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The dual relationship between retail price promotions and household level food waste. Part of the problem or part of the solution?

PhD dissertation

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In memory of my father Demétrios

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English summary

Approximately one third of the food that is produced for human consumption is wasted, with dire environmental, societal and economic consequences. In addition, food waste is an issue with ethical implications: in an epoch of food abundance millions live in a state of food insecurity and malnutrition, while perfectly edible food is wasted on a vast scale.

Research shows that a significant proportion of food waste occurs in consumer households. Pricing mechanisms in food marketing enacted by retailers are being criticized for prompting consumers to overpurchase beyond their capacity to consume and to consequently waste food. Paradoxically, the very same price mechanisms that are criticized for instigating food waste are becoming utilized for promoting the sale of blemished foods that are discarded before reaching retail due to non-compliance with marketing standards. The question that consequently arises is whether price promotions can assume both the role of the villain who exacerbates food waste and of the hero who combats it.

Research has utilized a multitude of methodological approaches to investigate the possible effects of price promotions on food waste, with contradictory results. Despite the ambiguous scientific evidence that exists in this relation, criticism persists. In the face of this criticism, many retailers aiming to adopt an ethical marketing approach have integrated these social concerns into their business operations and initiated actions against food waste, including the abolishment of certain types of price promotions such as e.g., multi-item price promotions. However, if this abolishment is done with the explicit goal of avoiding food waste, then retailers should ensure that these actions reduce food waste effectively.

One caveat that exists in current research on food waste is the use of self-reported measures in the operationalization of the variables employed. It is widely accepted that this approach, despite some advantages, leads to inaccurate estimations of food waste and of deal behavior, which impedes the

reliability of the findings. This caveat necessitates the use of objective measures of the focal variables to ascertain whether price promotions are indeed to be blamed for food waste. Another caveat that exists in current research on the topic of food waste is that it has thus far put less weight on identifying the consumer characteristics of that could potentially play a role in their food waste behavior.

Against this background, this PhD dissertation aims to investigate the relationship between retail price promotions and household food waste and answer the following research question: *‘Are retail price promotions the villain who is part of the problem of food waste, or are they the hero who is part of the solution of food waste, and which consumer characteristics play a differential role for the outcome?’*

This PhD dissertation aims to investigate the role of consumers’ price involvement, which dictates the manner in which they interpret and respond to price promotions, as a marketing tool that can potentially be employed to encourage the sale of suboptimal food products (SOF). Moreover, this PhD dissertation aims to answer the call for a more thorough investigation of consumers’ food waste behavior, and delve deeper into consumer characteristics to gain a more nuanced and detailed picture of the psychographic factors that relate to food waste.

To meet these aims, this PhD dissertation consists of three research papers. The first research paper employs a cross-national study of five North European countries (the Netherlands, Germany, Sweden, Norway, and Denmark) and investigates *‘Which dimensions of consumers’ price involvement affect their intention to purchase SOF? Which price involvement dimensions enhance or weaken consumers’ intention to purchase SOF?’* More specifically, the study examines the effect of five price involvement dimensions (deal proneness, value consciousness, price consciousness, price-quality schema, and prestige sensitivity), perceived budget constraints, and current use of suboptimal foods on consumers’ intention to purchase these products in the near future. The results indicate that

consumers' intention to purchase SOF is influenced by different price involvement dimensions within and across countries. The main takeaway from the study is that retailers should price promote SOF to present them as being a good deal rather than as cheap alternatives in order to prompt consumers to buy them since the latter approach seems unappealing for budget-constrained and prestige-sensitive consumers.

The second research paper aims to answer the following research question: *'Are retail price promotions and household-level food waste negatively or positively related? Which consumer characteristics could potentially influence this relationship?'* The paper comprises a literature review within the sphere of the existing scientific literature on food waste to assess the state of research on the issue and identify consumer characteristics that can possibly play a role in shaping the outcome of food waste. The results show that there is no scientific consensus: Half of the studies conclude that price promotions result in food waste by encouraging overpurchase, while the remaining studies conclude that consumers buying price-promoted food products show average or even lower levels of household food waste. Moreover, the results show that the relationship between price promotions and household food waste is conditional on price consciousness, attitudes, values, identities, and household roles.

The third research paper comprises a field study in households and combines actual food waste data from trash bins with actual deal behavior data from shopping receipts and questionnaire data to answer the following research question: *'Is the use of retail price promotions related to more or less food waste and which consumer characteristics play a differential role in the generation of food waste?'* The results show that households with the largest actual deal share waste less food, as do those who are environmentally concerned. Large households and those who lack skills in food practices on the other hand waste more food. A more nuanced picture of consumer characteristics and their relation to the outcome of food waste in households is illustrated.

The first study of this PhD dissertation was conducted as part of the COSUS project (COSUS—Consumers in a sustainable food supply chain: understanding barriers and facilitators for acceptance of visually suboptimal foods) funded by the Danish Strategic Research Fund (now Innovation Fund Denmark) under project number 4144-00002B. The second and third studies of this dissertation were conducted as part of the WASTEPROM project funded by the Aarhus University Research Foundation.

Dansk resumé

Det har store miljømæssige, sociale og økonomiske konsekvenser, at cirka en tredjedel af den mad, der produceres til forbrug, går til spilde. Ydermere er det et etisk problem, når der i en tid med overflod af mad, er millioner, der er ikke kan være sikre på at kunne få mad eller er underernærede, samtidig med at spiselige fødevarer i stort omfang spildes.

Forskningen viser, at en anseelig del af madspildet sker i almindelige husholdninger. Prissætningen i detailhandlens markedsføring af fødevarer kritiseres for at anspore forbrugerne til at købe mere, end de kan forbruge, og dermed resultere i at mad går til spilde. Paradoksalt nok bruges den samme form for prissætning, som kritiseres for at skabe madspild, også til at fremme salget af sekunda varer, som ellers kasseres, før de når detaileddet, fordi de ikke lever op til den ønskede standard. Det rejser derfor spørgsmålet om salgsfremmende foranstaltninger på en og samme tid kan være skurken, der forstærker madspildet, eller helten, der kan være med til at bekæmpe madspild.

Forskningen har anvendt en mængde metodemæssige tilgange til at undersøge den mulige effekt af salgsfremmende foranstaltninger på madspild – med modsatrettede resultater. På trods af de uklare videnskabelige resultater, hvad angår denne sammenhæng, fortsætter kritikken. I lyset af kritikken har mange detaillister, som har ønsket at indføre en mere ansvarlig markedsføringsstrategi, taget denne bekymring til sig i driften af deres virksomhed og er gået til angreb på madspildet, blandt andet

ved at gå bort fra flerstyks kampagnepriser. Hvis detaillisterne går bort fra denne salgsfremmende foranstaltning med det udtrykte mål at undgå madspild, så må de også sikre, at dette rent faktisk reducerer madspild effektivt.

I den aktuelle forskning om madspild er der et vist forbehold over for brugen af selvrapporterede tiltag i operationaliseringen af de anvendte variable. Det er bredt anerkendt, at denne tilgang – på trods af visse fordele – fører til unøjagtig vurdering af madspild og tilbudsadfærd, hvilket svækker resultaternes pålidelighed. Forbeholdet nødvendiggør objektive målinger af madspild og tilbudsadfærd for at kunne klarlægge om tilbud virkelig kan klandres for madspild. Ydermere har forskningen i madspild indtil nu lagt mindre vægt på at identificere de psykografiske faktorer som kunne spille en vigtig rolle i forbrugernes madspildsadfærd.

På denne baggrund er det denne ph.d.-afhandlings mål at undersøge forholdet mellem detailhandlens kampagnepriser og husholdningernes grad af madspild og besvare følgende spørgsmål: *‘Er detailhandlens kampagnepriser skurken som er en del af madspildsproblemet, eller er kampagnepriser helten som er en del af løsningen på madspildsproblemet, og hvilke forbrugerspecifikke faktorer spiller en afgørende rolle for udfaldet?’*

Denne afhandling forsøger at undersøge forbrugernes anskuelse af pris, og hvordan den dikterer deres måde at fortolke og reagere på kampagnepriser som et markedsføringsredskab, som potentielt kan anvendes til at fremme salget af sekunda fødevarer. Endvidere forsøger denne afhandling at imødekomme opfordringen til at gennemføre grundige studier af forbrugernes madspildsadfærd; studiet går mere i dybden med personlige karakteristika for at få et mere nuanceret og detaljeret billede af de psykografiske faktorer, der relaterer til madspild.

For at komme omkring disse emner består denne afhandling af tre forskningsartikler. Den første artikel beskriver et tværnationalt studie i fem nordeuropæiske lande (Holland, Tyskland, Sverige,

Norge og Danmark). I studiet undersøges, hvilke dimensioner af forbrugernes prisinvolvering, der påvirker deres intention om at købe sekunda fødevarer, og hvilke dimensioner der øger eller reducerer forbrugeres intention om at købe sekunda fødevarer. Mere specifikt undersøges effekten af fem prisinvolveringsdimensioner (tilbudsinteresse, værdibevidsthed, prisbevidsthed, pris-kvalitetsforholdet, prestigefølsomhed), deres opfattede budgetbegrænsninger og det aktuelle forbrug af sekunda varer på forbrugernes intention om at købe disse produkter i den nærmeste fremtid. Resultaterne indikerer, at forbrugernes intentioner om at købe sekunda fødevarer påvirkes af forskellige prisinvolveringsdimensioner indenfor og på tværs af landene. Hovedbudskabet af studiet er, at for at få forbrugerne til at købe sekunda varer, bør detaillisterne prissætte dem, så de fremstår som gode tilbud snarere end billige alternativer, da den sidstnævnte tilgang hverken synes at appellere til forbrugere, der har et stramt budget eller til prestige-søgende forbrugere.

Den anden artikel har til hensigt at besvare følgende spørgsmål: *‘Er detailhandlens kampagnepriser og husholdningers madspild negativt eller positivt relateret? Hvilke forbrugerkarakteristika kan potentielt påvirke denne sammenhæng.* Artiklen indeholder en gennemgang den eksisterende videnskabelige litteratur omkring madspild. Litteraturgennemgangen blev foretaget for at vurdere, hvor langt forskningen er nået på dette punkt og for at afdække forbrugerkarakteristika, som kan have indflydelse på regulering af madspild. Resultaterne viser, at der ikke er nogen videnskabelig konsensus, da halvdelen af undersøgelserne konkluderer, at kampagnepriser resulterer i madspild, fordi de opfordrer til merkøb, mens de resterende konkluderer, at forbrugere, der køber nedsatte varer, har en gennemsnitlig eller mindre produktion af madspild. Endvidere viser resultaterne, at forholdet mellem kampagnepriser og madspild afhænger af prisbevidsthed, holdninger, værdier, identitet og roller.

Den tredje artikel omhandler et feltstudie blandt danske husstande og sammenholder madaffald fra skraldespande med data om tilbudsadfærd fra supermarkedsboner samt psykografiske data fra en

spørgeskemaundersøgelse for at besvare følgende spørgsmål: *‘Er brugen af og forbrugernes reaktion på detailhandlens kampagnepriser relateret til mere eller mindre madspild, og hvilke forbrugerkaraktistika spiller en afgørende rolle i relation til madspild?’* Undersøgelsens resultater viser, at tilbudsinteresserede og miljøbevidste forbrugere producerer mindre madspild, hvorimod store husstande og forbrugere med mangelfulde køkkenfærdigheder producerer mere madspild. Vi danner et mere nuanceret billede af de psykografiske forbrugerkaraktistika og deres sammenhæng med mængden af husholdningernes madspild.

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Chapter 1

Introduction

To have and have not – the food waste issue

Never before in its history has humanity experienced such wide access to a profusion of food supplies to the extent that it does now ([Barrett, 2010](#); [Fogel, 2004](#); [Johnson, 2000](#)). However, despite this abundance of available food, a significant amount of it is wasted, along with the resources utilized for its production and distribution. This loss brings about a profound negative environmental impact. Food waste poses a threat to the planet's continuously depleting forests due to increased demand for agricultural land and use of water that are necessary for the production of food that is eventually thrown away ([Graham-Rowe et al., 2019](#)). It is estimated that food production contributes to approximately 30% of greenhouse gas emissions ([Garnett, 2011](#)), with approximately 3.3 gigatons of CO₂ emissions ([Graham-Rowe et al., 2019](#)), with dire ramifications for public health ([Swinburne & Sandson, 2019](#)). In addition, food waste imposes a financial drain on economies when an estimated \$936 billion is lost due to unconsumed food ([Chalak et al., 2016](#)). Given the difficulty of measuring food waste, only estimates of its approximate magnitude exist ([Alexander et al., 2017](#); [Bellemare et al., 2017](#)), according to which between 25% and 40% of the food that is produced for human consumption is lost within the food supply chain ([FAO, 2015](#); [Kummu et al., 2012](#); [Spiker et al., 2017](#); [Swinburne & Sandson, 2019](#)).

By the year 2050, the world will need 70-100% more food than it does today ([Parfitt et al., 2010](#); [World Bank, 2007](#)). This need commands production of more food, and places even greater demands on natural resources and agriculture ([Foley et al., 2011](#)). Furthermore, given the vast gap in food access, quality and food security worldwide ([Godfray et al., 2010](#)), food waste is an issue of social inequality and a problem for social sustainability, when millions of people, both in developed and developing countries, are chronically malnourished and struggle, or are utterly unable to satisfy their basic human need for/right to nutrition ([Foley et al., 2011](#); [Gjerris & Gaiani, 2013](#); [Marx, 2015](#); [Swinburne & Sandson, 2019](#)).

It therefore becomes apparent that food waste is a significant issue to address and it is imperative to develop a sustainable food system and understand in depth the reasons why perfectly edible food is wasted ("[Reduced Food Waste](#)", 2017; "[12.3.1 Global food losses : www.fao.org](#)"). For this reason international nongovernmental organizations (NGOs), governments, and local food market actors prioritize food waste highly. Organizations such as the United Nations and the European Union have taken up regulatory actions and launched initiatives with the aim of substantially reducing food waste across the entire food value chain, from post-harvest up to the retail and consumer stages ([EU, 2010](#); [UN, 2018](#)).

Defining food waste

Considering the variation that exists in the estimates of the economic and absolute quantity magnitudes of food waste, it is not surprising that there are variations in the definition of food waste itself ([Bellemare et al., 2017](#)). This heterogeneity in the definitions of what constitutes food waste manifests in the multitude of conceptualizations of food waste in the literature in this domain.

On the one hand, [Garrone et al. \(2014\)](#) conceptualize food waste as “[...] *the surplus food that is not recovered to feed people, to feed animals, to produce new products (e.g., jams or juices), new materials (e.g., fertilizers) or energy*”. Similarly, [Bellemare et al. \(2017\)](#) argue that “[...] *as long as food does not end up in a landfill it is not wasted*”. On the other hand [Stuart \(2009\)](#) maintains that food which is intentionally diverted from human consumption constitutes food waste, and [Giordano et al. \(2019\)](#)’s operational definition of food waste adopts the one by the FUSIONS project initiated by the EU ([Gheoldus, 2016](#)) “[...] *any food, and inedible parts of food, removed from the food supply chain to be recovered or disposed*”.

These conceptualizations differ in the teleological perspective that they adopt, as to whether food that is not consumed by humans as initially intended, yet ends up being utilized differently should be

considered as food waste. FUSIONS aims to harmonize the definition of food waste, by conceptualizing in a wider scope what constitutes food waste with the objective to support “...*the development of resource efficient and sustainable food systems in the EU*” (Gheoldus, 2016).

Nonetheless, a consensus exists regarding the classification of food waste as avoidable, possibly avoidable and unavoidable. The former class “[...] *includes all discarded food that has been edible prior to disposal*” (Koivupuro et al., 2012), whereas the second includes “[...] *food and drink that some people eat and others do not...*” (Giordano et al., 2019), and the latter includes food and drink “[...] *that is not and, has not been, edible under normal circumstances*” (Giordano et al., 2019). Nonetheless, edibility is complicated to ascertain because it is often dictated by cultural and social influences (Nicholes et al., 2019). Papargyropoulou et al. (2014) argue that there is a gradient of favorable and less favorable options in the utilization of avoidable and unavoidable food waste, that the authors refer to as the ‘food waste hierarchy’. The authors maintain that the most favorable option regarding avoidable food waste second to preventing it altogether, is using it for animal feed, or composting it, and thus transforming it into something useful. With regard to unavoidable food waste, the authors argue that recycling it is the most favorable solution, with energy recovery and disposal following in that order. In sum, avoiding food surplus throughout the food supply chain, and thus decreasing the probability of avoidable food waste is the most favorable solution to the issue, with re-use, recycle, and recovery as the next best solutions. For unavoidable food waste, recycling as animal feed or compost are the most favorable options, whereas disposal in landfills is the least favorable option.

There are researchers who propose an expansive perspective on what is regarded as food waste. These findings argue that excessive caloric intake through the overconsumption of food beyond the average human metabolic capacity of approximately 2000 kcal/day is unnecessary and therefore food intake beyond that capacity is wasteful (Blair & Sobal, 2006; Parfitt et al., 2010; Smil, 2004). Thus,

according to this perspective, not only discarded food but also food that is eaten beyond nutritional necessity can constitute food waste.

In addition, [Evans \(2012\)](#) discusses the role of fridges, refrigerators, and other food preservation conduits, which often “[...] *operate as coffins of decay...*” for the foods that are stored in them for later use but that are eventually forgotten—foods whose consumption is postponed and that are ultimately discarded ([Waitt & Phillips, 2016](#)). Therefore, taking a broader perspective to illustrate the diversity in the definitions of food waste, not only what is observable in households’ waste bins can be regarded as food waste but also what is stockpiled in food preservation conduits, as well as excessive calorie storage in the human body as a result of excessive food consumption.

This PhD dissertation utilizes an operational definition of food waste as the food (i.e., from meals), or raw food products and materials (e.g., whole or partly consumed fruits, meats etc.) that could have been consumed, stored, or incorporated in a meal, but ends up being thrown in the trash bin instead. Other inedible material such as vegetable peels, coffee grounds, bones etc. are not considered food waste in this dissertation.

This definition of food waste provides a simple guide for quantifying the food that households throw away. If the definition of food waste had adopted the expansive view of food waste as excessive caloric consumption and excessive storage, it would have been cumbersome to measure, and beyond the scope of this dissertation.

In order to explore the relationship between retail price promotions and household level food waste, two measures of food waste were implemented: a) the ‘standard measure’ used in the food waste literature, which is kg of food waste per household (i.e., everything edible including leftovers from meals, etc.), and b) a ‘new measure’ that only includes kg of food waste from unopened and not-emptied food packages per household. The rationale behind the latter measure is that it might be

more relevant to the focal relationship of over-purchasing because of price promotions that result in opened/unopened food packages being thrown out.

Food waste in households

Research suggests that consumers play a significant role in the production of food waste. Evidence shows that the largest share of food waste within the food value chain, in particular in affluent societies, occurs at the household level, and estimates indicate that food waste represents between 40% and 60% of the total food waste in Europe and in the US (Griffin et al., 2008; Hebrok & Boks, 2017; Stenmarck et al., 2011).

The causes of food waste in consumer households are complex and interrelated (Aschemann-Witzel et al., 2015; Quested et al., 2013). Consumers are not necessarily profligate in regard to their decision to discard food. On the contrary, there is evidence that consumers experience negative emotions when wasting food because food carries a significance at a visceral level beyond its nutritional value (Gjerris & Gaiani, 2013). Therefore, it is presumed that consumers do not purposefully waste food but that they do so nonetheless when they go about their everyday household activities and life events. For example, consumers might aspire to be ‘good providers’ and to that end, they might purchase more food than necessary to ensure a wide availability of food for their family (Porpino et al., 2016). Moreover, food waste can occur because of goal conflicts that inhibit food waste reduction, such as concerns over possible health risks or adherence to a particular diet (Barone et al., 2019). In addition, food waste in households comes about due to shortcomings and inefficiencies during planning, shopping, storing, and food handling or during meal preparation. Furthermore, food waste occurs due to an inadequacy in the ability to create use-occasions for the purchased food, in the utilization of leftovers, and in the uncertainty when assessing food edibility (Block et al., 2016; Hebrok & Heidenstrøm, 2019; Schanes et al., 2018; Stancu et al., 2016).

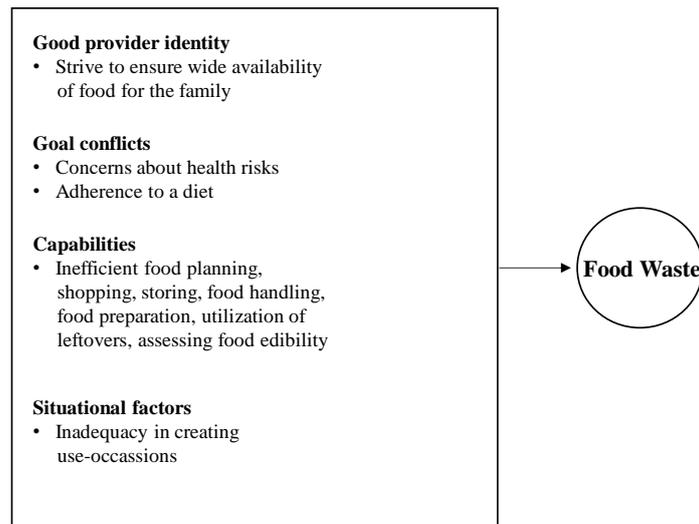


Figure 1: Antecedents of food waste

Consumers, retail price promotions and food waste

It is mentioned that the overall low level of food prices in developed countries leads to an undervaluation of food by consumers (Aschemann-Witzel et al., 2015). People may be able to waste food because the proportion of income that is allocated to food declines as the income level in the western world increases. For instance, in the US, Americans spent 19.3% of their disposable income on food in 1929 versus 6.1% in 2012, whereas in poorer countries, food expenditures as a proportion of income are still rather high; e.g., in Pakistan, people spend approximately 48% of their income on food (Thyberg & Tonjes, 2016). Moreover, Lusk and Ellison (2016) argue that food waste is an economic phenomenon where consumers' decisions to discard food depend on food prices as well as wage and non-wage income; thus, when prices are low(-er), a decision to waste is more likely to occur.

In addition to the overall low price level, pricing mechanisms in food marketing enacted by retailers are being criticized for prompting consumers to overpurchase food and consequently waste it (Gjerris & Gaiani, 2013; Hegnsholt et al., 2018; Stuart, 2009; WRAP, 2011). Pricing mechanisms

are thought to instigate food waste by both the consumers, as well as by the news media, who feel that price promotions encourage them to buy more than needed and consequently produce waste (WRAP 2011). The types of pricing mechanisms that are employed in a retail setting include multi-item offers such as ‘buy one get one free’ (BOGOF) (e.g., 3 for 2, or any number of items sold with the addition of a free item), or temporary price reductions (e.g., initial price reduced by X monetary units). The pricing mechanisms employed in retail help consumers get a deal on a normal price, allow them to stock up at lower prices, tempt them to try new products, or trade up (WRAP 2011). However, consumers’ responses to these pricing mechanisms are not flat. They depend on consumers’ price involvement, which comprises an array of characteristics embedded in consumers’ psyches. These dictate the way in which consumers interpret and the significance they assign to price promotions and eventually their reaction to price promotions (Lichtenstein et al., 1993). Price involvement outlines the nuances in consumers’ price-related marketplace behavior, such as searching exclusively for low prices or aiming to achieve a certain price-to-quality ratio.

In addition, some consumers search for deals more as part of their self-identity rather than as a result of economic need (Jensen & Bech-Larsen, 2017; Urbany et al., 1996; Völckner, 2008), and they might purchase food without much thought when it is sold on deal just as they would with other low-involvement, fast-moving goods (Bell & Marshall, 2003). These consumers appear more unengaged with the food they purchase and possibly waste more of it. However, consumers for whom price promotions on food represent an opportunity to make more out of their budget (Cassady et al., 2007) engage in deal seeking in an effort to save their resources (Goldsmith et al., 2014; Lastovicka et al., 1999) rather than to satisfy their inner propensity to seek price deals. These consumers exhibit caution regarding what they buy and are therefore possibly less wasteful (Gatersleben et al., 2017). Evidence from current research (e.g., Aschemann-Witzel et al. 2017, Di Talia et al. 2019, and Delley & Brunner 2017), further illustrates that heterogeneity in consumer characteristics is decisive both

for the consumers' response to price promotions during their shopping and for the outcome of household food waste. One issue that consequently becomes evident relates to the consumer characteristics that dictate consumers' deal behavior and the role that these characteristics play in exacerbating food waste or mitigating it.

In this PhD dissertation, actual deal behavior (i.e., actual deal share) of a household is calculated as the share bought on deal based on the grocery shopping receipts of the households.

Waste of suboptimal foods

Suboptimal foods (SOF) are foods that deviate from what is regarded as normal in terms of appearance (e.g., shape, size), in terms of date labeling (e.g., close to the expiration date), or in terms of packaging (e.g., dents), without deviating in quality and safety from optimal foods (de Hooge et al., 2017). Consumers measure food quality in impeccable appearance and are therefore reluctant to buy foods that are suboptimal (Göbel et al., 2015; Loebnitz & Grunert, 2015a; White et al., 2016). Recent findings indicate that consumers are unwilling to dispense money and time on SOF because they perceive them to be products of less value (Aschemann-Witzel et al., 2018a). This negative perception of SOF quality plays a major role in their acceptance of such products (Aschemann-Witzel et al., 2018b). Moreover, studies on suboptimal food choice highlight the role of consumer characteristics and socio-demographics such as value orientation, age, country (de Hooge et al., 2017), gender (Aschemann-Witzel, 2018) as well as environmental concern (Loebnitz et al., 2015b), as important factors for choosing SOF.

Retailers aim to offer food products that they believe will be the most appealing to consumers and therefore impose strict criteria that foods have to comply with to be displayed in retail settings (de Hooge et al., 2018). Consequently, large portions of produce are lost instead of becoming available for sale due to non-compliance with these specifications (Eriksson et al., 2012; Göbel et al., 2015).

What becomes apparent is that while the issue of SOF waste might appear to be pertinent to retailers only, the issue is highly relevant for households as well, as it has been created and sustained jointly: Consumers are reluctant to purchase SOF, and retailers accommodate that reluctance by excluding SOF from their assortment. However, this situation is beginning to shift, as retailers in an effort to curb food waste attributable to the loss of SOF, use price promotions to encourage sales of SOF to consumers in their stores. In this case, it becomes apparent that while pricing mechanisms have been criticized as instigators of household food waste, they are also paradoxically becoming utilized in the battle against it. Therefore, the issue that is consequently raised is whether price promotions are to blame as the villain who exacerbates food waste and then becomes the hero who combats it as well.

The retailers' ethical dilemma

The issue of food waste raises questions of ethical nature regarding the role of marketing and the decisions that retailers should contemplate regarding this matter and poses a series of ethical dilemmas (Hunt & Vitell, 1986). On the one hand, retailers can perceive the focal issue as one not having an ethical content and thus decide to ignore the growing concerns and criticism regarding the consequences that price promotions have for food waste and continue utilizing these to meet their economic goals. Alternatively, retailers can perceive the focal issue as one that has an ethical content and react by integrating these societal concerns about the possible effects of price promotions on food waste in their business operations (Carroll & Shabana, 2010). Both of these alternatives, however, impose tradeoffs. If retailers go about doing their business as usual, they risk creating a negative externality, i.e. food waste, with dire environmental, economic and health ramifications for society, but they safeguard their interests, facilitate their economic pursuits and provide access to good deals for their customers. If they choose to abolish price promotions, they face the possibility of losing

sales and reduced access to good deals for budget-constrained customers for the benefit of the society, with the additional outcome of a decrease in the amount of food waste.

Ethics should be the foundation of corporate actions, and ethical precepts be infused into marketing practice (Murphy et al., 2013), as marketers have “*prima facie*” (at first sight) duties that constitute moral obligations (Hunt & Vitell, 1986). Within the realm of moral philosophy, the notion of ethics has been described by Taylor (1975) in Hunt and Vitell (1986) as “*an inquiry into the nature and grounds of morality where the term morality is taken to mean moral judgements, standards, and rules of conduct*”.

How should retailers address this ethical conundrum? Hunt and Vitell (1986) mention that marketing decisions when determining their ethical judgements, should aim to fulfill the joint requirements of utility and justice, while facing the problem of a possible conflict between the two. Retailers can evaluate this conundrum with two kinds of evaluations: A *deontological* and a *teleological* evaluation. The key difference between these two kinds of evaluations is that in the former the retailers will evaluate the inherent rightness or wrongness of the focal action, whereas in the latter retailers will focus on examining the consequences of the focal action (Hunt & Vitell, 1986). However, the *teleological* approach entails an additional conundrum: When examining the consequences of a focal action, whose interest should be prioritized? Based on the work of Hunt and Vitell (1986), retailers can be *ethical egoists* and try to promote their own good, or be *ethical universalists* and strive for a balance of good over bad consequences for society as a whole.

Laczniak and Murphy (2006) describe an array of basic moral principles at the interface between marketing and society that organizations ought to evaluate in order to improve their ethical behavior. According to the authors, marketing decisions should strive for real societal benefits and to that end gather robust empirical information regarding the intensity of the negative externalities borne by

society as an outcome of a marketing action (Laczniak & Murphy, 2019). Therefore, normative prescriptions as for how retailers should fulfill their ethical obligations to society should stem from a deeper understanding of the phenomena that lie in the epicenter of the ethical discourse, which in this particular case is whether or not retail price promotions lead to an increased amount of household food waste.

Some retailers have chosen to abolish multi-item offers on the grounds that they trigger food waste, and by doing so, they have gained an improved image (Aschemann-Witzel et al., 2016). However, in order for this initiative to be meaningful its positive outcome – food waste avoidance – should be greater than its negative side effects, such as decrease in sales and reduced access to good deals for budget-constrained customers. Otherwise, the initiative becomes mere ‘window dressing’ or ‘green-washing’.

A pertinent question is raised about price promotions on suboptimal foods otherwise wasted in store: If price promotions lead to over-purchase and consequently food waste, then this would certainly also apply to price-reduced suboptimal foods, which then might be wasted at home instead of in the store. Are then retailers claiming that they make an effort towards reducing food waste, reaping the benefits of a favorable reputation as a good corporate citizen, while simultaneously contributing to an increased amount of food waste with the use of price promotions, thereby just pushing the problem to the household level? Despite the apparent conflict between these decisions, there is also potential for the alignment of interests of both retailers and consumers with beneficial outcomes for both. The basis for that proposition is that it might not necessarily be possible for retailers to maintain profitable operations under the conditions of the constant controversy, unfounded or not, that they exacerbate food waste, as consumers might denounce those retailers. Thus, a retailer’s effort to enact initiatives in relation to the environmental and social issue of food waste might prove economically successful in the long run (Schaltegger et al., 2012). Moreover, price promotions

provide a conduit for retailers to sell more and thus fulfill their economic goals, and for consumers to make more out of their limited budgets. Thus, price promotions and food waste do not affect consumers or retailers negatively, but have wider societal effects. The benefits of this alignment in the interests of retailers and consumers are illustrated by [Vitell \(2015\)](#), who emphasizes the important role of consumers in the success of such corporate initiatives.

Therefore, and in order to address this ethical conundrum, retailers who decide to abolish price promotions with the explicit goal of avoiding food waste, should have sound evidence that these actions effectively reduce food waste and that the positive outcome—food waste avoidance—is greater than its negative side effects. That endeavor into unearthing evidence on the consequences of a retail practice and the possible negative externalities for society will manifest that retailers are willing to assume responsibility for their actions and that they are not solely focused on promoting their own agenda and interests. Moreover, it will exhibit that they are responsive to social concerns and are eager to accept and respond to criticism by adjusting their business accordingly.

The caveats in food waste research

Measuring the amount of food waste in households is very difficult and highly prone to measurement errors for an array of reasons. Food waste is a sensitive issue and when households are asked to provide estimates of the food that they waste, their estimations can be distorted, due to social desirability bias ([Fisher, 1993](#)). The results of measurements of food waste that rely on self-reported estimations have “...a systematic error...resulting from the desire of respondents to avoid embarrassment and project a favorable image to others” ([Fisher, 1993](#)). Moreover, food waste research enquires respondents’ recollection of the occurrence of food waste in the recent past, which also provides inaccurate estimations of the amount of food wasted, since respondents do not have an accurate notion of the food that they have wasted in the past. Given that food waste occurs at the very

end of the household food provisioning process as an outcome that is not premeditated and therefore easy to forget, its accurate measurement becomes more difficult. Finally, food might not be thrown in the trash bin, but also composted, or fed to pets (Porpino, 2016).

Still, a noteworthy commonality among current research on the topic, regardless of the direction of their findings, is the use of self-reported measures in the operationalization of food waste. However, several studies have shown that self-reported measures are poor indicators of actual food waste because consumers misestimate their food waste behavior (Elimelech et al., 2019; Giordano et al., 2018; van Herpen et al., 2019). This caveat necessitates the use of objective measures of food waste to investigate the issue in a profound manner.

In a similar fashion, current studies on the topic rely on self-reported measures in the operationalization of deal behavior, necessitating the use of objective measures of the degree to which consumers use price promotions, in order to investigate the relationship between price promotions and household food waste based on behavioral data (Koivupuro et al., 2012).

Research has utilized a multitude of methodological approaches to investigate the possible effects of price promotions on food waste, e.g., online surveys (e.g., Aschemann-Witzel et al., 2017; Ponis et al., 2017), interviews (e.g., Farr-Wharton, Foth, & Choi, 2014; Graham-Rowe et al., 2014), ethnographic observations (e.g., Porpino et al., 2015), and kitchen diaries (e.g., Koivupuro et al., 2012; Williams et al., 2012). The current evidence from these studies, however, does not allow definitive conclusions on the direction of the focal relationship because of the contradictory nature of the results. A number of studies conclude that price promotions increase food waste (e.g., Farr-Wharton, Foth, & Hee-Jeong Choi, 2014; Mondéjar-Jiménez et al., 2016; Setti et al., 2016), while some conclude that consumers who buy on deal waste less (e.g., Parizeau et al., 2015; Silvennoinen et al., 2014), and others are inconclusive (e.g., Giordano et al., 2019; Qi & Roe, 2016; WRAP, 2011).

However, despite these ambiguous scientific results, the criticism that retail price promotions exacerbate food waste persists (Hegnsholt et al., 2018).

Finally, food waste research has thus far focused on identifying antecedents of food waste in households, and has put less weight on identifying the consumer characteristics that could potentially play a role in their food waste behavior. Therefore, a more thorough investigation of consumers' food waste behavior, one that delves deeper into personal characteristics, is needed to gain a more nuanced and detailed picture of the consumer characteristics that relate to food waste (Bartha & Horváth, 2019). However, investigation of such consumer characteristics that relate to food waste requires the use of psychometric scales with self-reported measures that will reveal these latent dimensions. From the outset, the use of self-reported measures poses an apparent caveat similar to the one described previously. However, psychometric research relies heavily on self-reported measures and scales developed and validated to measure latent dimensions in consumers' psyche, rather than recollect quantities as in food waste research. Therefore, the utilization of self-reported measures to identify consumer characteristics that relate to food waste is warranted.

Aims, scope and research questions

Against this background, this PhD dissertation sets out to investigate the relationship between retail price promotions and household-level food waste, and aims to bring evidence of whether the widely applied marketing practice of price promoting at one level (retail) is associated with negative outcomes (food waste) on another level (household). This evidence will provide substantive input for responsible, ethical marketing and decisions that are more informed for retailers who wish to engage in the mitigation of food waste from their standpoint in the food value chain.

Moreover, the dissertation aims to provide substantive input to facilitate the understanding of this phenomenon that lies in the epicenter of an ethical discourse, on whether or not retail price promotions

lead to an increased amount of household food waste. This issue will be investigated at the households, the final stage within the food value chain and for that reason the most relevant setting to the research aim of this dissertation. It is not within the aim of this PhD dissertation to investigate the effect of particular types of price promotions on the households' food waste, but the households' propensity to buy on deal expressed as the proportion of the total expenditure for food.

The overarching research question of this dissertation is as follows:

'Are retail price promotions the villain who is part of the problem of food waste, or are they the hero who is part of the solution of food waste, and which consumer characteristics play a differential role for the outcome?'

The quest for evidence on the directionality of the focal relationship commences with an empirical study at the retail level, which aims to ascertain whether price promotions can be employed to mitigate food waste. More specifically the first empirical study aims to investigate whether consumers' price involvement, which dictates the manner in which consumers interpret and respond to price promotions, can be employed to enhance the sale of SOF. The first empirical study aims to answer the following research questions: *'Which dimensions of consumers' price involvement affect their intention to purchase SOF? Which price involvement dimensions enhance or weaken consumers' intention to purchase SOF?'*

Thereafter, follows a literature review within the sphere of the existing scientific literature on food waste. The aim is to assess the state of research on the subject and establish a benchmark for comparison. Moreover, the literature review aims to identify consumer characteristics that can possibly play a role in shaping the outcome of food waste. The literature review aims to answer the following research question: *'Are retail price promotions and household-level food waste negatively or positively related? Which consumer characteristics could potentially influence this relationship?'*

Finally, in search of empirical evidence, the investigation continues at the household level in a field study that aims to generate concrete evidence on the nature of the focal relationship. To that end, the field study combines actual food waste with actual deal behavior and psychographic questionnaire data to answer the following research question:

‘Is the use of retail price promotions related to more or less food waste and which consumer characteristics play a differential role in the generation of food waste?’

Overview of research papers

This PhD dissertation comprises three research papers: a systematic literature review and two empirical studies. These papers contribute to a deeper understanding of the role that retail price promotions play in household food waste by examining the potentially dual role of retail price promotions: On the one hand, as a marketing tool that exacerbates food waste, and on the other hand, as a marketing tool that can be employed to combat food waste.

What’s the deal? Consumer price involvement and the intention to purchase suboptimal foods. A cross-national study

The first study aimed to answer the following research questions: *‘Which dimensions of consumers’ price involvement affect their intention to purchase suboptimal food products? Which price involvement dimensions enhance or weaken consumers’ intention to purchase suboptimal food products?’* This research explored the notion that consumers individually interpret and respond to price promotions based on their price involvement and that differences in this interpretation can enhance or weaken purchase intentions for SOF. To explore these research questions, an online questionnaire was administered to three thousand, one hundred and fourteen consumers (3.114) across five Northern European countries: the Netherlands (n=628), Germany (n=622), Sweden (n=620), Norway (n=625), and Denmark (n=619). The questionnaire contained measures of five price

involvement dimensions, derived from the work of [Lichtenstein et al. \(1993\)](#) and [Jensen \(2006\)](#): deal proneness, value consciousness, price consciousness, price-quality schema, and prestige sensitivity. Moreover, the questionnaire included measures of perceived budget constraints ([Urbany et al., 1996](#)), current use of SOF, and purchase intentions for these products. The results indicate that consumers' intention to purchase SOF is influenced by different price involvement dimensions across countries. The strongest predictor of future intentions to purchase SOF is consumers' current frequency of use. With increased frequency of use, consumers' wrongful perception of SOF having low quality can be countered. Moreover, consumers are concerned with the image they project socially when shopping for SOF. The effects of deal proneness and value consciousness on the intention to purchase SOF indicate that retailers should price promote them in a manner that emphasizes the good deal aspect. The thus far applied practice of selling SOF at a crude discount seems to be unappealing to low-price seeking and budget-constrained consumers, as well as consumers who are prestige sensitive. The study underlines the usefulness of approaching price promotions for SOF in a more nuanced manner that taps into consumers' heterogeneity in their reaction to price and price promotions. Therefore, the application of an even, one-size-fits-all price promotion approach would not prove to be as effective in encouraging the purchase of SOF.

Promoting food for the trash bin? A review of the literature on retail price promotions and household-level food waste

The second research paper aimed to address the following research questions: *'Are retail price promotions and household-level food waste negatively or positively related? Which consumer characteristics could potentially influence this relationship?'* To that end, a systematic literature review approach was employed to investigate the pertinent evidence in the existing scientific literature. Therefore, the search for literature was limited to articles published in peer-reviewed refereed journals that constitute established knowledge ([Podsakoff et al., 2005](#)). The search was

conducted in two databases: *ISI Web of Science* and *Scopus*. Several inclusion criteria were defined to screen the identified records for relevant publications. Thereafter, a sequential process took place where each identified record was evaluated for relevancy according to the inclusion criteria. Finally, backward and forward bibliographic searches were conducted on the identified papers. Eventually, 24 records met all inclusion criteria and were included in the literature review.

The results of the review show that the relationship between price promotions and household-level food waste is ambiguous and thus inconclusive. In total, 12 articles indicate a positive relationship between price promotions and household-level food waste. In these articles, the results suggest that price promotions are related to greater amounts of food waste. In contrast, eight articles hint at a negative relationship between price promotions and food waste. In this case, the results of the studies indicate that consumers who are more prone to shopping for discounted food products are less likely to waste food than those who are not prone to discount shopping. Finally, the remaining four studies find no association between retail price promotions and food waste.

This second study provides a more nuanced view of the role of pricing in food waste by showing that this relationship is conditional upon consumer characteristics that are relatively overlooked in this debate: price consciousness, attitudes, values, identities, and household roles. The study concludes that such issues of ethical content and their attempted solutions, such as abolishing certain price promotions, can both solve and create problems because of the existing heterogeneity in consumer reactions to these measures. The study shows that the assumption ‘price promotions lead to food waste’ is an example of simplifying a relation and neglecting the role of the consumer and that the consumer heterogeneity explains why research findings on the relation are ambiguous. The study thus underlines the importance of accounting for and acknowledging consumer responsibility. Finally, the study illustrates that the issue of food waste affects multiple levels of analysis, where retailer initiatives lead to differential effects conditional on consumer-level factors.

The relationship between retail price promotions and household-level food waste: Busting the myth with actual food waste and deal share data?

The third research paper aimed to answer the following research question: *‘Is the use of retail price promotions related to more or less food waste and which consumer characteristics play a differential role in the generation of food waste?’* The study addressed this research question by employing a multi-method approach, which comprised three elements: food waste sorting, collection of shopping receipts, and a questionnaire. The decision to implement this combined methodological approach was based on the need to address the acknowledged caveats that exists in the current research on food waste—the use of self-reported measures for the operationalization of the variables of food waste and deal behavior, which has been consistently criticized for impeding the reliability of the findings (e.g., Elimelech et al., 2019; Giordano et al., 2018), as well as delve deeper into consumer characteristics in the issue of food waste. We collected food waste data from trash bins, deal behavior data through shopping receipts, and price involvement and attitudinal data with a questionnaire from 118 households.

The results of this empirical study show that households with the largest actual deal share waste less food, as do those who are environmentally conscious. Larger households and those who lack skills in food practices waste more food. Moreover, the study identifies consumer clusters of low, medium and high food wasting households to illustrate the characteristics of consumers with varying levels of food waste. These results paint a nuanced picture of the profile of consumers by interweaving behavioral, attitudinal and demographic data. This provides, on the one hand, further support for the results from the previously conducted literature review on the role of consumers in food waste and, on the other hand, additional support for the view that the assumption that ‘price promotions lead to food waste’ is overly simplistic and disregards the role of consumer characteristics.

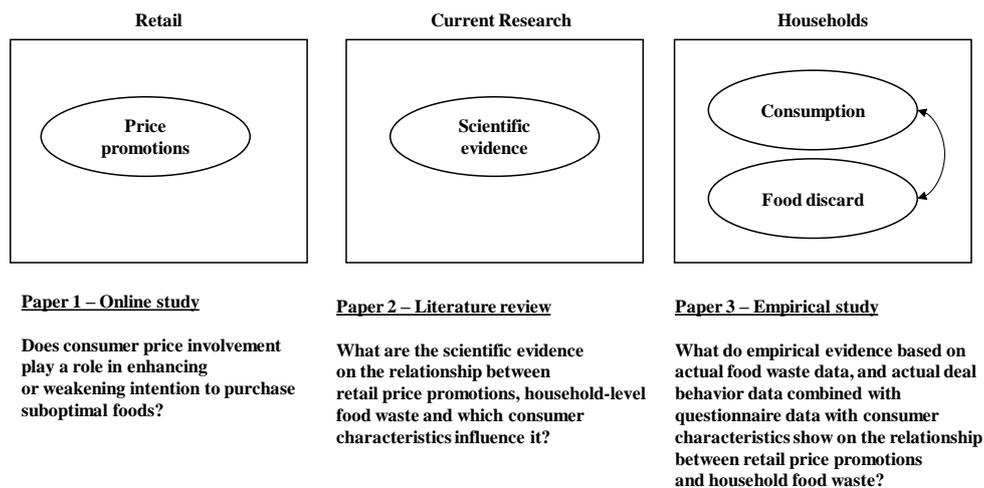


Figure 2: Overview of the research papers

Conclusions

The aim of this PhD dissertation was to answer the research question ‘*Are retail price promotions the villain who is part of the problem of food waste, or are they the hero who is part of the solution of food waste, and which consumer characteristics play a differential role for the outcome?*’

Three studies were conducted with the aim to address the overarching research question from multiple perspectives: One perspective that is grounded in the domain of the current literature and another that is within the empirical research domain. The conclusions of each of them are presented in the following.

The first study aimed to answer the following research question: ‘*Which dimensions of consumers’ price involvement affect their intention to purchase SOF? Which price involvement dimensions enhance or weaken consumers’ intention to purchase SOF?*’

The first research paper utilized an online study to investigate the effect of five consumer price involvement dimensions, perceived budget constraints, and frequency of SOF purchases on the

intention to buy suboptimal food products (SOF), across five North European countries: The Netherlands, Germany, Sweden, Norway, and Denmark.

The study demonstrates that consumers do not perceive price promotions in a uniform manner, and due to that diversity in interpretation, the application of an even, one-size-fits-all price promotion approach is not an effective practice to facilitate the purchase of SOF. The conclusion of the study points to the direction that implementation of delineated price promotions that tap into consumers' heterogeneity in their reaction to price promotions can have a positive effect on their intention to purchase SOF, and that consumers' intention to purchase SOF is influenced by different price involvement dimensions across countries.

The results of this study demonstrate that the relationship between consumers' current experience with SOF and their intention to purchase SOF in the future is positive. The progressively increasing consumer exposure to SOF can encourage SOF purchases as it raises awareness of SOF, provides them with the opportunity to evaluate the sensory qualities of these food products, and reinforces the notion that SOF represent good deals where consumers get value for money. Therefore, retailers should focus on convincing consumers that SOF offer the possibility to make good deals and offer a good price-quality ratio. The notion of SOF as products of inferior quality can be countered after increased SOF trials. The study concludes that retailers' efforts to present SOF solely as cheap(-er) products are ineffective, and can even have a negative effect on intention to purchase SOF, even for consumers with limited economic resources. Finally, in order to appeal to prestige sensitive consumers, whom, as the study concludes, do not purchase SOF under the current circumstances; it could be beneficial to promote an alternative prestige notion, in non-economic terms, for instance by promoting the societal and environmental benefits of purchasing SOF as evidence of serving a greater purpose.

The second study aimed to answer the following research question: *‘Are retail price promotions and household-level food waste negatively or positively related? Which consumer characteristics could potentially influence this relationship?’*

The second study, a systematic literature review, concludes that there is no clear consensus in the literature on the relationship between household-level food waste and price promotions, which appears to be ambiguous. Although a slight majority of the identified studies identify a positive correlation between price promotions and food waste, evidence from a number of other studies questions this conclusion. Additionally the literature review concludes that some of the investigated studies appear to have the default assumption that a positive relationship exists per se. Moreover, some of the identified studies emphasize the existence of a positive relationship between over-purchase and household food waste, yet they do not assert a causal relation given their qualitative nature. Furthermore, identified studies based on food waste diaries, tend to show a negative relation between the focal variables, which possibly provides a more accurate approximation of what is wasted. Finally, the included studies hint at the existence of an array of factors that can mitigate household food waste: A thrifty attitude, price consciousness, personal values that discourage wastefulness, and household members’ roles and capabilities within the food provisioning process.

The third and final study of this PhD dissertation aimed to answer the following research question: *‘Is the use of retail price promotions related to more or less food waste and which consumer characteristics play a differential role in the generation of food waste?’*

The third study employed a multi-method approach that combined the collection of actual food waste data and actual deal data through shopping receipts as well as questionnaire data from households in Denmark. The study indicates that on average households who buy more on deal produce less food waste. Furthermore, the study concludes that there exists an array of consumer

characteristics that play a differential role in the outcome of food waste. Increased environmental awareness is negatively associated with food waste, while household size also plays a negative role. Additionally, the study concludes that households are generally perceptive of behaviors that can exacerbate food waste, and that some practices that relate to the provisioning and handling of food might lead to increased amounts of actual food waste, e.g., not keeping stock overview of unused food. Finally, the third study's conclusion is that the notion that marketing induces excessive purchases through the application of price discounts, and hence increases food waste appears to be questionable.

In sum, this PhD dissertation concludes, based on actual food waste and actual deal behavior data, is that on average households who buy more on a deal basis appear to produce less food waste. However, consumers' characteristics play a pivotal differential role in the focal relationship between retail price promotions and food waste, as they influence both the way that consumers perceive and react to retail price promotions and the outcome of food waste in their households.

Thus, the PhD dissertation's findings provide evidence that a straightforward relation between the use of price promotions and household food waste is in fact a myth and that the notion that marketing induces food waste through the application of price discounts appears to be unfounded. The relationship between retail price promotions and household-level food waste is not ubiquitous for all consumers, and the scientific evidence provided by this dissertation points towards a more nuanced approach to the issue. Consumer characteristics, such as environmental awareness, food-related competencies, and demographic characteristics, can influence the amount of household food waste.

Consumers exhibit heterogeneity in the way that they interpret and react to price promotions. Therefore, to employ price promotions in the battle against food waste by means of price promoting SOF, retailers should appeal to consumers' heterogeneity by applying an array of price promotions,

not just crude discounts. This way, food waste reduction can be dealt with on the retailer level, by making food that otherwise would have been thrown out, available to consumers.

Moreover, food waste is not a behavior in itself but rather an outcome of a larger complex network of antecedents. Consumers do not deliberately waste food, but waste occurs nonetheless during the process of navigating through the contingencies of everyday life. The results corroborate that self-reported food waste behavior is not a good predictor of actual food waste behavior. This highlights the need for establishing reliable measures of food waste so as not to necessitate the collection of actual food waste data each time that studies aim to investigate food waste-related issues, since the collection of actual food waste data is a costly and time-consuming endeavor.

The dissertation illustrates that the issue of food waste exists as a discourse that affects multiple levels of analysis where institutional (retailer) initiatives lead to differential effects conditional on consumer level factors. This presents a difficult problem in so much as first-order solutions lead to immediate second-order problems. Thus, the issue of the ethical dilemma that is in focus here is one where actors are forced to both consider the lesser of two evils when making decisions and to understand the complications that their actions lead to, which could perhaps explain why institutions may feel paralyzed when considering how their actions could possibly affect consumers and society.

Limitations

The aim of the dissertation was to investigate the relationship between retail price promotions and household level food waste. Therefore, it was necessary to exclude the aspect of food waste related to the retailer level, and narrow the scope of investigation to what was directly relevant to meet the aims of the dissertation. The impetus for this demarcation of research scope was to include the aspect of retail that facilitates examining the outcome on another level, the households. That aspect is the use of price promotions to battle food waste otherwise wasted in retail due to being suboptimal.

Retailers have initiated an array of initiatives to help curb food waste, and one of these initiatives involves the use of price promotions to promote sales of suboptimal food. That raised the question of whether or not a price-based approach could facilitate substantive positive change, or whether it would exacerbate the problem of food waste. Hence, based on this background, this PhD dissertation initially dealt with the investigation of whether delineated price promotions can actually prove useful in enhancing the effectiveness of this approach, and subsequently with examining the overall association between retail price promotions and food waste at the household level.

However, it was not within the aims of this PhD dissertation to investigate the effect of particular types of price promotions on the households' food waste, hence it was deal share expressed as the proportion of the total household expenditure for food that was employed as a measure of the household's propensity to buy on discount. Moreover, based on the collected data, it was not possible to investigate the relationship between price promoting SOF and food waste, due to insufficient data. Stickers that are usually placed on SOF as indicators of them being suboptimal were destroyed either in the household or in the bin, making it more or less impossible for the sorters to identify them. In addition, it was not possible to differentiate between single item and multi-item offers in the trash bins, hence the focus was put on the aggregate food waste amounts and overall household deal share.

Finally, the main critique applied in this PhD dissertation that creates part of the impetus for the implementation of the food waste sorting study, is on the use of self-reported measures for the measurement of food waste, as well as deal behavior. The currently employed methods to measure food waste rely on self-reported approximations of its quantity, which is highly prone to bias and therefore misestimation. Similarly, when it comes to the measurement of deal behavior, where a self-reported measure would have a similar caveat; consumers could misestimate their own deal behavior. However, in order to identify consumer characteristics that relate to food waste, such as e.g.,

thriftiness, deal proneness, environmental concern, and value orientations, the use of psychometric scales with self-reported measures that will reveal these latent dimensions is necessary.

Contributions

This PhD dissertation, following [Crane et al. \(2016\)](#), *explains* the focal phenomenon and the existing ambiguity in current findings by identifying relevant consumer characteristics. The dissertation's contribution is *original* because it refutes the common assumption that price promotions unequivocally lead to food waste. Finally, this PhD dissertation has *utility*, as it has implications for responsible marketing.

This PhD dissertation adds to the ongoing debate on the issue of food waste and retail price promotions by compiling and synthesizing the current state of the debate on the issue. Furthermore, this dissertation offers substantive input on this focal issue and thus provides a handhold for informed decisions on this ethical dilemma in retail. This input should be accounted for when retailers design their marketing initiatives and overall corporate strategy, as ethics should be '*...the foundation of corporate responsibility in marketing*' ([Murphy et al., 2013](#)). The dissertation thus helps improve the 'utility' of the existing work in this domain that advances theory ([Whetten, 1989](#)) and explains the focal action of abolishing price promotions to reduce food waste and the ambiguity of the findings with the identification of consumer characteristics. These consumer characteristics have been largely disregarded in this debate, to which this thesis contributes to by showing that the role of consumers is crucial and by emphasizing the importance of acknowledging consumers' heterogeneity and responsibility in the ongoing discourse on the role of retail price promotions in household food waste. The findings question the common assumption of many researchers, practitioners and the public who assume that price promotions undeniably lead to food waste. Moreover, the dissertation has practical

utility because it has implications for responsible marketing and provides a compass for navigating the problem in the future.

The first study of this PhD contributes to the pricing and food waste literature and offers an understanding of the elements that play a role towards maximizing the effect of price promotions on consumers' purchase intentions of SOF. Furthermore, it contributes to the food waste literature by addressing the gap that pertains to the use of consumer price involvement as a sustainability instrument that helps reduce food waste. Finally, this first study offers suggestions for retailers that wish to sell SOF, to guide development of price-based interventions that enhance the sale of SOF products. Very importantly, the first study of this PhD dissertation contributes to a better understanding of the recent initiative of selling SOF by identifying consumer characteristics that can enhance the likelihood of its success. This confluence of consumer price perception and shopping behavior for SOF, while perhaps not immediately apparent as a theoretical addition as is an 'interesting' new phenomenon (Davis, 1971), offers clear managerial implications for retailers who wish to sell SOF, as these results guide further development in price-based interventions enacted against food waste.

The second study of this PhD dissertation contributes to the food waste literature first by compiling and synthesizing the current state of the debate on the issue and by providing a more nuanced view of the role of retail price promotions on household food waste. It does so by showing that this relationship is not as straightforward as initially believed, but that it is conditional upon consumer characteristics that are relatively overlooked.

The third study of this PhD dissertation offers a methodological contribution to the food waste research, by combining a multifold of measurements, i.e., actual food waste and deal share data, combined with attitudinal data. This approach is novel and provides substantive evidence that the relationship between retail price promotions and household food waste is not overly simplistic and

straightforward as thus far assumed in the discourse on the subject. The third study contributes by bringing valuable evidence that corroborate the existing ambiguity in the scientific literature on food waste, as well as empirical information regarding the intensity of the negative externalities borne by society as an outcome of a marketing action.

Furthermore, this PhD dissertation contributes to the literature on business ethics by addressing a core tenet in business ethics, which is to gather robust empirical information regarding the intensity of the negative externalities borne by society as an outcome of a marketing action. This PhD dissertation provides a deeper understanding of a phenomenon that lies in the epicenter of an ethical discourse, and provides substantive input that guides how retailers should fulfill their ethical obligations to society. The findings allow retailers to make more informed decisions and allows a better understanding of the consequences of their decisions on the economic, social, and environmental outcomes.

This PhD dissertation contributes to business practice by providing actionable suggestions for responsible marketing and how retailers should react to the food waste debate and claims made in this discussion. It does not necessarily help the cause of reducing household food waste if price promotions such as e.g., BOGOF are abolished. The evidence shows that the issue appears to be much more a question of how consumers handle price promotions, since the findings of this dissertation suggest that those consumers who buy more on deals, are also more likely those who are capable of handling their food so that they avoid food waste. An additional contribution pertains to business practice by warranting that retailers should not immediately respond to societal criticism by implementing marketing actions that might not address the focal issue effectively. In this particular case, retailers can assume responsibility for the issue of food waste and implement actions that support food waste avoidance at the household level, both by price promoting the sale of SOF, in communicating the issue, as well as facilitating the use and storage of the foods they sell.

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Chapter 2

Research paper 1

What's the deal? Consumer price involvement and the intention to purchase suboptimal foods. A cross-national study.

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Abstract

Retailers aim to supply consumers exclusively with food products that are flawless, and therefore impose strict standards that foods have to comply with before deemed qualified for retail. This practice results in large amounts of foods, suitable for human consumption, to be discarded due to deviation from these standards. In an effort to battle food waste, retailers have begun to offer suboptimal food products on price promotion. However, consumers' reactions to price promotions are not uniform and depend on the significance individuals assign to these promotions, based on their own price involvement. An online questionnaire administered to a total sample of 3.114 consumers divided across representative samples of Dutch (n= 628), German (n= 622), Swedish (n= 620), Norwegian (n= 625) and Danish (n= 619) consumers aimed to investigate the effect of five price involvement dimensions (deal proneness, value consciousness, price consciousness, price-quality schema, prestige sensitivity), perceived budget constraints, and current use of suboptimal foods on consumers' intention to purchase these products in the near future. Results indicate that consumers' intention to purchase suboptimal foods is influenced by different price involvement dimensions within and across countries. These findings offer evidence that a more nuanced approach to price promotions can increase consumers' intentions to purchase suboptimal foods and thus prove an efficient marketing tool that can be used to help reduce food waste. Retailers could benefit from applying price promotions that tap into the price involvement dimensions that increase consumers' intentions to purchase suboptimal foods, in contrast to the current practice of applying uniform price reductions.

Keywords

Food waste; suboptimal foods; price involvement; retail; pricing tactics; interaction

Introduction

Retailers aim to offer food products they believe will be most appealing to consumers, and therefore impose strict criteria on the appearance, weight, size and shape these foods have to fulfil in order to enter retail (de Hooge et al., 2018). Food products have to comply with a multitude of product specific marketing standards and strict specifications that result in the institution of quality levels and trade classes. Waste of blemished foods is often viewed as a sign of good quality control in the process of doing business (Gunders, 2012). Consequently large portions of produce are lost instead of becoming available for sale in retail due to non-compliance with these specifications (Eriksson et al., 2012; Göbel et al., 2015). Production statistics hardly record the amounts of produce that is lost within the supply chain due to non-compliance with quality standards (de Hooge et al., 2018), so it becomes difficult to calculate the exact environmental and economic ramifications attributable to this loss. However, several sources identify that non-compliance with quality standards results in substantial food losses, which could have been mitigated with a profound impact on food waste reduction had these products been made available for sale instead (e.g., Gustavsson et al., 2011; Göbel et al., 2015; Stenmarck et al., 2011; Stuart, 2009). Moreover, given the gap in food access, quality and security worldwide it appears unethical if food is wasted due to aesthetic reasons, while large populations are not able to satisfy their basic human need/right for nutrition (Gjerris & Gaiani, 2013). It becomes therefore clear that food waste due to non-compliance with quality standards is a significant issue to address. These non-compliant suboptimal foods (SOF) deviate from what is regarded as normal in terms of appearance (e.g., shape, size), in terms of date labelling (e.g., close to the expiration date), and in terms of packaging (e.g., dents), without deviating in quality from optimal foods (de Hooge et al., 2017).

Consumers measure quality in impeccable appearance and are reluctant to buy foods that deviate from that standard, have damaged packaging, or they are close to their expiry date (Göbel et al., 2015; Loebnitz & Grunert, 2015; White et al., 2016; Yue et al., 2009). This aversion has been attributed to a “...*deep-rooted evolutionary instinct*” that associates imperfections with increased food borne risks (Block et al., 2016). Even the idea of consuming foods with blemishes can have a negative effect on how consumers view themselves (Grewal et al., 2019). Retailers, who are important actors at the last stage of the food value chain, have the capacity to act as gatekeepers who could initiate change. On one hand by becoming willing to retail SOF, thus allowing more inclusive harvests, and on the other hand by encouraging and promoting SOF availability in retail outlets, thus changing consumers’ view on these products.

The question that consequently arises, is how to prompt consumers to buy SOF. Aschemann-Witzel et al. (2015) suggest that retailers should ideally market SOF differently across various consumer groups that the authors later identify (see Aschemann-Witzel, 2018b), in order to increase the impact of the sale of SOF. Price tactics are marketing tools that can become vehicles of change towards that aim (Verghese et al., 2013). Tsiros and Heilman (2005), propose that price-based approaches could convince consumers to purchase perishable SOF close to expiry date, and Aschemann-Witzel et al. (2017) found that consumers who focus on price tend to choose SOF to a larger extent than consumers who do not.

In many European countries retailers are beginning to offer SOF with price reductions in their outlets (Aschemann-Witzel et al., 2015; Kulikovskaja & Aschemann-Witzel, 2017) and consumers are becoming increasingly familiarized with the existence of SOF on supermarket shelves. Aschemann-Witzel (2018a) provided evidence that this familiarity translates into choice for consumers who are familiar with SOF.

This line of action can be further improved so that it will transition from being a crude price-reduction approach to becoming a more refined, and efficient instrument of change both for businesses, as well as sustainability purposes. The premise for that proposition is rooted in that consumers exhibit heterogeneity in their reactions to price and price promotions (Dickson & Sawyer, 1990). Therefore, and with the aim to maximize the effectiveness of price based approaches, retailers need to delineate price tactics that tap into consumers' heterogeneity in their reaction to price and price promotions. Lichtenstein et al. (1993), suggest that this heterogeneity is attributable to consumers' price involvement, which functions as the lens through which a consumer interprets and assigns significance and meaning to price promotions, which can in many cases be discrepant from what price setters assume (Monroe, 1973).

Moreover, de Hooge et al. (2017) conclude that “...almost every type of suboptimal product can be sold when consumers receive a discount that fits the sub-optimality”. The present study extends that thesis and proposes that SOF products can be sold when SOF are not merely discounted, but price promoted in a way that resonates with how consumers interpret price promotions and the significance they assign to price promotions. In other words when SOF are retailed with price promotions that appeal to consumers' individual price involvement.

Research objectives

On this background, the present study aims to answer the following research questions: ‘Which dimensions of consumers' price involvement affect their intention to purchase SOF? Which price involvement dimensions enhance or weaken consumers' intention to purchase SOF?’. This research explores the notion that consumers interpret prices individually based on their price involvement, and that differences in this interpretation can enhance or weaken purchase intentions for SOF. This study focuses on how prices are interpreted at the consumers' end, and intends to contribute to the pricing

and food waste literature a) by offering an understanding of the elements that play a role towards maximizing the effect of price promotions on consumers' purchase intentions of SOF, and b) by addressing the gap that exists within the food waste literature, and pertains to the use of consumer price involvement as a sustainability instrument that helps reduce food waste. Additionally this work has clear practical implications for retailers that wish to sell SOF, as these results will guide further development of price based interventions for the sale of SOF products.

Consumer price involvement

Consumer price involvement refers to an array of psychographic dimensions that underlie consumers' price related marketplace behavior. Consumers who exhibit price consciousness, focus exclusively on paying low prices (Lichtenstein et al., 1993), consumers who exhibit value consciousness, have an increased concern over the price paid relative to value received in a purchase transaction (Lichtenstein et al., 1993), and consumers who exhibit deal proneness, strive for achieving good deals when shopping (Jensen, 2006). It is noteworthy that even though both price consciousness and deal proneness seemingly revolve around low prices, the former dimension emphasizes on the degree to which consumers focus exclusively on finding low prices, whereas the latter dimension underlines the degree to which consumers aim for getting good deals, and not necessarily only low priced goods, which gives them a sense of being smart and competent shoppers (Völckner, 2008). Consumers who use price level as a cue for the quality of the product operate on a price-quality schema (Lichtenstein et al., 1993), and consumers who are concerned about their social status and use the prices of goods they buy to signal prominence, exhibit prestige sensitivity (Lichtenstein et al., 1993). According to Lichtenstein et al. (1993) price plays a role that is dual in its nature in consumer perception, i.e. it can be positive, or negative. Price assumes a negative role due to the economic outlay consumers have to give in order to acquire a good, and thus higher prices negatively affect

purchase behavior. On the other hand prices are perceived to assume a positive role, when they act as cues to a positive product attribute, such as its quality, thus higher prices positively affect purchase behavior. Price consciousness, value consciousness, and deal proneness relate to a perception of price in its negative role, whereas price-quality schema and prestige sensitivity relate to a perception of price in its positive role.

Finally, perceived budget constraints, which are not a psychographic characteristic, refer to the “*economic limitations consumers have*” (Urbany et al., 1996). However, the economic outlay consumers need to offer at each purchase transaction, and its perceived relative share to their total budget, play an important role in their buying decisions and influences their reactions to price and price promotions (Krishna et al., 1991; Urbany et al., 1996). Increased economic limitations in consumers’ budgets, will consequently impose constraints in their purchase ability. It is therefore reasonable to assume that for economically constrained consumers SOF would offer an alternative source for groceries that offers the possibility for getting more out of their limited financial resources.

Hypotheses formulation

Prior research has shown that the behavior one exhibits in the past is a highly reliable predictor of behavioral intentions in the future (Ajzen, 1991; Ouellette & Wood, 1998; Aarts et al., 1998). Therefore, consumers’ current preference for SOF, which is reflected in how frequently they purchase SOF, will affect their intention to purchase SOF in the future. Based on this assumption, it is hypothesized that:

H₁: Consumers’ current shopping frequency of SOF products will have a direct positive effect on intentions to purchase SOF.

Consumers who operate on price consciousness, value consciousness, and deal proneness seek to pay low(-er) prices. Therefore, and because SOF are usually offered on a price discount, it is hypothesized that:

H₂: Price consciousness, value consciousness and deal proneness will positively affect intentions to purchase SOF, i.e. intentions to purchase SOF increase when a) consumers focus more on paying low prices; b) consumers are more concerned with the price paid relative to value received in a purchase transaction; c) consumers focus more on price deals.

Consumers who operate on a price-quality schema, or are prestige sensitive, do not seek to pay low(-er) prices. Therefore, and because SOF are usually offered on a discount, it is hypothesized that:

H₃: Price-Quality schema and prestige sensitivity will negatively affect intentions to purchase SOF, i.e. intentions to purchase SOF decrease a) the more consumers believe that a high price signals high product quality; b) the more the consumers are concerned about their social status.

Consumers with increased perceived budget constraints seek to pay low(-er) prices. Therefore, and because SOF are usually offered on a discount, it is hypothesized that:

H₄: Perceived budget constraints will positively affect intentions to purchase SOF, i.e. consumers who have increased economic limitations in their budget, will have increased intentions to purchase SOF in the future.

This study proposes that consumers' intention to purchase SOF is influenced by their current shopping frequency of SOF, as well as their price involvement. However, on the basis of the findings by [Aschemann-Witzel et al. \(2017\)](#), that price focused consumers tend to choose SOF to a larger extent than non-price focused consumers, it is expected that the effect of current shopping frequency of SOF on intention will differ between consumers who exhibit higher and lower levels within each of the price involvement dimensions previously described. In other words it is proposed that there is

an interaction between the current frequency of SOF purchase and price involvement. The interaction between these two variables addresses ‘when’, or ‘for whom’ (i.e. consumers with high vs. consumers with low price involvement), current frequency of SOF purchase most strongly predicts intention to purchase SOF (Frazier et al., 2004). Based on that premise, it is hypothesized that:

H5: The price involvement dimensions relating to price in its negative role, price consciousness, value consciousness, and deal proneness, will strengthen the effect of current shopping frequency of SOF on intentions to purchase SOF, creating an enhancing interaction.

H6: The price involvement dimensions relating to price in its positive role, i.e. price quality schema and prestige sensitivity will weaken the effect of the current shopping frequency of SOF on intentions to purchase SOF, creating a dampening interaction.

Moreover it is hypothesized that:

H7: Perceived budget constraints will strengthen the effect of current shopping frequency of SOF on intentions to purchase SOF, creating an enhancing interaction.

Methodology

Sample and survey implementation

In total three thousand, one hundred and fourteen consumers (3.114) across five North European countries, the Netherlands (n= 628), Germany (n= 622), Sweden (n= 620), Norway (n= 625), Denmark (n= 619), participated in a 25 minute web-based survey in June 2017 (50.7% males, 18-74 years old, $M_{age}=47.3$, $SD_{age}=15.8$). All samples within each of the five countries were representative in terms of age, gender and residence across geographic regions within the respective countries. Demographic characteristics of each country sample can be found in the Appendix (Tables 8, 9, 10, 11 and 12). Respondents were recruited by a professional marketing research agency. The choice of

the participating countries took into account that perception of price among consumers is influenced by culture and degree of economic development (Meng, 2011; Zielke & Komor, 2015). Therefore countries that are comparable in terms of urbanization, literacy rates, and ecological footprint (de Hooge et al., 2017) were chosen, so as to ensure that cultural differences in price perception would be kept to a minimum. Thus it was anticipated that the findings of this study to be highly relevant and generalizable over a large geographic region.

The survey was developed in English and then translated into the native languages of the five participating countries by the collaborating researchers across these countries. Even though the overall objective of the study was to collect data on food waste behavior across all five countries, each part of the administered questionnaire pertained to the specific objectives of each team of researchers involved. The present study utilizes a subset of the data collected for its own purposes.

Measures

Participants rated all response items, in terms of their level of agreement on a seven-point scale (1 = “strongly disagree,” and 7 = “strongly agree”), except for the frequency of purchase of SOF, which was rated on a 5 point scale (1 = “never”, to 5 = “always”).

Current frequency of SOF purchase and intention to purchase SOF were measured with one and three statements respectively. Deal proneness was measured with three statements adapted by Jensen (2006). Price consciousness, value consciousness, price-quality schema and prestige sensitivity were measured using items from Lichtenstein et al. (1993). Perceived budget constraints was measured with three items by Urbany et al. (1996). Finally, sociodemographic questions were asked, regarding the households’ composition, education and income levels, as well as age. All of the above statements pertaining to the price involvement dimensions, as well as frequency of SOF purchase and purchase intentions are listed in Table 1.

Table 1: Questionnaire items per construct – Mean, Standard deviations and Chronbach’s α

Construct	Items	Mean (SD)	Chronbach’s α
Frequency of purchase of suboptimal food products Scale: “never” (1) - “always” (5)	How often do you usually buy food fruit and vegetable that are in unusual shapes and sizes, or food products have minor cosmetic flaws such as dented package or are close to their expiration date?	3.09 (.91)	n.a.
Intention to purchase suboptimal foods Scale: ‘strongly disagree’ (1) - “strongly agree”(7)	I intend to buy fruits and vegetables in unusual shapes and sizes at a grocery shop over the next couple of weeks I aim to buy food items that have minor cosmetic flaws, such as a dented package, etc., at a grocery shop over the next couple of weeks I intend to buy food products which are close to their expiration date at a grocery shop over the next couple of weeks	4.35 (1.75) 4.38 (1.72) 4.54 (1.83)	.873
Price consciousness Scale: ‘strongly disagree’ (1) - “strongly agree”(7)	The money saved by finding low prices is usually not worth the time and effort. <small>Reversed item</small> I am not willing to go through extra effort to find lower prices. <small>Reversed item</small>	4.77 (1.75) 4.79 (1.74)	.642
Deal proneness Scale: ‘strongly disagree’ (1) - “strongly agree”(7)	I would rather wait with buying groceries, until they are on sale At the supermarket, I look for which items are on sale I am prone to buying groceries on sale	3.88 (1.94) 5.32 (1.64) 5.28 (1.63)	.798
Value consciousness Scale: ‘strongly disagree’ (1) - “strongly agree”(7)	When grocery shopping, I compare the prices of different grocery products to be sure I get the best value for the money I always check prices at the grocery store to be sure I get the best value for the money I spend	4.79 (1.68) 4.79 (1.67)	.821
Price-quality schema Scale: ‘strongly disagree’ (1) - “strongly agree”(7)	Generally speaking, the higher the price of the grocery products , the higher their quality The old saying "you get what you pay for" is generally true The price of grocery products is a good indicator of quality	3.36 (1.6) 3.97 (1.61) 3.40 (1.52)	.830
Prestige sensitivity Scale: ‘strongly disagree’ (1) - “strongly agree”(7)	People notice when you buy the most expensive grocery products It says something to people when you buy the high priced version of a grocery product I think others make judgments about me by the kinds of grocery products I buy	2.74 (1.70) 3.16 (1.77) 2.45 (1.61)	.800
Perceived budget constraints Scale: ‘strongly disagree’ (1) - “strongly agree”(7)	I frequently have problems making ends meet My budgeting is always tight I often have to use more money than I have available	2.87 (1.91) 3.54 (2.02) 2.62 (1.81)	.875

The shown values Mean, SD and Cronbach’s α , are calculated on the aggregate level.
Cronbach’s α values were also calculated per country and they are above the acceptable threshold of .7.

Results

In the following sections the results of confirmatory factor analyses (CFA) are presented for the measurement instruments. Thereafter, results for measurement invariance (ME/I) assessment across the five participating countries are described, and descriptive statistics with country differences are reported. Lastly the results of the hypotheses testing pertaining to the direct and interaction effects are discussed. Analyses were performed using IBM AMOS 25. Correlation coefficients for the

associations between the price involvement dimensions, as well as the measures of SOF frequency and intention to purchase can be found in the Appendix (Table 13, Table 14, and Table 15).

Multi-group confirmatory factor analysis (MGCFA)

The manifest items used to measure the price involvement dimensions, were established measures borrowed from [Lichtenstein et al. \(1993\)](#), [Urbany et al. \(1996\)](#) and [Jensen \(2006\)](#). A MGCFA was conducted in order to ascertain whether the constructs comprising the theoretical model are adequately and trustworthily represented by the manifest items used for their measurement across and within the participating countries ([Milfont & Fischer, 2010](#)).

Before comparing the groups, it is important to make sure that the proposed model provides good fit to the empirical data. Initial CFA results indicated a model with a good model fit of the proposed model to the observed data ($\chi^2 = 2302.535$, $p < .01$, $df = 168$, CFI = .929, RMSEA = .064, 90% CI = .062 - .066, SRMR = .064) ([Hu & Bentler, 1999](#)). Upon close inspection of the standardized estimates, it was noticed that one item in the value consciousness construct had a loading of .36, which is below the commonly accepted threshold of .7 ([Jarvis et al., 2003](#)) and was therefore removed from the analysis. Moreover, all loadings on the construct of price consciousness were as well lower than the threshold of .7. Examination of the construct's internal consistency with the use of Cronbach's alpha criterion ([Cronbach, 1951](#)) indicated that one item pertaining to the practice of participants to shop in multiple outlets in order to take advantage of low prices was causing low internal consistency ($\alpha = .580$) and was also removed from the analysis, despite the statistically significant, albeit low, correlation coefficient with the remaining items. Detailed measures of reliability and validity for the utilized constructs can be seen per country in the Appendix (Tables 16, to 25).

The final model provided very good fit to the data ($\chi^2 = 1209.417$, $p < .01$, $df = 131$, CFI = .962, RMSEA = .051, 90% CI = .049 - .054, SRMR = .046) ([Hu & Bentler, 1999](#)). Multiple group analyses

were performed with the aim to cross validate the model within each of the participating countries. The results indicated very good model fit within each country (Table 2).

Table 2: Multiple group analyses - Model fit per country

Country	<i>N</i>	χ^2	<i>p</i>	<i>df</i>	χ^2/df	CFI	RMSEA (90% CI)	SRMR
The Netherlands	628	397.133	<.01	131	3.032	.956	.057 (.051 - .063)	.0586
Germany	622	400.337	<.01	131	3.056	.952	.058 (.051 - .064)	.0558
Sweden	620	344.925	<.01	131	2.633	.962	.051 (.045 - .058)	.0525
Norway	625	364.724	<.01	131	2.784	.959	.053 (.047 - .060)	.0507
Denmark	619	366.741	<.01	131	2.800	.957	.054 (.047 - .061)	.0531

Measurement invariance (ME/I)

It is necessary to determine whether the same measures evoke the same cognitive frame of reference across the five countries in order for cross-country comparisons to be substantive in the present study (Vandenberg & Lance, 2000). In order to test for equivalence of measures and thus establish ME/I, a series of increasingly constrained Structural Equation Models are run. Constraints are applied on factor loadings (metric invariance), intercepts (scalar invariance) and residual variances (measurement error invariance), with each additional model being nested within the previous one. ME/I is established by testing whether differences between these increasingly restrictive models are significant (Milfont & Fischer, 2010; Steenkamp & Baumgartner, 1998; van de Schoot et al., 2012). In this particular study, with a large number of groups and sample sizes, the chi-square test is likely not useful in ascertaining ME/I. Therefore ME/I was assessed with the use of the alternative fit indices CFI, and RMSEA, and particularly by comparing the decrement in model fit with every addition of constraints in the model (Rutkowski & Svetina, 2014). When comparing more than two groups, the change in these fit indices should not exceed .030 for RMSEA and .020 for CFI in order to claim metric invariance, and .010 for RMSEA as well as for CFI in order to claim scalar invariance (Rutkowski & Svetina, 2014). The results of the ME/I tests indicate that there is metric

invariance, which allows for meaningful comparisons of the measures across countries, but are ambiguous in relation to the existence of scalar invariance (see Table 3). Here the difference (Δ) in RMSEA is within the suggested threshold, but not the difference in CFI, which exceeds the suggested magnitude of change from the metric invariance model. A sequential approach was initiated by freeing the equality constraints on item intercepts in order to locate the source of invariance. Freeing all intercepts pertaining to the deal proneness construct resulted in a Δ CFI of .011, which is marginally above the suggested cutoff value of .010. In conclusion, the existence of metric invariance allows for comparisons of the relationships between the factors across countries, but due to the existence of partial scalar invariance, caution should be used in analyses involving comparison of means between countries.

Table 3: Measurement invariance of the CFA model

Level of invariance	χ^2	<i>p</i>	df	CFI	RMSEA	Δ CFI	Δ RMSEA
Configural invariance	1873.859	<.01	655	.957	.024	-	-
Metric invariance	2200.790	<.01	731	.948	.025	.009	.001
Scalar invariance	3468.708	<.01	807	.906	.033	.042	.008

Descriptive statistics

Table 4 provides an overview of the mean and standard deviation of the frequency of SOF purchases, and intention to purchase SOF across countries, as well as the pooled sample. Sweden and Norway exhibit respectively the lowest and highest averages on both the frequency of SOF purchase (Sweden: $M=2.90$, $SD=0.86$, Norway: $M=3.21$, $SD=0.85$), as well as the intention to purchase SOF (Sweden: $M=3.93$, $SD=1.70$, Norway $M=5.13$, $SD=1.46$). Regarding the intention to purchase SOF, with the exception of Denmark, who does not differ significantly from the Netherlands and Sweden, the remaining countries' intention to purchase SOF is significantly different from one another.

Table 5 provides an overview of the mean and standard deviation of the price involvement dimensions. Denmark exhibits the highest average deal proneness ($M=5.06$, $SD=1.49$), and Sweden the lowest ($M=4.49$, $SD=1.53$). With regards to value consciousness, Germany has the highest average ($M=5.08$, $SD=1.36$), and Norway the lowest ($M=4.56$, $SD=1.63$). Price consciousness does not vary widely across the participating countries, with the lowest average found in Germany ($M=4.59$, $SD=1.48$) and the highest in Denmark ($M=4.95$, $SD=1.52$). Similarly, price-quality schema does not differ widely among the participating countries. Here the lowest mean value is found in Norway ($M=3.39$, $SD=1.35$), and the highest in Sweden ($M=3.84$, $SD=1.34$). With prestige sensitivity, an interesting pattern of differences is observed. The Netherlands and Germany do not differ significantly between them, and so do Sweden, Norway and Denmark. However, these two country groups exhibit a significant difference with one another. Sweden has the lowest mean value in prestige sensitivity ($M=2.68$, $SD=1.38$), and the Netherlands the highest ($M=3.06$, $SD=1.41$). Similarly, the Netherlands and Germany do not differ between them in their perceived budget constraints, and so do Norway and Denmark. However, these two groups differ significantly from one another. Sweden exhibits the lowest perceived budget constraints ($M=2.43$, $SD=1.59$), and the Netherlands the highest ($M=3.54$, $SD=1.53$).

Table 4: Means and Standard Deviations per country for Frequency and Intention of SOF purchase

Country	Frequency of SOF purchase *		Intention to purchase SOF **	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
The Netherlands	3.15 ^{ac}	.95	4.27 ^b	1.36
Germany	3.18 ^{ac}	.94	4.66 ^c	1.47
Sweden	2.90 ^b	.86	3.93 ^d	1.70
Norway	3.21 ^a	.85	5.13 ^a	1.46
Denmark	3.04 ^{cb}	.92	4.09 ^{bd}	1.56
Total sample	3.09	.91	4.41	1.57

*Scale: 'never' (1) to 'always' (5);

**Scale: "strongly disagree," (1) - "strongly agree"(7)

Countries with the same letter index do not differ statistically

Table 5: Means and Standard Deviations per country for price involvement dimensions and Perceived budget constraints

Country	Deal Proneness		Value consciousness		Price consciousness		Price-quality schema		Prestige sensitivity		Perceived budget constraints	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
The Netherlands	5.00 ^a	1.28	4.74 ^{bc}	1.44	4.81 ^{cb}	1.53	3.51 ^{bc}	1.31	3.06 ^a	1.41	3.54 ^a	1.53
Germany	4.85 ^{ab}	1.41	5.08 ^a	1.36	4.59 ^c	1.48	3.47 ^b	1.42	3.05 ^a	1.52	3.49 ^a	1.77
Sweden	4.49 ^c	1.53	4.69 ^{bc}	1.63	4.74 ^{cb}	1.50	3.84 ^a	1.34	2.68 ^b	1.38	2.43 ^{dc}	1.59
Norway	4.72 ^{bc}	1.54	4.56 ^b	1.63	4.81 ^{cb}	1.44	3.39 ^b	1.35	2.47 ^b	1.34	2.84 ^b	1.74
Denmark	5.06 ^a	1.49	4.88 ^{ac}	1.58	4.95 ^{ab}	1.52	3.68 ^{ac}	1.35	2.66 ^b	1.41	2.73 ^b	1.64
Total sample	4.82	1.47	4.79	1.54	4.77	1.49	3.57	1.36	2.78	1.43	3.00	1.71

Scale: “strongly disagree,” (1) - “strongly agree”(7)

Countries with the same letter index do not differ statistically

Hypotheses testing

Table 6 provides an overview of the direct effects of current SOF frequency, and price involvement dimensions, on consumers’ intention to purchase SOF, as well as their interaction per country and for the pooled sample. These are discussed in detail in the following sections.

Direct effects – Per country

Current frequency of SOF purchase has a significant and positive direct effect on future intention to purchase SOF across all countries. Thus H₁ is accepted across all five participating countries. The effect is smallest in the Netherlands ($\beta = .39, p < .001$), and largest in Denmark ($\beta = .49, p < .001$).

Of the price involvement dimensions relating to price in its negative role, and in support of H₂, deal proneness has a significant positive direct effect, on the intention to purchase SOF across all five of the participating countries. The particular dimension exerts its smallest effect in Sweden ($\beta = .10, p < .05$), and the largest in Norway ($\beta = .19, p < .001$). Value consciousness has a significant positive direct effect on the intention to purchase SOF, in support of H₂, in the Netherlands ($\beta = .20, p < .001$), Germany ($\beta = .12, p < .05$) and Sweden ($\beta = .10, p < .05$). Price consciousness, contrary to what was

hypothesized in H₂, exerts a negative effect on intention to purchase SOF only in the Netherlands ($\beta = -.09, p < .05$) among the participating countries.

Of the price involvement dimensions relating to price in its positive role, both price-quality schema, and prestige sensitivity contrary to what was hypothesized in H₃, do not have an effect in any of the participating countries. Similarly, perceived budget constraints, contrary to what was hypothesized in H₄, exerts no direct effect on the intention to purchase SOF in any of the participating countries. An overview of the supported and not supported hypotheses that pertain to the direct effects of the current frequency of SOF purchase as well as of the price involvement dimensions and perceived budget constraints for each of the five countries is presented in Table 7.

Direct effects – Across all countries

Current frequency of SOF purchase has a significant positive direct effect on the intention to purchase SOF ($\beta = .47, p < .001$), and that confirms H₁. Of the price involvement dimensions relating to price in its negative role, deal proneness, and value consciousness have significant positive effects on the intention to purchase SOF of $\beta = .13$ ($p < .001$), and $\beta = .09$ ($p < .001$) respectively, as hypothesized in H₂, whereas price consciousness exerts a negative effect on intention to purchase SOF ($\beta = -.11, p < .001$), opposite to what was hypothesized in H₂. Of the price involvement dimensions relating to price in its positive role neither price-quality schema, nor prestige sensitivity have a significant effect on intention to purchase SOF, as hypothesized in H₃. Similarly, perceived budget constraints exert no effect on intention to purchase SOF counter to what was hypothesized in H₄. An overview of the supported and not supported hypotheses that pertain to the direct effects of the current frequency of SOF purchase as well as of the price involvement dimensions and perceived budget constraints for the pooled sample of all five countries, is presented in Table 7.

Interaction effects – Per country

For the purpose of testing for the interaction between current SOF frequency and the included price involvement dimensions and perceived budget constraints, variables were mean centered, and their product was subsequently calculated and used in the analyses as the interaction term (Dawson, 2014). The coefficients of the interactions are presented, so as to ascertain whether these interactions are enhancing or dampening. To enhance interpretability of these interactions, these are presented graphically for high and low values of SOF frequency and price involvement with the use of the online resource www.jeremydawson.com/slopes.htm (see Appendix, Figures 1, to 12). The values used for the calculation of the different groups are one standard deviation above and below the mean, following the procedure described in Dawson (2014); and Frazier et al. (2004).

Deal proneness and value consciousness, contrary to what was hypothesized in H₅, do not interact with the frequency of SOF purchase in any of the participating countries. Price consciousness, in support of H₅, strengthens the positive relationship between current frequency of SOF purchases and intention to purchase SOF in Norway ($\beta = .09, p < .05$) (Figure 1). Price-quality schema, counter to what was hypothesized in H₆, strengthens the positive relationship between current frequency of SOF purchases and intention to purchase SOF in Norway ($\beta = .09, p < .05$) (Figure 2), and Denmark ($\beta = .10, p < .05$) (Figure 3).

Table 6: Main and interaction effects on intention to purchase SOF per country and for the pooled sample

DV: Intension to purchase SOF	The Netherlands			Germany			Sweden			Norway			Denmark			All countries			
	B (SE)	β (p)	R ²	B (SE)	β (p)	R ²	B (SE)	β (p)	R ²	B (SE)	β (p)	R ²	B (SE)	β (p)	R ²	B (SE)	β (p)	R ²	
SOF freq.¹	.543 (.052)	.386***	.18	.678 (.06)	.462***	.21	.853 (.071)	.485***	.26	.767 (.067)	.457***	.26	.767 (.064)	.491***	.26	.756 (.028)	.468***	.24	
DP²	.178 (.048)	.171***		.145 (.045)	.149***		.094 (.047)	.095**		.174 (.044)	.186***		.107 (.046)	.112**		.128 (.021)	.127***		
VC³	.185 (.042)	.199***		.121 (.045)	.120**		.091 (.042)	.099**		.016 (.039)	.019 (.672)		.057 (.042)	.063 (.168)		.083 (.019)	.087***		
PC⁴	-.075 (.038)	-.086**		.020 (.038)	.022 (.602)		-.048 (.040)	-.047 (.232)		-.043 (.041)	-.043 (.293)		-.058 (.041)	-.061 (.159)		-.059 (.018)	-.060***		
PQS⁵	-.050 (.046)	-.049 (.271)	.29	-.031 (.044)	-.032 (.476)	.28	.035 (.046)	.031 (.447)	.29	-.081 (.042)	-.077 (.056)	.31	.027 (.043)	.025 (.528)	.28	-.036 (.020)	-.034 (.069)	.28	
PS⁶	.076 (.045)	.080 (.090)		.013 (.042)	.014 (.757)		.027 (.046)	.025 (.556)		-.042 (.043)	-.039 (.334)		.013 (.041)	.013 (.743)		.000 (.020)	.000 (.992)		
PBC⁷	-.004 (.034)	-.005 (.901)		-.059 (.031)	-.076 (.055)		.027 (.037)	.028 (.470)		-.039 (.032)	-.047 (.220)		.011 (.034)	.013 (.739)		.006 (.015)	.006 (.711)		
DP x SOF freq.	-.004 (.049)	-.004 (.932)		.050 (.043)	.053 (.246)		.105 (.054)	.094 (.055)		-.055 (.049)	-.052 (.257)		.036 (.047)	.038 (.445)		.041 (.021)	.040 (.054)		
VC x SOF freq.	.055 (.043)	.061 (.209)		.080 (.048)	.073 (.097)		-.052 (.048)	-.051 (.275)		-.029 (.045)	-.029 (.522)		.059 (.046)	.064 (.197)		.016 (.021)	.016 (.447)		
PC x SOF freq.	.030 (.037)	.036 (.410)		-.018 (.039)	-.020 (.636)		.048 (.044)	.045 (.275)		.089 (.043)	.084**		.005 (.042)	.006 (.897)		.021 (.018)	.022 (.247)		
PQS x SOF freq.	.018 (.045)	.018 (.686)	.34	.016 (.047)	.017 (.727)	.30	.022 (.054)	.018 (.683)	.31	.103 (.049)	.090**	.34	.105 (.042)	.103**	.33	.062 (.021)	.058**	.30	
PS x SOF freq.	-.184 (.045)	-.199***		-.074 (.043)	-.086 (.086)		-.150 (.054)	-.128**		-.173 (.050)	-.152***		-.131 (.042)	-.129**		-.157 (.021)	-.153***		
PBC x SOF freq.	-.039 (.034)	-.046 (.249)		-.069 (.030)	-.092**		.023 (.040)	.023 (.566)		.010 (.037)	.010 (.783)		-.091 (.038)	-.094**		-.051 (.016)	-.057***		
Model fit criteria																			
χ^2	41.983			62.325			63.673			99.624			114.535			252.084			
df	26			26			26			26			26			26			
χ^2/df	1.615			2.397			2.449			3.818			4.405			9.696			
CFI	.995			.986			.987			.974			.964			.984			
RMSEA	.031			.047			.048			.067			.074			.053			
90% CI	.011 - .048			.032 - .063			.033 - .064			.053 - .081			.061 - .088			.047 - .059			
SRMR	.011			.016			.015			.024			.030			.016			

** $p < .05$, *** $p < .001$

1: SOF purchase frequency; 2: Deal proneness; 3: Value consciousness; 4: Price consciousness; 5: Price-quality schema; 6: Prestige sensitivity; 7: Perceived budget constraints

Prestige sensitivity, in support of H₆, dampens the positive relationship between current frequency of SOF purchases and intention to purchase SOF in the Netherlands ($\beta = -.20, p < .001$), Sweden ($\beta = -.13, p < .05$), Norway ($\beta = -.15, p < .001$) and Denmark ($\beta = -.13, p < .05$) (Figure 4, Figure 5, Figure 6 and Figure 7). Perceived budget constraints dampens the positive relationship between current frequency of SOF purchases and intention to purchase SOF in the future in Germany ($\beta = -.09, p < .05$) and Denmark ($\beta = -.09, p < .05$) (Figure 8, Figure 9), contrary to what was hypothesized in H₇. An overview of the supported and not supported hypotheses that pertain to the interaction of the price involvement dimensions and current frequency of SOF purchases for each country is presented in Table 7.

Table 7: Hypotheses testing per country and for the pooled sample

		The Netherlands	Germany	Sweden	Norway	Denmark	Pooled sample
Hypothesis		Hypothesis supported/not supported					
SOF freq.	H ₁	Supported	Supported	Supported	Supported	Supported	Supported
DP		Supported	Supported	Supported	Supported	Supported	Supported
VC	H ₂	Supported	Supported	Supported	Not supported	Not supported	Supported
PC		<i>Not supported*</i>	Not supported	Not supported	Not supported	Not supported	<i>Not Supported*</i>
PQS		Not supported	Not supported	Not supported	Not supported	Not supported	Not supported
PS	H ₃	Not supported	Not supported	Not supported	Not supported	Not supported	Not supported
PBC	H ₄	Not supported	Not supported	Not supported	Not supported	Not supported	Not supported
DP x SOF freq.		Not supported	Not supported	Not supported	Not supported	Not supported	Not supported
VC x SOF freq.	H ₅	Not supported	Not supported	Not supported	Not supported	Not supported	Not supported
PC x SOF freq.		Not supported	Not supported	Not supported	Supported	Not supported	Not supported
PQS x SOF freq.		Not supported	Not supported	Not supported	<i>Not supported*</i>	<i>Not supported*</i>	<i>Not supported*</i>
PS x SOF freq.	H ₆	Supported	Not supported	Supported	Supported	Supported	Supported
PBC x SOF freq.	H ₇	Not supported	<i>Not supported*</i>	Not supported	Not supported	<i>Not supported*</i>	<i>Not supported*</i>

*The effect is significant and opposite to what was hypothesized; bold font indicates a significant effect

Interaction effects – Across all countries

Deal proneness, value consciousness and price consciousness, contrary to what was hypothesized in H₅, do not interact with SOF frequency. Price-quality schema strengthens the relationship between

SOF frequency and intention to purchase SOF ($\beta = .06, p < .05$) (Figure 10). However, the effect is opposite to what was hypothesized in H₆. On the other hand, as predicted in H₆, prestige sensitivity dampens the positive relationship between SOF frequency and intention to purchase SOF ($\beta = -.15, p < .001$) (Figure 11) and so does perceived budget constraints ($\beta = -.06, p < .001$) (Figure 12). However, the latter effect is opposite to what was hypothesized in H₇. An overview of the supported and not supported hypotheses that pertain to the interaction of the price involvement dimensions and current frequency of SOF purchases for the pooled sample of all five countries, is presented in Table 7.

General discussion

This study has investigated the effect of five consumer price involvement dimensions, as well as of perceived budget constraints, and of the frequency of SOF purchases, on the intention to buy suboptimal food products (SOF), i.e. food products that are close to their expiration date, have deformities and/or dents across five North European countries: The Netherlands, Germany, Sweden, Norway and Denmark. To that end an online survey was administered in June 2017.

The results indicate that consumers do not perceive price promotions uniformly, and therefore the application of an even, one-size-fits-all price promotion approach would not prove to be as effective in encouraging purchase of SOF. Given that the presence of SOF in the retail settings of the investigated countries is a relatively recent approach, the results of this study provide evidence that implementing delineated price promotions in order to appeal to consumers' heterogeneity in how they react to price promotions can prove effective: Tapping into consumers' individual price involvement can positively affect their intention to purchase SOF, and thus provide an efficient tool to increase purchase intentions for SOF.

Discussion on direct effects and their implications for retailers – Per country

The results of this study demonstrate that the relationship between consumers' current experience with SOF and their intention to purchase SOF in the future is positive. This finding corroborates and adds on previous literature on the effects of past behavior on future purchase intentions ([Armitage & Conner, 2001](#); [Ouellette & Wood, 1998](#); [Aarts et al., 1998](#)). By promoting the assortment of SOF within their outlets, and progressively expanding it, retailers increase exposure that can encourage SOF purchases. This result further supports the findings of [Aschemann-Witzel \(2018a\)](#), that consumers' familiarity with the practice of SOF sale positively influences their choice. Increased experience with SOF is beneficial not only in that it raises consumers' awareness of SOF, but also in that it provides them with the opportunity to acknowledge that the sensory qualities of these food products are not inferior to their optimal counterparts.

To that end retailers can additionally reinforce the notion of SOF quality by e.g., providing SOF samples to their customers. Particularly for the case of fruits, vegetables, and foods in dented packages, SOF should not be regarded inferior due to their visual deviations from optimality, similarly to the organic product segment where visual blemishes and non-perfect appearances are considered a sign of authenticity ([de Hooge et al., 2018](#)).

In the case of food products close to their expiration date the situation is more complicated and requires additional and more nuanced efforts on behalf of retailers in order to promote their sale. This additional effort could potentially focus on providing assurances to the consumers that will lessen concerns related to close-to-date foods. An example of such an assurance is a money back guarantee in case that the close-to-date food does not live up to the consumer expectations, or to provide explicit instructions as for how to cook or further store the particular product.

Deal proneness has a positive direct effect on intention to purchase SOF in all of the participating countries, and value consciousness has direct positive effects on intention to purchase SOF in the Netherlands, Germany and Sweden. These results indicate that retailers within these countries should focus on reinforcing the notion that SOF represent good deals where consumers get value for their money. Marketing efforts could focus on convincing deal seeking consumers that SOF offer the possibility to make good deals, e.g., by promoting the sale price of SOF accompanied with a reference price, and thus create a more favorable evaluation of the offer for those consumers who are deal hunting. If those consumers who are concerned with the ratio of quality received to price paid in their shopping can be persuaded that SOF represent value for money, then retailers will have achieved progress towards establishing the presence of SOF in retail.

To the contrary, price consciousness in most countries does not have a direct effect on the intention to purchase SOF, which is an indication that when it comes to marketing SOF, retailers' efforts to present SOF solely as cheap(-er) products and hope that this will appeal to consumers is ineffective. This result further supports the results of [Aschemann-Witzel \(2018a\)](#) who found that communicating budget savings does not have an effect on purchase intentions for SOF. Similarly, [Alford and Biswas \(2002\)](#), found that price consciousness influences search intention, rather than purchase intention, and [Lichtenstein et al. \(1993\)](#) suggest that both economic as well as noneconomic price-related factors underlie marketplace behaviors, i.e. it is not always the sheer presence of a discount that plays the most important role when making purchases.

This notion is further supported in the case of the Netherlands, where price consciousness even has a negative effect on intention to purchase SOF. Prestige sensitivity does not have a direct effect on intention to purchase SOF in any of the participating countries. This result is in unison with previous literature on prestige sensitivity and culture, according to which concern for self-image is a characteristic of consumers in Asia, rather than in the Western world (see [Zhang et al., 2018](#)).

Discussion of direct effects – Across all countries

When looking at the results from the pooled data across all of the five participating countries, these illustrate a similar picture for the collective sample albeit with a few variations. Deal proneness, and value consciousness have direct positive effects on intention to purchase SOF, whereas price consciousness has a direct negative effect on the intention to purchase SOF. While some of these results confirm what was hypothesized (see Tables 6 and 7), the effect of price consciousness is in the opposite direction. Seen in the context of the results of the current study, this finding reinforces the notion that exclusive focus on presenting SOF as cheap, crudely and arbitrarily discounted products will not suffice to prompt consumers buy them. The idea of buying cheap, discounted SOF does not seem to be appealing to consumers.

Discussion on interaction effects and their implications for retailers – Per country

In Norway only, where there is a significant positive interaction between price consciousness and SOF purchase frequency, price consciousness strengthens the positive relationship between current frequency of SOF purchases and intention to purchase SOF (Figure 1). For consumers who purchase SOF frequently, viewing SOF as the cheapest alternatives increases their intention to purchase SOF in this country.

In the cases of Norway and Denmark, it can be seen that price-quality schema strengthens intention to purchase SOF for frequent SOF consumers (Figures 2 and 3), which is an indication that the notion of SOF as products of inferior quality can be countered after increased SOF trials. Consumers' wrongful perception of SOF as products of inferior quality, has profound marketing repercussions for the battle against food waste. Regardless of the subjective perceptions, meanings and attributions consumers assign to SOF, there exists an objective measure for their quality, sensory and nutritious characteristics, which is undisputed and should be universally communicated by retailers and

understood by consumers. To the contrary, the thus far narrow focus on product specific requirements, has in many occasions even rendered taste to be evaluated secondary to appearance (Göbel et al., 2015). SOF products deviate from what is regarded as normal in appearance, date labelling and packaging, but do not deviate in quality from optimal products. They maintain all the sensory and nutritious characteristics of their optimal counterparts and are therefore not inferior in quality or jeopardize consumers' health (de Hooge et al., 2017; Halloran et al., 2014).

An interesting implication arises from the observation that consumers' prestige sensitivity weakens the intention to purchase SOF for consumers with a high current SOF purchase frequency in the Netherlands (Figure 4), Sweden (Figure 5), Norway (Figure 6), and Denmark (Figure 7). Given that the particular price involvement dimension pertains to consumers' propensity to make attributions about other consumers, or to be sensitive to attributions that other consumers may make about them, on the basis of the price level of their purchases, this result is not unexpected. A possible explanation for this observation derived from the work of Lichtenstein et al. (1993) is that prestige sensitivity pertains to marketplace behaviors that are more socially visible. Since SOF are commonly sold on designated shelves at the supermarkets, often in the proximity of shelves with normal products, this could imply that consumers would be concerned about what status signal do they project to other shoppers when purchasing SOF. This effect could possibly be countered if retailers sell SOF products as they would as if these had not been rendered suboptimal, on the shelf next to their optimal counterparts. Moreover, retailers should utilize marketing communications that aim to convince consumers to view prestige from an alternative viewpoint: That prestige can be projected in non-economic terms, i.e. not only through expensive purchases, but also with purchases that signal sustainability awareness of a higher order. In either case, retailers can initiate marketing efforts that highlight the positive consequences of buying SOF so consumers will associate purchasing SOF with a sense of contribution towards achieving a higher order purpose that benefits society and projects

increased social awareness and therefore status, despite the lower prices of SOF (see [Griskevicius et al., 2010](#)).

In this study the interaction results from Germany (Figure 8) and Denmark (Figure 9) illustrate that consumers with economic limitations intend to purchase SOF to a lesser extent even in the occasion when their current SOF purchase frequency is higher. This is an indication that retailers' efforts to promote SOF solely as being cheap(-er) is not an effective marketing approach, even when a potential target group consists of consumers with limited economic resources. The effects of perceived budget constraints on consumers' intention to purchase SOF seem to contradict the notion that limited economic resources would encourage consumers to resort to purchasing SOF.

This counter intuitive effect can possibly be justified when having a closer look at the bivariate correlations between two particular price involvement dimensions within Germany and Denmark (Table 14). Here, significant positive correlations are observed between perceived budget constraints and prestige sensitivity, $r=.212, p < .001$, $r=.258, p < .001$ respectively. This observation indicates that in these two countries consumers with perceived limitations in their economic resources, might not want to signal to others that they are experiencing these limitations, and hence do not intend to purchase SOF based solely on economic grounds.

Discussion of interactions effects – Across all countries

The results of the interaction between how frequently consumers currently purchase SOF and their price involvement, indicate that price-quality schema strengthens the relationship between current SOF purchases and intention to purchase SOF in the future (Figure 10). The results indicate that for consumers who operate on a price-quality schema the negative perception of SOF becomes positive with increased use of SOF. This is an indication, in unison with the per-country results, that repeated

exposure and direct experience with SOF have the potential to change consumers' opinion regarding the quality of SOF.

Finally, prestige sensitivity and perceived budget constraints have a dampening effect on consumers' intention to purchase SOF (Figures 11 and 12). Consumers who frequently shop SOF, operate on a lower level of prestige sensitivity, and perceived budget constraints. Implications for retailers are similar to those discussed in the previous sections.

A general concluding observation that pertains to the results of this study is that the price involvement dimensions included in the analyses explain a fraction of the variance within intention to purchase SOF over and beyond the variance explained by the frequency of SOF purchases, ranging from 2%, in Denmark, 3% in Sweden, to 5% in Norway, 7% in Germany, and 9% in the Netherlands. This however, as previously discussed, is a strong indication that firsthand experience with SOF is a very strong predictor of whether or not consumers will choose SOF in their future shopping trips, and that the design of price promotions that tap onto different facets of consumers' price involvement can help increase SOF sale.

Limitations and further research

This study has a few limitations. One limitation pertains to the use of reduced scales that are employed to measure the price involvement dimensions of interest. This could have caused the reliability issues in some of the dimensions, which could have been avoided had the full scales been used, and it could be argued that the complexity of a price-related psychographic characteristic cannot be measured sufficiently with three items. However, based on the statistical measures of reliability and internal consistency of the investigated dimensions, it can be ascertained that the price involvement dimensions investigated are measured sufficiently.

Another limitation in this study has to do with the formulation of the question that pertains to the dependent variable dealing with the intention to buy SOF. There, it was not stated that the suboptimal products in question are price reduced, and interpretation of the results is based on the assumption that respondents had this knowledge. However, respondents during an earlier stage in the process of the web survey had gone through a choice task showing price-reduced SOF. Thus it is assumed that they were primed to think that SOF are actually food products sold with a price reduction.

Finally, this study has employed a subset of the possible antecedents of the intention to purchase SOF. Future studies should investigate other possible determinants in addition to price involvement, such as e.g., perceived health risks, and environmental sustainability. The results of this study however illustrate that for future studies that aim to investigate similar effects on behavioral intentions for SOF that entail an economic outlay by consumers, the inclusion of price involvement is highly relevant.

Despite the expectation that the participating countries would exhibit similar interpretation of the price involvement dimensions, lack of scalar invariance has indicated that these dimensions are not perceived identically across the five countries. However, since the focus of this paper is to illustrate differences between countries, this limitation might not be of paramount importance. Nevertheless, focus should be placed on investigating the cross-cultural dimensions of price involvement in future research.

Future studies can further explore intention in a more delineated manner when it comes to the operationalization of the intention to purchase SOF. In the present study, intention to purchase SOF is measured with the use of three items, each pertaining to one suboptimal characteristic, i.e. close to expiration date, deformities and cosmetic flaws. Intention to purchase might manifest itself differently for products that are close to their expiration date, because such a decision entails the element of

health risk, whereas deformities and cosmetic flaws do not. In this study the composite item that formed the dependent variable operationalized intention to purchase SOF collectively for all three types of suboptimal characteristics.

Finally, this study's results pertaining to the role of prestige sensitivity raise questions regarding the course of action that retailers should take in order to utilize the possible effects of prestige sensitivity in order to further promote the sale of SOF in retail outlets. In future studies, the role of the particular price involvement dimension can be further explored through qualitative research in order to ascertain possible differences across countries.

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Appendix

Table 8: Demographic characteristics - The Netherlands

Demographic characteristics – The Netherlands (N=628)	N	%
Gender		
Male	320	51.0
Female	307	48.9
Age		
18-34	181	28.8
35-52	184	29.3
53-74	263	41.9
Education		
Primary school	5	0.8
High school/unfinished secondary education	132	21.0
Vocational education	266	42.4
Bachelor's degree	150	23.9
Master's degree	68	10.8
PhD	7	1.1
Income level		
Less than half of the average income	147	23.4
Between half the average and the average income	135	21.5
Average income	148	23.6
Between the average income and 1.5 times above that	78	12.4
More than 1.5 times above the average income	38	6.1
Not sure/do not wish to disclose	82	13.1
Household size		
1 member	179	28.5
2 - 3 members	322	51.3
4 - 5 members	95	15.1
6 or more members	27	4.3

Table 9: Demographic characteristics - Germany

Demographic characteristics – Germany (N=622)	N	%
Gender		
Male	319	51.3
Female	303	48.7
Age		
18-34	166	26.7
35-52	184	29.6
53-74	272	43.7
Education		
Primary school	75	12.1
Junior high school	225	36.2
High school	68	10.9
High school, preparatory for university	102	16.4
Bachelor's degree	43	6.9
Master's degree	101	16.2
PhD	8	1.3
Income level		
Less than half of the average income	112	18.0
Between half the average and the average income	176	28.3
Average income	106	17.0
Between the average income and 1.5 times above that	117	18.8
More than 1.5 times above the average income	62	10.0
Not sure/do not wish to disclose	49	7.9
Household size		
1 member	185	29.7
2 - 3 members	350	56.3
4 - 5 members	74	11.9
6 or more members	3	.5

Table 10: Demographic characteristics - Sweden

Demographic characteristics – Sweden (N=620)	N	%
Gender		
Male	313	50.5
Female	304	49.0
Age		
18-34	193	31.1
35-52	170	27.4
53-74	257	41.5
Education		
Primary school	37	6.0
High school	194	31.3
Post high school	79	12.7
Bachelor's degree (up to 3 years)	105	16.9
Master's degree (more than 3 years)	188	30.3
PhD	12	1.9
Income level		
Less than half of the average income	67	10.8
Between half the average and the average income	84	13.5
Average income	113	18.2
Between the average income and 1.5 times above that	163	26.3
More than 1.5 times above the average income	124	20.0
Not sure/do not wish to disclose	69	11.1
Household size		
1 member	159	25.6
2 - 3 members	331	53.4
4 - 5 members	101	16.3
6 or more members	15	2.4

Table 11: Demographic characteristics - Norway

Demographic characteristics – Norway (N=625)	N	%
Gender		
Male	318	50.9
Female	305	48.8
Age		
18-34	200	32.0
35-52	217	34.7
53-74	208	33.3
Education		
Primary/secondary school	36	5.8
Preparatory education for higher studies	92	14.7
Higher education, vocational education	137	21.9
Bachelor's degree (3years)	232	37.1
Master's degree (5 years)	123	19.7
PhD	5	0.8
Income level		
Less than half of the average income	60	9.6
Between half the average and the average income	120	19.2
Average income	130	20.8
Between the average income and 1.5 times above that	154	24.6
More than 1.5 times above the average income	90	14.4
Not sure/do not wish to disclose	71	11.4
Household size		
1 member	138	22.1
2 - 3 members	331	53.0
4 - 5 members	135	21.6
6 or more members	18	2.9

Table 12: Demographic characteristics - Denmark

Demographic characteristics – Denmark (N=619)	N	%
Gender		
Male	310	50.1
Female	308	49.8
Age		
18-34	171	27.6
35-52	171	27.6
53-74	277	44.7
Education		
7.-10. Class of primary school	29	4.7
High school	56	9.0
Vocational education	131	21.2
Higher education (up to 2 years)	71	11.5
Higher education (between 2-4 years)	210	33.9
Higher education (over 4 years)	116	18.7
PhD	6	1
Income level		
Less than half of the average income	72	11.6
Between half the average and the average income	96	15.5
Average income	151	24.4
Between the average income and 1.5 times above that	143	23.1
More than 1.5 times above the average income	89	14.4
Not sure/do not wish to disclose	68	11.0
Household size		
1 member	181	29.2
2 - 3 members	319	51.5
4 - 5 members	94	15.2
6 or more members	17	2.7

Table 13: Correlations between price involvement dimensions and intention and frequency of purchase of SOF

The Netherlands	Intention to purchase SOF	Frequency of purchase of SOF
Perceived budget constraints	.136**	.110**
Deal proneness	.303**	.129**
Value consciousness	.323**	.153**
Price consciousness	.145**	.085*
Price-quality schema	-.031	-0.071
Prestige sensitivity	.086*	.068

**The correlation is significant at the .01 level; * The correlation is significant at the .05 level

Germany	Intention to purchase SOF	Frequency of purchase of SOF
Perceived budget constraints	-.003	.043
Deal proneness	.257**	.113**
Value consciousness	.241**	.098*
Price consciousness	.105**	.003
Price-quality schema	-.048	.032
Prestige sensitivity	.019	.130**

**The correlation is significant at the .05 level; * The correlation is significant at the .05 level

Sweden	Intention to purchase SOF	Frequency of purchase of SOF
Perceived budget constraints	.149**	.185**
Deal proneness	.246**	.194**
Value consciousness	.239**	.162**
Price consciousness	.023	.041
Price-quality schema	-.004	-.051
Prestige sensitivity	.115**	.094*

**The correlation is significant at the .05 level; * The correlation is significant at the .05 level

Norway	Intention to purchase SOF	Frequency of purchase of SOF
Perceived budget constraints	.049	.117**
Deal proneness	.380**	.350**
Value consciousness	.232**	.233**
Price consciousness	.204**	.207**
Price-quality schema	-.150**	-.085*
Prestige sensitivity	-.057	-.007

**The correlation is significant at the .05 level; * The correlation is significant at the .05 level

Denmark	Intention to purchase SOF	Frequency of purchase of SOF
Perceived budget constraints	.075	.082*
Deal proneness	.244**	.198**
Value consciousness	.161**	.110**
Price consciousness	.133**	.176**
Price-quality schema	-.054	-.121**
Prestige sensitivity	.057	.077

**The correlation is significant at the .05 level; * The correlation is significant at the .05 level

Table 14: Correlations between price involvement dimensions

The Netherlands	Perceived budget constraints	Deal proneness	Value consciousness	Price consciousness	Price-quality schema	Prestige sensitivity
Perceived budget constraints	1	.295**	.228**	.02	.111**	.272**
Deal proneness	.295**	1	.593**	.468**	-.029	-.03
Value consciousness	.228**	.593**	1	.477**	-.064	-.016
Price consciousness	.02	.468**	.477**	1	-.303**	-.321**
Price-quality schema	.111**	-.029	-.064	-.303**	1	.594**
Prestige sensitivity	.272**	-.03	-.016	-.321**	.594**	1

** Correlation is significant at the .01 level

Germany	Perceived budget constraints	Deal proneness	Value consciousness	Price consciousness	Price-quality schema	Prestige sensitivity
Perceived budget constraints	1	.276**	.134**	-.102*	.088*	.212**
Deal proneness	.276**	1	.537**	.207**	-.052	.005
Value consciousness	.134**	.537**	1	.225**	-.054	-.054
Price consciousness	-.102*	.207**	.225**	1	-.301**	-.301**
Price-quality schema	.088*	-.052	-.054	-.301**	1	.538**
Prestige sensitivity	.212**	.005	-.054	-.301**	.538**	1

** Correlation is significant at the .01 level; * The correlation is significant at the .05 level

Sweden	Perceived budget constraints	Deal proneness	Value consciousness	Price consciousness	Price-quality schema	Prestige sensitivity
Perceived budget constraints	1	.249**	.104**	-.046	.015	.282**
Deal proneness	.249**	1	.622**	.267**	-.057	.176**
Value consciousness	.104**	.622**	1	.240**	-.024	.098*
Price consciousness	-.046	.267**	.240**	1	-.281**	-.161**
Price-quality schema	.015	-.057	-.024	-.281**	1	.395**
Prestige sensitivity	.282**	.176**	.098*	-.161**	.395**	1

** Correlation is significant at the .01 level; * The correlation is significant at the .05 level

Norway	Perceived budget constraints	Deal proneness	Value consciousness	Price consciousness	Price-quality schema	Prestige sensitivity
Perceived budget constraints	1	.305**	.205**	.113**	-.047	.235**
Deal proneness	.305**	1	.550**	.474**	-.110**	.094*
Value consciousness	.205**	.550**	1	.550**	-.091*	.122**
Price consciousness	.113**	.474**	.550**	1	-.256**	-.07
Price-quality schema	-.047	-.110**	-.091*	-.256**	1	.403**
Prestige sensitivity	.235**	.094*	.122**	-.07	.403**	1

** Correlation is significant at the .01 level; * The correlation is significant at the .05 level

Denmark	Perceived budget constraints	Deal proneness	Value consciousness	Price consciousness	Price-quality schema	Prestige sensitivity
Perceived budget constraints	1	.122**	.165**	-.006	.035	.258**
Deal proneness	.122**	1	.596**	.490**	-.051	-.018
Value consciousness	.165**	.596**	1	.460**	-.098*	.027
Price consciousness	-.006	.490**	.460**	1	-.255**	-.145**
Price-quality schema	.035	-.051	-.098*	-.255**	1	.320**
Prestige sensitivity	.258**	-.018	.027	-.145**	.320**	1

** Correlation is significant at the .01 level; * The correlation is significant at the .05 level

Table 15: Correlations between intention to purchase SOF and frequency of SOF purchase

	The Netherlands	Germany	Sweden	Norway	Denmark
Intention to purchase SOF					
Frequency of purchase of SOF	.421**	.450**	.500**	.515**	.496**

**The correlation is significant at the .01 level

Table 16: Measures of reliability and validity of the constructs – The Netherlands

The Netherlands					
Construct	No. of indicators	Composite Reliability	Item loading Range	AVE	Cronbach's alpha
Deal proneness	3	.83	.63 → .87	.62	.80
Value consciousness	3	.77	.45 → .86	.55	.75
Price consciousness	3	.73	.50 → .78	.48	.70
Price-quality schema	3	.84	.67 → .86	.63	.84
Prestige sensitivity	3	.84	.79 → .80	.63	.84
Perceived budget constraints	3	.82	.57 → .92	.61	.80
Intention to purchase SOF	3	.89	.76 → .91	.72	.88

Goodness-of-fit of the measurement model: $\chi^2 = 742,069$, $df = 168$, $p < 0.001$, $\chi^2/df = 4.41$, $GFI = .89$, $CFI = .91$, $RMSEA = .07$.

Table 17: Assessment of discriminant validity of the first-order constructs using the Fornell-Larcker criterion – The Netherlands

The Netherlands							
Construct	1	2	3	4	5	6	7
1. Perceived budget constraints	.78						
2. Deal proneness	.25	.78					
3. Value consciousness	.24	.67	.74				
4. Price consciousness	-.06	.51	.53	.69			
5. Price-quality schema	.14	-.07	-.08	-.41	.80		
6. Prestige sensitivity	.31	-.07	.01	-.48	.72	.79	
7. Intention to purchase SOF	.13	.31	.38	.12	-.05	.10	.85

Table 18: Measures of reliability and validity of the constructs - Germany

Germany					
Construct	No. of indicators	Composite Reliability	Item loading Range	AVE	Cronbach's alpha
Deal proneness	3	.83	.54 → .94	.63	.80
Value consciousness	3	.80	.65 → .85	.58	.80
Price consciousness	2	.58	.53 → .74	.41	.56
Price-quality schema	3	.83	.63 → .89	.64	.83
Prestige sensitivity	3	.81	.74 → .82	.59	.81
Perceived budget constraints	3	.88	.72 → .97	.71	.87
Intention to purchase SOF	3	.86	.75 → .92	.69	.86

Goodness-of-fit of the measurement model: $\chi^2 = 461,444$, $df = 168$, $p < 0.001$, $\chi^2/df = 3.09$, GFI = .93, CFI = .947, RMSEA = .05.

Table 19: Assessment of discriminant validity of the first-order constructs using the Fornell-Larcker criterion - Germany

Germany							
Construct	1	2	3	4	5	6	7
1. Perceived budget constraints	.85						
2. Deal proneness	.24	.79					
3. Value consciousness	.15	.66	.76				
4. Price consciousness	-.10	.36	.36	.64			
5. Price-quality schema	.07	-.13	-.08	-.40	.80		
6. Prestige sensitivity	.18	-.07	-.06	-.44	.67	.77	
7. Intention to purchase SOF	-.02	.29	.28	.14	-.05	.01	.83

Table 20: Measures of reliability and validity of the constructs - Sweden

Sweden					
Construct	No. of indicators	Composite Reliability	Item loading Range	AVE	Cronbach's alpha
Deal proneness	3	.82	.57 → .92	.62	.80
Value consciousness	3	.77	.45 → .87	.54	.74
Price consciousness	2	.61	.66 → .67	.44	.61
Price-quality schema	3	.82	.68 → .84	.61	.82
Prestige sensitivity	3	.79	.63 → .83	.56	.77
Perceived budget constraints	3	.90	.77 → .95	.74	.89
Intention to purchase SOF	3	.89	.79 → .95	.73	.88

Goodness-of-fit of the measurement model: $\chi^2 = 432,048$, $df = 149$, $p < 0.001$, $\chi^2/df = 2.9$, GFI = .93, CFI = .95, RMSEA = .06.

Table 21: Assessment of discriminant validity of the first-order constructs using the Fornell-Larcker criterion - Sweden

Sweden							
Construct	1	2	3	4	5	6	7
1. Perceived budget constraints	.86						
2. Deal proneness	.19	.79					
3. Value consciousness	.12	.72	.73				
4. Price consciousness	-.08	.35	.37	.67			
5. Price-quality schema	.04	-.07	-.07	-.39	.78		
6. Prestige sensitivity	.35	.13	.11	-.24	.47	.75	
7. Intention to purchase SOF	.15	.22	.25	.04	.01	.13	.85

Table 22: Measures of reliability and validity of the constructs - Norway

Norway					
Construct	No. of indicators	Composite Reliability	Item loading Range	AVE	Cronbach's alpha
Deal proneness	3	.80	.60 → .89	.57	.77
Value consciousness	2	.82	.83 → .83	.69	.82
Price consciousness	3	.59	.43 → .68	.33	.60
Price-quality schema	3	.85	.70 → .88	.66	.85
Prestige sensitivity	3	.79	.63 → .85	.57	.78
Perceived budget constraints	3	.90	.81 → .94	.75	.89
Intention to purchase SOF	3	.87	.68 → .94	.70	.86

Goodness-of-fit of the measurement model: $\chi^2 = 492.292$, $df = 149$, $p < 0.001$, $\chi^2/df = 3.3$, $GFI = .92$, $CFI = .94$, $RMSEA = .06$.

Table 23: Assessment of discriminant validity of the first-order constructs using the Fornell-Larcker criterion - Norway

Norway							
Construct	1	2	3	4	5	6	7
1. Perceived budget constraints	.86						
2. Deal proneness	.30	.76					
3. Value consciousness	.22	.65	.83				
4. Price consciousness	.19	.70	.87	.57			
5. Price-quality schema	-.05	-.11	-.10	-.29	.81		
6. Prestige sensitivity	.27	.06	.13	-.05	.48	.75	
7. Intention to purchase SOF	.05	.39	.23	.27	-.16	-.09	.83

Table 24: Measures of reliability and validity of the constructs - Denmark

Denmark					
Construct	No. of indicators	Composite Reliability	Item loading Range	AVE	Cronbach's alpha
Deal proneness	3	.86	.69 → .88		.84
Value consciousness	3	.77	.49 → .85		.74
Price consciousness	3	.67	.62 → .64		.66
Price-quality schema	3	.83	.68 → .87		.83
Prestige sensitivity	3	.81	.67 → .86		.80
Perceived budget constraints	3	.88	.75 → .96		.87
Intention to purchase SOF	3	.85	.69 → .93		.84

Goodness-of-fit of the measurement model: $\chi^2 = 591,103$, $df = 168$, $p < 0.001$, $\chi^2/df = 3.51$, $GFI = .92$, $CFI = .93$, $RMSEA = .06$

Table 25: Assessment of discriminant validity of the first-order constructs using the Fornell-Larcker criterion - Denmark

Denmark							
Construct	1	2	3	4	5	6	7
1. Perceived budget constraints	.85						
2. Deal proneness	.09	.82					
3. Value consciousness	.13	.69	.73				
4. Price consciousness	-.01	.63	.66	.63			
5. Price-quality schema	.06	-.54	-.11	-.34	.79		
6. Prestige sensitivity	.30	-.05	.02	-.17	.39	.77	
7. Intention to purchase SOF	.08	.22	.14	.12	-.04	.09	.81

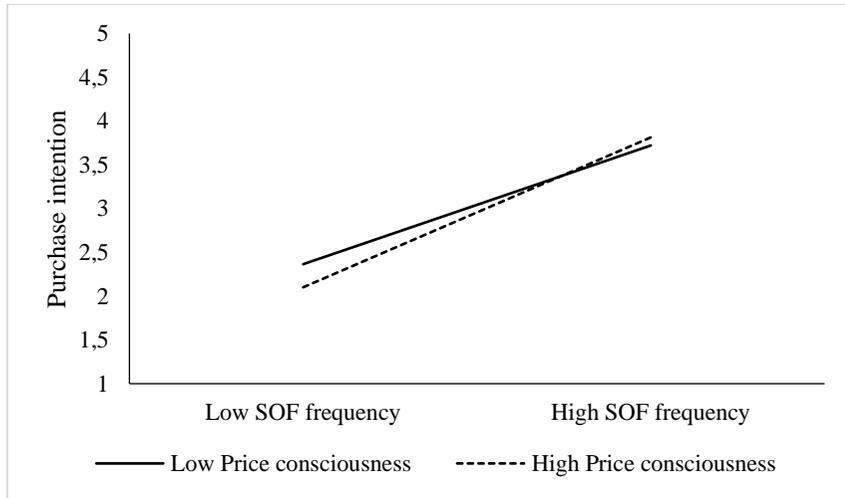


Figure 1: Interaction between frequency of SOF purchases and price consciousness - Norway

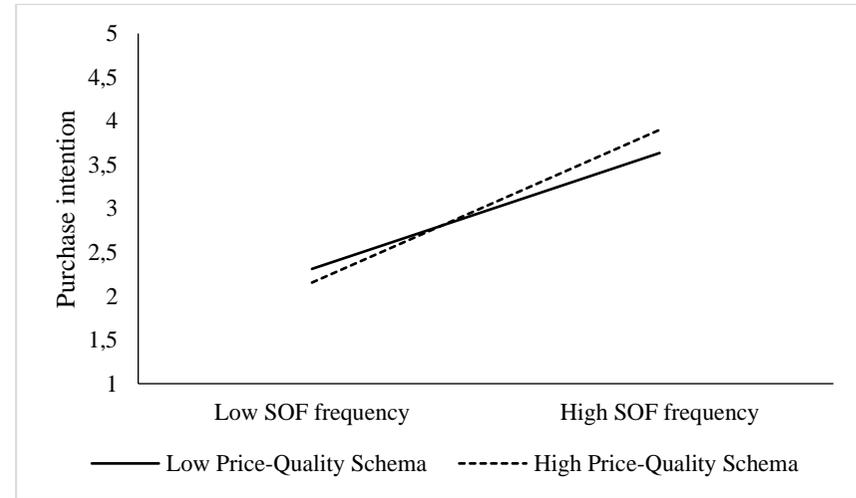


Figure 3: Interaction between frequency of SOF purchases and price-quality schema – Denmark

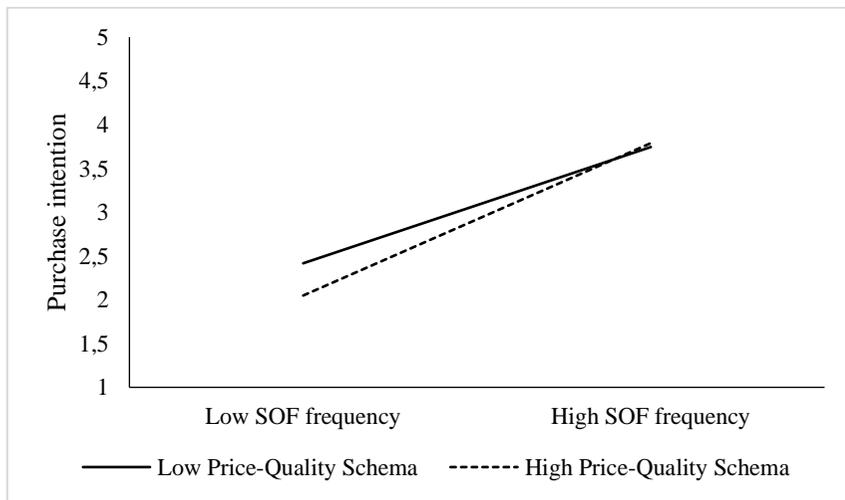


Figure 2: Interaction between frequency of SOF purchases and price-quality schema – Norway

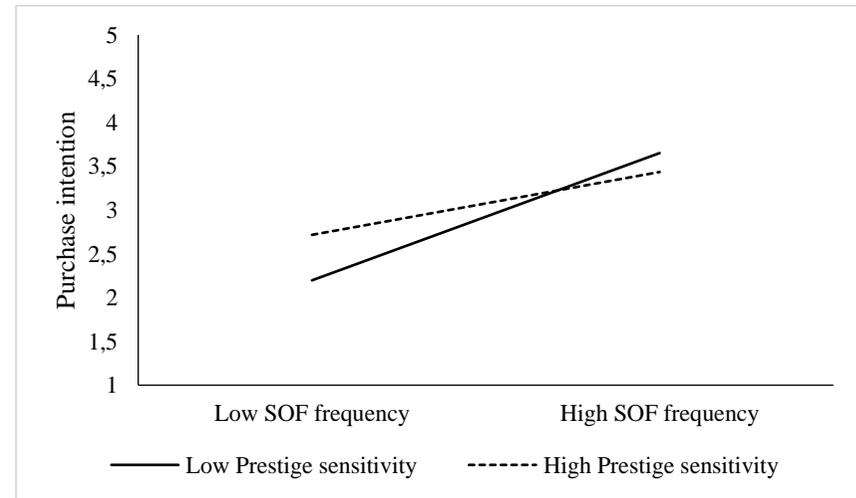


Figure 4: Interaction between frequency of SOF purchases and prestige sensitivity – The Netherlands

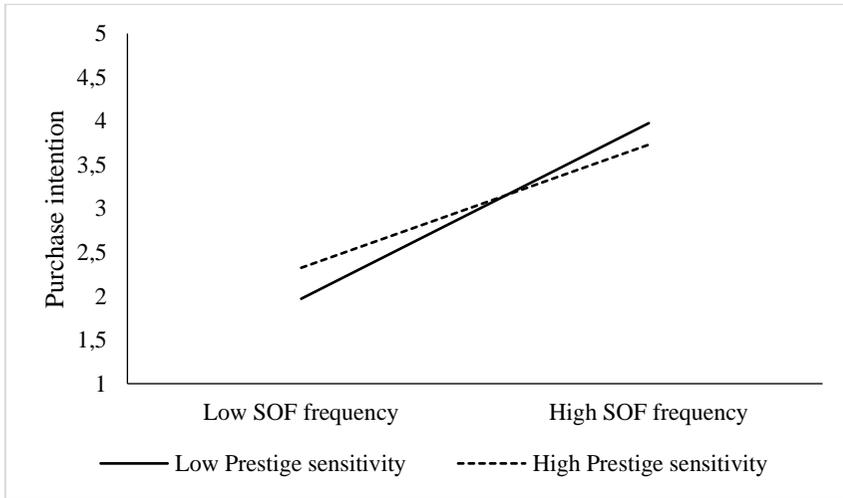


Figure 5: Interaction between frequency of SOF purchases and prestige sensitivity – Sweden

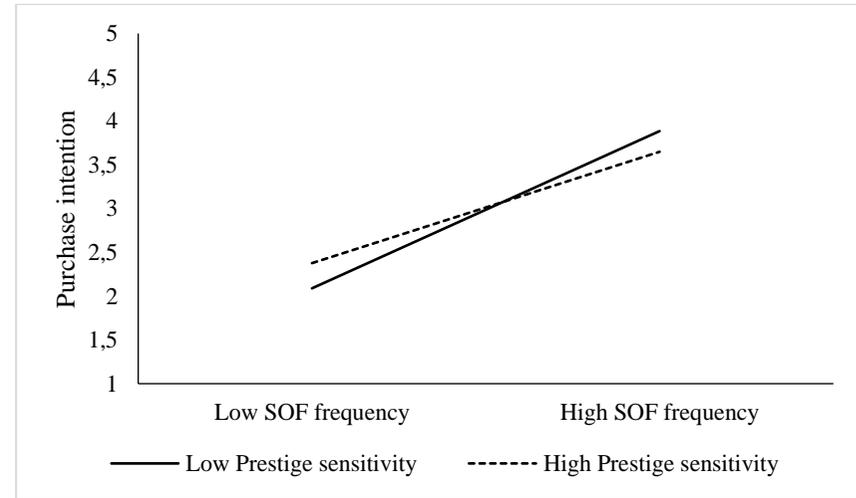


Figure 7: Interaction between frequency of SOF purchases and prestige sensitivity – Denmark

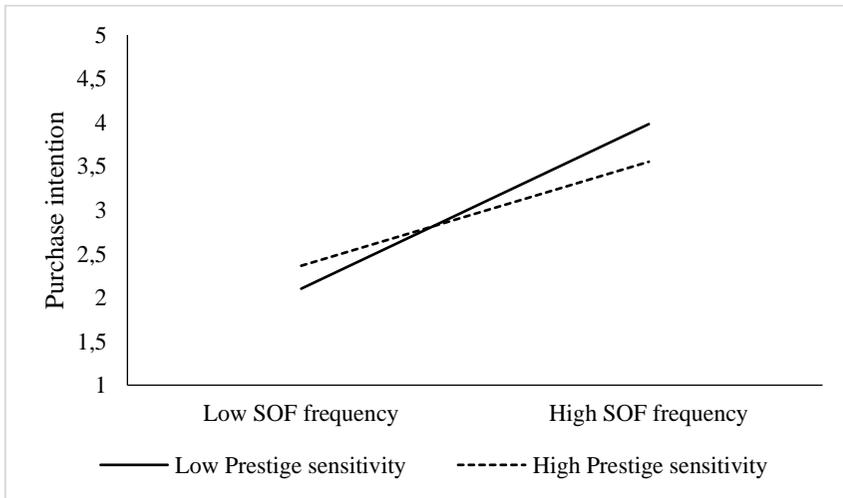


Figure 6: Interaction between frequency of SOF purchases and prestige sensitivity – Norway

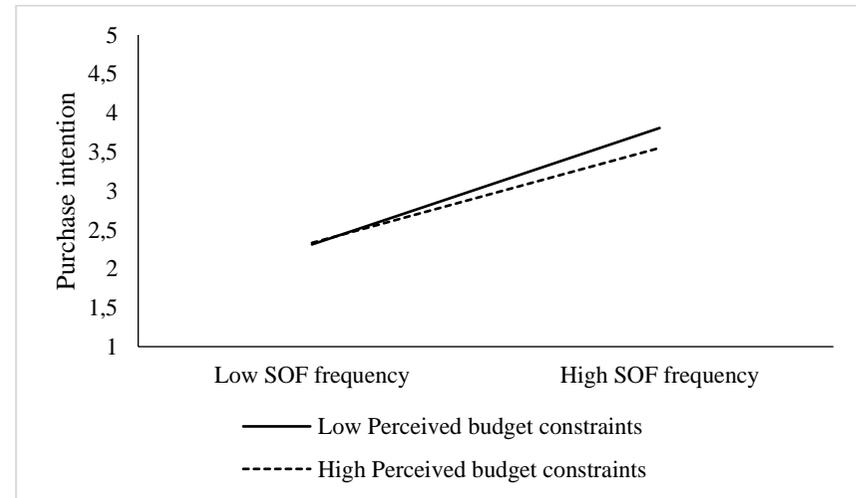


Figure 8: Interaction between frequency of SOF purchases and perceived budget constraints – Germany

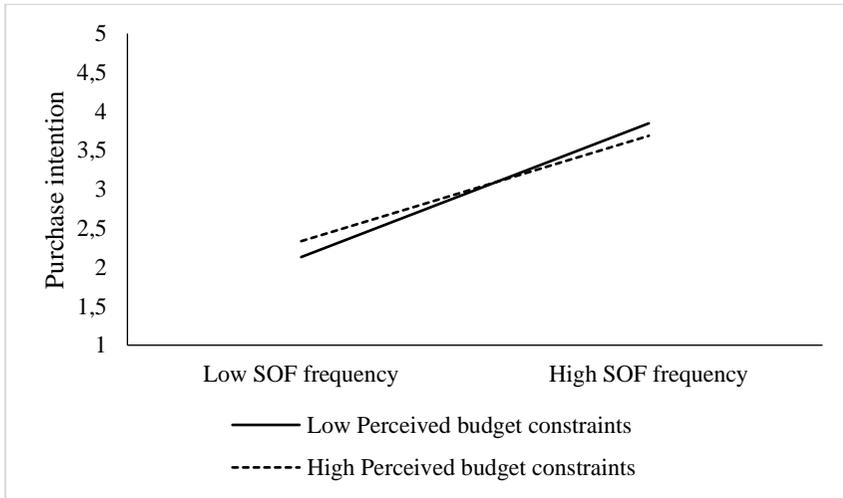


Figure 9: Interaction between frequency of SOF purchases and perceived budget constraints – Denmark

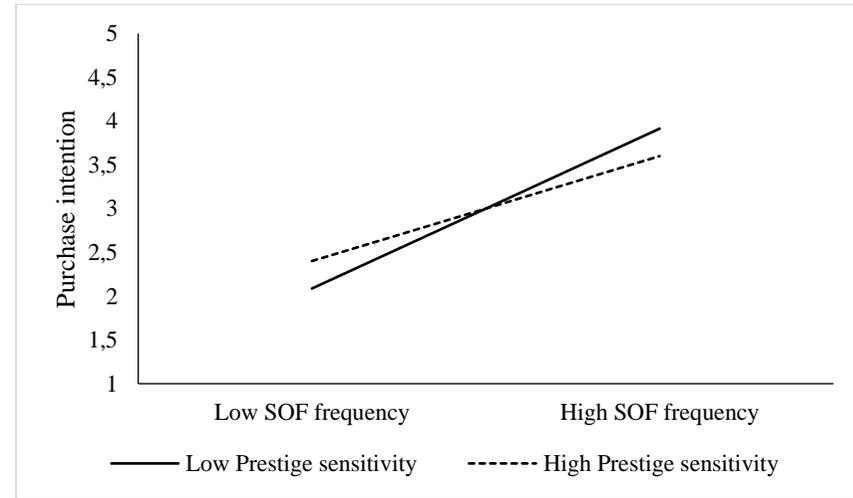


Figure 11: Interaction between frequency of SOF purchases and prestige sensitivity – All countries

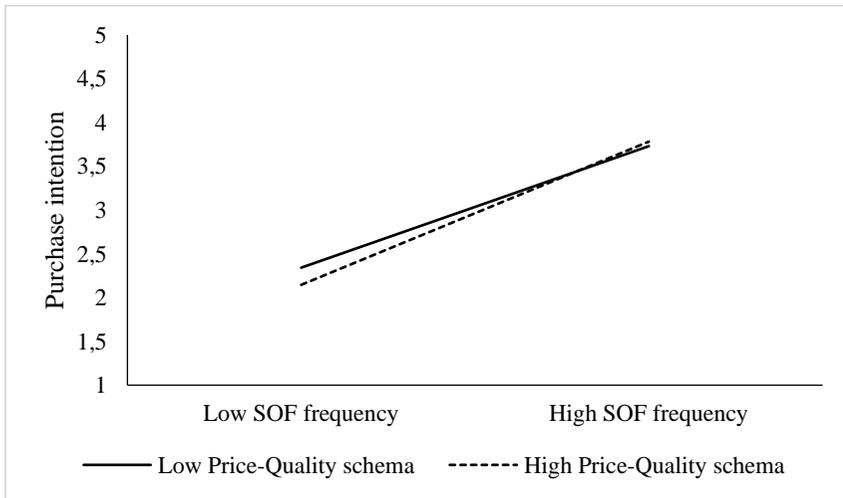


Figure 10: Interaction between frequency of SOF purchases and price-quality schema – All countries

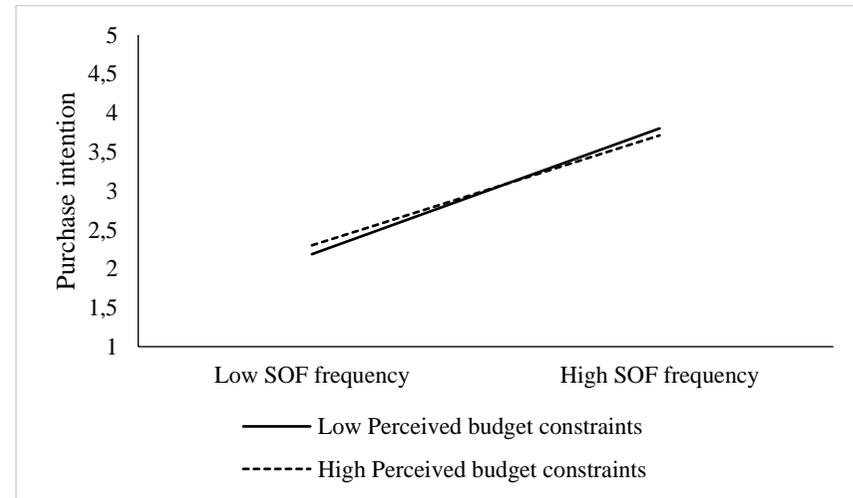


Figure 12: Interaction between frequency of SOF purchases and perceived budget constraints – All countries

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Chapter 3

Research paper 2

Promoting food for the trash bin? A review of the literature on retail price promotions and household-level food waste

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(The manuscript has been invited for a third review round in the Journal of Business Ethics)

Abstract

Supermarkets receive criticism for irresponsible marketing practices, such as price promotions, that trigger over-purchasing and seemingly contribute to consumer waste. In the wake of this, retailers have abolished certain price promotions as part of an effort to meet corporate social responsibility (CSR) goals. Yet, for this particular action to fulfill its goal, the underlying assumption that price promotions are positively related to consumer food waste needs to hold true. Through a review of the existing literature, we show that there is no scientific consensus on this assumption. Half of the studies conclude that price promotions result in food waste by encouraging over-purchase, while the remaining conclude that consumers buying price-promoted food products show average or even lower levels of household food waste. Unraveling this inconsistency, we propose a multi-level model of CSR behavior, where CSR actions at an institutional level (retailer) interact with individual characteristics at a micro (consumer) level leading to demonstrably different outcomes. We argue that the assumption that price promotions necessarily cause food waste has been overly simplistic, as it did not take into account the consumers' role. We conclude that the relationship between price promotions and consumer food waste is conditional on price consciousness, attitudes, values, household identities, and household roles. Thus, we illustrate that CSR problems are often wicked ones, where first order solutions often lead to secondary problems that stymie the progress of institutions and policy makers in addressing social needs in business. We derive specific recommendations for retailers seeking to meet CSR goals.

Keywords

Food waste; Retailing; Corporate Social Responsibility (CSR); Consumer Social Responsibility (CnSR); Corporate ethics; Consumer behavior; Price promotions

Introduction

The issue of food waste has received increased attention in the past few years. Not only have governments and international non-governmental organizations (NGOs) prioritized this issue, but local food market actors have seen value in addressing this problem, enacting potential solutions for reducing food waste at all stages of the food supply chain. ‘Halving food waste’ has been listed among the measures that can help to achieve the sustainable development goals (UN, 2018). Although food waste estimates vary (Parfitt et al., 2010; Xue et al., 2017), assessments indicate that approximately 25%, or 614 kcal/cap/day, of the produced crop supply is lost within the food supply chain alone (Kummu et al., 2012), and approximately one third of the food that is produced for human consumption, or roughly 1.3 billion tons, is wasted overall (Alexander et al., 2017; Gustavsson et al., 2011). This contributes to about 30% of greenhouse gas emissions (Garnett, 2011) and is playing a significant role in climate change. Moreover, food waste is also regarded as a social inequality issue, helping to perpetuate inequalities in global food supply (Gjerris & Gaiani, 2013), and a financial drain on economies where an estimated \$936 billion is lost due to unconsumed food (Chalak et al., 2016). Thus, it becomes clear that to meet socially desirable outcomes, food waste is a significant issue to address.

Who is to blame for food waste? Research suggests that a large share of it occurs in consumer households. The amount of avoidable food waste in households, i.e. food that was perfectly edible prior to disposal (Koivupuro et al., 2012), has been estimated to represent as much as 50% of total food waste in Europe (Hebrok & Boks, 2017; Kummu et al., 2012) and 60% in the US (Griffin et al., 2008), whereas food waste at the retail stage is estimated to be only about 5% of the food waste in developed countries (EU, 2010). The conclusion from this seems to be that consumers themselves play a significant role in the production of food waste. But are consumers the only actors that contribute to food waste?

Research also points to the important role that retailers play in the production of food waste due to the power they wield both within the supply chain (Devin & Richards, 2018) and on the retail-consumer interface (Aschemann-Witzel et al., 2017). For instance, retailers often make strategic decisions on standards of appearance (de Hooge et al., 2018; Stuart, 2009) which influence how consumers expect food should look (Loebnitz et al., 2015), and retailers also decide on the size of the product units they sell, or the breadth of an assortment offered. These are decisions that ultimately can contribute to food waste in the supply chain (Devin & Richards, 2018). Importantly, and central to our exploration, retailers enact pricing tactics, and these have been blamed to trigger over-purchasing that contributes to food waste (Hegnsholt et al., 2018; WRAP, 2011).

In the wake of the knowledge that retailers play an important role when considering food waste, they have begun to take action against food waste with a variety of initiatives e.g., information and awareness initiatives, redistribution of excess food (Aschemann-Witzel et al., 2017; Kulikovskaja & Aschemann-Witzel, 2017), including abolishment of ‘buy one get one free’ (BOGOF) price promotions (Aschemann-Witzel et al., 2016; Evans et al., 2017). At face value, these actions are socially responsible in so much as they integrate social concerns in business operations in order to alleviate the environmental and social impacts of businesses (Dahlsrud, 2008). Yet, if abolishing BOGOF price promotions is done with the explicit goal of avoiding food waste, then the retailer should ensure that these actions effectively reduce food waste.

By reviewing the existing literature, we find that the relationship between retailer price promotions and food waste is less clear than one might expect. We argue this is the case because an important stakeholder is disregarded in this assumption: the consumer. Specifically, we propose that the role of retail price promotions for food waste should be viewed from a multi-level perspective (Klein & Kozlowski, 2000). If retailers attempt to address consumer food waste while treating consumers as monolithic and homogeneous actors, this may lead to unintended consequences. We explain

inconsistencies in existing literature examining price promotions and food waste, by suggesting that retailer price promotions affect consumers heterogeneously. For some consumers, price promotions encourage over purchasing in ways that the existing criticism of price promotion suggests, ultimately contributing to food waste. Yet, for other consumers, price promotion helps them meet important economic goals, giving them access to food in ways that lead to economically sustainable outcomes. Critically, we introduce a micro-level of analysis into these more macro-level debates on CSR, suggesting that factors at the individual level explain the divergent responses to retailer actions. Thus, the debate surrounding price promotions and food waste appears to present a wicked problem (Buchanan, 1992; Head, 2008), where retailer efforts to address first order socially desirable problems (i.e. reducing food waste) may lead to second order problems (i.e. reducing economic access to food), problems that complicate efforts towards socially desirable ends.

We make several contributions to the literature. First, we contribute to the food waste literature, where it is often taken for granted that price promotions are a definite cause of food waste, by providing a more nuanced view of the role of pricing on food waste. We show that this relationship is not as strong as initially believed, rather it is conditional upon consumer characteristics that are relatively overlooked in this debate. Second, we contribute to the literature on business ethics by suggesting that issues within CSR are often wicked problems (Head, 2008) where solutions to present issues differentially impact the variety of social expectations involved in CSR issues in ways that both solve and create problems (e.g., economic, social, environmental: see Carroll, 1979). We stress the importance of introducing a multi-level perspective to the study of CSR problems so that broad institutional responses effectively consider how existing heterogeneity in consumer psychological reactions contributes to disparate outcomes in CSR policies. Moreover, we also contribute to the literature on business ethics by showing that the assumption ‘price promotions lead to food waste’ is an example of simplifying a relation and neglecting the role of the consumer in a CSR action, and

that the consumer heterogeneity explains why research findings on the relation are ambiguous. We therewith underline the importance of CSR that accounts for and acknowledges consumer responsibility.

Finally, we derive implications for business ethics in practice. We show that the CSR perspective expressed by retailers who decide to abolish certain price promotions excludes the important role of the consumer as an active agent. We thus argue that this view should be redefined to include consumers' social responsibility as well (Vitell, 2015): When retailers decide on CSR actions against food waste, they should do so after considering what characterizes the consumers they serve and how they act. The findings allow retailers to make more informed CSR decisions, allowing for a better understanding of the consequences of their decisions on the economic, social, and environmental outcomes. We derive recommendations of practical utility for responsible retail marketing practices and future directions for research. We propose that there can be cases in which retail price promotions might cause food to be wasted, as the dominant criticism suggests; but we also propose that consumer characteristics have a crucial influence on food waste avoidance behavior, thus potentially blurring the picture. Therefore, it becomes crucial to explore the various factors that might play a role in moderating the relationship between instructional efforts towards CSR and outcomes that match set goals.

The remainder of the article is organized as follows: The first section presents a background on the overall relation between retail price promotions, consumers and food waste, as well as an analysis into CSR goal conflicts for the stakeholder groups of consumers, companies and society. Following this, we describe the methodology of the literature review, helping to answer the research question *'are retail price promotions and household-level food waste negatively or positively related? Which consumer characteristics could potentially influence this relationship?'*. We then describe the findings and discuss the factors suggested by the research articles as moderators of the relationship

between price promotion and food waste. Lastly, we discuss the implications and develop recommendations for responsible retail marketing practices, as well as future directions for research.

Consumers, food journey and food waste, and the role of price promotions

The causes of food waste in consumer households are complex and interrelated (Aschemann-Witzel et al., 2015; Quested et al., 2013). Research has shown that consumers experience negative emotions and guilt with regards to food waste (Gjerris & Gaiani, 2013). Therefore, it can be assumed that consumers do not plan for food to be wasted. Rather, consumers might for example plan for a certain over-supply of food in their homes, aspiring towards being a ‘good provider’ (Porpino et al., 2016), but have these plans interrupted by unpredictable events. As research shows, food waste occurs due to goal conflicts (e.g., eating to avoid food waste, versus not eating to adhere to a diet or to eat something more appealing) caused by the various motives behind food purchases and the distinct roles food plays in daily life (Frewer & Van Trijp, 2006). In addition, food waste also results from shortcomings and lack of capabilities in planning, food handling or preparation (Block et al., 2016; Stancu et al., 2016).

There is wide heterogeneity in how the concept of food waste is defined in research (Bellemare et al., 2017). The majority of definitions describe food waste as the discard of edible food that is still suitable for human consumption (FAO, 2013). These definitions range from general definitions, e.g., “[...] *the food brought home or prepared at home but not consumed*” (Grandhi & Singh, 2016), to more elaborate ones, e.g., “[...] *the surplus food that is not recovered to feed people, to feed animals, to produce new products (e.g., jams or juices), new materials (e.g., fertilizers) or energy*” (Garrone et al., 2014). However, some researchers expand the definition of food waste by including excessive caloric intake through the overconsumption of food beyond the average human metabolic capacity of

approximately 2000 kcal/day (Blair & Sobal, 2006; Parfitt et al., 2010; Smil, 2004). Thus, according to this perspective, not only discarded food but also food that is eaten beyond nutritional and caloric necessity, when accounting for the level of physical activity and special caloric demands, can constitute food waste.

There is also, however, the intermediate stage of storage in which most foods remain after purchase. Food storage facilities and behavior have been observed to play a role in food waste. Evans (2012b), for example, argues that disposal of food in the household happens via a gradual process in which devices whose purpose is to preserve foods, such as e.g., freezers, often “[...] *operate as coffins of decay that play an active part in carrying discarded food towards the waste stream*”. Similarly, Waitt and Phillips (2016) draw attention to the fact that consumers postpone consumption and store foods that, with time, become revalued as excess and are discarded.

Taking a broader perspective, with the aim to illustrate an expansive view of food waste and of what can conceptually be regarded as food waste, we therefore note that food waste is not only what is observable in households’ trash bins but also as excessive calorie storage in the human body as a result of excessive food consumption. What is stockpiled in fridges, refrigerators, and other food preservation conduits might or might not become food waste, depending on how the foods’ journey progresses, and how the consumer decides about its further use. Figure 1 offers a visualization of the paths where foods can become waste as an outcome of reacting favorably to a price promotion at the retail level. A path may potentially begin via a period of stockpiling, and then waste may be manifested either as food discard or as overconsumption. Table 2 in the Appendix provides examples of the different conceptualizations of food waste.

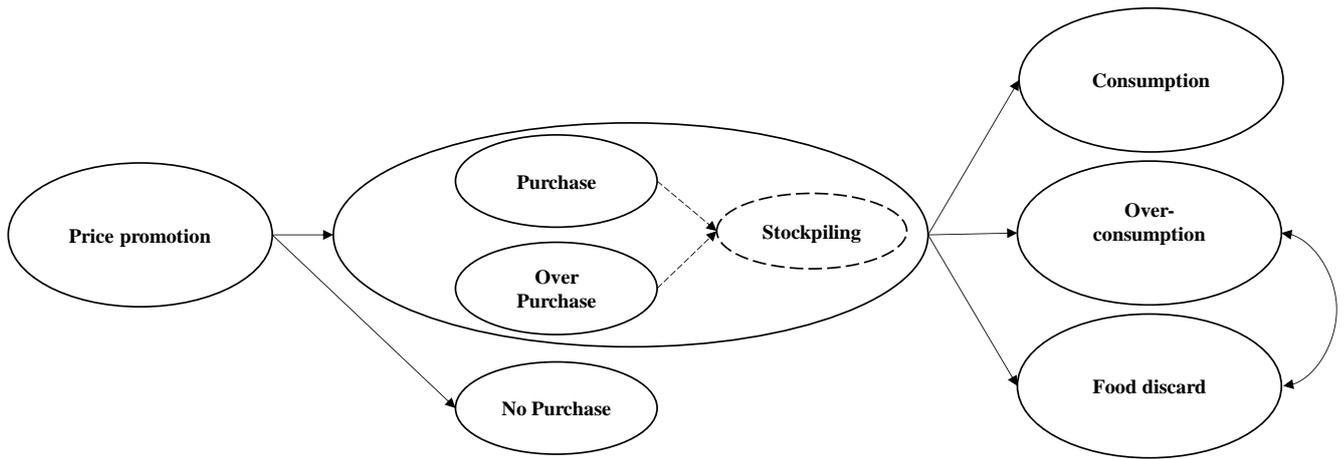


Figure 3: Conceptual framework of the relations between price promotions and food waste

The price of food plays a particularly important role for the issue of food waste, and it does so through various connections. It is often mentioned that the overall low level of food prices in developed countries leads to an under-valuation of food by consumers and a disregard of the natural resources that have been used to produce it (Aschemann-Witzel et al., 2015; Gjerris & Gaiani, 2013). Moreover, people may be able to waste food because the proportion of income that is allocated to food declines as the income level in the western world increases (Thyberg & Tonjes, 2016). Food is often purchased without much thought, given that in marketing terms, it is a low-involvement, fast-moving consumer good to many customers (Bell & Marshall, 2003). When grocery shopping, consumers might search for good deals on food much more as part of their self-identity than for reasons of economic need (Jensen & Bech-Larsen, 2017; Urbany et al., 1996). In addition to the overall low price level and low valuation of food, pricing mechanisms – such as BOGOF offers, multi-item offers, and a price gradient more favorable to large unit sizes – in food marketing can trigger consumers to over-purchase and over-stock food items because it becomes economically cheaper to purchase larger units (Ganglbauer et al., 2013; Ponis et al., 2017; Stuart, 2009).

Interestingly, however, pricing mechanisms are also suggested as a means to tackle the problem of food waste, as reducing the price of suboptimal food allows the sale of food that would otherwise

be wasted at the retail level. Suboptimal foods are foods that deviate from normal in appearance, date labeling (e.g., close to expiration date), and packaging (e.g., presence of dents) (de Hooge et al., 2017). Many retailers have begun to mark such suboptimal foods with specially designed stickers, not only communicating the price reduction, but also the food waste avoidance, thus positioning the action as contributing to the CSR objectives (Kulikovskaja & Aschemann-Witzel, 2017). However, this raises the question whether pricing can be given part of the blame for food waste but then used to combat it as well – and whether pricing really causes that much food waste in the first place? A plausible reasoning to the opposite end is that consumers who specifically seek out price promotions might not necessarily always waste food: first, because they face economic constraints, and second, because they are conservative and cautious with what they have bought. In that sense, the use of price promotions might not necessarily trigger wastage, as wastage might depend on the type of consumer.

Corporate Social Responsibility, CSR goal conflicts, and food waste

Food waste is a sustainability issue with societal consequences, and a topic that raises questions about the ethics of marketing (Devin & Richards, 2018; Javalgi & La Toya, 2015). If the responsibility of retailers were purely ‘business’ (Friedman, 2007), companies would focus on maximizing their own benefit, and not care about what happens to the food after it is successfully sold. Food waste would then be a necessary evil that contributes to the end goal of increasing sales volume and thus business growth. However, from the corporate social responsibility perspective (Carroll & Shabana, 2010), the adverse effects of food waste in terms of negative environmental and social impact should trigger businesses to act responsibly on behalf of society as a whole by altering their business and marketing actions accordingly. Carroll (1991, 1999) argues that an organization needs to meet the ethical, economic, legal and philanthropic expectations of society, in order to be considered socially responsible, including when addressing issues surrounding food waste (Devin &

Richards, 2018). These societal expectations function as CSR bellwethers and should eventually be adopted by organizations that wish to be considered socially responsible.

However, these multiple expectations create goal conflicts. Hunt and Vitell (1986) mention that marketing decisions when determining their ethical judgements, should aim to fulfill the joint requirements of utility and justice, while facing the problem of a possible conflict between the two. Should retailers promote their own greatest good (ethical egoism), or strive for greater balance of good over bad consequences for all of society (ethical universalism)? The relationship between retail price promotions and household food waste, as well as the actions taken by retailers on the matter, lie within the realm of teleological theories of moral philosophy, where the primary focus is put on the amount of value the end result brings to define whether an action is right (Hunt & Vitell, 1986). Some retailers have abolished price promotions at the store based on the belief that price promotions cause food waste at the household level, thus justifying the action of abolishing an otherwise economically efficient practice (price promotions), as a means to a societally desirable end (food waste reduction).

However, normative prescriptions as for how retailers should fulfill their ethical obligations to society, should stem from a deeper understanding of the phenomena that lie in the epicenter of the ethical discourse, which in this particular case is whether or not retail price promotions lead to an increased amount of household food waste. The deeper understanding is needed in order to ascertain if price promotions are condemnable, as well as because causal relations between means and end are rarely that simple.

Vitell (2015) argues that in order to maximize social benefits, corporate and consumer interests should align and emphasize the importance of consumers' social responsibility (CnSR) as a factor that plays a synergistic role in the success of CSR. With the application of price promotions both

retailers and consumers' interests align in ways that benefit them both, but possibly negative externalities (food waste) occur nonetheless. For instance, price promotions provide a conduit for retailers to sell more in order to fulfill their financial goals (meeting retailer economic goals), and for consumers to make more out of their limited budgets (meeting consumer economic goals). Thus, price promotions and food waste do not affect consumers or retailers negatively, but have wider societal effects, which call for corporate as well as consumer social responsibility.

Some retailers within their CSR initiatives have abolished multi-item offers on the grounds that they trigger food waste, and by doing so, they have gained an improved corporate social responsibility (CSR) image (Aschemann-Witzel et al., 2016). However, in order for this initiative to be an effective step in line with the multiple aspects of CSR, its positive outcome – food waste avoidance – should be greater than its negative side-effects, such as decrease in sales and reduced access to good deals for budget constrained customers. Otherwise, the CSR action becomes mere 'window dressing' or 'green-washing', and does not fulfil the actual goal of CSR. The same critical question can be asked about price promotion on suboptimal foods otherwise wasted in store: If price promotions lead to over-purchase and consequently food waste, then this would surely also apply to price-reduced suboptimal foods, which then might be wasted at home instead of in the store. Are then retailers claiming that they make an effort towards reducing food waste, reaping the benefits of a favorable reputation as a good corporate citizen, while simultaneously contributing to an increased amount of food waste with the use of price promotions? Another example of the complication of the issue is the fact that retailers are increasingly encouraged to promote healthy eating and increased consumption of fruits and vegetables that are highly perishable. Such initiatives, however, could increase the probability of food waste. Should retailers therefore reduce the availability of fresh produce, or increase availability of processed foods with longer shelf lives in order to avoid food being wasted?

What becomes apparent with these questions, is that implementation of one CSR action can possibly nullify another, due to the multiplicity and conflict of the purposes it sets out to serve. Therefore, CSR actions aimed at serving one goal can consequently conflict with another and have different effects on the various stakeholders involved – consumers, companies, and society as a whole.

In this paper, we bring a multi-level perspective between institutions and actors into the CSR debate. Drawing parallels with established literature in organizational behavior ([Klein & Kozlowski, 2000](#)), we argue that CSR efforts to address food waste should be understood as an ongoing process that involves both institutional actors (i.e. retailers) and individuals (i.e. consumers), and exists both at institutional and individual levels. Sometimes the values of these actors are monolithic and perfectly aligned, helping to point the way to relatively straightforward solutions to existing social problems. In other situations, consumer and retailer values are misaligned, just as retailer and supplier values may also be ([Devin & Richards, 2018](#)). Thus, we present the issue of food waste as a wicked problem for retailers and consumers ([Head, 2008](#)). We do so, because consumers do not have homogenous values that help retailers effectively meet their value driven needs in a way that they might be able to if they treated consumers as a single institutional actor or monolithic group with uniform preferences. Rather, consumers are heterogeneous, and retailers face situations where their actions to address CSR goals may simultaneously meet the social needs of some consumers, while ignoring the needs of others. We furthermore argue that the heterogeneous characteristics of consumers highlight their influential role and responsibility in whether price promotions do in fact lead to food waste at the household level. The view that consumers are responsible for the ethical consequences of their actions has received increasing attention in the past decades ([Giesler & Veresiu, 2014](#)).

Despite the apparent conflicts between different CSR goals and the wicked problem encountered in CSR decisions, there is also potential for win-win situations for various goals simultaneously. It is not necessarily profitable for the retailer to induce over-purchases that exacerbate household food waste, as consumers might dislike being driven into wasting food, and thus turn away from the offending market actors. In that sense, a retailer's efforts to help consumers reduce food waste might pay off in terms of customer acquisition, increased customer loyalty, and an improved image, aligning profit goals with sustainability goals in a so-called business case for sustainability (Schaltegger et al., 2012).

Method

Literature search procedure

The search for literature was limited to articles published in peer-reviewed refereed journals. The rationale for imposing this limitation is that peer reviewed work constitutes established knowledge with the highest impact on the field (Podsakoff et al., 2005). Furthermore, the search scope was narrowed to articles published in English between 2007 and 2017 in order to obtain relatively recent developments in the field, which has experienced a surge in food waste related publications within the last 8 years (Chen et al., 2017). Initially, a series of exploratory searches were conducted in order to develop a notion of the literature on the subject of food waste and to create keywords to be used during the subsequent main search. The main search was conducted in two databases: *ISI Web of Science* and *Scopus*. The keywords included combinations of terms relating to food waste and price promotions, and the searches were implemented on the Title-Keyword-Abstract fields of the database records. The search keywords can be found in Table 3 and Table 4 in the Appendix.

The last search was performed in December 2017. No a priori requirements were made regarding the measurement of either price promotions or measurement of food waste. The reason for not

imposing any such requirements is that there is a somewhat wide variation in price promotions on food and in what they are called at the retail level, such as a) multi-item offers, e.g., '3 for 2', BOGOF promotions, or any multiple number of items that are sold with another for free; b) extra quantity for free, or bundle discounts, which provide the consumer with a certain extra quantity of the item for free; c) Y for €X, a number of items for a set amount; and d) temporary price reductions, e.g., normal price reduced by €X (WRAP, 2011). Similarly, there is a great variety of methods used to operationalize food waste, ranging from self-reported food waste with the use of questionnaires, kitchen diaries, and qualitative interviews, to quantification of food waste based on actual food waste measurements (Bellemare et al., 2017).

Inclusion criteria

The database search yielded 837 full-text records that were subsequently checked for duplicates and then screened for eligibility using the following inclusion criteria:

1. The articles should address food waste generation at the household/consumer level.
2. The articles should be based on primary data and investigate consumer-level factors related to food waste.
3. The articles should investigate, among other factors, the role of price, as well as provide information on the measurement of the respective focal variables.

A more detailed description of these inclusion criteria can be found in Table 5 in the Appendix. Backward and forward bibliographic searches were conducted on the identified papers during the fourth step of the flow process (after applying inclusion criteria 1 and 2) in Google Scholar and the reference lists of each paper, respectively. Through this process, 15 additional articles were identified and added at the final step of the literature flow. After the completion of this procedure, we conducted a search within the first 10 pages of results in Google Scholar with the aim of identifying records

addressing price promotions and food waste that might have been listed in a database other than *ISI WoS* and *Scopus*. The previously identified records appeared multiple times, indicating that our search had reached a saturation point.

Eventually, after applying inclusion criteria 3, 24 records met all inclusion criteria to be included in the literature review. The procedure flow is summarized in Figure 2.

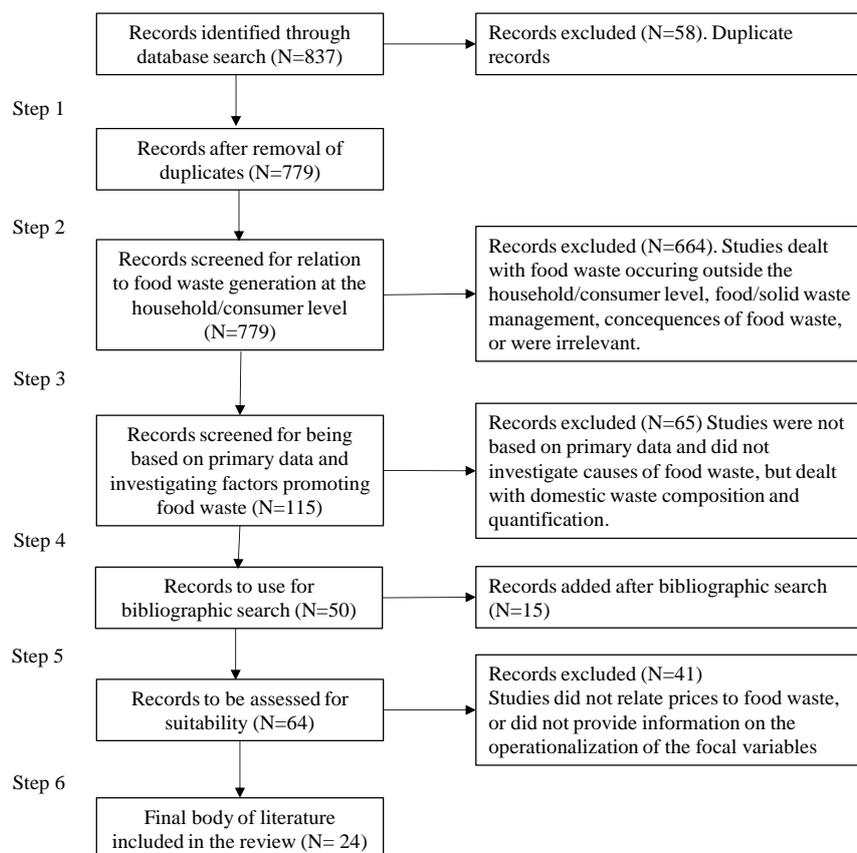


Figure 4: Schematic representation of the data collection process

Results

The identified relationship between retail price promotions and household food waste identified in each paper is summarized in Table 1. A complete list of the 24 articles included in the review can be found in Table 6, in the Appendix, with details regarding their method, sample, country, and main

findings. Three of the identified articles are based on the same study but are described separately. In the following sections, we provide a short overview of the articles with regard to the methodological approaches and the measurement of price promotions and food waste that we found. We then present the overall results in terms of the direction of the identified relationship between price promotions and food waste. Then, we introduce each set of articles – those that suggest a positive, a negative, or no relation. Given the diverse types of studies, we give a short description of each study so that the reader can understand the context of the result. For each set of articles, we finalize with a discussion of the findings and the potential moderators of the relation between price promotions and food waste that the studies might hint at². We use quotation marks to indicate that variable description occurs in the same way as in the source paper.

Characterization of studies

A total of 13 studies employed a quantitative approach and based their findings primarily on survey methodology. One study employed physical waste sorting of food waste alongside a questionnaire, and another study used a combination of food waste weighing and a survey instrument. Six studies utilized qualitative methods: two applied semi-structured interviews and ethnographic observations, whereas the remaining four employed a combination of ethnographic observations, focus groups, and photographic documentation. Finally, the remaining five studies employed a mixed methodology, both quantitative and qualitative, three of which used a kitchen diary and a questionnaire, and the two others a combination of questionnaires and interviews.

² 3 of the identified records are based on one common study. However, we present each paper as an individual study. Each of these 3 papers can be found in the Appendix.

Table 1: Identified relationships by publication

Publication	Relationship between retail price promotions and food waste		
	Positive	Neutral	Negative
Aschemann-Witzel et al., (2017)			*
Delley, M. & Brunner, T. A. (2017)	*		
Ponis et al., (2017)	*		
Mondejar-Jimenez et al., (2016)	*		
Porpino et al., (2016)	*		
Qi, D. & Roe, B. E. (2016)		*	
Sassi et al., (2016)			*
Schmidt, K. (2016a)	*		
Schmidt, K. (2016b)	*		
Yildirim et al., (2016)		*	
Jörissen et al., (2015)			*
Parizeau et al., (2015)			*
Neff et al., (2015)			*
Porpino et al., (2015)	*		
Setti et al., (2015)	*		
Farr-Wharton et al., (2014)	*		
Graham-Rowe et al., (2014)	*		
Katajajuuri et al., (2014)		*	
Silvennoinen et al., (2014)			*
Ganglbauer, E. & Fitzpatrick, G. (2013)	*		
Fonseca, Jaime R.S. (2013)	*		
Evans, D. (2012a)		*	
Koivupuro et al., (2012)			*
Williams et al., (2012)			*

The relationship between price promotions and food waste

The results of the review show that the relationship between price promotions and household-level food waste is indeed ambiguous and thus inconclusive. In total, 12 articles indicate a positive relationship between price promotions and household-level food waste. In these articles, the results suggest that price promotions are related to greater amounts of food waste. However, 8 articles hint at a negative relationship between price promotions and food waste. In this case, the results of the studies indicate that consumers who are more prone to shopping for discounted food products are less likely to waste food than those who are not prone to discount shopping. Finally, the remaining 4 studies find no association between price promotions and food waste.

Results – Articles that found a positive relationship between price promotions and food waste

[Delley and Brunner \(2017\)](#) aim to understand attitudes, perceptions and behaviors of Swiss consumers toward food waste and to provide targeted suggestions for an effective solution of the food waste problem. To achieve their goal, the authors utilize a postal survey of a non-representative sample of 681 German- and French-speaking Swiss residents. [Delley and Brunner \(2017\)](#) measure food waste generated by households by asking participants to indicate the amount of food they waste during an average week for an array of food categories. This estimation takes place for a subset (n = 506) of the original sample due to inconsistent and missing responses. The authors thereafter convert food waste portions per food category into grams and create an aggregate measure of food waste per household, per week. Price promotions are operationalized with four statements where the respondents have to indicate their level of agreement on a 6-point Likert scale using the end points 1=do not agree at all, and 6=completely agree. The statements are based on previous research, and the authors utilize them in order to measure price and discount-driven food-shopping behavior in households. An example of a statement is: ‘I get inspired by sales and buy food that was not initially planned’.

The results indicate that one particular consumer segment (out of a total of six that the authors identify) is very price- and discount-driven, and it produces a high, albeit not the highest among the identified clusters, amount of food waste per household: this segment is ‘short-term’-oriented consumers, who comprise approximately 21% of the Swiss population. Contrary to that segment, the cluster of consumers characterized as ‘conservative,’ who are also very price- and discount-driven in their shopping routines, tend to report little food waste in their households. The conclusion of the study by [Delley and Brunner \(2017\)](#) points to the inference that price discounts do not have a universal

impact on food waste but rather that the impact of price discount on the production of food waste is conditional on the type of consumer who utilizes price discounts in his or her shopping routines.

[Mondéjar-Jiménez et al. \(2016\)](#) use the framework of the Theory of Planned Behavior with the aim of investigating the relationship between individual habits, attitudes towards food waste, and ‘addiction to marketing and sales strategies’ with regard to consumers’ food waste behavior. The operational definition of food waste that [Mondéjar-Jiménez et al. \(2016\)](#) use in their study comprises a group of behaviors the authors consider positive (correct) towards food waste. Accordingly, consumers who comprehend expiration dates, use left-overs, and use a shopping list exhibit positive behavior towards food waste. Price promotions are operationalized as ‘marketing/sale addiction’ with three items enquiring about participants’ inclination to purchase unnecessary items as a result of food packaging as well as about the layout of the products and special offers in supermarkets. Participants are asked to indicate their level of agreement with the survey questions on a 5-point Likert scale, with end points 1 = strongly disagree, and 5 = strongly agree.

The authors utilize a survey instrument administered to a non-representative sample of 380 youths in Italy and Spain. Their findings indicate that ‘marketing and sales strategies’ promoted by food retailers have a direct and significantly negative effect on consumers’ food waste behavior; the authors also emphasize the importance of the role of retailers in preventing the generation of food waste.

[Setti et al. \(2016\)](#) aim to provide insights into the relationship between income and household food waste behaviors; they utilize an online survey that they administer to a representative sample of 1,403 Italian consumers. The authors measure food waste within five product typologies: Fresh bread, cheeses, yogurt, fresh vegetables, and fruits. Respondents have to indicate how often they throw away leftover food on a frequency scale ranging from ‘Nearly every day/3-4 times a week’, to ‘Less than

once a week/rarely'. The authors use a single item to inquire about the frequency with which consumers take advantage of special offers (often/sometimes/rarely).

The findings by [Setti et al. \(2016\)](#) reveal that the overwhelming majority of consumers purchase their food when special offers are available (99%). However, purchases when special offers are available do not impact the amount of food waste for all food products but rather contribute to increased amounts of food waste for particular categories: cheeses, yogurt and fresh vegetables.

[Schmidt \(2016a\)](#) applies an experimental approach in her study, which aims to increase the likelihood of food waste prevention in households by improving the self-reported performance of food-waste-prevention behaviors of household members. Thus, the author a priori assumes that retail price promotions bring about increased food waste.

To achieve this aim, the author administers a survey instrument at two time points to a non-representative sample of 217 consumers in Germany. Thereafter, the author divides the sample into two groups, applies an intervention with informational material containing action knowledge using a public commitment and a goal-setting technique for one of the groups, and repeats the procedure at a second time point. [Schmidt \(2016a\)](#) operationalizes food waste with a battery of eleven items that represent food-waste-prevention behaviors on a 5-point Likert scale ranging from 1=almost never to 5=almost always. Price promotions are operationalized with two items, with the answer to the second item being conditional on the answer to the first one. The author first inquires whether respondents spontaneously buy more than they actually need, and in the case of an affirmative response, she inquires about the reasons for doing so. Among the options for answering, [Schmidt \(2016a\)](#) includes the option 'special offers / discounts (e.g., 'Take 3, pay for 2!')

The results of the study indicate that after the intervention, improvements are observed with regard to avoiding impulsive purchases and buying excessive unnecessary food due to special offers. Two

outcomes (avoiding impulsive purchases/buying more food than currently necessary due to special offers) are characterized by the lowest baseline ratings compared to other food-waste-promotion behaviors ($M_{t1}=2.76$, $SD=0.94$). After the intervention, the same results receive a higher average score for both the experimental group ($M_{t2}=3.55$, $SD=0.89$) and the control group ($M_{t2}=3.21$, $SD=0.98$). As a result of the intervention study, the author concludes that measures can be implemented to remind consumers that susceptibility to price promotions while shopping can lead to increased food waste.

In a subsequent study, [Schmidt \(2016b\)](#) administers an online survey at three time intervals; the aim is to create an instrument that measures self-reported behaviors that relate to food waste. The author bases the selection of the questionnaire items on previous research and a-priori assumes that the included items antecede food-waste behavior. Thus, the author does not measure food waste behavior per se but rather investigates, with the use of exploratory factor analysis, whether the thesis that the included items indeed comprise core food waste factors consistently holds true. The measurement of price promotions takes place in an identical fashion to [Schmidt \(2016a\)](#).

The results indicate that a factor that comprises behaviors related to spontaneously purchasing food items due to promotional activities, e.g., special offers and discounts, appears consistently.

In their recent study, [Ponis et al. \(2017\)](#) aim to investigate the effects of, among others, intensive promotion-shopping on food waste generation. The authors administer an online survey to a non-representative sample of 500 households in Greece and operationalize food waste with one item referring to the total amount of food waste and six items on the waste of specific food categories: 1) fruits, 2) vegetables, 3) bread and bakery, 4) milk and dairy, 5) meat, fish and eggs, and 5) rice, pasta and potatoes. Participants are asked to state the degree of the food waste they produce on a 7-point Likert scale with end points 1=not at all to 7=extremely much. Moreover, [Ponis et al. \(2017\)](#) include a battery of 7 items that, based on the literature, relate to potential causes of avoidable food waste,

e.g., food that has been forgotten in the cupboard past its expiration date and is therefore discarded, and they ask participants to state the frequency of such food-waste-promoting occurrences on a 7-point Likert scale with end points 1=not at all and 7=extremely often. Price promotions are not included in this battery of items, but they are operationalized as the respondents' tendency to purchase promotional offers, such as 'buy one get one free'.

The study's results indicate that consumers who have an increased tendency to purchase food products on promotion tend to throw away more food due to a variety of food-waste causes than do consumers who do not exhibit this type of shopping behavior.

[Graham-Rowe et al. \(2014\)](#) take a qualitative research approach to explore the nature of household food-waste minimization behavior. To address this aim, the authors incorporate semi-structured interviews and recruit 15 student and non-student participants from 13 households from the South of England, UK. [Graham-Rowe et al. \(2014\)](#) operationalize food waste with open questions that aim to elicit participants' thoughts and feelings regarding food choices and food preparation at home, e.g., 'once at home, how is it decided what food is going to be eaten and when?', 'When, if at all, does food get thrown away in your household?', 'Can you describe why you think this happens?'. The researchers use a similar approach and employ open questions that aim to elicit thoughts and feelings regarding purchasing food, e.g., 'Tell me how you shop for food for your household. Can you describe a typical food-shopping trip?', 'How do you feel about shopping for food?', 'How do you decide what food you are going to buy?'

According to the results, financial incentives, such as price promotions, are cited as a source of food waste. According to [Graham-Rowe et al. \(2014\)](#), 'in-store marketing techniques' put consumers in a predicament and entrap them in the unpleasant dilemma of either buying bulk and saving money, but increasing the likelihood of food waste, or buying smaller quantities of food and spending a larger

amount of money, but decreasing the likelihood of creating food waste. However, the authors note that a decrease in disposable income, or other lifestyle changes, compel households to “...adapt their food waste attitudes and behaviors and become less frivolous with food”. Moreover, supermarkets were criticized for “...trying to palm off their own waste onto consumers”, through the use of ‘2 for the price of 1’ offers, typically on fruits and vegetables.

[Porpino et al. \(2015\)](#) aim to identify antecedents of food waste among lower-middle class families in Brazil, and to that end, the authors incorporate a qualitative approach comprising observation, interviews, photos and a focus group of 14 lower-middle class Brazilian families. The authors do not reveal the purpose of the study to participants but encourage them to elaborate on the topic of food waste when it is mentioned. The authors operationalize food waste based on observations of the process of preparation, consumption and disposal of food, and they complement the data on food waste with photos of food storage compartments as well as the places where food was thrown away. The authors do not provide information on the way they operationalize price promotions.

[Porpino et al. \(2015\)](#) conclude that buying bulk in order to achieve a reduced relative price generates more food waste, and therefore the households’ preference for large and economy packages “...nullifies the efforts to save financial resources at the time of purchase”.

In a subsequent study, [Porpino et al. \(2016\)](#) aim to further investigate antecedents of food waste in lower-middle income families in the United States. The authors employ a grounded theory approach, with quasi-ethnographic methodology, semi-structured interviews, photos and observations, to a sample of 20 caregivers. The authors do not provide details on the measurement of price promotions; however, the authors did inquire about participants’ food-provisioning routines. Food waste is documented via photos and direct observations by the researchers as it occurs during the households’ every day food-related activities.

Porpino et al. (2016) conclude that point-of-sale promotions are driving consumers to buy more than they need and are conducive to excessive buying, a driver of food waste that according to the authors, is identified in 60% of the families investigated.

Farr-Wharton et al. (2014) aim to identify factors that promote household food waste behavior; they use a framework that is inspired by the Value-Belief-Norm theory. The authors employ a qualitative research approach with interviews and ethnographic observations in two sequential methods of data collection over a period of three months in Australia. The authors operationalize food waste through observations of food consumption, household waste management practices, photos of the contents of fridges, and weekly examination of the contents of a bin that was provided to the households purposefully for the study. The authors operationalize price promotions with the use of open-ended questions concerning grocery-shopping practices and experiences and food-waste prevalence.

The authors find that, what they coin as price related ‘marketing ploys’ initiated by retailers that promote consumer savings through bulk purchases is a theme that emerges prevalently in their research. They conclude that food purchasing attitudes motivated by the perceived monetary benefit of ‘buy bulk and save’ are primary contributors to households’ waste from expired food. Their findings indicate that ‘marketing ploys’ constitute forces that tap into consumers’ tendency to stockpile food, something that consequently leads to increased amounts of waste due to expired food.

Ganglbauer et al. (2013) employ semi-structured interviews and ethnographic observations among a sample of 11 households in Austria and the 3 in the UK, with the aim of investigating everyday domestic practices around food and waste. The authors measure food waste with home tours and fridge cameras deployed inside participants’ refrigerators over a period of one month. Furthermore, the authors incorporate price promotions when developing their interview guide that covers broad

themes, including aspects that motivate choices around food, such as price, the process that lasts from planning for food shopping until food is discarded in daily practice, and reasons why food gets wasted in the household.

The results indicate that household efforts to achieve ‘economies of scale’ through the purchase of large quantities of food products often result in buying too much food that is subsequently thrown away. Households that aim for less-expensive food resort to large quantities instead of smaller ones under the conviction that these are less expensive. The authors note that shopping “...*in the context of another dispersed practice such as living on a tight budget*” leads people to choose big packages, but consequently, the likelihood of throwing away the unused excessive food is increased.

In a mixed method study, [Fonseca \(2013\)](#) aims to uncover consumer profiles that relate to food waste. The author employs a focus group as well as an online survey administered to a non-representative sample of 542 consumers in Portugal and combines this methodological approach with semi-structured interviews of a subset of 18 of these consumers. Based on the focus group, the author incorporates a multitude of behaviors that are associated with food waste into a questionnaire, which then forms the basis for subsequent semi-structured interviews. Food waste is operationalized as an amalgamation of behaviors that relate to the way in which consumers buy, prepare and dispose of food in their household. Price promotions are operationalized with a question that inquires about whether respondents habitually purchase food during sales of the type ‘take 2 and pay 1’, or ‘buy one get one free’. Respondents have to respond on a yes/no basis.

The results of this study indicate that purchases of price-reduced food products are prevalent in the cluster of consumers who generally exhibit food-waste-promoting behaviors to a higher degree – thus called ‘food wasters’ – than among those characterized as ‘non-food-waste’ consumers. An important finding in [Fonseca \(2013\)](#)’s study, one that potentially impacts the results to a certain

degree, is that the majority of those consumers who exhibit food waste behaviors are not the primary buyers of food products in their household, whereas the opposite is the case with the ‘non-food-wasters’.

Summary of findings

Upon closer inspection of the studies that conclude there is a positive relationship between price promotions and household food waste, some interesting findings emerge. We find that the studies can be grouped into 4 categories: first, those that identify a potential causal relation between the frequency of price promotion use and food waste, second, those that a priori assume that price promotions lead to food waste, third, those that identify consumer clusters characterized simultaneously by price promotion use and food waste, and fourth, qualitative research clearly showing that ‘bulk buying’ is discussed as a cause of food waste.

Three of the studies indicate that self-reported frequent use of price promotions relates to a higher degree of self-reported food discard (Ponis et al., 2017; Setti et al., 2016) and has a negative influence on consumers’ waste behavior (Mondéjar-Jiménez et al., 2016). A set of studies assume a priori that there is a positive relationship between price promotions and food waste and incorporate that assumption into the study framework (Schmidt, 2016a, 2016b). Schmidt’s studies provide evidence that price promotions and household level food waste are conceptually associated, however, due to the exploratory nature of these studies, confirmatory evidence are necessary to further support that argument, and substantiate that proposition. Two studies identify a cluster of consumers in which both a high degree of self-reported price promotion use and a high degree of food waste are found (Delley & Brunner, 2017; Fonseca, 2013). None of the research studies are based on actual measures of food waste or food waste diaries. Thus, all the above findings draw on self-reported measures. The five qualitative studies consistently find that consumers report that multi-item purchases and price

promotions trigger food-waste behavior, and consumers talk about this as a source of food waste. However, the extent to which this leads to food waste appears to be, at least partly, the impression of the authors when they interpret the observations. Interestingly, none of the qualitative studies shows that consumers might talk about using price promotions for stockpiling food, but then not waste any of their stocks. The quantitative studies provide some hints as to which factors might moderate the relation between purchasing price-promoted food and food waste: [Mondéjar-Jiménez et al. \(2016\)](#) suggest attitude as a factor; [Fonseca \(2013\)](#) suggest that a factor could be whether one is the main shopper or not, while [Delley and Brunner \(2017\)](#)'s study indicates that holding conservative values might be a moderating factor. The qualitative studies primarily indicate that not only lack of food-handling capabilities but also the goal of maintaining one's identity as a good provider lead to price-promoted food being wasted.

Results – Articles that found a negative relationship between price promotions and food waste

[Neff et al. \(2015\)](#) implement a nationally representative survey among a sample of 1.010 consumers in the United States, with the aim of investigating the attitudinal factors that shape consumer decisions to purchase and discard food as well as the extent to which consumers exhibit behaviors that impact food waste. The authors operationalize food waste with five questions that ask whether consumers perform a set of behaviors that [Neff et al. \(2015\)](#) characterize as waste-promoting and waste-reducing. These behaviors include a) perceived knowledge about reducing waste of food; b) estimation of the waste of food in the U.S.; c) estimation of the total percentage of food the participants themselves discard; d) estimation of the household waste of food in comparison to that of the average American; e) acceptance of the brown banana; and f) perceived current effort to minimize waste of food. Price promotions are operationalized with one item that asks about the

frequency with which participants buy too much food due to sales. The response scale was a 5-point Likert scale with the end points ‘always’ and ‘never’.

The relationship between price promotions and food waste is established indirectly based on the findings of the study. The authors found that approximately half of the respondents indicate that they sometimes buy too much food due to it being price-promoted. A small minority (approximately 2%) indicate that they always buy food on promotion, whereas 9-10% of respondents report that they often buy food on promotion. Respondents overwhelmingly reported low amounts of food waste, with 13% indicating they do not discard any food, and 56% indicating that they throw out less than 10% of the food they buy. Interestingly, [Neff et al. \(2015\)](#) provide respondents with a list of possible changes that could be implemented by retailers to help reduce the amount of food that is wasted at the household level. Here, the results show that 48% of respondents indicate that they would like an increase in ‘buy one get one later’ promotions as well as discounts on foods that are over-ripe or near expiration (48%), indicating that consumers regard price promotions as an initiative that can reduce rather than increase food waste.

In a single study that resulted in three separate articles, [Silvennoinen et al. \(2014\)](#), and [Koivupuro et al. \(2012\)](#) set out to investigate the volume, composition, and drivers of food waste among Finnish households, whereas [Katajajuuri et al. \(2014\)](#) expand that aim and include all parties involved in the Finnish food production-consumption chain. The joint data collection process is described below, however the results of the article by [Katajajuuri et al. \(2014\)](#) are described in the subsequent chapter because they differed.

During the data collection process, the researchers employ an approach at the household level that combines a kitchen diary and questionnaire among a sample that is not entirely representative of the Finnish population; the sample includes 380 households with 1,054 individuals. The researchers

measure food waste with the use of a kitchen diary containing detailed instructions on how households should weigh and record their food waste as well as the reasons for the waste. Participants weigh their food waste daily and assign a note on the reason why the food was wasted, such as ‘spoiled’ or ‘past best-before date’. Participants register food waste under pre-defined headings such as ‘bread’, ‘potatoes and potato products’. Unavoidable food wastes, e.g., peels, bones and coffee grounds, are excluded from the measurement process, but potable dairy products and milk are included. The authors do not provide detailed information on how they measure price promotions; however, they describe how they study the influence of several socio-demographic, behavioral and attitudinal factors relating to food waste. Price promotions are measured as the degree of ‘appreciation for low food prices’, and more specifically, their ‘valuation of offers’ when buying. It can be deduced from the results section that the authors ask about the frequency with which participants buy food products on sale; however, the authors do not provide information on the response scale used for quantifying the independent variable.

[Silvennoinen et al. \(2014\)](#)’s results show that ‘appreciation of low food prices’ in the form of BOGOF offers and frequent purchases of discounted food products is a factor with a statistically significant inverse impact on the amount of food waste in a household. The amount of food waste in households that shop both low-priced as well as discounted food products and BOGOF offers is less than food waste in households that do not shop that way.

The results of the study by [Koivupuro et al. \(2012\)](#) show that households that do not buy discounted food products or BOGOF offers waste more food than those households who do buy food products on discount. This finding is uncorrelated to the households’ overall income, and thus the authors conclude that consumers who tend to buy discounted food products value food more and therefore waste less of it.

[Parizeau et al. \(2015\)](#) collect organic, recyclable and garbage waste data from a non-representative sample of 222 households in Guelph Ontario, Canada and combine these data with survey results obtained from a subset of 68 households; the survey contains attitudinal, behavioral and food-waste-related belief measures. The authors operationalize food waste by means of weighing organic, recyclable and residual garbage produced by the participating households; however, their observations do not include waste that is discarded in other ways than being placed in the recycle bin, e.g., being put in composting units or fed to pets. The resulting weights are subsequently standardized and averaged to reflect a 7-day weighing period.

The authors conduct door-to-door surveys with the household member primarily responsible for the households' shopping and cooking. They operationalize price promotions by inquiring into the household's shopping and cooking practices, and more specifically into the frequency with which the household buys foods that are price-promoted. The authors do not provide further details on the response scale.

The results indicate that 34% often or always bought price-promoted food; however, only 2% of the respondents indicate that they often waste food that was bought on promotion. Moreover, the authors' findings indicate that households that report that they do not often waste discounted foods tend to produce fewer types of food waste overall. [Parizeau et al. \(2015\)](#)'s findings point to the conclusion that price promotions do not necessarily lead to increased amounts of food waste.

[Jörissen et al. \(2015\)](#) focus on factors within the household that influence the generation of food waste, such as shopping, eating and food preparation habits. The authors administer an online survey to a non-representative sample of 857 researchers in two European research centers, KIT in the city of Karlsruhe, Germany (n=453), and JRC, Ispra, Italy (n=404). The authors operationalize food waste by asking participants to estimate the amount of edible food waste they generate in certain predefined

food categories, using a scale with the following levels: nothing, 250-500, 500-1000, 1000-2000, more than 2000 g per household/week. On the basis of this information, the authors calculate the amount of food waste produced per capita within each household. Price promotions are operationalized as ‘attraction to special offers’ by the item ‘Do you think you are drawn to special offers, e.g., ‘buy one get one free’, ‘three for the price of two etc.’, with the following answer options: Yes, sometimes, no.

The results of [Jörissen et al. \(2015\)](#) indicate that consumers who are more often drawn to special offers waste less food on average than consumers who are less interested in special offers.

[Williams et al. \(2012\)](#) aim to investigate reasons for food waste and particularly how and to what extent packaging influences food waste in households. They employ a mixed study, with the use of a kitchen diary and questionnaire, in a non-representative sample of 61 families in and around the county of Värmland, in Midwest Sweden. The authors measure food waste both in connection to meals and in connection to storage of foods. In the former case, the amount of discarded food, whose measurement excludes inedible food parts such as bones, peels, or any other inevitable waste, is weighed and recorded in a kitchen/food waste diary either by weight or in volume numbers. Participants are thereafter asked to indicate the reason(s) for discarding food by choosing among 6 alternatives. An example of an answer option is ‘saved leftover not used in time’. In the latter case, i.e. in relation to storage of foods, [Williams et al. \(2012\)](#) provide respondents with a list of eight different reasons for wasting the foods they did. An example of an answer option is ‘bought too much’.

[Williams et al. \(2012\)](#) operationalize price promotions with statements relating to the shopping habits of the households. The authors operationalize price promotions as the household’s ‘price awareness’, i.e. caring about price/kg and the use of discount coupons, with two statements that

address how price influences purchase behavior: ‘I/we look around and decide a lot based on price/kg’ and ‘I/we purchase food items with discount coupons’. All answers were recorded on a 7-point Likert scale with end points 1=do not agree at all and 7=do fully agree. These two items are subsequently merged into one variable, ‘price awareness’, and based on the variation in responses, the authors perform a median split to divide the sample into two groups, one that ‘places high importance on price’ and one that places low importance on price.

The authors conclude that on average, the households that note ‘price to be more important’ waste less (1.51 kg/household/week) than the households that note ‘price to be less important’ (1.86 kg/household/week).

[Sassi et al. \(2016\)](#) administer an online survey to a random, non-representative sample of 281 Tunisian consumers with a multifold aim to assess the impact of behaviors regarding food and food management on the quantity of food waste. The authors operationalize food waste with an item that asks for an estimate of the edible food households dispose of per week based on predefined levels of waste, starting from throwing away nothing, to less than 250 g, 250-500 g, 500-1000 g, 1000-2000 g, and more than 2000 g per household/week. Measurement of price promotions is done with the question ‘Do you think you are drawn to special offers? (e.g., ‘buy one get one free’, ‘three for the price of two’, etc.)’. The authors do not specify the response scale.

The results of the study by [Sassi et al. \(2016\)](#) do not establish an explicit association between price promotions and food waste; however, the directionality of the relation can be implicitly inferred based on the information the authors provide. Almost half of the participants (46%) indicate that they are attracted to special offers; however, 39% of them indicate that they do not throw away any food at all, and 23.5% that they throw away less than 250 g of food per week.

[Aschemann-Witzel et al. \(2017\)](#) aim to explore consumers' considerations when during grocery shopping, they encounter price-reduced food products that are close to their expiration date. The authors employ an approach that combines an online experimental survey of a representative sample of 848 Danish consumers and 16 qualitative accompanied shopping interviews. Measurement of food waste takes place with the following item: 'If you estimate your own household, how much of the following food that you buy or cook ends up being thrown away at home?' The authors' enquiry relates to five product categories: fresh fruits and vegetables, milk and dairy, bread and other bakery products, meat and fish, and prepared dishes/meals. Price promotions are operationalized as consumers' 'price criterion', which consists of the following questions: 'I frequently buy food close to the best-before date, if it is offered at a lower price', and 'I look for ads in the newspaper for store specials or purchase food that is on discount'.

The results of the study by [Aschemann-Witzel et al. \(2017\)](#) do not support the assumption that price promotions lead to increased amounts of food waste; rather, they indicate the opposite. Consumers who are 'price focused' produce less food waste than do consumers who are not. The authors interpret these results as being the outcome of consumers' price consciousness, which creates increased consciousness and valuation of food.

Summary of findings

Upon closer inspection of the studies that conclude there is a negative relationship between price promotions and household food waste, some interesting findings emerge. Study methodologies can be categorized into, first, food-waste sorting and food-waste diaries identifying a negative relation; second, studies showing a negative relation in self-reported food waste, and a third group that are diverse in character.

We find that most reviewed studies that are based on either food waste sorting or food waste diaries indicate a negative relation, i.e. consumers who use promotions frequently or are price conscious end up producing relatively low food waste (Koivupuro et al., 2012; Parizeau et al., 2015; Silvennoinen et al., 2014; Williams et al., 2012). Two survey studies support this finding as well (Aschemann-Witzel et al., 2017; Jörissen et al., 2015), and another survey study appears to show that the majority of consumers who use price promotions state that they do not waste food (Sassi et al., 2016). The studies reviewed in this section provide some hints as to which factors moderate the relation between purchasing price-promoted food and food waste: Price-oriented behavior might be related to more conscious purchase behavior and subsequent use of food, as well as to an attitude of not wanting to waste anything.

Results – Articles that found a neutral relationship between price promotions and food waste

Evans (2012a) employs a qualitative approach with the aim of offering a sociological analysis of household food waste. The author draws on ethnographic observations to illustrate how food waste arises as a consequence of domestic practices, with special emphasis on, among other factors, those household routines that relate to food provisioning, as well as the contingencies of everyday life. To meet his aim, the author engages with the residents of 19 households on two ‘ordinary’ streets in Manchester, UK in an eight-month ethnographic study. Evans (2012a) focuses primarily on the reasons why purchased food becomes wasted, rather than on quantifying food waste. The author does not provide details for the measurement of price promotions, but based on the presentation of the study’s results, this can be deduced to have been incorporated into the repeat in-depth interviews with participants, where the author discusses, among other topics, the ways in which households shop for their food.

Evans (2012a) results indicate that every participating household routinely buys more food than necessary and wastes the vast majority of that surplus. However the author concludes that “...it is not satisfactory to position food waste as a matter of profligate consumers being lured in by ‘buy one get one free’ offers and then being too lazy to cook properly or find a use for every last scrap of foodstuff before mindlessly throwing the discards in the bin”. Instead, the author suggests, food is being discarded as a consequence of the enactment of everyday domestic practices and contingencies of everyday life in the household.

Katajajuuri et al. (2014) set out to investigate the volume, composition, and drivers of food waste among parties involved in the Finnish food production-consumption chain (see previous chapter for a detailed description of the data collection process). The authors find that there is no correlation between food waste levels and discounted prices. Their results indicate that households who bought ‘buy one get one free’ and price-reduced food products more frequently did not end up wasting either more or less food compared to households that did not follow that practice. It is noteworthy that households who consider low prices to be an important factor when buying food waste less food than do households who do not consider low food prices to be important.

Qi and Roe (2016) aim to estimate models of consumer food waste awareness and attitudes; to that end, they employ telephone interviews in an omnibus study of a representative sample of 500 consumers in the United States. The authors, measure food waste awareness and attitude with the use a slate of nine statements relating to food waste, for instance: ‘Throwing away food is bad for the environment’. Similarly, an example of one of these statements that measures price promotions is: ‘I/we waste more food when bought in large packages or large quantities during sales’. Participants are asked to express their agreement or disagreement with the statements on a four-point Likert scale ranging from 1=strongly agree, to 4=strongly disagree.

Results from [Qi and Roe \(2016\)](#)'s research indicate that consumers are split with respect to their perception of price promotions and their role in attenuating or exacerbating food waste in their households. Respondents are equally split between agreeing and disagreeing that food waste is exacerbated by bulk and sale purchases (52.9%). The authors merge three statements to create a component that reflects the potential for further reduction of food waste. A significant positive loading of the particular construct comes from the agreement that bulk purchases due to price promotions exacerbate food waste in the household; however, the authors do not provide any information on the internal consistency of that construct. These results indicate that the prevailing notion is that price promotions are associated with exacerbation of food waste. However, as mentioned above, respondents are split between agreeing and disagreeing with that statement.

[Yildirim et al. \(2016\)](#) aim to explore the demographic, social and economic factors that affect household food waste behavior in Turkey. To that end, they employ an online survey among a non-representative sample of 150 Turkish consumers. The authors operationalize food waste with a question relating to how much edible food households throw away on a weekly basis. The range of available answers varies from 'I do not throw away food that is still consumable' and moves upward in increments to 'More than 2 kg'. Although [Yildirim et al. \(2016\)](#) do not provide any information on how they operationalize price promotions, this can be deduced from the results, where the authors state that "...Supermarkets and hypermarkets attract consumers and increase their purchase by applying marketing strategies such as the special offers (buy 2 get one free, buy 2 and get 30% off, etc.)". The answer scale is not explicitly provided, but it can be inferred that the authors ask participants to state the frequency with which they buy price-promoted food products.

According to the results of the survey by [Yildirim et al. \(2016\)](#), 51% of respondents are attracted to special offers and sales when they buy food, while approximately 37% are only sometimes attracted by these offers. Moreover, in response to the above-stated question regarding the amount of edible

food wasted at the household level per week, approximately 44% of the sample responded that they do not throw away any food, while 27.3% answered that they waste less than 250 g and 21.3% throw out between 250 g and 500 g food per week.

Summary of findings

The studies that do not reach a conclusive result on the relationship between price promotions and household food waste are primarily quantitative in their approach. One bases its results on actual food waste measurements provided by the participants themselves (Katajajuuri et al., 2014), whereas the rest base their results on self-reported frequencies of shopping and food waste, as well as awareness and attitudes towards food waste (Qi & Roe, 2016; Yildirim et al., 2016). The qualitative study by Evans (2012a) focuses on the reasons why food waste occurs and underlines that households routinely provision more food than they can find uses for, but not necessarily due to the use of price promotions.

Conclusions

We conclude that the results of the literature review provide evidence that the relationship between household-level food waste and price promotions is ambiguous. We reach that conclusion based on two observations from the review. First, although a slight majority of the identified studies conclude that price promotions are positively related to food waste, evidence from a number of other studies questions this conclusion (for an overview of the direction of the findings, see Table 5). Thus, there is no clear consensus in the literature. Second, the slight majority of the studies suggesting a positive relation have limitations that give grounds to interpret their conclusions with care. These limitations are as follows: some of these studies are partly based on the built-in assumption that such a positive relationship exists per se, e.g., through the operationalization of measures. Furthermore, some of these studies clearly emphasize that a relationship exists between over-purchase and household food waste, yet they do not necessarily assert a causal relation given they are qualitative in nature. Studies based

on food waste diaries, in turn, tend to show a negative relation. Given that the waste diary is assumed to be less prone to bias, and provide a more accurate approximation of what is wasted ([van Herpen et al., 2016](#)), this finding gives more weight to the potential negative relation.

One possible explanation for the ambiguous picture and potentially dual nature of the investigated relationship stems from the argument that food waste is not a single behavior but rather an outcome within a larger complex network of antecedents ([Quested et al., 2013](#)), such as consumers' perceived budget constraints ([Graham-Rowe et al., 2014](#); [Jörissen et al., 2015](#)), price consciousness ([Aschemann-Witzel et al., 2017](#); [Katajajuuri et al., 2014](#); [Williams et al., 2012](#)), and shopping habits ([Silvennoinen et al., 2014](#)). The investigated studies hint at the existence of an array of factors within that network of antecedents that can mitigate household food waste. We therefore conclude that a thrifty attitude, price consciousness, personal values that discourage wastefulness, and household members' roles and capabilities within the food provisioning process can attenuate the amounts of household food waste (see Figure 3).

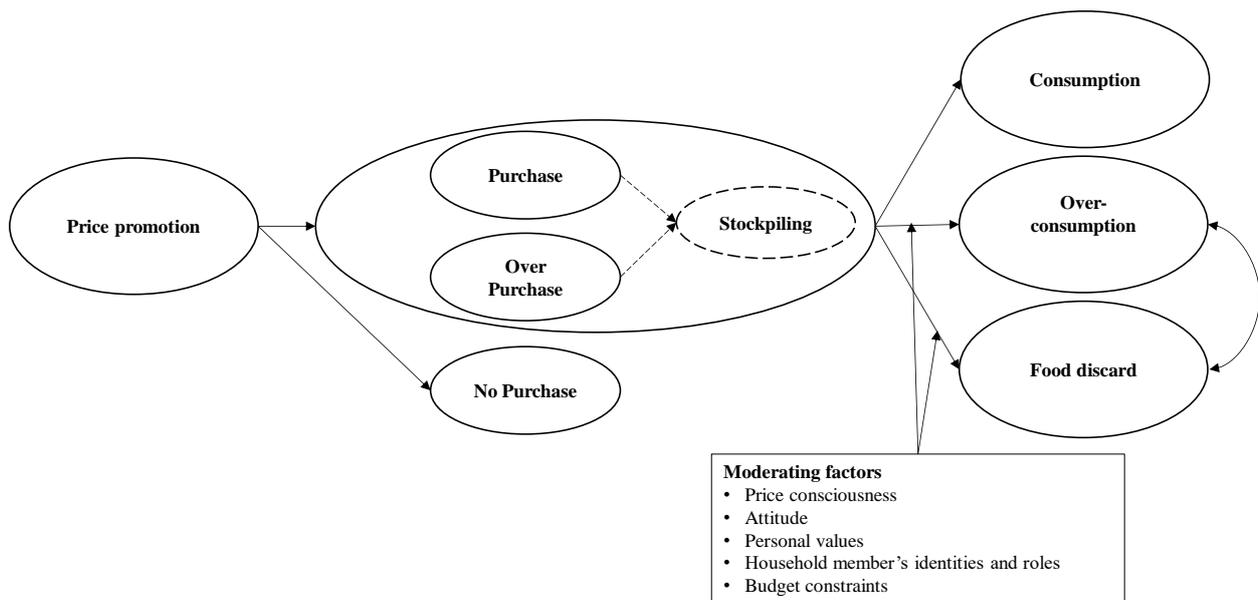


Figure 3: Conceptual framework of factors that potentially moderate the creation of household-level food waste

Future research directions

An important point to consider is that the majority of the included studies investigate the creation of food waste from the perspective of the research subjects, i.e. the consumers. The qualitative studies investigate food waste and its relationship to price promotions by relying on consumers' own perceptions of the directionality of this relationship. The quantitative studies rely on self-reported deal-shopping and food waste behaviors. Given the sensitivity of the topic of food waste, in combination with respondents' "...desire to avoid embarrassment and project a favorable image to others" (Fisher, 1993), the studies' conclusions on the nature and directionality of this relationship can become biased. This caveat raises a question regarding the reliability of the results and furthermore calls for further studies on the subject of the relation between retail price promotions and household-level food waste. Future studies should take a direct approach and utilize direct

measurements of actual purchases of food items as well as actual deal behavior and combine these measurements with quantitative measures of actual food waste for each household.

An additional consideration is that some researchers assume an a priori positive relationship between retail price promotions and household-level food waste. In other words, researchers consider price promotions to be a waste-promoting factor and consequently treat them as such in their studies, as for example when using the tendency to purchase multi-items as an indicator of food waste behavior. There is a need for further validation of constructs that are hypothesized to influence household food waste, either statistically through model selection techniques (Pitt & Myung, 2002) or through application/utilization of the particular construct in a research setting.

Moreover, the independent and dependent variables are operationalized differently across the identified studies, and thus direct comparisons between the results of these might not be substantive, particularly if the methodological diversity across the studies is also taken into consideration. The vast majority of the studies included in this review examine the relationship between food waste and price promotions in a correlational manner, and use of theory is limited. Some of the included studies present their results purely descriptively, in percentage distributions, without providing further information on the analyses conducted, e.g., there is even an absence of correlation coefficients in some studies. Future research would benefit from more homogenous operationalization of the food waste variable. We suggest that an objective measure of food waste, based on actual household food waste data, will provide the most reliable operationalization.

The results of this literature review provide evidence that the relationship in question needs to be explored further and investigated within a larger network of antecedents that influence food waste behavior. The diversity of the results is an indication that the relationship between price promotions and food waste is not ubiquitous but rather dependent on factors that lie within the individual

consumer and among consumer segments with similar psychographic and demographic characteristics.

Based on the findings of these studies, as well as the methods used and the moderating factors identified, we suggest that future research should investigate whether these moderating factors exert their influence on food-waste behavior via a study measuring actual food waste. Moreover, departing from the findings of [Silvennoinen et al. \(2014\)](#), who argue that consumer thriftiness and moderation in spending may help reduce food waste, we suggest that future research should investigate whether and under which circumstances pricing and price orientation can also be utilized as a factor that can help avoid food waste. For instance, a thrifty attitude might increase the intention to purchase suboptimal foods that are otherwise wasted in the earlier stages of the supply chain or in the retail setting.

Implications for business ethics and recommendations for retailers

Our results highlight that retail price promotions are not drivers of household food waste per se, even though they have been regarded as such. Thus, the assumption that price promotions necessarily lead to food waste, which is often taken for granted, appears questionable. We, instead find that certain consumer characteristics moderate this relationship.

Retailers, in an effort to be considered socially responsible at various levels ([e.g., economic, legal, ethical, and philanthropic: see Carroll, 1979; Devin & Richards, 2018](#)), seek to address both issues of food waste and the economic circumstances of consumers. However, what becomes apparent is that price promotions that address one goal (reducing economic burden on consumers) can cannibalize another goal (waste reduction at the household level) conditional on characteristics of consumers. When CSR issues arise, they often force actors into social situations where the best action is unclear because it points to two different value driven directions, forcing actors to make choices about the

relative importance of the goals they pursue. Such moral problems are common regardless as to whether they are addressed by individual actors (i.e. whistleblowers: Waytz et al., 2013) or broader institutions (i.e. anomie: Merton, 1957). Thus, our findings have important implications for the ethics of businesses deciding for and against food price promotions, or the specific type of food pricing tactic chosen, due to the plurality and often misaligned moral values embedded within CSR decisions (Carroll, 1979; Graham et al., 2013; Rai & Fiske, 2011). Supermarkets have been accused of triggering food waste through their pricing tactics (e.g., Stuart, 2009), and some have reacted by, for instance, abolishing multi-item offers across the entire retail chain (Kulikovskaja & Aschemann-Witzel, 2017). Our findings, however, show that there is not necessarily proof that this is the most efficient action. Rather, such an action has disregarded the consumer's role and responsibility for the issue at hand.

From a business ethics and social responsibility perspective, we caution that it is important not to overlook the needs of consumers with limited financial resources. For them, retail price promotions are excellent conduits for getting more value from grocery shopping, either in terms of adding better food quality to their basket, such as more fresh produce, or in terms of food quantity, for instance getting more food items per monetary unit spent (Cassady et al., 2007). Therefore, eliminating price promotions altogether based on an unfounded expectation of the societal benefit of food waste reduction would deprive this sensitive segment from an essential benefit to no avail, and thus, this approach could also be considered unethical. For instance, recent research by Noble et al. (2017) shows that impoverished consumers redeem coupons at greater rates than higher income consumers when taking the basket size into account. The coupon is a well-integrated price-promotional tool in certain markets, including the US, and often related to multi-item and BOGOF offers. Removing this promotional tool based on the questionable assumption of a positive relationship between price promotions and household food waste could therefore have social ramifications.

The challenge that consequently arises for retailers is how to accomplish the advantages of price promotions while at the same time minimizing the risk of food waste. To that end, retailers can implement initiatives that consider the multi-level implications as well as the role of the individual consumer. Some examples of this are discussed in the following.

Retailers can provide elaborate information to consumers about the best storage conditions for their bulk purchased foods bought on price promotions, so that consumers can become better at avoiding wastage of food stock. In collaboration with producers, retailers can facilitate ease of portioning food from bulk purchases through packaging innovations, in order to account for differing household size and resulting needs. Furthermore, retailers can suggest alternative recipes so as to increase meal variety and thus better utilize multiple units of foods from multi-item offers. With the use of mobile applications, retailers can notify customers of special offers at the store, including price-reduced suboptimal foods, and help their customers to better plan their shopping trips. Moreover, retailers can apply different types of price promotions depending on whether the food has a short or long shelf life, and promotions on perishable foods can be accompanied with clear instructions that they are best to be consumed immediately, and which recipe could be convenient for that purpose.

In Denmark, for example, the retail chain REMA1000 has abolished multi-item offers and replaced them with discounts on single items ([Kulikovskaja & Aschemann-Witzel, 2017](#)). In the light of the current findings, it does not appear necessary to abolish multi-item offers altogether. An alternative would be to replace the traditional ‘buy one get one free’ with the ‘buy one get one later’ approach where the second item remains in the store until needed by the consumer. Besides a positive CSR-image outcome for the retailer, such an approach also creates store traffic when the second item is picked up by the consumer. This is an initiative that consumers have shown to favor ([Neff et al., 2015](#)). In sum, our review contributes to the discussion of supermarkets’ responsibility for food waste and the retailer action tackling food waste which is best in line with corporate social responsibility

objectives. Instead of a clear link between price promotions and food waste, it is the characteristics of the consumer that are decisive.

Our study supports a multi-level model of CSR behavior, and a CSR view that takes into account both corporate responsibilities, as well as the consumers' role and responsibility. Given this, the case of price promotions and food waste exemplifies how CSR questions are wicked and evolving problems, issues that point to consumers as important co-actors in the success of CSR (Vitell, 2015). This expansive view of CSR has also been previously advocated by Vitell (2015), on the ground that it aligns corporate (i.e. profits) and consumer interests. Retailers who willingly engage in CSR but who fail to acknowledge the multi-level nature of the interactions and the consumers' role, run the risk of merely performing 'window dressing', and their CSR initiatives becoming eroded by this exclusion, appearing merely as a façade.

Our study raises questions of the ethical nature that retailers need to consider and relate to when developing their CSR initiatives. They need to be aware of the paradoxes and conflicts that emerge from alternative actions they put forward and be ready to compromise the conflicts that are inherent in ethical dilemmas. Our study has examined in depth a phenomenon central to the discourse of marketing ethics and CSR that can facilitate the answers to these dilemmas during the process of developing a CSR strategy. As such, this research provides a deeper understanding of the role of retail price promotions and consumer characteristics in household food waste.

Appendix

Table 2: Examples of the conceptualization of food waste

Publication	Description	Conceptualization of food waste		
		Food disposal in the bin	Stockpiling	Excessive caloric intake
Grandhi & Singh (2016)	'...the food brought home or prepared at home but not consumed'	*		
Garrone et al., (2014)	'... the surplus food that is not recovered to feed people, to feed animals, to produce new products (e.g., jams or juices), new materials (e.g., fertilizers) or energy'	*		
Blair & Sobal (2006)	'...luxus consumption is consumption beyond metabolic need, resulting in caloric dissipation as well as other physiological and social consequences'			*
Smil (2004)	'...per capita gaps between average availability and actual consumption are now greater than 1,000 kcal/day...a significant part of the excessive food supply is actually consumed and this overeating...leads...to higher levels of obesity'			*
Evans (2012b)	'...freezers, Tupperware, and aluminium foil are typically designed to preserve food...they very often operate as coffins of decay that play an active part in carrying discarded food towards the waste stream'		*	
Wait & Phillips (2016)	'...refrigerated foods often became revalued as excess and binned'		*	

Table 3: Keywords applied on ISI Web of Science

((household-level food-waste OR domestic food-waste OR household* food-wast* OR consumer* food-wast* OR household* food-loss* OR consumer* food-loss* OR "avoidable food-waste" OR household* kitchen-waste OR food-waste behavio\$r household* OR food-waste behavio\$r consumer* OR "food-waste prevent*" OR "exces* food consum*" OR "household* food suppl*" OR "household calor*" OR food waste overeate* OR food-abundance wast* OR food-waste behavio\$r consumer* household* OR consumer* household* food-wast* OR food* stockpil* OR food-overconsum*) AND (food promotion* pric* OR "food promotion*" OR supermarket promotion* food* OR "in-store promotion*" OR "food sale*" OR food "pric* discount*" OR "food discount*" OR food "pric* reduction*" OR "pric*-bundl*" OR "buy one get one free" OR "special-offer*" OR "retail promotion*" OR "*market* promotion*" OR food bargain* OR food "price cut*" OR food "price reduction*" OR food pric* deal* OR food* retail* promot* OR "promotion* sale*" food OR food retail promotion* pric* OR food bundle purchase* OR cause* OR determinant* OR driver* OR factor* OR antecedent* OR predictor* OR reason* OR impact*))

Table 4: Keywords applied on Scopus

((household* "food-waste" OR "household food waste" OR "consumer food waste" OR food AND loss* OR "avoidable food waste" OR "household kitchen waste" OR "food waste prevent*" OR "exces* food consum*" OR "household* food suppl*" OR "household calor*" OR "overeat*" OR "food-abundance" OR "food waste behavior" OR "food stockpil*" OR "food overconsum*") AND (food "promotion* pric*" OR "food promotion*" OR "in-store promotion*" OR "food sale*" OR food "pric* discount*" OR "food discount*" OR food "pric* reduction*" OR "pric*bundl*" OR "buy one get one free" OR "special-offer*" OR food "*market* promotion*" OR "food bargain*" OR food "price cut*" OR food "pric* deal*" OR food* "retail* promot*" OR food "promotion* sale*" OR "food bundle purchase*" OR cause* OR determinant* OR driver* OR factor* OR antecedent* OR predictor* OR reason* OR impact*))

Table 5: Description of the inclusion criteria

1. The articles should address food waste generation at the household/consumer level.

Studies that dealt with a) food waste occurring at the post-harvest, distribution, or retail stage of the food value chain; b) any form of food waste or solid waste management, such as composting, and valorization; c) the environmental, societal, nutritional and other consequences of food waste; or d) whose subjects were irrelevant to our aim, such as depressive symptoms related to food addictions, insect consumption, etc. were excluded (N=664).

2. The articles should be based on primary data and investigate consumer-level factors that potentially exacerbate food waste. Studies that a) were literature reviews, and b) did not investigate factors that play a role in the generation of food waste but dealt with domestic waste composition and quantification, were excluded (N = 65).

3. The articles should investigate, among other factors, the role of price, as well as provide adequate measurement of the respective focal variables. Studies that a) did not explicitly relate price promotions, price discounts, or bulk purchases due to a price-based promotional activity, such as ‘buy one get one free’, as a contributing factor for food waste, and b) did not operationalize price promotions or food waste adequately were excluded (N=41).

Table 6: Overview of included studies

Author(s) (year)	Methodology	Sample size	Country(-ies)	Main findings
Aschemann-Witzel et al., (2017)	Online survey and interviews	N = 16 (interviews) N = 848 (online survey)	Denmark	Findings do not support the assumption that the abundance created by price offers might trigger food waste but rather indicate that price-focused consumers might simultaneously be more focused on avoiding food wastage.
Delley, M. & Brunner, T. A. (2017)	Postal survey	N = 681	Switzerland	The study identified clusters of consumer profiles. Among these profiles, those coined short-termists (short-term oriented consumers, 20.9%), are the most likely to go shopping at discounters but also at convenience stores, where they probably carry out their frequent top-up shopping trips. The short-termists' rather low planning capabilities translate to an oversupply of food, which then has to be discarded.
Ponis et al., (2017)	Online survey	N = 500	Greece	Consumers displaying relatively frivolous shopping behavior (frequent off-list and promo-intensive purchasing, such as 'buy one get one for free') tend to throw away more food.

Mondejar-Jimenez et al., (2016)	Online survey	N = 380	Italy, Spain	Marketing and sales strategies were found to have a direct, and significantly negative, effect on the food waste behavior of individuals.
Porpino et al., (2016)	Interviews, photos, observations	N = 20	USA	Excessive buying—a driver of food waste identified in 60% of the families investigated—indicates that point-of-sale promotions are driving consumers to buy more than they need. Stockpiling comfort foods in abundance can promote more wasted food.
Qi, D. & Roe, B. E. (2016)	Telephone interviews	N = 500	USA	Respondents are approximately equally split between agreeing and disagreeing with statements that food waste is exacerbated by bulk and sale purchases.
Sassi et al., (2016)	Online survey	N = 281	Tunisia	Almost half (46%) of the respondents indicated that they are drawn to special promotions, (e.g., ‘buy one get one free’, ‘three for the price of two’, etc.), and at the same time, 39% of them stated that they do not throw away any edible food.

Schmidt, K. (2016)	Online survey	N = 217	Germany	Avoiding impulsive purchases/buying more food than currently necessary due to special offers is a factor that contributes to food waste.
Schmidt, K. (2016)	Online survey	N = 535 (at three time points)	Germany	A factor that comprises behaviors related to spontaneously purchasing food items due to promotional activities, i.e. special offers and discounts among others, was identified as an antecedent of food waste.
Yildirim et al., (2016)	Online survey	N = 150	Turkey	Special offers, such as buy 2 get one free, buy 2 and get 30% off, etc., may play a key role in increasing food wastage, but not conclusively.
Jörissen et al., (2015)	Online survey	N = 453 (Karlsruhe) N = 404 (Ispra)	Germany, Italy	The amount of food waste is slightly lower in households that tend to buy discounted groceries than in households that are not interested in special offers.
Parizeau et al., (2015)	Door-to-door surveys and waste separation	N = 68 (surveys) N = 222 households (waste sorting)	Canada	Wasting sale food was not a common occurrence (only 2% of respondents said that they often waste sale food).

Neff et al., (2015)	Online survey	N = 1010	USA	A small percentage of respondents reported buying food on sale, but overall food waste is rather high.
Porpino et al., (2015)	Observation, interviews, photos and focus group	N = 14	Brazil	Strategies used to save money – such as buying groceries in bulk (to pay a relatively reduced price) – actually end up generating more food waste.
Setti et al., (2015)	Panel data	N = 1403	Italy	89% of respondents buy foodstuffs mainly when special offers are available, and food purchasing when special offers are available contributes to food waste.
Farr-Wharton et al., (2014)	Interviews and ethnographic observations	N = 29	Australia	Bulk-purchasing attitudes were prevalent and motivated by perceived monetary benefits. ‘Buy bulk and save’ purchases were also reported to be one of the prime contributors to expired-food waste.
Graham-Rowe et al., (2014)	Semi-structured interviews	N = 15 (across 13 households)	UK	In-store marketing techniques in the form of financial incentives that represented ‘value-for-money’ were cited as a source of food waste.

Katajajuuri et al., (2014)	Kitchen diary and questionnaire	N = 380 (Kitchen diary) N = 1054 (questionnaire)	Finland	The study did not find a correlation between food waste levels and discounted prices. Those households who bought 'buy one get one free' and discounted food products more often did not waste less or more compared to other households.
Silvennoinen et al., (2014)	Waste-weighing and questionnaire	N = 380	Finland	Appreciation of low food prices 'buy one get one free' (BOGOF) and discounted food products bought often, are factors that have a significant effect on the amount of food waste.
Ganglbauer, E. & Fitzpatrick, G. (2013)	Semi-structured interviews and ethnographic observations	N = 14	Austria, UK	"Economy of scale" shopping, the purchase of big quantities that are less expensive than small ones, results in buying too much and then in increased quantities of food being thrown away.
Fonseca, R.S. (2013)	Online survey and interviews	N = 542 (survey) N = 18 (interviews)	Portugal	Approximately 35 percent of respondents can be characterized as food waste citizens, who have habits of responding to food promotions and making impulse purchases.

Evans, D. (2012)	Ethnographic observations	N = 19	UK	It is not satisfactory to position food waste as a matter of profligate consumers being lured in by 'buy one get one free' offers.
Koivupuro et al., (2012)	Kitchen diary and questionnaire	N = 380	Finland	The amount of food waste was somewhat greater in those households where BOGOF 'buy one get one free' and discounted food products were not often bought.
Williams et al., (2012)	Kitchen diary and questionnaire	N = 61	Sweden	On average, the households that noted price to be more important wasted less than the households that noted price to be less important.

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Chapter 4

Research paper 3

The relationship between retail price promotions and household-level food waste: Busting the myth with actual food waste and deal share data?

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Abstract

In the debate on food waste, pricing mechanisms used in marketing are criticized for triggering consumers to over-purchase and consequently waste food. Despite the ambiguity of the scientific results on the matter, the criticism persists, prompting some retailers to abolish multi-item price promotions such as ‘buy one get one free’. However, evidence that such actions are justified is lacking. In this paper we aim to empirically explore the relation between retail price promotions and household-level food waste. We collected actual food waste data from trash bins, deal behavior data through shopping receipts, as well as price involvement and attitudinal data with a questionnaire from 118 households. Our results provide evidence that question the commonly held assumption that price promotions by definition cause food waste and show that households with the largest actual deal share waste less food, as do those who are environmentally conscious. Larger households and those who lack skills in food practices waste more food. We identify consumer clusters, and argue that retailers should apply a combined approach rather than abandon price promotions entirely.

Keywords

Food waste; Retailing; Price promotions; Actual deal behavior; Actual food waste data

Introduction

Pricing is a fundamental element of marketing and a pivotal tool for a retailer's management of product stock and consumer demand. However, in the debate on food waste, pricing mechanisms in food marketing, such as 2-for-1 offers, multi-item offers, and a price gradient more favorable to large unit sizes, receive wide criticism on the grounds that they can prompt consumers to over-purchase and eventually waste food (Hegnsholt et al., 2018; Stuart, 2009). Evidence suggests that the largest share of food waste in the food value chain, particularly in affluent societies, occurs at the household level (Griffin et al., 2008; Hebrok & Boks, 2017). Thus, if the criticism holds true, pricing might indeed trigger a sizable share of food waste. This raises questions on the dark side of the role of marketing as a tool that promotes corporate financial interests and disregards the negative societal externalities that harm consumers and the environment.

In the wake of this criticism, and increasing pressure from NGOs, many retailers in Denmark have integrated these social concerns in their business operations, and among other initiatives, have abolished 'buy one get one free' (BOGOF) price promotions (Aschemann-Witzel et al., 2016). Denmark is a global leader in the battle against food waste because it is reputed to have successfully reduced its own food waste (Gadd, 2018; Marsh, 2015). Therefore, the country's initiatives towards that end are promoted as a benchmark for other countries to follow (Miljø og Fødevarerministeriet, 2019). However, when it comes to the relation between price promotions and food waste, the scientific evidence base for this causal relation is surprisingly weak.

Research on food waste has thus far utilized a wide spectrum of methodologies with the aim to understand the relationship between retail price promotions and food waste, e.g., online surveys (e.g., Aschemann-Witzel et al., 2017; Ponis et al., 2017), interviews (e.g., Farr-Wharton et al., 2014; Graham-Rowe et al., 2014), ethnographic observations (e.g., Porpino et al., 2015), and kitchen diaries

(e.g., Koivupuro et al., 2012; Williams et al., 2012). This methodological diverseness has provided varying conclusions regarding the relationship between retail price promotions and food waste: A number of studies conclude that price promotions increase food waste (e.g., Farr-Wharton et al., 2014; Mondéjar-Jiménez et al., 2016; Setti et al., 2016), while some conclude the opposite (e.g., Parizeau et al., 2015; Silvennoinen et al., 2014), while others are inconclusive (e.g., Giordano et al., 2019; Qi & Roe, 2016). Despite these ambiguous scientific results, the criticism that pricing, particularly BOGOF offers, trigger food waste is often treated as a fact by campaigners or in stakeholder reports – as early as in the influential book by campaigner Tristram Stuart (2009), and as recent as in a report by the Boston Consulting Group nearly a decade later (Hegnsholt et al., 2018).

However, there is a noteworthy limitation in most food waste research. A commonality of the studies in this research domain is the use of self-reported measures in operationalizing food waste, as well as price related marketplace behaviors. The self-reported measures utilized thus far impede the reliability of the findings by underestimating the level of food waste. Several studies have shown that self-reported measures are poor indicators of actual food waste, and that consumers under- or misestimate food waste (Elimelech et al., 2019; Giordano et al., 2018; van Herpen et al., 2019). This caveat necessitates the use of objective measures of food waste as well as objective measures of its potential causes, such as the use of price promotions (Koivupuro et al., 2012).

Therefore, further evidence is needed in order to ascertain whether price promotions are indeed blameworthy of food waste and whether abolishing them will indeed reduce it. Consequently, the question that lies in the epicenter of the debate about food waste and the role of marketing is: Do retail price promotions lead to an increased amount of household food waste? The importance of providing evidence on the matter is further necessitated because the very same pricing mechanisms that are criticized for increasing food waste are suggested as vehicles for the promotion of the sale of blemished food products (see de Hooge et al., 2017) which are wasted before they reach retail or

when they become ‘imperfect’ in the store (Aschemann-Witzel et al., 2015). The issue which is consequently raised is whether price promotions can be given part of the blame as the villain that exacerbates food waste but then becoming the hero that combats it as well.

In addition, it should be noted that the relation between price promotions and food waste is not as simple as it is often portrayed. After all, consumer attitudes and behaviors can differ markedly from one individual to the next. There is evidence, regardless of the methodologies and measurements utilized, that consumer characteristics moderate the relationship between marketing input, i.e. price promotions, and behavioral outcomes, i.e. household food waste (Aschemann-Witzel, Jensen, et al., 2017; Delley & Brunner, 2017; Fonseca, 2013). Not all consumers who seek out price promotions are consumers who also waste food, either because they face economic constraints and/or because they are conservative and cautious with what they have bought.

Against this background, our research aims to provide empirical evidence that sheds light on the relationship between retail price promotions and consumer-level food waste. We investigate whether the widely held assumption that pricing mechanisms in food marketing lead to increased amounts of food waste in households holds true, like the criticism implies or whether this is a myth. We do so by implementing an objective approach in the measurement of food waste as well as the measurement of price related marketplace behaviors by using a) actual household food waste sorting and b) actual household shopping receipts. The research question that the waste sorting study aims to answer is the following: *‘Is the use of retail price promotions related to more or less food waste and which consumer characteristics play a differential role in the generation of food waste?’*.

Background

As mentioned earlier, current research in the area of food waste has utilized self-reported measures for the operationalization of the antecedents of food waste, as well as for the measurement of food

waste itself. However, the general consensus is that these measures are discrepant from reality. In this study, we aim to illustrate this discrepancy and therefore we employ actual behavioral measures of the focal variables of deal behavior and food waste in addition to the self-reported measures. These are incorporated in the overall conceptualization of the relationships to be investigated, as shown in Figure 1. We aim to further investigate the discrepancy between how consumers perceive their own deal and food-waste behaviors, in comparison to what actual data reveal about these behaviors and therefore we investigate bivariate relationships between the attitudinal, self-reported and actual measures.

As mentioned earlier, a cohort of consumers who specifically seek out price promotions might not necessarily be the same consumers who waste food. A plausible explanation for this behavior could be that they exhibit a higher degree of cautiousness with what they have bought, a personality trait that has been found to be negatively related to wastefulness (Gatersleben et al., 2017). This type of frugal behavior manifests itself when seeking deals while shopping (Lastovicka et al., 1999) in an effort to save one's own resources (Goldsmith et al., 2014), which is in accordance with Silvennoinen et al. (2014) who argue that consumer thriftiness and moderation in spending can bear fruit in reducing food waste.

However, this deal seeking behavior is not monolithic, but rather nuanced and dependent on the psyche of consumers who exhibit heterogeneity in their reactions to price and price promotions (Dickson & Sawyer, 1990; Jensen & Grunert, 2014; Lichtenstein et al., 1993). More specifically, consumers who exhibit price consciousness, focus exclusively on paying low prices (Lichtenstein et al., 1993), consumers who exhibit value consciousness, have an increased concern over the price paid relative to value received in a purchase transaction (Lichtenstein et al., 1993), and consumers who exhibit deal proneness, strive to achieve good deals when shopping (Jensen, 2006), not necessarily only on low-priced goods, which gives them a sense of being smart and competent shoppers

(Völckner, 2008). Moreover, consumers' reaction to price and price promotions depend on the economic limitations consumers have (Urbany et al., 1996). These psychographic nuances in consumers' price interpretation provide us with a more detailed picture of the role of price promotions in household food waste as a function of the way in which consumers interpret and assign meaning to price promotions and expand previous literature which has identified that consumer characteristics influence food waste (e.g., Stancu et al., 2016; Visschers et al., 2016).

Moreover, previous research in the area of food waste has indicated that household food-related practices and skills in food provisioning can promote or prevent food waste (Aschemann-Witzel et al., 2015; Farr-Wharton et al., 2014; Stancu & Lähteenmäki, 2018). These practices for instance revolve around households' ability to reuse leftovers (Stancu et al., 2016), keep an overview of the food products stocked, so as to consume them before they expire (Aschemann-Witzel et al., 2018), or get to consume or properly stock those foods that have been purchased under price promotion, such as 3 for the price of 2, discounted items etc. (Aschemann-Witzel et al., 2018).

Higher order factors, such as consumers' value orientation constitute “...*the most abstract form of motivators of human behavior exerting influence across situations and life spheres*” (Mørk et al., 2017). According to Schwartz's value domain theory, collectivist values such as universalism are positively related to pro-environmental behaviors, whereas the opposite is the case with individualistic values, such as achievement (Stern, 1999).

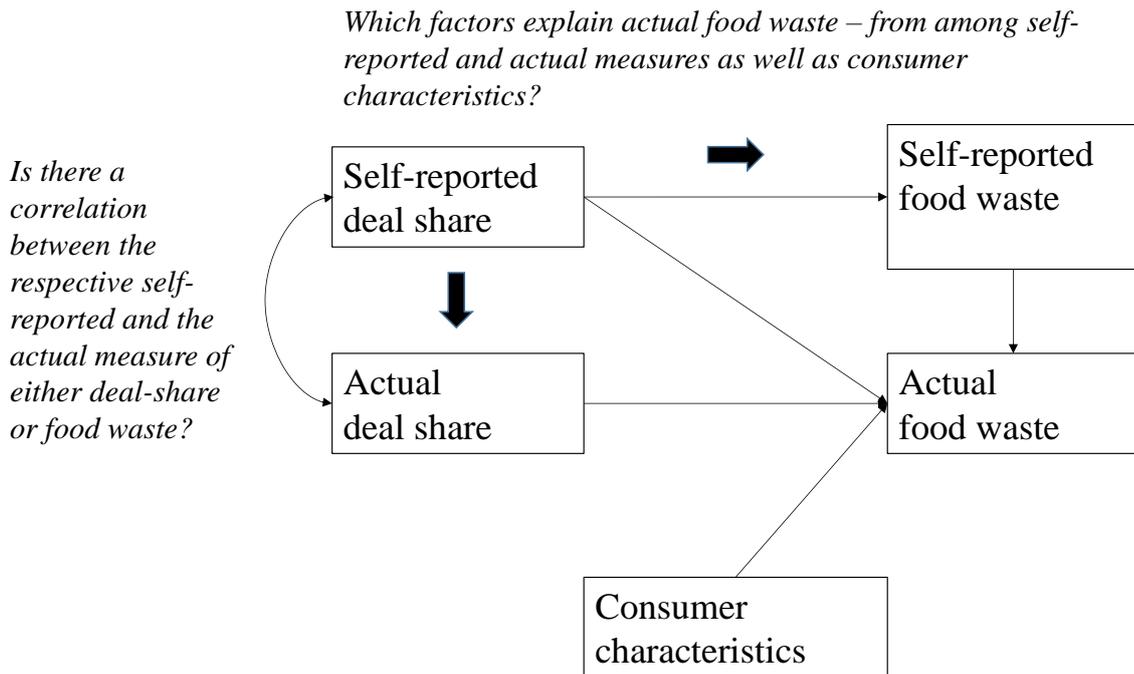


Figure 1: Conceptual framework of the relationships between actual and self-reported measures

Method

In order to acquire actual behavioral measures of food waste and deal behavior, and to combine these with attitudinal measures, we utilized a multimethod approach, comprising three elements: food waste sorting, collection of shopping receipts, and a questionnaire. The data collection procedure for each of these elements, as well as the measures pertaining to each is described in detail in the following sections.

Data collection procedure

The waste sorting study took place from the 19th of November until the 9th of December 2017 and was done in collaboration with a specialized sub-contractor that operates in the waste management business. The sub-contractor provided us with contact information of households that had already accepted to participate in a general-waste sorting project, unrelated to ours, run by the Danish

Ministry of Environment and Food of Denmark. Initially, we contacted those households asking for their permission to access these waste data, without explicitly stating our objective in order to avoid focusing their attention on food waste during the waste collection period.

Additionally, the participant households were asked to provide us with their supermarket shopping receipts from the period of the waste sorting project. Shopping receipts were either sent to us physically by letter in a pre-postmarked envelope or as MMS (i.e. photos of the receipts). Participants received reminders for this particular task during the three-week period.

At the end of the waste sorting period, we contacted each household again by email and letter asking them to fill out a questionnaire either online or on paper if participants had not provided us with an e-mail address. We contacted participants three times by email and letter to remind them to fill out the questionnaire.

Participant households that completed the questionnaire, and sent us their receipts received a gift card of DKK 200 (approx. EUR 26) for each of these tasks. If both tasks were completed, the household was eligible to participate in a lottery in which 10 of them won an additional gift card of DKK 2500 (approx. EUR 330). The participating households were informed of this incentive scheme before the study started.

Attitudinal and demographic measures

Participants were asked to complete a questionnaire that included: 1) price involvement measures (deal proneness, value consciousness, price consciousness), 2) perceived budget constraints, 3) perceived deal share, 4) measures of thriftiness orientation, 5) perceived food waste, 6) self-reported food waste measured by food waste incidents (SRFWIN), 7) food-related practices (i.e. shopping, storing, and cooking practices), 8) environmental concern, 9) grocery shopping frequency, 10)

shopping frequency for suboptimal food products (SOF), 11) value orientation (universalism and achievement), and 12) demographics (household size, gender, age, education level, and income).

Deal proneness, value consciousness, price consciousness, and perceived budget constraints were measured on a 7-point scale with the use of multiple items adapted from [Jensen and Grunert \(2014\)](#), [Lichtenstein et al. \(1993\)](#), and [Urbany et al. \(1996\)](#). Perceived deal share was measured with a single item, where respondents indicated the share of purchases they think they buy on offer (1 = '0 – 10%', to 10 = '91-100%') for six food categories: meats, dairy, bakery, fruit and vegetables, long-life foods and miscellaneous. Thriftiness orientation was measured on a 7-point scale with the use of three items adapted from [Lastovicka et al. \(1999\)](#) and [Goldsmith and Flynn \(2015\)](#) as well as a new item conceived to reflect the domain of food. Self-reported food waste measured by food waste incidents was measured on a 7-point scale (1 = 'very unlikely', to 7 = 'very likely') with the use of five items from [Aschemann-Witzel et al. \(2018\)](#). Food-related practices were measured on a 7-point scale (1 = 'very unlikely', to 7 = 'very likely') with the use of seven items from [Stancu and Lähteenmäki \(2018\)](#). Environmental concern was measured on a 7-point scale (1 = 'totally disagree', to 7 = 'totally agree') with the use of four items by [Haws et al. \(2014\)](#). Shopping frequency was measured with a single item where respondents indicated how often they shop for groceries, on a 5-point scale (1 = 'less than once a week', to 7 = 'every day'), and shopping frequency for SOF was measured with three items on a 7-point scale (1 = 'never', to 7 = 'always'). Finally, universalism and achievement were measured with five items in total (1 = 'does not look like me at all', to 7 = 'looks exactly like me') from [Schwartz et al. \(2001\)](#). All attitudinal and demographic measures can be seen in detail in Table 1 and Table 2.

Actual and perceived food waste measures

Actual food waste was measured in two different ways: a) the ‘standard measure’ used in the food waste literature, which is kg of food waste per household (i.e. everything edible including leftovers from meals, etc.), and b) a ‘new measure’ that only includes kg of food waste from unopened and not-emptied food packages per household. The idea behind the latter measure is that it might be more relevant to the focal relationship of over-purchasing as a consequence of price promotions that result in opened/unopened food packages being thrown out. We measured the households’ self-reported food waste with the use of a single item where respondents indicated the share of edible food they think they throw away (1 = ‘0 – 5%’ to 11 = ‘Over 50%’) for the same six food categories as previously mentioned: meats, dairy, bakery, fruits and vegetables, long-life foods and miscellaneous (Table 1).

Deal behavior measures

We measured the actual deal behavior (i.e. actual deal share) of a household by calculating the share bought on deal based on the grocery shopping receipts received. Moreover, based on the receipts, we calculated the discount share of wallet, i.e. the share of shopping done in discount stores. A discount store is defined as a store that sells groceries at price levels lower than the average retail prices of the retail grocery market in Denmark. This classification was based on our own interpretation and knowledge of the retail landscape of Denmark.

Perceived deal behavior was measured on a 10-point scale with the following question (0-100% with 10% intervals): ‘‘If you consider a typical month, how much would you say you buy on offer in (category)’’ for each of the six generic product categories described above (Table 1).

Table 1: Variable means, standard deviations and Cronbach's alpha values

Construct	Mean	SD	Cronbach's α
Deal proneness	5.23	1.26	.722
I would rather wait with buying groceries, until they are on sale	4.36	1.99	
At the supermarket, I look for which items are on sale	5.77	1.44	
I am prone to buying groceries on sale	5.23	1.66	
Jeg køber gerne ind til lager, når der er gode tilbud på dagligvarer	5.56	1.67	
Value consciousness	4.52	1.43	.641
I am very concerned about low prices, but I am equally concerned about product quality	3.81	2.00	
When grocery shopping, I compare the prices of different grocery products to be sure I get the best value for the money	4.71	1.80	
I always check prices at the grocery store to be sure I get the best value for the money I spend	5.03	1.81	
Price consciousness	4.20	1.65	.812
The money saved by finding low prices is usually not worth the time and effort. <small>Reversed item</small>	4.17	1.99	
I am not willing to go through extra effort to find lower prices. <small>Reversed item</small>	3.99	1.97	
I will shop for groceries at more than one store to take advantage of low prices	4.33	2.11	
I compare prices among supermarkets in order to make the best buy	4.30	2.16	
Perceived Budget Constraints	2.21	1.54	.879
I frequently have problems making ends meet	2.16	1.69	
My budgeting is always tight	2.63	1.94	
I often have to use more money than I have available	1.84	1.49	
Thriftness	5.10	1.46	.753
I could never think of throwing something out that can still be used	5.53	1.80	
I buy only what I have use for	4.59	1.73	
I always finish my meals	5.18	1.82	
Self-reported food waste measured by food waste incidents (SRFWIN)	2.39	1.12	.764
I/we do not manage to eat the leftovers I/we have stored in the fridge to eat at some later point in time <small>Reversed item</small>	2.65	1.83	
I/we discover unopened food products in the cupboard, fridge, or freezer that I/we decide to discard	1.99	1.41	
I/we do not get to use products that I/we had bought on offer (multi-item packages, price reductions, etc.) <small>Reversed item</small>	2.33	1.63	
I/we have to throw out the last part of a food product because the expiry date has passed	2.52	1.55	
Food related practices	5.51	1.17	.803
We often store food leftovers in the refrigerator or in the freezer	5.98	1.50	
We use food leftovers in new meals	4.87	1.91	
We have control over how long we keep things in the refrigerator	5.09	1.65	
We evaluate whether a food is still edible by smelling it, tasting it and/or looking at it	5.93	1.61	
We prioritize the use of leftovers, and foods that are close to expiring when we cook	5.33	1.80	
We check the shelf life of the foods we buy at the supermarket	5.96	1.70	
When we find a good bulk discount at the supermarket, I consider whether there is room in the freezer for the part we will not eat right away	5.47	1.90	
Shopping frequency	2.87	.71	n.a.
How often do you typically do grocery shopping in your household?			
Discount share of wallet			
Percentage of shopping in discount stores	.17	.15	n.a.
Shopping frequency for SOF	3.11	1.14	.620
How often do you buy fruits and vegetables in unusual shapes and/or sizes when you do grocery shopping?	3.27	1.49	
How often do you buy products with a cosmetic flaw (e.g. a dented package) when you do grocery shopping?	2.70	1.37	
How often do you buy products that are close to their expiry date when you do grocery shopping?	3.38	1.67	
Perceived deal share	4.27	1.99	.843
In a typical month how high do you estimate the share of purchases made with a discount to be within...			
...meat and meat products?	5.19	2.57	
...dairy products?	4.31	2.86	
...bakery products?	3.98	2.61	
...fruits and vegetables?	3.98	2.49	
...long duration foods?	5.25	2.69	
...other food categories?	2.88	2.73	
Perceived food waste	1.73	.93	.817
In a typical month how high do you estimate the share of food that is thrown away to be within...			
...meat and meat products	1.64	.92	
...dairy products?	1.55	1.2	
...bakery products?	2.25	1.63	
...fruits and vegetables?	2.35	1.8	
...long duration foods?	1.34	1.07	
...other food categories?	1.26	.76	
Achievement	2.32	1.15	.742
Being very successful is important to him. He likes to stand out and to impress other people.	2.18	1.29	
It is very important to him to show his abilities. He wants people to admire what he does.	2.46	1.3	

Universalism	4.68	.84	.573
He/she strongly believes that people should care for nature. Looking after the environment is important to him/her.	4.78	1.14	
He/she thinks it is important that every person in the world should be treated equally. He/she wants justice for everybody, even for people he/she doesn't know	4.86	1.11	
It is important to him/her to listen to people who are different from him/her. Even when he/she disagrees with them, he/she still wants to understand them.	4.41	1.17	
Environmental concern	4.62	1.52	.904
It is important to me that the products I use do not damage the environment	4.98	1.6	
My shopping habits are affected by my concern for the environment		1.78	
I would describe myself as environmentally responsible	4.87	1.66	
It is alright that acting in an environmentally responsible manner causes inconvenient	4.37	1.87	
Household size	2.57	1.18	n.a.
Age	57.3	12.6	n.a.

Table 2: Demographic characteristics

Demographic characteristics	N	%
Gender		
Male	36	35.3
Female	66	64.7
Age		
29-50	32	32.3
51-65	33	34.4
66-82	31	32.3
Education		
Primary school	14	13.7
Secondary school	4	3.9
Vocational education	25	24.5
Higher education (up to 2 years)	14	13.7
Higher education (from 2-4 years)	36	35.3
Higher education (over 4 years)	9	8.8
Income level		
0-199.999 dkk*	3	2.9
200.000 - 399.999 dkk	27	26.5
400.000 - 599.999 dkk	30	29.4
600.000 - 799.999 dkk	18	17.6
800.000 - 999.999 dkk	12	11.8
Over 1.000.000 dkk	4	3.9
Do not want to indicate	8	7.8
Household size		
1 member	9	8.3
2 members	66	60.6
3 members	10	9.2
4 members	14	12.8
5 members	7	6.4
6 members	3	2.8

*100.000 dkk is approximately 15.200 USD or 14.000 Euros

Preliminary handling of data

Food waste data were collected from a sample of 118 households in Central Denmark over a three-week period at the end of November and beginning of December 2017. After collection, the food waste was transported to a central waste sorting facility in Copenhagen where it was documented, weighed and divided into six generic fractions (meat, dairy, fruit and vegetables, bread, dry foods,

other/misc.) to facilitate comparison with other food waste studies. We scanned all paper receipts, assigned identifier codes and entered them in their exact form into an Excel sheet. Each product purchased was accompanied by a description, along with the price and the discount received. These data were used to calculate the share bought on deal as a proportion of the total household grocery expenditure in that period. This result was utilized as the measure of actual deal share in our analyses. As mentioned earlier, some of the participants filled out the questionnaire in paper form. These data had to be entered into the master questionnaire data file. For that purpose, a student assistant transferred the data by ‘taking the survey’ and copying the answers of each of the paper questionnaires. As a quality control, two other student assistants cross checked whether the answers had been entered correctly.

Lastly, we received the food waste data in a separate Excel sheet from the subcontractor. We merged all files based on the identifier codes and imported the data in IBM, SPSS 25 for subsequent analyses. These analyses aimed first to investigate the bivariate associations between actual and self-reported measures of food waste and deal behavior, with the attitudinal measures included in the questionnaire, and subsequently to apply a descriptive modeling approach by means of fitting a regression model in order to capture the association between the independent and dependent measures included (Shmueli, 2010).

Results

Bivariate relationships

We analysed the relationship between self-reported and actual food waste behaviour, and bivariate correlations show a significant positive association between self-reported food waste and both measures of actual food waste (total edible food waste: $r = .256, p < .01$; food waste found in packages: $r = .398, p < .001$). All of the bivariate correlation coefficients between the measures of

actual/self-reported food waste and the attitudinal variables described above can be seen in Table. Subsequently, we examined the bivariate relationships between actual, and perceived deal behavior and interestingly, we find no significant relationship ($p = .198$). The bivariate correlations between price involvement measures, perceived budget constraints, thriftiness and the actual/self-reported deal behavior measures can be seen in Tables 3 and 4.

Table 3: Correlations between measures

	Actual food waste	Perceived food waste
Actual food waste	1	.256*
Edible food waste in packages	.814**	.398**
Deal proneness	-.297**	-.145 n.s.
Value consciousness	-.196*	-.067 n.s.
Price consciousness	-.175 n.s.	-.123 n.s.
Perceived budget constraints	.360**	.323**
Thriftiness orientation	-.166 n.s.	-.321**
Actual deal share	-.189 n.s.	.097 n.s.
Perceived food waste	.256**	1
SRFWIN	.437**	.590**
Food related practices	-.277**	-.279
Shopping frequency	.249*	.204*
Preference for SOF	-.203*	.031 n.s.
Perceived deal share	-.201*	.104 n.s.
Discount share of wallet	-.158 n.s.	-.022 n.s.
Achievement	-.006 n.s.	.197*
Universalism	-.246*	-.072 n.s.
Environmental concern	-.296**	-.138 n.s.
Household size	.550**	.327**

* $p < .05$. ** $p < .01$

Table 4: Correlations between measures of price involvement and deal behavior

	Actual deal share	Perceived deal behavior
Perceived deal behavior	.149 n.s.	1
Deal proneness	.160 n.s.	.496 **
Value consciousness	.094 n.s.	.467 **
Price consciousness	.255 *	.402 **
Perceived budget constraints	.018 n.s.	.079 n.s.
Thriftiness	-.195 n.s.	.049 n.s.

* $p < .05$. ** $p < .01$

Hierarchical regression

A hierarchical multiple regression was run to capture the association between actual food waste and the attitudinal, demographic, actual and perceived food waste, as well as the deal behavior variables described previously. In our analyses, we used the actual food waste variable, which we

named ‘the total amount of edible food waste’ in each household as the dependent variable³, rather than food waste per capita, following [Elimelech et al. \(2018\)](#)⁴. The variables were added in the regression in blocks, as seen in Table 5. The rationale behind this sequential approach is to determine if the addition of independent variables improves the prediction of the dependent variable, while at the same time allowing us to control for the effects of each additional block of variables.

The full model of these variables to predict food waste (Model 5) was statistically significant, $R^2=.55$, $F(17, 56) = 4.078$, $p < .0005$; Adjusted $R^2=.42$. Accordingly, actual deal share has a significant negative effect on actual food waste ($\beta = -.239$, $p < .05$), and so does environmental concern ($\beta = -.260$, $p < .05$), whereas self-reported food waste measured by food waste incidents ($\beta = .421$, $p < .05$) and household size ($\beta = .403$, $p < .001$) are positively related to actual food waste.

³ We intended to employ the ‘new measure’ of food waste, but unfortunately there were not enough stickers to allow us to proceed with such an analysis.

⁴ The same analysis were conducted with actual food waste per capita as the dependent variable. Results were identical.

Table 5: Hierarchical regression results

Variable	Actual food waste		Model 2		Model 3		Model 4		Model 5	
	Model 1		B	β	B	β	B	β	B	β
Constant	5499.033***		4714.695***		2909.374		3046.630		1200.024	
Deal proneness	-1088.941	-.269	-717.389	-.177	-718.731	-.178	-429.887	-.106	-85.569	-.021
Value consciousness	135.417	.034	209.836	.053	386.020	.098	454.374	.116	453.240	.115
Price consciousness	302.242	.081	309.850	.083	375.963	.100	153.245	.041	-27.858	-.007
Perceived budget constraints	1334.320	.338*	855.227	.216	842.287	.213	567.996	.144	294.648	.075
Thriftiness	-446.600	-.120	530.751	.143	588.188	.158	947.949	.255	827.625	.222
Actual deal share	-11394.970	-.203	-10166.301	-.181	-12064.083	-.215	-12660.634	-.226*	-13408.985	-.239*
Perception of own waste			528.863	.111	362.808	.076	359.790	.075	85.128	.018
SRFWIN			1657.870	.387*	1658.893	.388*	1859.119	.434*	1800.720	.421*
Food related practices			28.826	.008	53.646	.015	168.425	.046	296.824	.081
Shopping frequency					1043.169	.193	1253.402	.232*	736.300	.136
Preference for SOF					-139.639	-.042	-65.631	-.020	-225.069	-.067
Perceived deal share					31.459	.016	-101.197	-.052	-82.382	-.043
Discount share of wallet					-2501.208	-.099	-875.792	-.035	-1225.986	-.049
Achievement							129.032	.036	68.242	.019
Universalism							-177.343	-.036	-35.128	-.007
NEP							-1204.008	-.310*	-1009.031	-.260*
Household size									1500.593	.403**
R^2	.192		.308		.353		.433		.553	
Adj. R^2	.12		.211		.213		.274		.417	
F	2.661**		3.164**		2.517**		2.718**		4.078***	
ΔR^2	.192		.115		.045		.080		.120	
ΔF	2.661**		3.560**		1.043 n.s.		2.676 n.s.		15.083***	

* $p < .05$. ** $p < .001$

Effect of demographic variables

We created dummy variables for the demographic measures included in our analyses (see Table 2). We conducted separate analyses to ascertain if the amount of actual food waste was different for groups at varying levels of education, income, as well as different age and gender groups. With regard to education, participants were classified into six groups based on the Danish educational system. Actual food waste was not significantly different across education groups. With regard to income, participants were classified into three groups. The highest income group turned out to produce significantly more food waste in comparison to the lowest income group. With regard to age, participants were classified in three age groups. We found a significant difference across all three groups in the amounts of actual food waste, with the youngest group having on average higher levels of actual food waste than the two other groups and the oldest age group having the lowest amounts of actual food waste. Finally, with regard to gender, actual food waste was not statistically different between male and female respondents. Inclusion of these demographic variables in the regression equation did not alter the results presented in the previous section.

Variance contributions

Even though actual deal share is uncorrelated with actual food waste (see Table 3), the regression results indicate that the variable plays a significant role in the prediction of the dependent variable nonetheless. This particularity points toward the existence of a suppression effect. A suppression effect occurs when “...*a variable that contributes little or no variance in the dependent variable, ‘purifies’ one or more independent variables of their irrelevant variance, thereby allowing it or their predictive power to increase*” (Nathans et al., 2012). Therefore, it is necessary to further investigate the contribution of the independent variables to the variance within the dependent variable. To ascertain the existence of suppression, we employed commonality analysis (Nathans et al., 2012;

Nimon & Reio Jr, 2011) in SPSS, as suggested and described by Nimon (2010) as well as Capraro and Capraro (2001).

Table 6 shows the coefficients of the commonality analysis. There, it is observed that negative commonality coefficients exist, which indicates a suppression effect by one of the variables included. On closer inspection, we see that including actual deal share results in negative commonality coefficients in almost every combination of the particular variable with the remaining predictors included in the regression. Inclusion of actual deal share in the regression increases the unique contributions of household size and environmental concern by .014 and .009, respectively. Moreover, the magnitude of change in R^2 when actual deal share is excluded from the regression (.06) is larger than its relationship with the dependent variable (.03). In total, the suppression effect by actual deal share accounts for 6.2%, (sum of values in Column 2, Table 6), of the regression effect through its role in suppressing variance in household size, environmental concern and self-reported food waste measured by food waste incidents. Moreover, actual deal share contributes uniquely 6.4%, (unique minus percentage of variance suppression), of the regression effect. Lastly the aggregate of the percentage contributions of each predictor is less than 100% (see Table 7), which further supports the evidence for the existence of the suppression effect of actual deal share. The predictor with the largest contribution to the regression effect is household size, which uniquely contributes to 37.12% (unique minus variance when combined with actual deal share) of the regression effect.

Table 6: Commonality matrix

Variables	Coefficient (1)	% Total (2)
Unique to Actual deal share (ADS)	.0628	12.5725
Unique to SRFWIN*	.0807	16.1529
Unique to Household size (HS)	.1995	39.9292
Unique to Environmental concern (EC)	.0408	8.1731
Common to ADS SRFWIN	.0042	.8413
Common to ADS HS	-.0141	-2.8122
Common to SRFWIN HS	.0788	15.7643
Common to ADS NEP	-.0092	-1.8423
Common to SRFWIN NEP	.0025	.5012
Common to HS NEP	.0459	9.1941
Common to ADS SRFWIN HS	-.0018	-3.671
Common to ADS SRFWIN NEP	-.0005	-1.083
Common to ADS HS NEP	-.0042	-8.476
Common to SRFWIN HS NEP	.0152	3.0501
Common to ADS SRFWIN HS NEP	-.001	-2.012
Total	.4997	100

* Self-reported food waste measured by food waste incidents

Table 7: Regression results

Predictor	R	R ²	R ² _{adj.}	β	p	r _s [*]	Unique	Common	Total	% of R ²
	.744	.553	.417							
ADS				-.239	.018	.064	.062	-.026	.036	12.57
SRFWIN				.421	.010	.345	.080	.097	.178	16.15
NEP				-.260	.018	.158	.040	.048	.089	8.17
HS				.403	< .001	.547	.199	.118	.318	39.92

*Structure coefficient: $r_s = \frac{r_{(xy)}^2}{R^2}$

Identification of consumer profiles

We aimed to classify consumers based on the attitudinal, demographic, actual and perceived food waste, and deal behavior measures described in sections 4, 5 and 6, respectively. To that end, we employed a two-stage clustering procedure: Initially a hierarchical, and subsequently a non-hierarchical (*k*-means) clustering method. The rationale behind this approach is that the combination of the two methods allows us to ascertain the stability of the cluster solution, given the inductive nature of this exploratory classification approach, along with the relatively small sample size.

Moreover, the combined approach allows us to utilize the advantages of each method (see [Ketchen & Shook, 1996](#)) and thus optimize the resulting cluster solution.

The means of the scales included were calculated and a hierarchical cluster analysis was conducted employing Ward's method, using the squared Euclidean distance. Solutions between two and four clusters were assessed. The hierarchical clustering method provided the initial cluster centers for the subsequent *k*-means approach. The three-cluster solution converged after one iteration with no changes between the initial and final cluster centers, and was therefore retained. The resulting solution of three clusters can be seen in Table 8: High food wasting households (13.5% of the sample), medium food wasting households (28.4% of the sample), and low food wasting households (58.1% of the sample). In the following sections, the characteristics of each of these profiles are summarized.

High food wasting households (13.5%)

High food-wasting households are above sample average in their price involvement, and they perceive themselves to be more budget constrained than the sample average. They are less thrifty and their deal behavior indicates that they buy less on deals. However, their own perception of this deal behavior is discrepant from their behavior, as indicated by their above average deal share perception. Additionally, high food-wasting households seem to have above average food-wasting incidents, less than average food-avoiding incidents, and shop more often and to a lesser degree at discount retailers. They exhibit above average preference for suboptimal food products, and they are driven by projecting achievement and exhibit a lesser environmental concern. Lastly, these households are on average larger in size.

Low food wasting households (58.1%)

Low food-wasting households are above sample average in their price involvement, and they perceive themselves to be less budget constrained. They are characterized by increased thriftiness,

they have the highest average actual deal share and seem to be correctly aware of their own deal behavior. Additionally, low food wasting households seem to have above average food wasting and food avoiding incidents, and shop less often and to a larger degree at discount retailers. This group exhibits above average preference for suboptimal food products. Moreover, they are driven by universalism values and exhibit a higher environmental concern. Lastly, the household size is the smallest.

Medium food wasting households (28.4%)

Medium food-wasting households are below sample average in their price involvement, and they perceive themselves to have higher budget constraints. They are characterized by increased thriftiness, they have a below average actual deal share as well as awareness of their deal behavior. Additionally, medium food-wasting households seem to have below average food-wasting and above average food-avoiding incidents, and shop more often and to a larger degree from discount retailers. They exhibit below average preference for suboptimal food products. Moreover, they are driven by achievement values and exhibit a higher environmental concern. Lastly, their household size is the largest.

Table 8: Cluster and sample means

Variable	Cluster 1 (N=21, 28.4%)	Cluster 2 (N=43, 58.1%)	Cluster 3 (N=10, 13.5%)	Sample mean (N=74)
Actual food waste*	6168.14 ^A	1341.78 ^B	11452.3 ^C	4851.94
Deal proneness	5.05	5.53	5.25	5.23
Value consciousness	4.24	4.67	4.67	4.52
Price consciousness	3.8	4.41	4.43	4.20
Perceived budget constraints*	2.49	1.71 ^A	3.17 ^B	2.21
Thriftiness	5.21	5.28	4.67	5.10
Actual deal share	0.1	0.12	0.09	0.11
Perceived deal share	4.07	4.29	4.48	4.27
SRFWIN	3.82	3.97	4.15	3.88
Food related practices	5.78	5.65	4.91	5.52
Shopping frequency	3	2.77	3.2	2.87
SOF preference	2.98	3.25	3.3	3.12
Discount share of wallet	0.17	0.18	0.15	0.17
Achievement	2.4	2.21	2.55	2.32
Univeralism	4.62	4.87	4.57	4.69
Environmental concern*	4.74	5.02 ^A	3.7 ^B	4.62
Household size*	2.95 ^{A,C}	2.05 ^B	3.5 ^C	2.57

Notes: Clusters sharing the same letter index A,B, or C, do not differ significantly

Highlighted cells with bold font, indicate values greater than the sample mean.

Non-highlighted cells indicate values lower than the sample mean.

Asterisks indicate statistically significant differences between the clusters.

Discussion

We investigated the relationship between retail price promotions and household level food waste through a multi-method study that combined the collection of actual food waste data with the gathering of actual deal data through shopping receipts as well as questionnaire data among a sample of 118 households in Denmark. The aims were a) to empirically explore the assumption that the use of retail price promotions leads to more food waste in the household; b) to explore which variables explain actual food waste, and c) to identify households that differ in the pattern of actual deal share and actual food waste.

According to our findings, households who buy more on deal produce less food waste. Thus, our findings provide evidence that a straightforward relation between use of price promotions and

household food waste is in fact a myth. Furthermore, we explored the consumer characteristics of relevance when distinguishing between consumers with differing levels of food waste as well as different degrees of price-related marketplace behavior. Our study offers a methodological contribution to food waste research and a conclusion that questions common assumptions in the debate on the causes of household food waste.

Given that previous studies have commented extensively on the discrepancy between self-reported and actual measures of food waste (e.g., [Abeliotis et al., 2014](#); [Delley & Brunner, 2017](#)) as well as the possible ramifications on the results of studies that have used self-reported measures, our findings indicate that consumers' perceptions of the food they waste is positively associated with the actual amount of food waste they produce. Still, the results also show that self-reported food waste behavior is far from being a good predictor of actual food waste behavior as the majority of actual food waste produced was not captured by the self-reported measure ($r = .256$).

Households are generally perceptive of the food waste they produce. Additionally, careless behaviors are positively associated with actual and perceived food waste, and these associations seem to point towards the direction that households are aware of that, and also which food-related behaviors are associated with negative actual and perceived food waste.

Based on the bivariate relationship between actual food waste, perceived food waste and the shopping behavior variables, our results are in accordance with the notion that frequent shopping is related to food waste. The size of the household is positively correlated with both actual and perceived food waste, a result which is in accordance with previous studies ([Koivupuro et al., 2012](#); [Parizeau et al., 2015](#)).

Finally, our results indicate that consumers misperceive their own deal behaviour and appear to report being more deal prone than their own shopping reveals. Thus, they seem to overestimate the importance of getting and searching for grocery deals when asked.

The main result of our study that consumers who buy more on deal produce less food waste is contrary to what a range of studies have concluded (e.g., [Delley & Brunner, 2017](#); [Mondéjar-Jiménez et al., 2016](#); [Ponis et al., 2017](#); [Porpino et al., 2016](#)). However, our findings are in line with a few other studies whose results indicate a relationship between price promotions and food waste similar to ours ([Aschemann-Witzel, Jensen, et al., 2017](#); [Jorissen et al., 2015](#); [Neff et al., 2015](#); [Parizeau et al., 2015](#)). According to our findings, the notion that marketing induces excessive purchases through the application of price discounts appears to be unfounded, which has implications for retailers; these are discussed in the subsequent section.

Based on our results, it appears that consumers are aware that some practices that relate to the provisioning and handling of food indeed lead to increased amounts of actual food waste, e.g., not keeping stock overview of unused food in the household's storage facilities. The significant relationship between that awareness of these practices and actual food waste in our study could possibly indicate that the particular construct (SRFWIN in our analysis) could provide a suitable proxy for the measurement of food waste in studies that aim to utilize self-reported measures. Respondents are better at recollecting food waste incidents, compared to the vagueness of having to quantify in percentage units the amount of food they estimate they waste, which might also explain why the self-reported measure of food waste only captures a relatively small fraction of actual food waste produced.

Our results also show that increased environmental awareness negatively affects food waste. Environmental awareness in combination with price promotions may possibly act synergistically

towards creating a positive change for sustainability and society if; for instance, they are used towards promoting the sale of blemished food products. Bivariate correlations show that preference for suboptimal foods is negatively associated with the amount of food waste produced in households ($r = -.203, p < .05$), which is partly supported by a negative, albeit non-significant coefficient in our regression analysis. Nevertheless, our results support the notion that increased environmental concern can be the driver of pro-environmental behavior; therefore communicating the issue of food waste as being tightly intertwined with the detrimental effects on the environment can prove effective in reducing food waste.

Lastly, household size plays a negative role, which from a retailer perspective raises the challenge of facilitating the varying culinary desires and conflicting idiosyncrasies of large households' members. Suggestions include facilitation of smaller package sizes, communicating alternative recipes through mobile apps or at the store, or replacement of the traditional 'buy one, get one free' with the 'buy one, get one later' approach, where the second item remains in the store -these could all be beneficial routes to take as a retailer. Application of 'buy one, get one later' type of price promotions, which is an initiative that consumers favor (Neff et al., 2015), can assist large households in handling their grocery shopping in a more efficient manner thereby producing less food waste.

Limitations and further research

This study has a few limitations. One limitation is that the questionnaire reflects the attitudes of the person completing it, not necessarily of the household as a whole. However, we assume that the respondent of the questionnaire, who was either responsible for food provisioning or meal preparation, indeed expresses views that portray the general attitudes of the household.

Another limitation of this study relates to attitudinal measures not being embedded in a nomological network of antecedents and consequences. Our study does not offer such a framework

of relationships of the variables included. However, our analyses are driven by the objective we aim to meet, which is to examine the association between the independent and dependent measures included rather than the possible interrelationships between the independent variables. Future research should draw from our study in order to create a framework that accounts for the existence of intermediary relationships between the variables included.

Finally, another limitation pertains to the sample we used in our study. The sample size is limited and non-representative in terms of demographic parameters of the population of Denmark. On the other hand, we do find significant and highly interesting results despite our small sample size. However, the significance of the results in a random town of Denmark can only be a positive indication that our findings are not attributable to a large sample size and that in larger cities where the population is somewhat different in terms of demography these results can be replicated. Still, this is a task for future research, given that the financial requirements of such an undertaking on a nation-wide scale is colossal, and, in fact, this is one of the main reasons why food waste research so rarely applies actual measures of household food waste.

Lastly, it is advisable due to the complexity of the issue of food waste, and the multiplicity of factors that influence its outcome, that future studies employ a qualitative approach in addition to quantitative measures. Utilizing a qualitative approach will capture the finer nuances of consumer food waste behavior, and better understand existing as well as identify additional factors that play a role in the relationship between retail price promotions and household level food waste.

Implications for responsible retail marketing

The findings of this study entail practical implications for retailers' responsible marketing. Contrary to the commonly held assumption, abolishing price promotions might not necessarily combat household food waste. Even though price promotions and retailer discount practices should

not be the scapegoats of food waste, we do not advocate applying them in an irresponsible way; neither do our findings lessen the responsibility of retailers as gatekeepers at the last stage of the food value chain. To the contrary, our study has implications for responsible marketing and how retailers should react to the food waste debate and claims made in this discussion. Most retailers have designed corporate social responsibility strategies and devised a range of tactics to put them into practice. They are ready to react to societal criticism and consumer concerns if there is a potential action in sight that appears as the best answer to these concerns. The case that we look at, abolishing price promotions for the sake of reducing household food waste, however, shows that a repeated discussion of a potential relation between a common marketing tool and a societal ill does not per se mean that the causal relation is in fact true. Such relations are not necessarily as black and white and straightforward as the debate seems to suggest. This is also explained by the fact that resolving issues of ethical nature involves a lot of trade-offs and potential conflict between different goals (Head, 2008; Hunt & Vitell, 1986). In the case that we explored, our findings imply that rather the opposite appears to hold true, namely, that consumers that are more prone to buy on deal when grocery shopping, show a relatively lower level of actual food waste. This observation was made possible by the use of measures for both actual deal share and actual food waste, instead of the self-reported indicators typically used in food waste research. The implication for retailers' responsible marketing in the area of food waste is that it does not necessarily help the cause of reducing household food waste if price promotions such as BOGOF are abolished. It appears to be much more a question of how consumers handle price promotions, and our results suggest that those making more use of price promotions are more likely also those who are capable in handling their food so that they avoid food waste.

If the evidence base is weak and unsubstantiated as for whether a certain marketing action/tool really serves the intended outcome of societal improvement, retailers who want to use such marketing tools responsibly, should be cautioned not to change them readily just because they receive broad

criticism. In the case studied, instead of abolishing price promotions, such as BOGOF in particular, retailers should apply price promotions in ways supportive of avoiding food waste, or accompany their marketing with actions that support consumers' food waste avoidance in their household. An already applied example is the 'buy one, get one later' variant of the BOGOF promotion, where the second item can be picked up at later point (Neff et al., 2015). In addition, accompanying communication making aware of the issue of food waste to make environmental concerns more salient, and practical tips on how to cook, store, and deal with the food bought on price promotion can help consumers in avoiding food waste. Instructions on portioning and freezing, variations in how the same food can be used in various meals, or the best storage conditions can be practical recommendations that responsible retailers can provide their customers with. As the results show, the motivator of environmental concern is particularly strong and should be appealed to in such communication, and a special attention by responsible marketers should be given to large households.

Not all countries have seen retailers experimenting with acting against food waste such as the case of abolishing BOGOF price promotions. The degree to which countries across Europe have seen such retail chain activities, depends on the development and state of the societal discussion and media coverage in the country (Aschemann-Witzel et al., 2017). Still, the debate on what constitutes 'bad marketing' versus responsible marketing as well as which actions and policies should be enacted against food waste is international. In particular because Denmark is perceived to be an international frontrunner in food waste avoidance actions, a closer exploration of one of these actions in the Danish context is of great relevance for how this action will be assessed and used internationally. The current study shows that contrary to common assumption, abolishing price promotions might not necessarily combat household food waste. To the contrary, we provide evidence that the application of a more nuanced approach in order to tap into the different characteristics of consumers is worth considering.

Lastly, our combined studies on price promotions and food waste indicate that retailers should continue their CSR efforts of building an image of being forefront food waste combatants to aggressively/ defensively to attract/ retain customers ([Schaltegger et al., 2012](#)) and to avoid being blamed.

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Co-author statements

Declaration of co-authorship*

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This declaration concerns the following article/manuscript:

Title:	Promoting food for the trash bin? A review of the literature on retail price promotions and household-level food waste
Authors:	George Tsalis, Birger Boutrup Jensen, S. Wiley Wakeman and Jessica Aschemann-Witzel

The article/manuscript is: Published Accepted Submitted In preparation

If published, state full reference:

If accepted or submitted, state journal: Journal of Business Ethics

Has the article/manuscript previously been used in other PhD or doctoral dissertations?

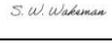
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- B. Major contribution
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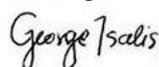
Element	Extent (A-E)
1. Formulation/identification of the scientific problem	B
2. Planning of the experiments/methodology design and development	A
3. Involvement in the experimental work/clinical studies/data collection	A
4. Interpretation of the results	B
5. Writing of the first draft of the manuscript	A
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Has the article/manuscript previously been used in other PhD or doctoral dissertations?

No Yes If yes, give details:

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- A. Has essentially done all the work
- B. Major contribution
- C. Equal contribution
- D. Minor contribution
- E. Not relevant

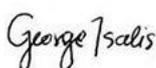
Element	Extent (A-E)
1. Formulation/identification of the scientific problem	B
2. Planning of the experiments/methodology design and development	B
3. Involvement in the experimental work/clinical studies/data collection	B
4. Interpretation of the results	A
5. Writing of the first draft of the manuscript	A
6. Finalization of the manuscript and submission	A

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