt u morgen via dezelfde link weer verder met meetdag 4.

U bevindt zich nu op de vragenlijst van **meetdag 4.** *Mocht u vandaag een maaltijd hebben gegeten welke u niet zelf heeft klaargemaakt, dan morgen op deze dag weer beginnen.*

De maaltijd die u vandaag heeft gegeten, hoe heeft u deze klaargemaakt?

- Maaltijdpakket supermarkt
- Maaltijdbox bezorgservice

- Traditioneel

De volgende vraag staat in het kader van voedselverspilling. We willen u vragen om de hoeveelheid voedsel dat u (mogelijk) heeft weggegooid te noteren als een percentage van wat u heeft gekocht om de maaltijd te bereiden.

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

4. Hoeveel voedsel zou u zeggen dat u heeft weggegooid van wat u heeft gekocht om de maaltijd te bereiden?

U bent nu klaar met meetdag 4. Nadat u op **'volgende'** heeft geklikt, kunt u morgen via dezelfde link weer verder met meetdag 5.

U bevindt zich nu op de vragenlijst van **meetdag 5.** *Mocht u vandaag een maaltijd hebben gegeten welke u niet zelf heeft klaargemaakt, dan morgen op deze dag weer beginnen.*

De maaltijd die u vandaag heeft gegeten, hoe heeft u deze klaargemaakt?

- Maaltijdpakket supermarkt
- Maaltijdbox bezorgservice
- Traditioneel

De volgende vraag staat in het kader van voedselverspilling. We willen u vragen om de hoeveelheid voedsel dat u (mogelijk) heeft weggegooid te noteren als een percentage van wat u heeft gekocht om de maaltijd te bereiden.

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

5. Hoeveel voedsel zou u zeggen dat u heeft weggegooid van wat u heeft gekocht om de maaltijd te bereiden?

U bent nu klaar met meetdag 5. Nadat u op **'volgende'** heeft geklikt, kunt u morgen via dezelfde link weer verder met meetdag 6.

U bevindt zich nu op de vragenlijst van **meetdag 6.** *Mocht u vandaag een maaltijd hebben gegeten welke u niet zelf heeft klaargemaakt, dan morgen op deze dag weer beginnen.*

De maaltijd die u vandaag heeft gegeten, hoe heeft u deze klaargemaakt?

- Maaltijdpakket supermarkt
- Maaltijdbox bezorgservice
- Traditioneel

De volgende vraag staat in het kader van voedselverspilling. We willen u vragen om de hoeveelheid voedsel dat u (mogelijk) heeft weggegooid te noteren als een percentage van wat u heeft gekocht om de maaltijd te bereiden.

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

6. **Hoeveel voedsel zou u zeggen dat u heeft weggegooid van wat u heeft gekocht om de maaltijd te bereiden?**

U bent nu klaar met meetdag 6. Nadat u op **'volgende'** heeft geklikt, kunt u morgen via dezelfde link weer verder met meetdag 7.

U bevindt zich nu op de vragenlijst van **meetdag 7.** *Mocht u vandaag een maaltijd hebben gegeten welke u niet zelf heeft klaargemaakt, dan morgen op deze dag weer beginnen.*

De maaltijd die u vandaag heeft gegeten, hoe heeft u deze klaargemaakt?

- Maaltijdpakket supermarkt
- Maaltijdbox bezorgservice
- Traditioneel

De volgende vraag staat in het kader van voedselverspilling. We willen u vragen om de hoeveelheid voedsel dat u (mogelijk) heeft weggegooid te noteren als een percentage van wat u heeft gekocht om de maaltijd te bereiden.

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

7. **Hoeveel voedsel zou u zeggen dat u heeft weggegooid van wat u heeft gekocht om de maaltijd te bereiden?**

U bent nu klaar met meetdag 7. Nadat u op ´**volgende**´ heeft geklikt, volgen er nog een aantal laatste vragen van het onderzoek.

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

1. Ik maak een boodschappenlijstje voordat ik naar de supermarkt ga
2. Ik controleer mijn voedselvoorraad voordat ik naar de supermarkt ga
3. Ik plan maaltijden vooruit voor de komende paar dagen
4. Ik koop teveel eten (meer dan ik eigenlijk nodig heb) wanneer ik naar de supermarkt ga
5. Ik koop eten dat ik niet van plan was om te kopen
6. Ik koop meestal grotere hoeveelheden eten wanneer de prijs daalt
7. Ik probeer om minder eten te kopen om zo voedselverspilling te minimaliseren

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Het onderzoek is nu afgerond, nogmaals bedankt voor uw deelname!

Appendix C: statistics regression analysis
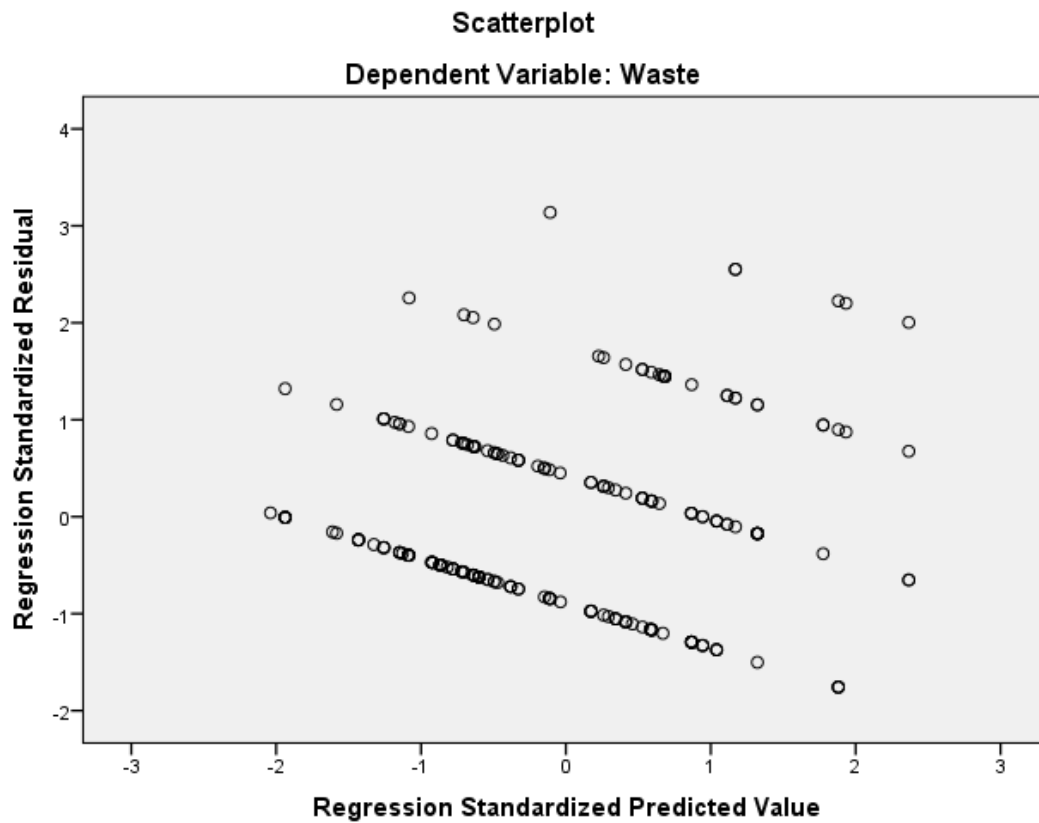
Figure 2: Scatterplot

R	R Square	Adjusted R Square	Kolmogorov-Smirnov	Durbin-Watson
,430	,185	,120	,309	1,973

Table 3: R square, Kolmogorov-Smirnov, Durbin-Watson

Histogram

Dependent Variable: Waste

Mean = -1,19E-16
Std. Dev. = 0,962
N = 218

Figure 3: Histogram

Normal P-P Plot of Regression Standardized Residual

Dependent Variable: Waste
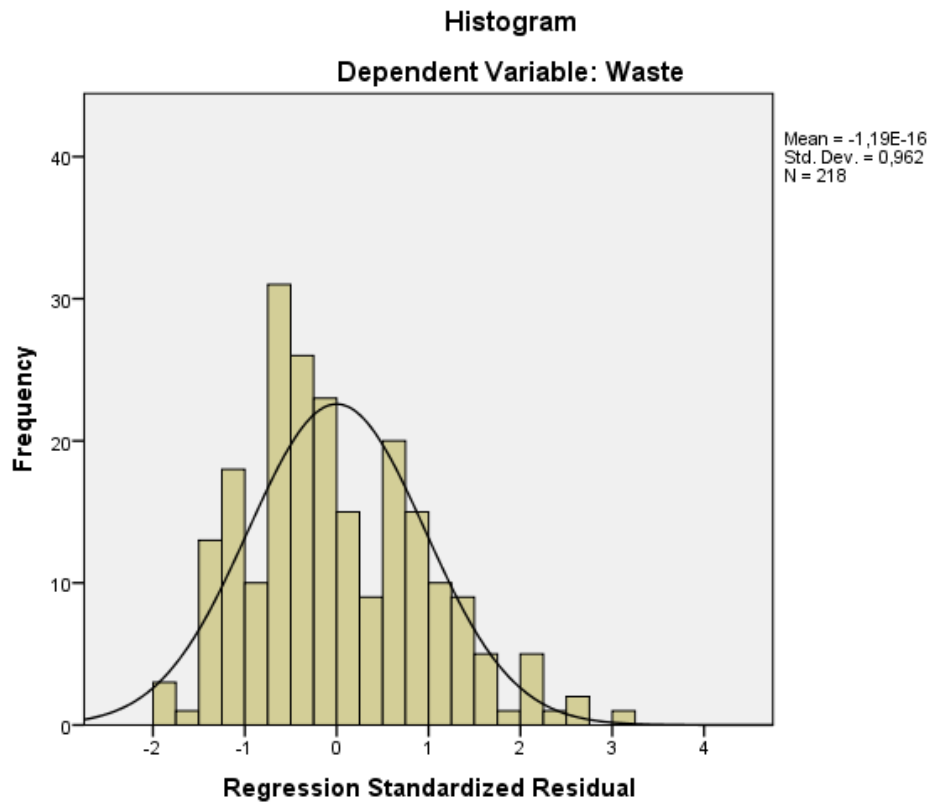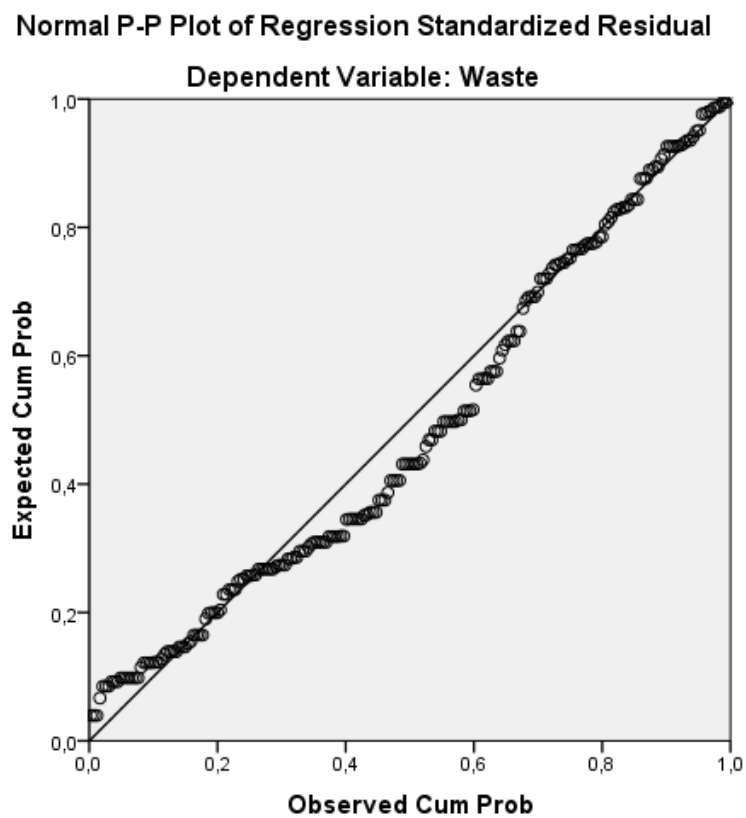
Figure 4: P-P Plot

	Tolerance	VIF
GSMK-cooking	,965	1,036
Planning routines	,372	2,689
Shopping routines	,517	1,934
Cooking skills	,475	2,107
Interaction planning routines x GSMK-cooking	,472	2,117
Interaction shopping routines x GSMK-cooking	,640	1,561
Interaction cooking skills x GSMK-cooking	,687	1,455
Education level (Elementary and Secondary school)	,599	1,669
Education level (Bachelor's degree)	,644	1,553
Education level (Master's degree)	,489	2,047
Education level (Doctorate degree)	,831	1,203
Education level (other)	,463	2,159
Gender (male)	,377	2,654
Household size (1 person)	,498	2,008
Household size (3 persons)	,420	2,383
Household size (4+ persons)	,566	1,767

Table 5: Tolerance & VIF scores

Table 6: Correlations

Column legend (columns are numbered to match the row variables):
(1) Food waste; (2) GSMK-cooking; (3) Planning routines; (4) Shopping routines; (5) Cooking skills; (6) Interaction planning routines x GSMK-cooking; (7) Interaction shopping routines x GSMK-cooking; (8) Interaction cooking skills x GSMK-cooking; (9) Dummy education level (Elementary and secondary school); (10) Dummy education level (Middle-level applied education MBO); (11) Dummy education level (Associate degree); (12) Dummy education level (Bachelor's degree); (13) Dummy education level (Master's degree); (14) Dummy education level (Doctorate degree); (15) Dummy education level (other); (16) Dummy gender (male); (17) Dummy household size (1 person); (18) Dummy household size (2 person); (19) Dummy household size (3 person); (20) Dummy household size (4+ persons)

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
Food waste	1	-,175**	-,184**	,190**	,015	-,016	-,016	-,102	,074	NA	-,135*	,108	,047	,024	-,056	,049	-,087	-,001	,076	,066
GSMK-cooking	-,175**	1	,022	,003	,076	,025	,004	,106	-,057	NA	,017	,046	-,023	-,029	,001	,055	-,056	,064	,006	-,021
Planning routines	-,184**	,022	1	-,254**	,071	,612**	-,256**	,117	-,425**	NA	,183**	-,131	-,042	-,043	,322**	-,148*	-,305**	,202**	,139*	,024
Shopping routines	,190**	,003	-,254**	1	,154*	-,202**	,483**	-,005	-,034	NA	-,044	,101	-,012	,138*	-,133*	,079	-,083	-,170**	,112	,285**
Cooking skills	,015	,076	,071	,154*	1	,099	-,006	,517**	,208**	NA	-,151*	-,056	,126	-,102	,090	-,249**	,000	,180**	-,077	-,208**
Interaction planning routines x GSMK-cooking	-,016	,025	,612**	-,202**	,099	1	-,419**	,190**	-,102	NA	,202**	-,219**	-,060	-,017	,148*	-,200**	-,267**	,203**	,062	,029
Interaction shopping routines x GSMK-cooking	-,016	,004	-,256**	,483**	-,006	-,419**	1	-,011	-,011	NA	-,081	,138*	-,004	,057	-,079	,092	,084	-,192**	,033	,141*
Interaction cooking skills x GSMK-cooking	-,102	,106	,117	-,005	,517**	,190**	-,011	1	,045	NA	-,054	-,067	,095	-,050	,038	-,143*	-,004	,156*	-,066	-,176**
Dummy education level (Elementary and secondary school)	,074	-,057	-,425**	-,034	,208**	-,102	-,011	,045	1	NA	-,166**	-,077	-,121	-,028	-,033	-,162*	,249**	-,165**	-,053	-,068
Dummy education level (Middle-level applied education MBO)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dummy education level (Associate degree)	-,135*	,017	,183**	-,044	-,151*	,202**	-,081	-,054	-,166**	NA	1	-,385**	-,608**	-,140*	-,166**	-,364**	-,126	,176**	,078	-,147*
Dummy education level (Bachelor's degree)	,108	,046	-,131	,101	-,056	-,219**	,138*	-,067	-,077	NA	-,385**	1	-,281**	-,065	-,077	-,014	,040	-,202**	-,123	,346**
Dummy education level (Master's degree)	,047	-,023	-,042	-,012	,126	-,060	-,004	,095	-,121	NA	-,608**	-,281**	1	-,102	-,121	,330**	,097	,038	-,194**	-,039
Dummy education level (Doctorate degree)	,024	-,029	-,043	,138*	-,102	-,017	,057	-,050	-,028	NA	-,140*	-,065	-,102	1	-,028	,173**	-,112	,170**	-,045	-,058
Dummy education level (other)	-,056	,001	,322**	-,133*	,090	,148*	-,079	,038	-,033	NA	-,166**	-,077	-,121	-,028	1	,205**	-,133*	-,165**	,626**	-,068
Dummy gender (male)	,049	,055	-,148*	,079	-,249**	-,200**	,092	-,143*	-,162*	NA	-,364**	-,014	,330**	,173**	,205**	1	-,377**	,146*	,328**	,059
Dummy household size (1 person)	-,087	-,056	-,305**	-,083	,000	-,267**	,084	-,004	,249**	NA	-,126	,040	,097	-,112	-,133*	-,377**	1	-,661**	-,213**	-,275**
Dummy household size (2 person)	-,001	,064	,202**	-,170**	,180**	,203**	-,192**	,156*	-,165**	NA	,176**	-,202**	,038	,170**	-,165**	,146*	-,661**	1	-,263**	-,340**
Dummy household size (3 person)	,076	,006	,139*	,112	-,077	,062	,033	-,066	-,053	NA	,078	-,123	-,194**	-,045	,626**	,328**	-,213**	-,263**	1	-,109
Dummy household size (4+ persons)	,066	-,021	,024	,285**	-,208**	,029	,141*	-,176**	-,068	NA	-,147*	,346**	-,039	-,058	-,068	,059	-,275**	-,340**	-,109	1

Bold = significant at .05

57

	Sum of Squares	df	Mean Square	F	Sig.
Regression	25,864	16	1,616	2,850	,000
Residual	114,012	201	,567		
Total	139,876	217			

Table 7: F-test