Erasmus School of Economics

Using the power of nudging to increase sustainable preference in an online grocery shopping environment

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Abstract

In this thesis we combined two growing movements: the sustainability movement and the online groceries movement. We aimed to find out if sustainable preference of online grocery shoppers can be increased. To do so, we apply nudging, a concept entailing 'pushing' people towards a certain choice without taking away their freedom of choice. This concept has not been studied in online environments much before, opening potential for research. We created two nudges: a social norm nudge and informational nudge, harnessing the elements of respectively social pressure and information availability of the conceptual model. We hypothesized both instruments to have beneficial effects on sustainable preference. In our experiment 359 participants were asked to make product choices in an artificial online grocery shopping environment. These subjects were divided into three groups: Control, Social and Info. Participants in the latter two groups were shown the social or informational nudge respectively in each product category. From the results we saw no evidence for an effect of the social nudge. The informational nudge however increased sustainable preference by 26.92%. Furthermore, the informational nudge also decreased price elasticity at a 10% significance level. We reasoned that informational nudges have indirect effects as well, through a diminished price sensitivity. The effects of the social nudge do not follow previous nudging studies, showing the need for further research. These insights give a new dimension on the effects of nudging instruments and create potential for future research and debate about nudging and sustainability.

Keywords: nudging – sustainability – online – social norm – information - preference

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Introduction

In recent years, climate change has become an increasingly important aspect of individuals' lives. Its effects are experiences by almost all human beings. Effects like extreme weather, sea level rise, ice cap melting, temperature rises etc. affect lives around the globe in multiple ways. As such, societies all around the world have become aware of the vulnerability of the earth and the scarcity of its resources. Thus, the issue of sustainability has increased in importance. Sustainability can be described as: *"The degree to which a process or enterprise is able to be maintained or continued while avoiding the long-term depletion of natural resources"* (Simpson, 1989). In the early days of sustainability policymaking, appeals were mainly made on the so-called 'mega-polluters', being companies like Shell. The main thought behind these policies was that the most-polluting entities must also be held accountable to an equal extent. Over time, however, the realization that there is an individual obligation as well has become common thought. Therefore, the sustainability movement focuses more and more on individual responsibility. An example of this is the veganism trend. Between 2014 and 2017 the number of vegan U.S. consumers increased by 600% (Forgrieve, 2018). Preserving the planet was found to be the primary reason for most people, which demonstrates a growing awareness about the impact of humans on the ecological environment.

Because of this individual-based thinking, the effects of consumer consumption have increasingly become a subject for researchers. It has been shown that human consumption is a large contributor to climate change. Almost every form of consumption has some impact on the climate. Globalization has caused product parts to be manufactured in different countries. As such, a simple product like a t-shirt can already have a large ecological footprint, due to the many travel movements. To countereffect this phenomenon, sustainable consumption is stimulated in multiple countries. Not only in the clothing industry, but also in other industries (food, transportation etc.) sustainable consumption has become an area of interest for many 'green' policies (WBCSD, 2008). Sustainable consumption is defined as: *"Purchasing goods that do not harm the ecological environment in the long-term*" (Maniatis, 2016).

Regarding sustainable consumption, a difference is observed in consumer attitudes and their displayed behaviors. The Greenindex (2012) investigated 'green' attitudes of consumers in 17 countries. It was found that while 56% of the respondents claimed to be 'green', only 34% actually bought sustainable products. In the long term, sustainable consumption has collective benefits. However, it also has short-term individual disadvantages (mostly monetary motivated). Therefore, it is tempting for consumers to pursue personal objectives instead of community goals (Moisander, 2007). This phenomenon is labeled the Attitude-Behaviour or Intention-Behaviour gap and is considered as one of the main issues in sustainable consumption (Carrington et al., 2010; Young et al., 2010; Tsen et al., 2006).

In the present thesis we investigate the sustainable preference of grocery shoppers. Customers have to make many decisions while choosing their groceries. The potential cognitive overload associated with

these choices allows for a fallback on heuristics. Therefore, initial sustainable attitudes might not result in desired behaviour. In recent times, grocery shopping has been confronted with a new dimension: online grocery shopping. An increasing group of consumers is deciding to buy their consumption goods online via services like Picnic (an online Dutch grocery service). During the COVID-19 crisis in 2020, online grocery stores recorded record-breaking revenues. A common consensus among analysts exists about the potential of this market. Online grocery shopping is assumed to grow rapidly in the coming years (Saifi, 2019). However, with a growing popularity, there is also a growing ecological impact and thus responsibility. The relatively short existence of online grocery services offers opportunities for sustainable promotion. In this thesis we aim to increase the sustainable preference of online grocery shoppers. By doing so, we want to discover a new field of research by forming a bridge between sustainable consumption and online grocery shopping.

To do so, we apply the concept of Nudging. This tool has been described by Thaler & Sunstein (2009) as: *'any aspect of the choice architecture that alters people's behavior in a predictable way without forbidding any options or significantly changing their economic incentives'* (Sunstein & Thaler, 2009). In short: consumers are motivated to make a certain choice, without harming their freedom of choice. Nudge interventions have been used successfully before for sustainability purposes. However, since previous nudging studies took place in 'offline' settings, this thesis allows for a new 'online' dimension for this often-used tool. Demarque et al. (2015) showed that there is potential for the concept of Nudging to be successful in an online environment. The concept has not been used before extensively in this setting, however. This notion makes online sustainable nudging a relevant topic.

Nudging sustainable behaviour has proven to be effective when harnessed with social norms. In previous nudging experiments, social norms are mainly used: Aldrovandi et al. (2015) used social norms to change the willingness to pay for healthy food. Marteau et al. (2011) also found beneficial effects of social nudging, by using it to promote healthy alternatives. Furthermore, in an online setting the dominant social force is taken away: fellow customers. These examples give sufficient reason to use social norms in this study as well and reassess their strength. Another force for consumption identified by behavioral economists is the availability of information. Calzolari & Nardotto (2011) found positive effects of nudging using information. Furthermore, Demarque et al. (2015) tested the informational strategy in an online shopping environment. It was found that it had limited effects due to a lack of clarity in the information. By providing sustainable information, consumers are more aware about what they are buying. However, the effect can also be contradictory, causing information overload. The right amount of information should thus be provided. However, previous literature gives sufficient reason for informational nudging interventions to be successful.

Even though nudging has proven to be a successful force, in this thesis we want to dive deeper into

the effects of nudging and identify their background processes. Therefore, we investigate whether nudge interventions can change the sensitivity towards prices. A change in price sensitivity would provide an explanation behind the effects of the interventions. Until now, this area of nudging research has not been widely examined. Olstad et al. (2014) found some degree of change in sensitivity towards prices, but these applied to specific situations. Pricing is described, however, as the most prevalent factor in consumption decision making (Hargreaves et al., 2008). Thus, making it a relevant side-concept to study.

All in all, in this thesis we test the effects of two types of nudge interventions: a social norm and an informational intervention. These tools aim to influence the sustainable preference of online grocery shoppers. Furthermore, we take a two-fold approach by also assessing the effects of both interventions on price elasticity. We expect both interventions to have a positive impact on sustainable preference, with the social norm intervention to be most successful. Furthermore, both interventions are expected to cause products to be less price sensitive, making product price a less decisive factor in consumption decision making. To test these interventions the guiding research question is:

How can consumers be nudged into buying sustainable alternatives in an online grocery shopping environment?

Literature Review

To get a richer understanding of the concept of online grocery shopping, we examined existing scientific literature. The analysis of this literature is outlined below. First, we look at consumption in general. Next, we add the elements of sustainability and online shopping.

Consumption in general

Regarding consumption, past research established a three-fold relationship between Attitudes, Intentions and Behaviour (Hansen, 2008). Attitudes refer to a sense or feeling consumers have towards e.g. products, brands, and stores. These attitudes influence the shopping intentions, meaning the actions consumers aim for. After they displayed the corresponding behaviour, this action is completed (Figure 1). This phenomenon has a broad support in economic science. However, previous studies also emphasize the existence of variables affecting the different stages of this relationship. While examining sustainable consumption, we use this threefold relationship as a basis.

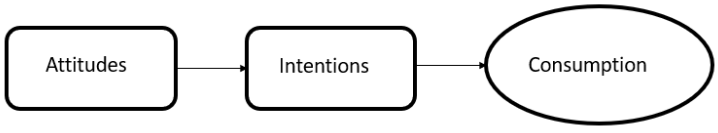


Figure 1 – Basic theoretical model of consumption

Sustainable consumption

Moisander (2007) developed a model of sustainable consumption, distinguishing between motivation and ability as two main drivers of sustainable consumption. A difference was found in overall motives and the actions corresponding to that motive. For example, individuals might not engage in recycling, even when they are motivated to act environmentally friendly. Terlau & Hirsch (2015), on the other hand, developed a decision-making model of sustainable consumption, in which they distinguished three factors: individual, social, and situational factors. These individual factors consist of characteristics and motivations. The three factors influence consumers' intentions regarding sustainable consumption, which consequently led to different behaviour than originally intended. Nguyen et al. (2016) took another approach and considered sustainable attitudes to have indirect effects. They found that environmental concern mitigates perceived inconvenience associated with the product. On the other hand, subjective norms, environmental awareness, and environmental attitudes are positively affected.

Combining these three studies, all found discrepancies between the attitudes and behaviors of consumers because of the existence of third variables. Multiple studies confirm the existence of other variables by calling the inconsistency between attitudes and behaviour the Attitude-Behaviour gap (Carrington et al., 2010; Young et al., 2010; Tsen et al., 2006). This gap is regarded as one of the main issues regarding sustainable consumption. All three studies are suggesting the roots of the AB-gap to lie in both external and internal factors. This is also emphasized by the Theory of Planned Behaviour (TPB), which explains this gap by identifying external and internal factors (Armitage & Conner, 2001). This theory extends the notion that attitudes form the basis for intentions and subsequently behaviour. The TPB is made of three constructs: attitude towards act or behaviour, subjective norm and perceived behavioral control. If one or more factors are negative, the likelihood of behaviour decreases as well. The TPB looks at all factors from both an external and internal point of view, which elaborates on the literature findings in the previous section. Therefore, when analyzing this gap, we consider both internal and external factors.

External (situational) factors

External factors affecting sustainable preference all relate to situational variables (Carrington et al, 2010; Moisander, 2007; Terlau & Hirsch, 2015). First, sustainable products are on average priced higher. A higher price also means a higher loss of resources. As such, even though individuals might be motivated to act sustainably, there is still a motivation to save resources. This dilemma creates arousal in one's mind, which an individual wishes to reduce. A way of taking away this arousal is to opt for the less sustainable product (Adams & Whelan, 2009). The principles of loss aversion and cognitive dissonance thus drive the preference for lower prices and consumers thus weigh environmental and economic benefits when they are purchasing sustainable products (Maniatis, 2016).

Another often-found situational variable in research is information availability. A lack of

information about the effectiveness of a products negatively impacts the attitude towards buying that sustainable product (Vermeir & Verbeke, 2006). Information overload, on the other hand, can cause inertia in consumer's brains. This leads to less motivation towards buying (Bray et al., 2010) and a reliance on heuristics and old habits. Previous research has shown that sustainable products with the right amount of information are chosen more often (Meise et al., 2014).

Being under time pressure also affects attributes to 'green' purchases. Being under time pressure causes a consumer to fall back on heuristics, which are often habitual factors. On average, these factors entail a purchase of non-sustainable goods.

Lastly, the setting in which the consumption decision takes place also matters for sustainable consumption. Direct situational effects affect the decision-making process. For this study, a relative stable setting is examined: an online grocery shopping environment. Since the amount of (online) movements is limited, consumers are less likely to be prone to the effect of setting.

The effect of social pressure on consumer behaviour is widely investigated. Humans are social creatures that do not want to be disapproved/ rejected by their peers. Hence, to be socially accepted they tend to comfort to the majority (Asch, 1952; Bird & Hughes, 1997; Vermeir & Verbeke, 2006). An experiment by Salazar & Oerlemans (2016) showed that participants who were informed that most of their peers had paid a price premium for an eco-product, also displayed a higher WTP for that product. In the theory of planned behaviour (TPB), social norms are treated as an extra separate component. Since, other studies also emphasize the important role of social pressure in consumption, we also treat social pressure as a separate component in our model.

Internal (individual) factors

Looking at the individual (internal) factors on the other hand, other factors are in play. First, economic research agrees that environmental concern form the basis of sustainable consumption. Lee, Kim, Kim, and Choi (2011) found that environmental concern positively contributed to green purchase behaviour. Young, Hwang et al. (2010) also recognized the importance of environmental knowledge and values for an intention of a sustainable purchase. Furthermore, Pagiaslis & Krontalis (2014) outlined the importance of environmental concern, beliefs, and knowledge on the WTP for environmentally products. As such, environmental concern strongly affects sustainable preference.

Personal characteristics showed to have an influence as well. Women are more likely than men to engage in sustainable consumption (Isenhour & Ardenfors, 2009). Since sustainable consumption is priced higher on average, income is negatively associated with the purchase of eco-friendly products (Hargreaves et al., 2008). The level of education was also connected to this. The same was found for individuals living in urban city areas.

Consumption habits show to have an influence as well on sustainable consumption. Due to bounded

rationality consumers rely back on heuristics when much cognitive effort is required. These heuristics are often present in the form of habits. They are less effortful and therefore easier to rely on. The System 1 and 2 theory by Kahneman confirms this (Kahneman, 2011). Sustainable consumption requires thoughtful decision-making and thus requires more cognitive effort. It is, however, found that consumers mostly rely on habits when shopping for groceries.

Lastly, factors referring to consumers perception of the product also have a play in this relation. The TPB calls this Perceived Behavioural Control (Javadi et al., 2012): how easy difficult it is to engage in a certain behaviour. Nguyen et al. (2016) called this the perceived inconvenience. Tsen et al. (2006) also investigated the inconvenience when buying. All found that a higher perceived inconvenience in buying or using the product decreases sustainable attitudes. It also includes past experiences (Vermeir & Verbeke, 2008). This factor also has an influence in the sustainable consumption domain. All in all, internal factors influencing sustainable consumption are environmental concern, personal characteristics, and social norms.

All in all, combining the previously discussed situational and individual factors, we can adjust the model in Figure 1. This results in the sustainable consumption model (Figure 2). To be relevant for this study, an extra layer must be added: the online component.

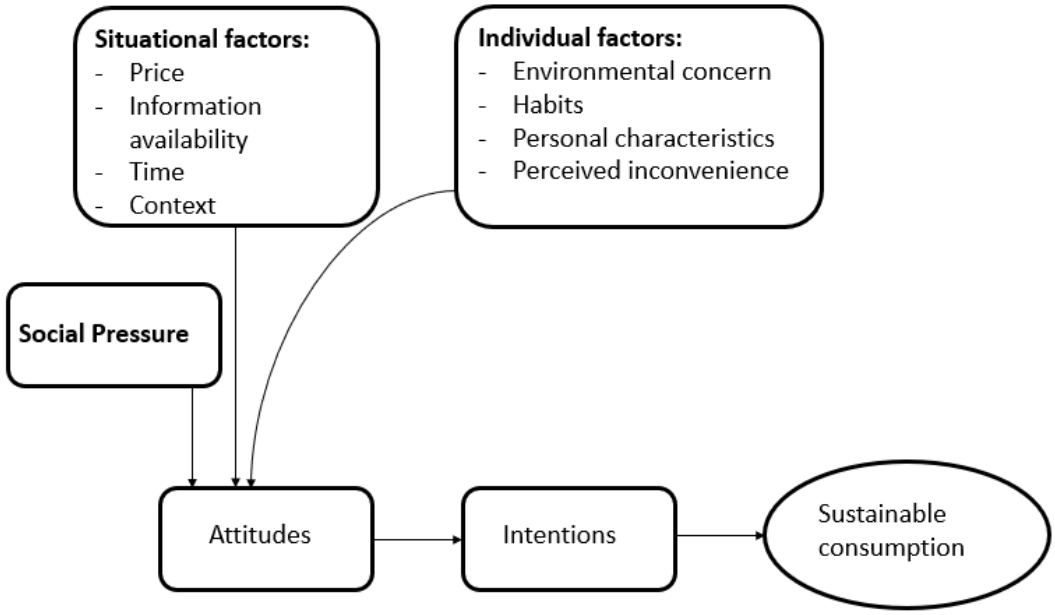


Figure 2 – Sustainable consumption model, based on previous research

Online sustainable consumption behaviour

An online grocery shopping environment differs from its 'offline' equivalent in the sense that the situational context is changed. As consequence of this change of environment, the effects of external factors are also altered. Compared to real supermarkets, an online environment is more stable with less external stimuli.

First, the influence of social pressure has decreased. Social norms are always prevalent, but the direct controlling power in the form of other customers has been erased. According to Demarque et al. (2015), reminders of social norms can change sustainable consumption online. This indicates that even though social pressure is less prevalent, it should be enforced more directly. Thus, social pressure as a force for behaviour still exists, but needs to be activated while online shopping (Javadi et al., 2012).

One of the key components of the internet is its information possibilities. Individuals tend to seek for more control and therefore want to be better informed online (Slevin, 2007). Hereby increasing the influence of information availability. However, consumers also want to have control over the amount and type of information they receive online (Hansen, 2008). Ming-Shen et al. (2007) found that consumers with a higher online information searching experience, have more favorable attitudes towards online shopping. Thus, the previously discussed information component in sustainable shopping increases in value in online sustainable shopping.

A change to an online environment also brings about a change in the individual variables (identified in Figure 2). The habits consumers fall back on, have now become online grocery shopping habits. Since the service is relatively new, these habits are also relatively new, allowing for change to be made. This is emphasized by past research, as another factor strengthening the use of habits is experience. Previous experience is identified as an important predictor of online purchasing intention (Ming-Shen et al., 2007; Giantari et al., 2013), opening potential for nudge interventions to have a lasting effect in the long run. A last factor in online consumption refers to convenience (Zhou et al., 2007; Robinson et al., 2007). Online consumers tend to be more convenience-oriented (Zhou et al., 2007). Hansen (2008) found that most online grocery shoppers mention convenience and time benefits as main reasons for a switch to online. The perceived inconvenience, as proposed in Figure 1, refers to product attributes. However, in this context perceived inconvenience can also relate to the inconvenience with online shopping.

Combining previous arguments with the model in Figure 2, we can reason a new model (Figure 3). Social pressure has decreased in importance but is still prevalent. Information availability and perceived inconvenience on the other hand have increased in importance. Lastly, the effects of past habits have become less certain, since in an online grocery shopping environment, habits must be re-invented.

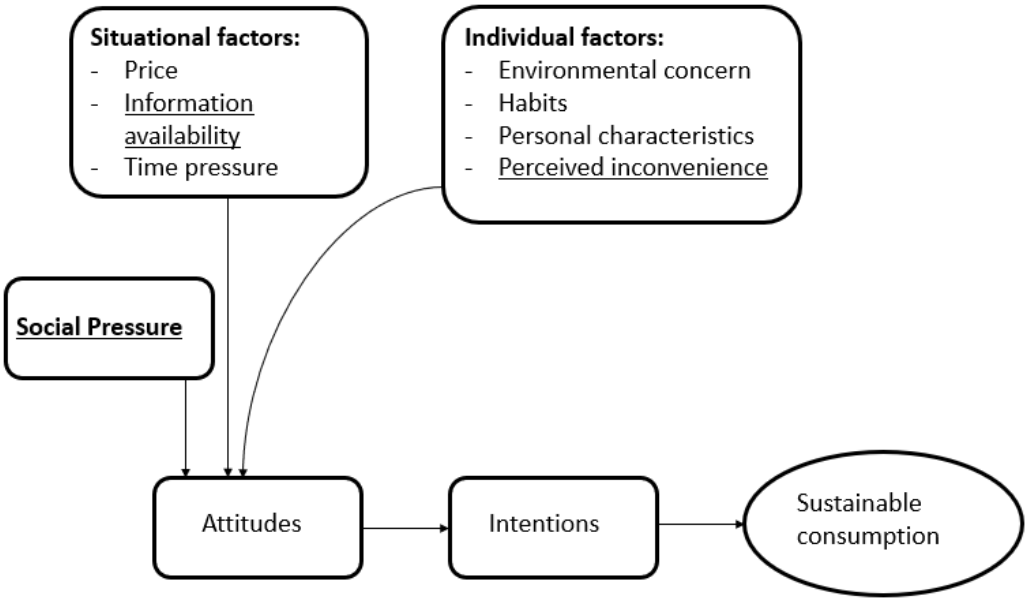


Figure 3 – Conceptual model online grocery shopping (underscored variables have increased in importance)

Nudging online sustainable consumption

In the past sections we created a model of online sustainable consumption, based on the Theory of Planned Behaviour. In this thesis we aim to influence consumers into buying sustainable products. A promising tool for this objective is nudging. Nudging entails: *'any aspect of the choice architecture that alters people's behavior in a predictable way without forbidding any options or significantly changing their economic incentives'* (Sunstein & Thaler, 2009). This implies that consumers are subtly guided towards a certain choice, but they still have a freedom of choice, making this tool ethically responsible.

Comparing Figure 3 to existing literature about digital nudging, social pressure is identified as a force for effective nudging. Thaler & Sunstein (2009) also emphasize the importance of social pressure in choice-making. It was described as one of the triggers for individuals to follow the herd. In cases of uncertainty, individuals tend to conform themselves to others. Adding a nudge intervention in the form of social pressure can cause individuals to adhere to this social norm. As discussed previously, activation of social pressure can change consumers behaviour online. This provides potential for a social norm nudge to be successful. Statements like *'...% of the consumers bought this product*' showed to be successful in leveraging social pressure in a nudge intervention (Demarque et al., 2015). This leads to our first Hypothesis:

H1: a social norm nudge increases the preference for sustainable products

Secondly, in the conceptual model in Figure 2, information plays an important role. It allows consumers to be better informed and have a feeling of control. A nudge intervention containing information also showed to be one of the main triggers for desirable attitudes (Thaler & Sunstein, 2009). On the other hand, an information effect might backfire. If the informational tool is too complicated, overload can occur, hindering the effectiveness of this tool. As such, clear and comprehendible information is important to be effective. As said before, online consumers engage in automatic behaviour (Mirsch et al., 2017). To play into this type of behaviour, the informational tool should convey an informational message that can be captured instantly. Peattie (2010) showed that labels are a good solution to diminish information asymmetry between producers and consumers. This leads to our second hypothesis:

H2: an informational nudge increases the preference for sustainable products

All in all, based on existing literature, we established a conceptual model of online sustainable consumption. Since we aim to increase sustainable preference of online grocery shoppers, we leverage this model by using the concept of nudging. As such, we propose two nudge interventions: a social norm and an informational intervention. We expect both interventions to increase sustainable preference of online grocery shoppers.

Methods

Based on existing literature, we set up an experiment. With this experiment we aimed to test how consumers can be nudged into sustainable consumption while purchasing their groceries online. Two different nudging approaches were tested: using a social norm tool and informational tool. Furthermore, price elasticities were calculated between the groups to test for potential effects on price sensitivity.

Experimental design

The experiment entailed an online survey in which participants were exposed to an artificial online grocery shopping environment. They were asked to buy one product in each of the ten different product categories (Appendix A). For each product category, multiple products were shown, one being the sustainable option. The sustainable option was distinguished by a difference in product name (e.g. *eco-*, *green* etc.). In Figure 4, the basic decision-making environment (without interventions) is shown.

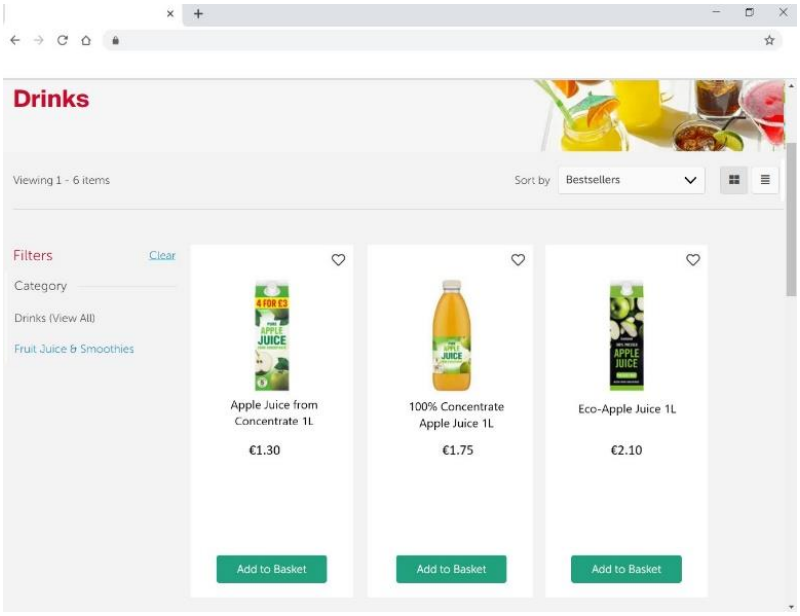


Figure 4 – experimental design, basic decision-making environment

The dependent variable of this study was: **sustainable preference**. The potential effects of the variables **SocialNormTool** and **InformationTool** were investigated. These two independent variables were both binary variables (1 = received nudge, 0 = no nudge). Participants were divided into three groups:

Control group (Control): received no treatment

Treatment 1 (Social): was shown the social nudge

Treatment 2 (Info): was shown the information nudge

Participants in the control group did not receive any treatment and were asked to make choices in ten product categories in the basic decision-making environment as seen in Figure 4. Participants in the Social group were shown a message like: '*75% of our customers bought this product before you'* for the sustainable alternatives, with the percentages differing per product. A study about descriptive norms by Demarque et al. (2015) did not find significant differences in effects of descriptive norms when percentages were higher. As such, to account for this, social norms in the range 50-80% were chosen.

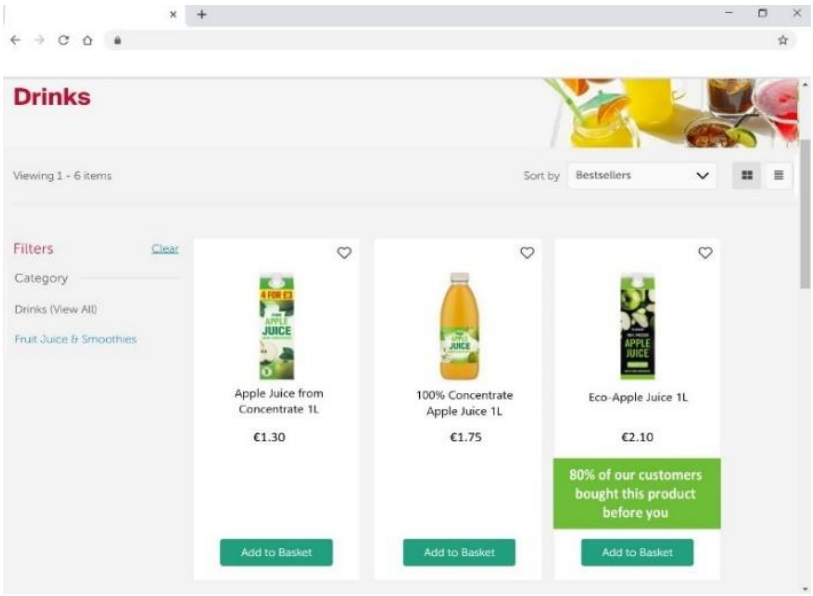


Figure 5 – example of social norm intervention

In the Info group we tested for the potential effects of **InformationTool**. Participants were exposed to the informational nudge, which was a simple scale, with a grey-to-dark-green area indicating sustainability of the product. Alongside this scale the water and/or CO2 production savings were shown.

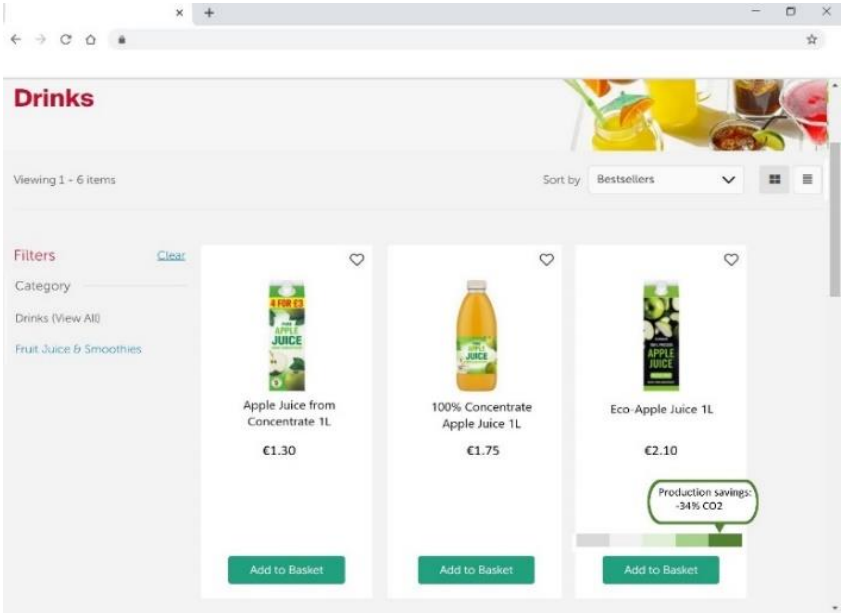


Figure 6 – example of informational intervention

In the experiment description it was clearly stated that participants were entering an artificial situation, ethically allowing for non-real products, numbers, and prices to be used. To test for the effectiveness of the different interventions, we looked at potential differences between the respective treatment groups and the control group. Hence, both variables are between-subjects variables.

In the conceptual model (Figure 2) multiple independent variables were identified. As mentioned before, the independent variables of interest in this thesis are: **SocialNormTool** and **InformationTool**. The other independent variables were controlled for, this was done in two ways. First, **time pressure** and **information availability** were held constant in this experiment by leaving out a time-component or extra information about the product. **Income** was also controlled for by giving participants an artificial budget of €30. With this budget participants were able to buy all (un)sustainable products if they wanted to. However, it was stated before that not the whole budget needed to be spent, like in real life. By doing so, the leverage of a price tag on a purchase decision was simulated. Second, the remaining independent variables were controlled for by including it in the linear regression equation. These were**: personal characteristics** (**living situation** and **gender**), **environmental concern**, **perceived inconvenience**, **habits**, and **social pressure**. An overview of all variables can be found in Appendix B.

In this experiment we paid extra attention to the effects of product prices. Past research identified product prices as strong demotivator for sustainable preference. To test this claim, an extra dimension was added by differentiating in price varieties between the options within each group. Subjects either received products having small price differences (<30%), or large price differences (+30%) (Example in Figure 7). The price distribution per product category can be seen in Appendix E. In each group, half of the participants was shown the high price differences (**highpdif** = 1) and subsequently the other half was shown the lower price differences (**highpdif** = 0). The variable **highpdif** was also included in the linear regression.

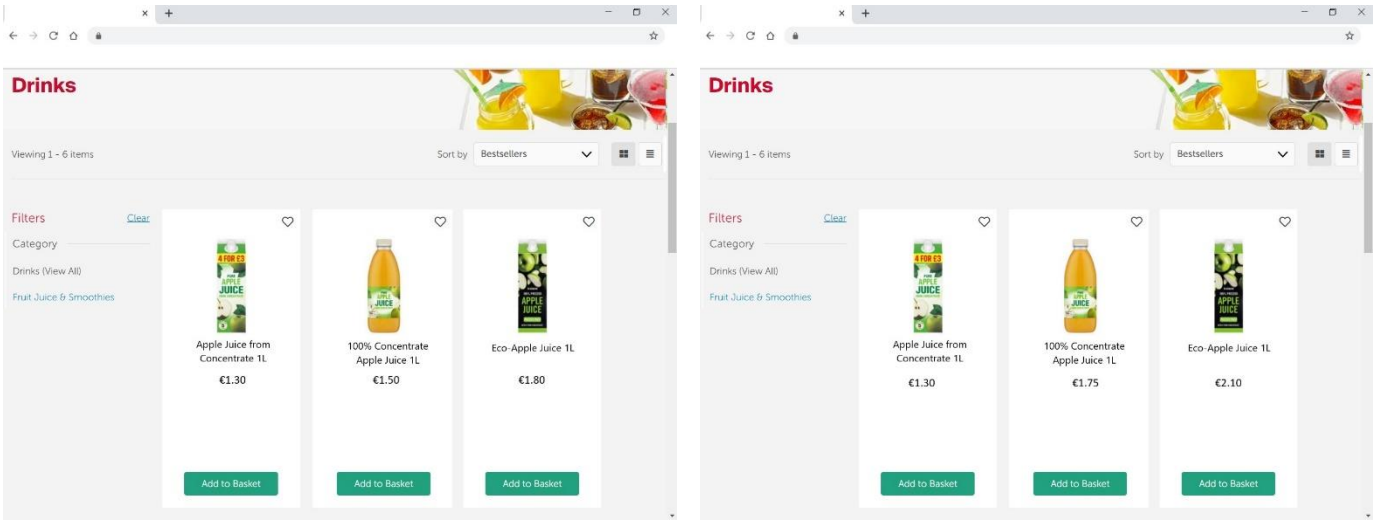


Figure 7 – Example of price difference (in this case: control group), small difference (left) & large difference (right)

Furthermore, by doing to, sensitivity towards prices can be measured by using the concept of price elasticity. This concept shows the effect of changes of prices on demand. It is thus calculated by dividing the percentage change in demand by the percentage change in price (Figure 8). A highly price elastic

product has a strong change in demand when there is a small change in price. The average price elasticity of each product category was calculated in both treatment groups, using the control group as a baseline.

$$\text{Price Elasticity of Demand} = \frac{\%\ \text{Change in the Quantity Demanded } (\Delta Q)}{\%\ \text{Change in the Price } (\Delta P)}$$

Figure 8 – Price Elasticity of Demand formula

Participants

We identified three groups of participants to measure the between-subjects variables. Participants were divided over the groups Control, Social and Info. Furthermore, as said in the previous section, we tested for the effects on price sensitivity. Thus, within these groups participants were divided in subgroups, resulting in a 2-by-3 design.

	Control	**Social**	**Info**
Highpdif = 1	1a	2a	3a
Highpdif = 0	1b	2b	3b

Table 1 – 2-by-3 design lay-out

Based on comparable studies and a power size calculation (α=0.05 and β=0.20), we aimed for a sample size of 60 participants per group to be able to make claims at a confidence interval of 95%. Thus, we aimed for a total number of 180 subjects. Participants were recruited using various online sources and online research communities. Many participants were peer-researchers themselves and looking for survey participants. Therefore, as an incentive for research participation a response return was promised, when needed.

The research population was young adults. Previous research showed that young adults were more environmentally conscious (Isenhour & Ardenfors, 2009). Hence, there was potential for the tools to adequately leverage environmental concern participants potentially had. The participants were recruited by sending out the survey in online researching communities. As a benefit these sources ensured that a survey was filled in consciously. Furthermore, it was made sure that the correct respondents were targeted. Besides age, no other variables were used to exempt individuals from participating.

A total of 414 participants replied. 21 participants were removed from the sample, because their time spent to fill in the questionnaire was below a 120 second threshold. If the control question was wrongly answered, participants were excluded as well, leaving out another 30 participants. Due to an error, four answers were not completely filled in. As such, a final sample of 359 participants remained. The responses were evenly divided over all three groups (Table 2). The respondents also belonged to the correct research population, looking at the age characteristics (Table 3). Based on the demographics found in Table 4, some attention must be paid to gender. Whereas naturally a 50/50 split would be expected, this experiment had a

69/31 split in favour of females. Thus, when analyzing results there could be a potential gender effect. From the other demographical values, we saw that most of the research population was students. This also possibly explains the educational level distribution (leaning to University level) and living situation (90% urban). Even though these distributions were a consequence of the methodological choice for the current research population, they might influence the results.

Group	***n***	
Control	119	33.1%
Social	118	32.9%
Info	122	34.0%

Table 2 – Distribution of subjects over three research groups

Age	Mean	25.8
	SD	6.1
	Median	24.0
	Range	45.0

Table 3 – Information regarding variable Age

Measure	**Item**	**Count**	**Percentage (%)**
Gender	Male	112	31.2%
	Female	247	68.8%
Age	below 20	16	4.5%
	20-24	176	49.0%
	25-30	118	32.9%
	over 30	49	13.6%
Education	High school or below	34	9.5%
	Bachelors	141	39.3%
	Masters	169	47.1%
	PHD	11	3.1%
	Other	4	1.1%
Occupation	Student	241	67.1%
	Employed	81	22.6%
	Unemployed	23	6.4%
	Self-employed	14	3.9%
Living Situation	Urban	323	90.0%
	Rural	36	10.0%

Table 4 – Demographical Information

Procedure

Before deciding to participate, participants were provided with information regarding the purpose of the study and a brief survey explanation. The exact purpose of the research was not revealed, to prevent researcher bias from occurring. In section 2, participants were informed about the rules of the study. These included a confidentiality assurance and contact details. Most importantly, it was stated that everything in the questionnaire referred to an artificial situation. By doing so, we obtained freedom to use non-real numbers in the questionnaire without being unethical. The precise text of this section, along with the entire survey design can be found in Appendix F. After being informed and having agreed to the rules, the experiment was described. First, an artificial situation was created stating that the participants should imagine they were buying online groceries with a preset budget. A control question, asking to restate the artificial budget they received, was also included.

Subsequently, questions regarding the dependent variable were asked. Participants were given choices between three products in ten product categories. There was no possibility for skipping a question, ten choices had to be made. In this set of questions, the interventions were included for participants in one of the two treatment groups. After the measurement of the sustainable preference, questions were asked regarding the confounding variables. The precise measurement of these variables is outlined in the *Materials* section. After finishing the questionnaire, participants were thanked for participation and again given contact details if they had any questions relating to the research. Participation took roughly 10 minutes and participants were not compensated.

Materials

Based on participants' responses, different variables were measured. In the following section, an overview of the used measurements per variable is included.

First, the dependent variable **sustainable preference** was measured by the percentage of participants opting for the eco-friendlier alternatives. The two interventions were tested on their effect on these values. The percentages of consumers opting for 'green' products from both treatment groups were compared with the same percentages in the control group.

In the beginning of this chapter, we identified multiple confounding variables. **Environmental concern** was measured using the Environmental Concerns scale (EC-scale) developed by Schultz (2001). This metric is widely applied in environmental and economic research and tested by independent studies to be externally and internally valid (Cruz & Manata, 2020). The EC-scale looks at concern at three levels: self, other people, and the biosphere. Therefore, the questions were also divided among these three dimensions. The answers to these questions were averaged into one value per subject.

The controlled factors referring to demographical information were measured by asking directly. All variables were categorical variables, such as **age** (below 20, 20-24, 25-30, over 30), **educational level**

(High school or below, Bachelor's degree, Master's degree, PHD, Other), **living situation** (urban/rural), **occupation** (Student, Employed, Unemployed, Self-employed) and **gender** (male, female, other). These variables were asked after the product choices were made.

Perceived inconvenience was measured by using the belief part of the perceived behavioral control aspect of the Theory of Planned Behaviour (Armitage & Conner, 2001). In this research was found that asking two questions regarding convenience suffices. The questions related to this variable were hence also focused on these two aspects.

Social pressure was measured with questions using a Likert scale from 1 to 7 developed by Javadi, Dolatabadi et al. (2012). The results of these questions are combined into one value per person.

In this thesis **habits** referred to the willingness for consumers to change. If a low willingness to change was observed, regarding sustainable consumption and/or online grocery shopping, habits were measured to be high. Therefore, it was asked whether consumers often bought the same products in the same place and whether they were open to buy alternatives.

Variable	**Measurement**
Sustainable preference	Percentage of participants opting for 'green' product
Environmental concern	Environmental Concern Scale (Schultz, 2001)
Personal characteristics	Categorical variables
Perceived inconvenience	Likert Scale with questions about eco-products and grocery shopping
Social pressure	Likert Scale developed by Javadi, Dolatabi et al. (2012)
Habits	Likert Scale with questions regarding past performance frequency

Table 5 – Overview of measurements per variable

Analysis

After all variables were measured, we set up a linear regression to analyze the effects of both **SocialNormTool** and **InformationTool** on **sustainable preference**.

To test whether **SocialNormTool** had a causal effect on **sustainable preference**, we investigated if the means from the Social and Control group came from the same population. We did so by conducting a Mann-Whitney U test. Since we use 10 product categories in the experiment, **sustainable preference** can only have a value at 10% interval. As such, in this regard **sustainable preference** can be regarded as an ordinal variable. Furthermore, the observations were made independently. These are two assumptions of the Mann-Whitney U test. By also having an ordinal independent variable and a dependent variable measured in two independent groups, all its assumptions were met. Regarding **InformationTool**, a similar approach was taken. A linear regression was run, and a Mann-Whitney U test were executed.

Subsequently, the price sensitivity of participants in both groups was investigated. This concept

was not included in the linear regression since price effects are captured by the variable **highpdif**. By using the average prices and quantities per product in each product category, the price elasticities were measured (using small differences as a benchmark). For these results, a Mann-Whitney U test was conducted as well.

Results

In the present thesis we designed two interventions to test two related hypotheses. Furthermore, we examined the effects of these interventions on sensitivity towards prices. A total of 359 participants took part in the questionnaire (119 in Control, 118 in Social, 122 in Info). The average sustainable preference of Control was 26% (Table 6). In Social and Info, the average sustainable preference amounted to 24% and 33% respectively. For Info, this implies an increase of 26.92%. The relatively large standard deviations show that the data points are widely spread around the mean.

Participant Group	Mean Suspref	SD Suspref	Variance Suspref	*n*
Control	0.26	0.24	0.06	119
Social	0.24	0.22	0.05	118
Info	0.33	0.27	0.07	122

Table 6 – Descriptive statistics of Sustainable preference

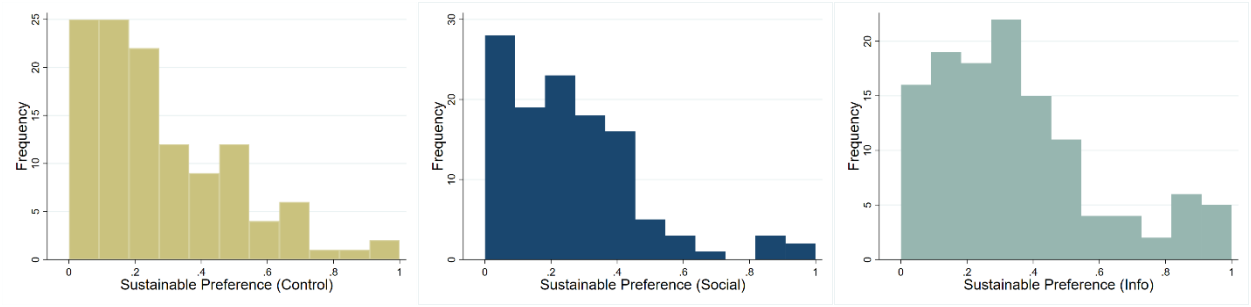


Figure 9 – Histograms with frequencies of sustainable preference per treatment group (from left to right: Control, Social and Info)

The histograms of the three groups show differences in the distribution of sustainable preference of the three groups (larger figures can be found in Appendix G). Compared to the control condition, sustainable preference is more skewed to the left for the Social group. This implies a lower sustainable preference when confronted with a social norm tool. On the other hand, the informational tool shows a distribution more skewed to the right. It thus appears that an informational intervention has more beneficial effects for sustainable preference. To further investigate this effect, we executed a linear regression. Three regressions were run: (1) only control, (2) all variables, (3) all variables + interaction terms. The respective results are displayed below.

VARIABLES	(Control) Suspref	(Treatments) Suspref	(Treatments + interactions) Suspref
Environ. Concern	0.0826**	0.0600***	0.0614***
	(0.0371)	(0.0192)	(0.0191)
Perceived Inconvenience	-0.00469	-0.0436**	-0.0460***
	(0.0331)	(0.0170)	(0.0173)
Social Pressure	-0.0184	-0.00195	-0.00343
	(0.0260)	(0.0174)	(0.0173)
Habits	-0.0757	-0.0851***	-0.0841***
	(0.0509)	(0.0248)	(0.0248)
Male	0.170***	0.0405	0.0425
	(0.0546)	(0.0296)	(0.0297)
Urban	0.0293	0.0624	0.0598
	(0.0524)	(0.0396)	(0.0401)
SocialNormTool		-0.0180	-0.0152
		(0.0287)	(0.0440)
InformationTool		0.0799**	0.0403
		(0.0310)	(0.0492)
Information + Highprices			-0.00493
			(0.0581)
Socialnorm + Highprices			0.0778
			(0.0639)
High price-differences	-0.0974**	-0.0703***	-0.0952**
	(0.0425)	(0.0252)	(0.0420)
Age: below 20	0.0628	-0.00657	-0.00353
	(0.0709)	(0.0455)	(0.0461)
Age: 20-24	0.0386	-0.00276	0.00187
	(0.0699)	(0.0460)	(0.0467)
Age: 25-30	-0.0504	0.0420	0.0437
	(0.0930)	(0.0814)	(0.0833)
Educ.: Highschool (or lower)		0.0214	0.0346
		(0.0660)	(0.0682)
Educ.: Bachelors	0.0907	0.0744	0.0854
	(0.0859)	(0.0615)	(0.0641)
Educ: Masters	0.0668	0.0893	0.0999
	(0.0912)	(0.0608)	(0.0637)
Educ.: PHD	0.0905	0.0135	0.0314
	(0.161)	(0.0950)	(0.0979)
Occupation: Student	0.120	0.0319	0.0319
	(0.0879)	(0.0512)	(0.0508)
Occupation: Employed	0.139	-0.0125	-0.0114
	(0.152)	(0.0611)	(0.0623)
Occupation: Self-employed	0.116	0.0390	0.0416
	(0.0713)	(0.0445)	(0.0441)
Constant	-0.0294	0.257	0.257
	(0.285)	(0.156)	(0.159)
Observations	119	359	359
R-squared	0.266	0.170	0.176

Robust standard errors in parentheses

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

Table 7 – Regression results for Sustainable preference

Environmental concern has a consistently favorable effect on sustainable preference. The effects are always significant at a minimum 5% significance level. When one of the interventions is included, the effects of **perceived inconvenience** are magnified and become significant (5% level). **Pricing** also shows consistent significant negative effects (at 5% level). Habits and pricing also show significantly negative effects on sustainable preference. Regarding the categorical variables **Age**, **Educational Level** and **Occupation** no significant effects are found. Important to note is that the negative effects of high prices are diminishing when interventions are included. Thus, when the interventions were included, participants were less likely to be influenced by higher prices when choosing between products.

Hypothesis 1

For H1 we predicted that a social norm nudge increases the sustainable preference of the participants. Looking at the descriptive statistics in Table 5, the average sustainable preference of the respondents receiving the social norm nudge decreased. Looking at the linear regression results in Table 6, we find no support for an effect of a social norm nudge on sustainable preference. To test whether indeed no association can be assumed between the social norm tool and sustainable preference, a Mann-Whitney U test is conducted. It was tested whether the populations of Control and Social were similar.

Z	0.427
p-value	0.6696

Table 8 –Mann-Whitney U test statistics for SocialNormTool

The Mann-Whitney U results suggest that there is a 66.96% possibility that the population of the Control Group and Social are similar. As such, there is a low degree of difference between the two populations. Therefore, we can reject Hypothesis 1 and imply that there is no support for an effect of a social norm nudge on sustainable preference.

Hypothesis 2

In H2 it was predicted that an informational nudge would increase the sustainable preference of participants. The descriptive statistics in Table 5 show an increase from 0.26 to 0.33, an increase of 26.92%. Thus, participants prone to the informational tool showed on average a 26.92% higher sustainable preference, compared to the initial control condition. The regression results confirm this notion with a Beta of 0.0799 (significant at 5% level). This suggests that receiving the informational nudge increases the sustainable preference of our subjects by 7.99%. To test whether we indeed can find support, we conducted a Mann-Whitney U test, where it was tested whether the populations of Control and Info were similar.

Z	-2.390
p-value	0.0168

Table 9 –Mann-Whitney U test statistics for InfoTool

These results show that there is a 1.68% probability that the results from the informational tool come from the same population as the control group. As such, there is a discrepancy created by the information nudge. As such, we cannot reject Hypothesis 2 and we find evidence that an informational nudge increases sustainable preference online.

Test for effects on price sensitivity

As we mentioned earlier, the effect size of high price differences decreased when the interventions were included. To dive further into this notion, two interaction terms were created: **social+highprices** and **information+highprices**. With these interactions we aimed to test whether the effects of both tools were affected when confronted with high prices. Looking at the corresponding regression results, we do not find support for this. However, splitting the histograms in Figure 9 into two parts, we can see that there is a difference in effects of high price differences between the three groups (Figure 10).

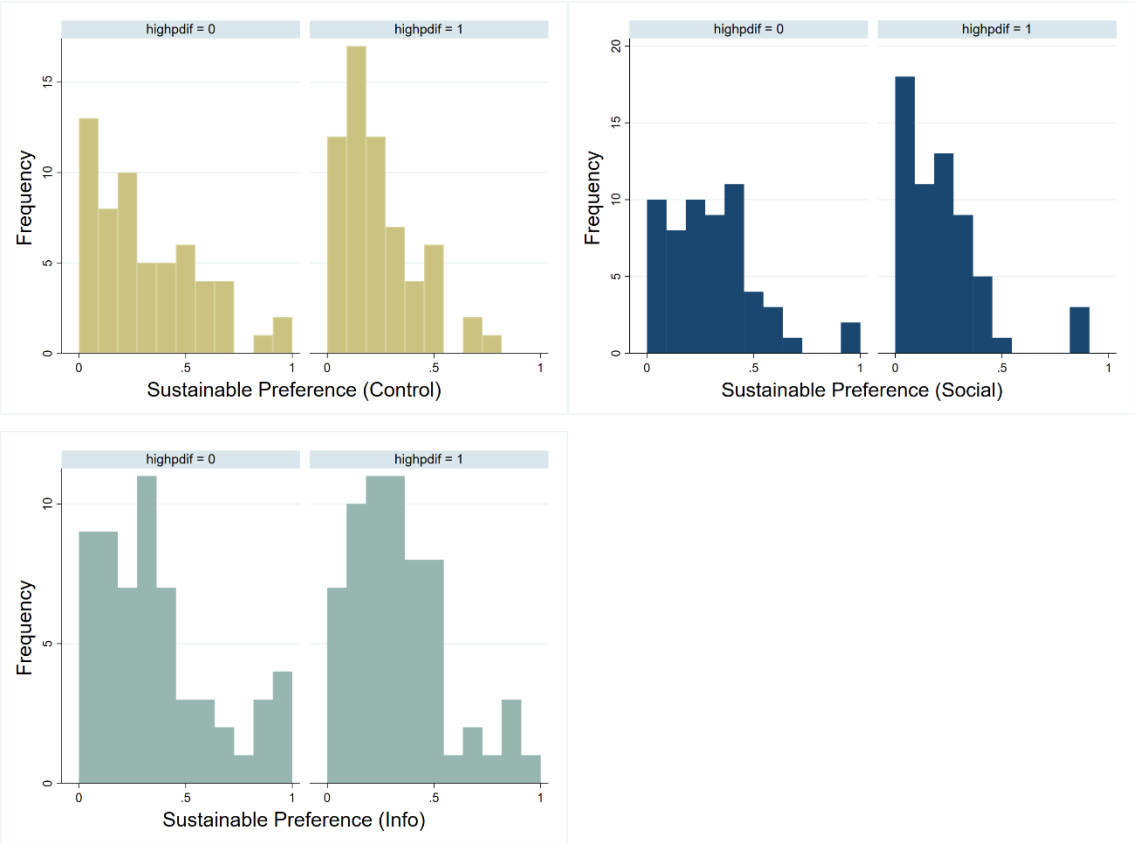


Figure 10 – Frequencies of sustainable preference per group for highpdif = 0 and highpdif = 1

All groups show a lower sustainable preference when price differences were high (enlarged figures can be found in Appendix H). However, compared to the control condition the sustainable preference in Social is more skewed to the left. The sustainable preference for Info is conversely more skewed to the right compared to the control condition. This pattern was found in Figure 9 as well. However, based on this Figure we can conclude that higher price differences do not erase effects for the informational nudge.

To be able to understand the change in effect size of prices, we look at price sensitivity as a possible cause. In each group, the price sensitivity per product category was measured (Appendix I). Subsequently, this was averaged for all groups.

	Control	**Social**	**Info**
Average Price elasticity	-2.84	-3.14	-0.62

Table 10 - Average price elasticity for all three groups

Based on this table, we see that Info shows a radical different average price elasticity. The demand in this group has become less elastic, which indicates a lower responsiveness of demand to changes in price. To test for a causal relation, we executed a Mann-Whitney U test for both groups, with the control condition as a baseline (Table 11).

	Control – Social	**Control – Info**
Z	0.302	-1.814
p-value	0.7624	0.0696

Table 11 – Mann-Whitney-U test results for Price Elasticities of both groups compared to control condition

Table 11 shows that the price elasticities of Social come from a different population than the control condition (at a 10% significance level). As such, we can conclude that an informational nudge decreases price elasticity at a 10% significance level. Further reasoning tells that an informational nudge thus has an indirect effect on sustainable preference through its effects on price elasticity.

All in all, based on the regression results and additional statistical tests, we find support for Hypothesis 2. Not enough conclusive findings are found to find support for Hypothesis 1. Furthermore, we also find support for the claim that an informational intervention decreases sensitivity towards changes in prices. As such, we state that an informational nudge both directly and indirectly influences sustainable preference, through price sensitivity.

Discussion

In this thesis, we examined whether online sustainable preference can be influenced by using nudging instruments. Based on existing scientific literature, we proposed and constructed a social nudge and an informational nudge. These two tools leveraged the aspects of social pressure and information availability respectively, two variables identified in the conceptual model. As an extra dimension, we investigated the effects of these nudges on price sensitivity for sustainable products. To test for potential effects, two treatment groups and one control group were created (n = 359). Positive effects on sustainable preference were hypothesized for both interventions.

From the main results, we see that there is no support for an effect of the social nudge on sustainable preference. The informational nudge showed beneficial effects regarding sustainable preference. Compared to the control group, sustainable preference increased by 26.92% for participants in the Info group. Furthermore, the results also showed the negative effects of high prices to be decreased for this group of subjects. By looking at the average price elasticities per group and the subsequent test results, an explanation is offered in the form of diminished price sensitivity.

From the results, no support is found for Hypothesis 1. Past literature stressed the importance of social pressure in sustainable consumption. Thaler & Sunstein (2009) even argued it to be one of the key triggers in decision-making. Terlau & Hirsch (2015) also described social pressure as being one of the three main determining variables in sustainable consumption. Social pressure interventions have proven to be effective in numerous situations. Past research emphasized that social pressure is often linked to 'offline' characteristics like appearance, group size etc. In an online environment these characteristics diminish in importance. However, in a similar online experiment conducted by Demarque et al. (2015) an online effect of social pressure was found. As such, a possible explanation for the discrepancy between this thesis and other literature can be the research circumstances. For social norms to be effective, some social pressure must be felt. Participants were aware of the artificialness of the experiment; thus, they possibly did not fully experience social pressure. Participants in Info did not have to experience an extra form of pressure for the intervention to be successful. However, since the field of online social pressure has not been widely examined yet, this phenomenon should be investigated more deeply.

Regarding Hypothesis 2, the results support previous literature about sustainable consumption. Previous literature stressed the importance of information availability on sustainable preference. Young et al. (2010) described lack of information as one of the key aspects negatively affecting sustainable consumption. Therefore, the availability of information has a beneficial effect on sustainable preference. This claim has been supported by numerous authors (Meise et al., 2014; Vermeir & Verbeke, 2006). Based on the results of this thesis a positive effect of information can indeed be concluded and past literature is supported. Furthermore, a lower sensitivity towards prices was found when the informational tool was used.

This opens the possibility of an indirect effect of the informational nudge through price sensitivity. Huber, Holbrook & Kahn (1986) found a decreased price sensitivity when information was added to the product. Other studies also emphasize the effects of brand information on price elasticity (Erdem et al., 2002). Therefore, the observed effect supports past literature. Whether the diminished price sensitivity can be contributed to the nudge itself, the extra information, or a combination of both can subject for future research and/or debate. Furthermore, the aim of this thesis was not to examine the indirect effects of informational tools. Therefore, to confirm the existence of such an indirect effect, additional research is required. When both interventions are included in the linear regression, the constant is larger than the results of the control group. This denotes more ambiguity about the side-effects of both interventions, which emphasizes the need for future research into indirect effects of online nudging experiments.

In the introductory chapter, we defined the ambition to discover a new field of research by forming a bridge between sustainable consumption and online grocery shopping. In this thesis, we showed a possible way to do so and both showed a direct effect and reasoned an indirect effect of the informational nudge. These findings can be used to contribute to the debate about nudging online sustainable consumption.

Limitations and future research

Some methodological limitations exist that could have affected the results of this thesis. First, in this study no real money incentive has been used. As past literature emphasizes, money is the most important consideration in purchasing decisions. Having no real money incentive also means that there are no real consequences, offering potential for less attentive decision making. This thesis aimed at imitating the effect of a money incentive as much as possible, by providing participants with an artificial budget. However, this still allowed for freeriding behaviour. One solution could be to pay participants a fixed amount of money. This will cost resources on the one hand but ensures more conscious decision-making on the other hand.

Second, the results of this thesis can have been affected by gender effects resulting from the composition of the sample. Naturally, a 50/50 gender split could be expected, instead this sample has a 31/69 gender split (112 males, 247 females), allowing results to be skewed. Solutions to this problem would be to use a more specific targeting approach.

A last limitation also refers to participant selection. We used online services to randomly gather participants. As a benefit this caused the sample size to be almost double the pre-calculated amount. However, as a disadvantage the survey was open for everyone receiving the questionnaire. Thus, opening potential for a slightly less representative sample. More direct targeting based on certain variables would be of greater use but was not possible due to budget considerations.

In future studies, these limitations should be overcome. A significant part of the problem can be solved by reserving more budget. By doing so, participants can be incentivized more heavily, resulting in an effect closer to reality. Furthermore, with an increased budget, participants can be targeted more directly,

resulting in a more representative sample. Another way of increasing the representativeness of the sample could be by using more selection questions and thus leaving out irrelevant respondents.

Conclusion

This thesis investigated the effects of two types of nudge interventions. The overarching research question was:

How can consumers be nudged into buying sustainable alternatives in an online grocery shopping environment?

In this thesis we found that an informational nudge can increase the sustainable preference of online grocery shoppers. We argued that this happens both directly and indirectly (through a diminished price elasticity). These results have relevance for different groups of stakeholders.

Online vendors can use these results to implement nudges in their decision-making environment. With an increasing focus of the general consumer on sustainability, demand will likely shift to be more eco-friendly in the coming years. Hence, with implementing informational nudges this trend can be harnessed and the demands of the public can be played into. There are however some aspects that should be considered when a similar nudge is implemented. First, the right balance between information overload and lack of information must be found. An information overload opens the possibility of a reliance on heuristics (Bray et al., 2010). However, a lack of information about the effectiveness of a product negatively impacts the respective buying attitude (Vermeir & Verbeke, 2006). To determine the right amount of information, extensive testing is required. In an online environment trust can be a (de)motivator as well. Consumers generally want to be in control and thus are vigilant for deceiving information. A vendor might not always be trusted since commercial motives might be a driver for certain actions in the eye of the consumer. Lastly, when implementing an informational tool, it should not be overused. Thaler & Sunstein (2009) emphasized the decreasing effect of nudge interventions, when used too often.

A second group of stakeholders relevant to these results are researchers, especially in the field of behavioral economics and/or nudging. Unsimilar to initial thought, we observed an effect for the informational nudge and no evidence for a social nudge. As emphasized in the literature review, the concepts of internet and information are intertwined. This allows for a possible explanation for the difference in effects between the social and informational nudges. As such, a debate can be started about the importance of the underlying factors. The results of this thesis suggest information availability to be more important than social pressure. However, existing nudging research generally assumes social pressure to be more powerful. As argued previously, social norms in online environments serve more as enactors of social pressure in a more individualized environment. With in-person situations, social pressure is activated

through the presence of other individuals. The question remains however whether this raise and drop in effectiveness of respectively information availability and social pressure has been sufficient to make a claim about the ranking in importance of both variables. We also added in price sensitivity, a concept hardly examined before in previous studies, to better understand the role pricing is playing in online sustainable consumption. Previous literature describes product prices as one of the key demotivators for sustainable consumption (Hargreaves et al., 2008). Having a tool diminishing this sensitivity towards prices, can overcome part of this problem. However, as stated in the discussion, exact effects on the price elasticity must be examined more thoroughly. This study does thus open a new promising area of nudging research: the effects of nudging tools on price sensitivity. Much literature focuses on the effect of nudges themselves, instead of further examining this effect. The results of this thesis reveal that there is sufficient ground to open this debate and investigate the potential effects.

Overall, in this thesis it has been shown that nudges influence sustainable preference. If constructed and applied correctly, nudging tools can be used to increase sustainable preference. Since sustainability is becoming more and more an 'hot' topic for individuals around the world, these findings are relevant in today's society. As discussed in the introduction, individuals and entities are becoming more aware of their individual contribution to sustainability. Hence, applying such nudges can harness this individual mandate and move consumers to more sustainable consumption. Even though the concept of nudging is not without its controversy, nudges can thus be used as a building block in moving the world to a more sustainable place.

Bibliography

Adams, C. A., & Whelan, G. (2009). Conceptualising future change in corporate sustainability reporting. *Accounting, Auditing & Accountability Journal*.

Aldrovandi, S., Brown, G. D., & Wood, A. M. (2015). Social norms and rank-based nudging: Changing willingness to pay for healthy food. Journal of Experimental Psychology: Applied, 21(3), 242.

Armitage, C. J., & Conner, M. (2001). Efficacy of the theory of planned behaviour: A meta-analytic review. *British journal of social psychology*, *40*(4), 471-499.

Asch, S.E. (1952). *Social Psychology*, New York: Prentice-Hall.

Bird, K., & Hughes, D. R. (1997). Ethical consumerism: The case of "Fairly–Traded" coffee. *Business ethics: A European review*, *6*(3), 159-167.

Calzolari, G., & Nardotto, M. (2011). Nudging with information: a randomized field experiment on reminders and feedback.

Carrington, M. J., Neville, B. A., & Whitwell, G. J. (2010). Why ethical consumers don't walk their talk: Towards a framework for understanding the gap between the ethical purchase intentions and actual buying behaviour of ethically minded consumers. *Journal of business ethics*, *97*(1), 139-158.

Cruz, S. M., & Manata, B. (2020). Measurement of Environmental Concern: A Review and Analysis. *Frontiers in Psychology*, *11*, 363.

Demarque, C., Charalambides, L., Hilton, D. J., & Waroquier, L. (2015). Nudging sustainable consumption: The use of descriptive norms to promote a minority behavior in a realistic online shopping environment. *Journal of Environmental Psychology*, *43*, 166-174.

Erdem, T., Swait, J., & Louviere, J. (2002). The impact of brand credibility on consumer price sensitivity. International journal of Research in Marketing, 19(1), 1-19.

Forgrieve, J. (2018, November 2). The Growing Acceptance Of Veganism. Retrieved from https://www.forbes.com/sites/janetforgrieve/2018/11/02/picturing-a-kindler-gentler-world-vegan-month/

Giantari, I. G. A. K., Zain, D., Rahayu, M., & Solimun, M. (2013). The role of perceived behavioral control and trust as mediator of experience on online purchasing intentions relationship a study on youths in denpasar city (Indonesia). *International Journal of Business and Management Invention*, *2*(1), 30-38.

Gupta, S., & Ogden, D. (2006). The attitude-behavior gap in environmental consumerism. *APUBEF Proceedings*, *3*(1), 199-206.

Hansen, T. (2008). Consumer values, the theory of planned behaviour and online grocery shopping. *International Journal of Consumer Studies*, *32*(2), 128-137.

Hargreaves, T., Nye, M., & Burgess, J. (2008). Social experiments in sustainable consumption: an evidence-based approach with potential for engaging low-income communities. *Local Environment*, *13*(8), 743-758.

Häubl, G., & Trifts, V. (2000). Consumer decision making in online shopping environments: The effects of interactive decision aids. *Marketing science*, *19*(1), 4-21.

Huber, J., Holbrook, M. B., & Kahn, B. (1986). Effects of competitive context and of additional information on price sensitivity. Journal of Marketing Research, 23(3), 250-260.

Isenhour, C., & Ardenfors, M. (2009). Gender and sustainable consumption: policy implications. *International Journal of Innovation and Sustainable Development*, *4*(2-3), 135-149.

Javadi, M. H. M., Dolatabadi, H. R., Nourbakhsh, M., Poursaeedi, A., & Asadollahi, A. R. (2012). An analysis of factors affecting on online shopping behavior of consumers. *International Journal of Marketing Studies*, *4*(5), 81.

Kahneman, D. (2011). *Thinking, fast and slow*. Macmillan.

Keller, C., Markert, F., & Bucher, T. (2015). Nudging product choices: The effect of position change on snack bar choice. *Food Quality and Preference*, *41*, 41-43.

Kohavi, R., & Longbotham, R. (2007). Online experiments: Lessons learned. *Computer*, *40*(9), 103-105.

Lee, Y. K., Kim, S., Kim, M. S., & Choi, J. G. (2014). Antecedents and interrelationships of three types of pro-environmental behavior. *Journal of Business Research*, *67*(10), 2097-2105.

Machín, L., Arrúa, A., Giménez, A., Curutchet, M. R., Martínez, J., & Ares, G. (2018). Can nutritional information modify purchase of ultra-processed products? Results from a simulated online shopping experiment. *Public health nutrition*, *21*(1), 49-57.

Maniatis, P. (2016). Investigating factors influencing consumer decision-making while choosing green products. *Journal of Cleaner Production*, *132*, 215-228.

Marriott, H. R., & Williams, M. D. (2018). Exploring consumers perceived risk and trust for mobile shopping: A theoretical framework and empirical study. *Journal of Retailing and Consumer Services*, *42*, 133-146.

Marteau, T. M., Ogilvie, D., Roland, M., Suhrcke, M., & Kelly, M. P. (2011). Judging nudging: can nudging improve population health?. Bmj, 342.

Meise, J. N., Rudolph, T., Kenning, P., & Phillips, D. M. (2014). Feed them facts: Value perceptions and consumer use of sustainability-related product information. *Journal of Retailing and Consumer Services*, *21*(4), 510-519.

Ming-Shen, W., Chih-Chung, C., Su-Chao, C., & Yung-Her, Y. (2007). Effects of online shopping attitudes, subjective norms, and control beliefs on online shopping intentions: A test of the theory of planned behaviour. *International Journal of Management*, *24*(2), 296.

Mirsch, T., Lehrer, C., & Jung, R. (2017). Digital nudging: Altering user behavior in digital environments. *Proceedings der 13. Internationalen Tagung Wirtschaftsinformatik (WI 2017)*, 634-648.

Moisander, Johanna. "Motivational complexity of green consumerism." *International journal of consumer studies* 31.4 (2007): 404-409.

Nguyen, T. N., Lobo, A., & Greenland, S. (2016). Pro-environmental purchase behaviour: The role of consumers' biospheric values. *Journal of Retailing and Consumer Services*, *33*, 98-108.

Olstad, D. L., Goonewardene, L. A., McCargar, L. J., & Raine, K. D. (2014). Choosing healthier foods in recreational sports settings: a mixed methods investigation of the impact of nudging and an economic incentive. International Journal of Behavioral Nutrition and Physical Activity, 11(1), 6.

Pagiaslis, A., & Krontalis, A. K. (2014). Green consumption behavior antecedents: Environmental concern, knowledge, and beliefs. *Psychology & Marketing*, *31*(5), 335-348.

Peattie, K. (2010). Green consumption: behavior and norms. *Annual review of environment and resources*, *35*, 195-228.

Saifi, R. (2019, September 17). The Future of Online Grocery Shopping. Retrieved from https://www.influencive.com/the-future-of-online-grocery-shopping/

Salazar, H. A., Oerlemans, L., & van Stroe-Biezen, S. (2013). Social influence on sustainable consumption: evidence from a behavioural experiment. *International Journal of consumer studies*, *37*(2), 172-180.

Schultz, P. W. (2001). The structure of environmental concern: Concern for self, other people, and the biosphere. *Journal of environmental psychology*, *21*(4), 327-339.

Simpson, J. A., Weiner, E. S. C., & Oxford University Press. (1989). The Oxford English Dictionary. Oxford: Clarendon Press.

Tanner, C., & Wölfing Kast, S. (2003). Promoting sustainable consumption: Determinants of green purchases by Swiss consumers. *Psychology & Marketing*, *20*(10), 883-902.

Thalheimer, W., & Cook, S. (2002). How to calculate effect sizes from published research: A simplified methodology. *Work-Learning Research*, *1*, 1-9.

Terlau, W., & Hirsch, D. (2015). Sustainable consumption and the attitude-behaviour-gap phenomenon-causes and measurements towards a sustainable development. *International Journal on Food System Dynamics*, *6*(3), 159-174.

Thaler, R. H., & Sunstein, C. R. (2009). *Nudge: Improving decisions about health, wealth, and happiness*. Penguin.

Tsen, C. H., Phang, G., Hasan, H., & Buncha, M. R. (2006). GOING GREEN: A STUDY OF CONSUMERS'WILLINGNESS TO PAY FOR GREEN PRODUCTS IN KOTA KINABALU. *International Journal of Business and Society*, *7*(2), 40.

Vermeir, I., & Verbeke, W. (2008). Sustainable food consumption among young adults in Belgium: Theory of planned behaviour and the role of confidence and values. *Ecological economics*, *64*(3), 542-553.

Watkins, L., Aitken, R., & Mather, D. (2016). Conscientious consumers: a relationship between moral foundations, political orientation, and sustainable consumption. *Journal of Cleaner Production*, *134*, 137-146.

Weigel, R., & Weigel, J. (1978). Environmental concern: The development of a measure. *Environment and behavior*, *10*(1), 3-15.

Young, W., Hwang, K., McDonald, S., & Oates, C. J. (2010). Sustainable consumption: green consumer behaviour when purchasing products. *Sustainable development*, *18*(1), 20-31.

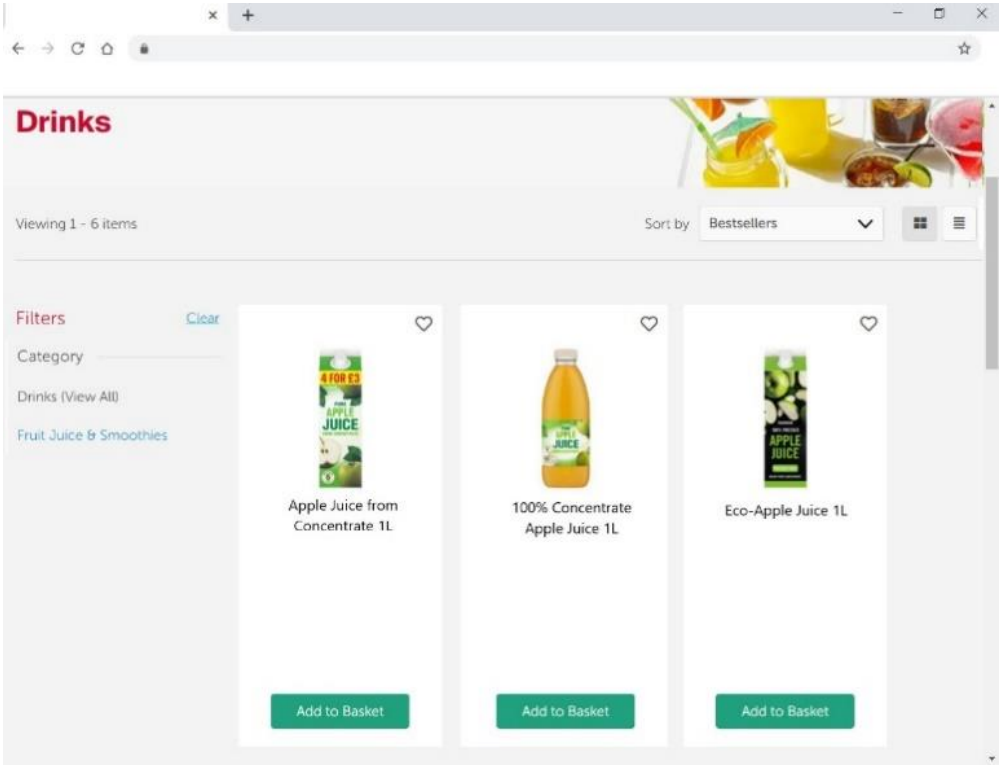
Zhou, L., Dai, L., & Zhang, D. (2007). Online shopping acceptance model-A critical survey of consumer factors in online shopping. *Journal of Electronic commerce research*, *8*(1).

Appendices

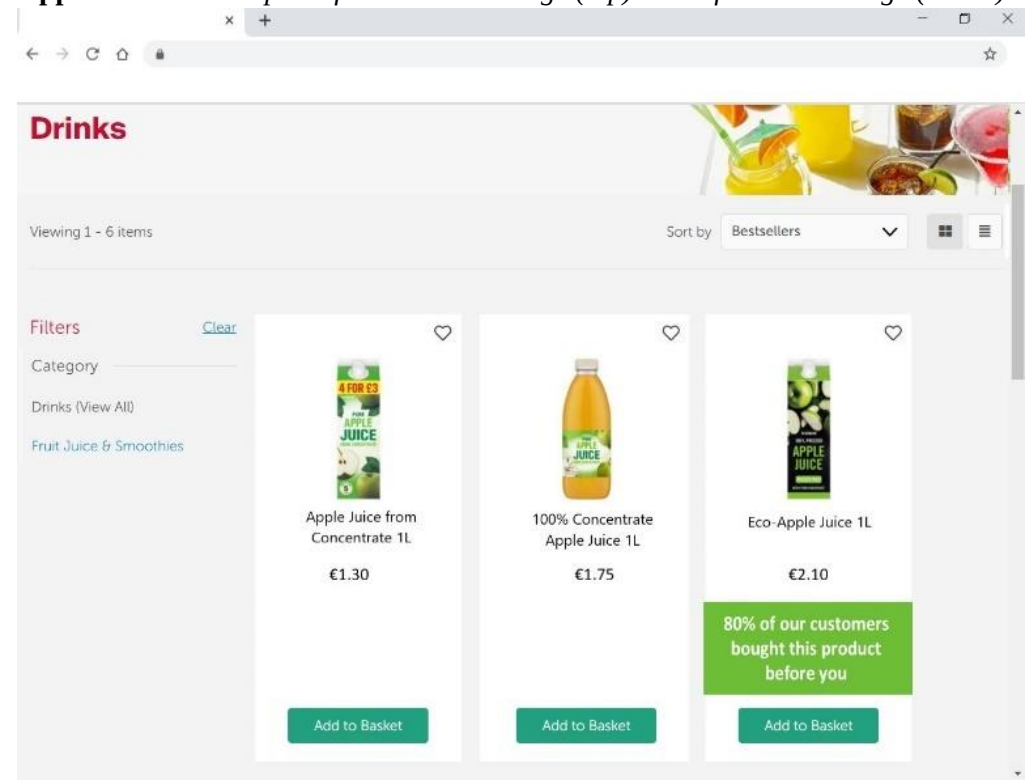
Appendix A – *Overview of the ten different product categories*

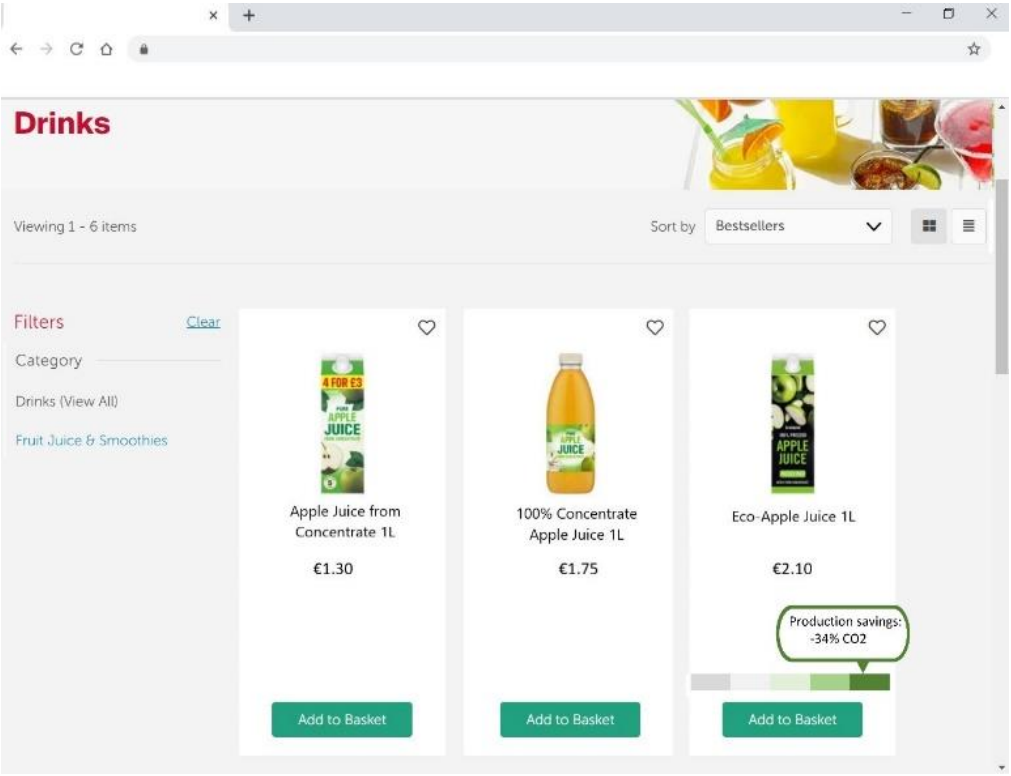
1. Tomatoes
2. Milk
3. Bananas
4. Cheese
5. Sausages
6. Mixed Peppers
7. Biscuits
8. Olive Oil
9. Cereal
10. Apple Juice

Appendix B – *experimental design, basic decision-making environment*

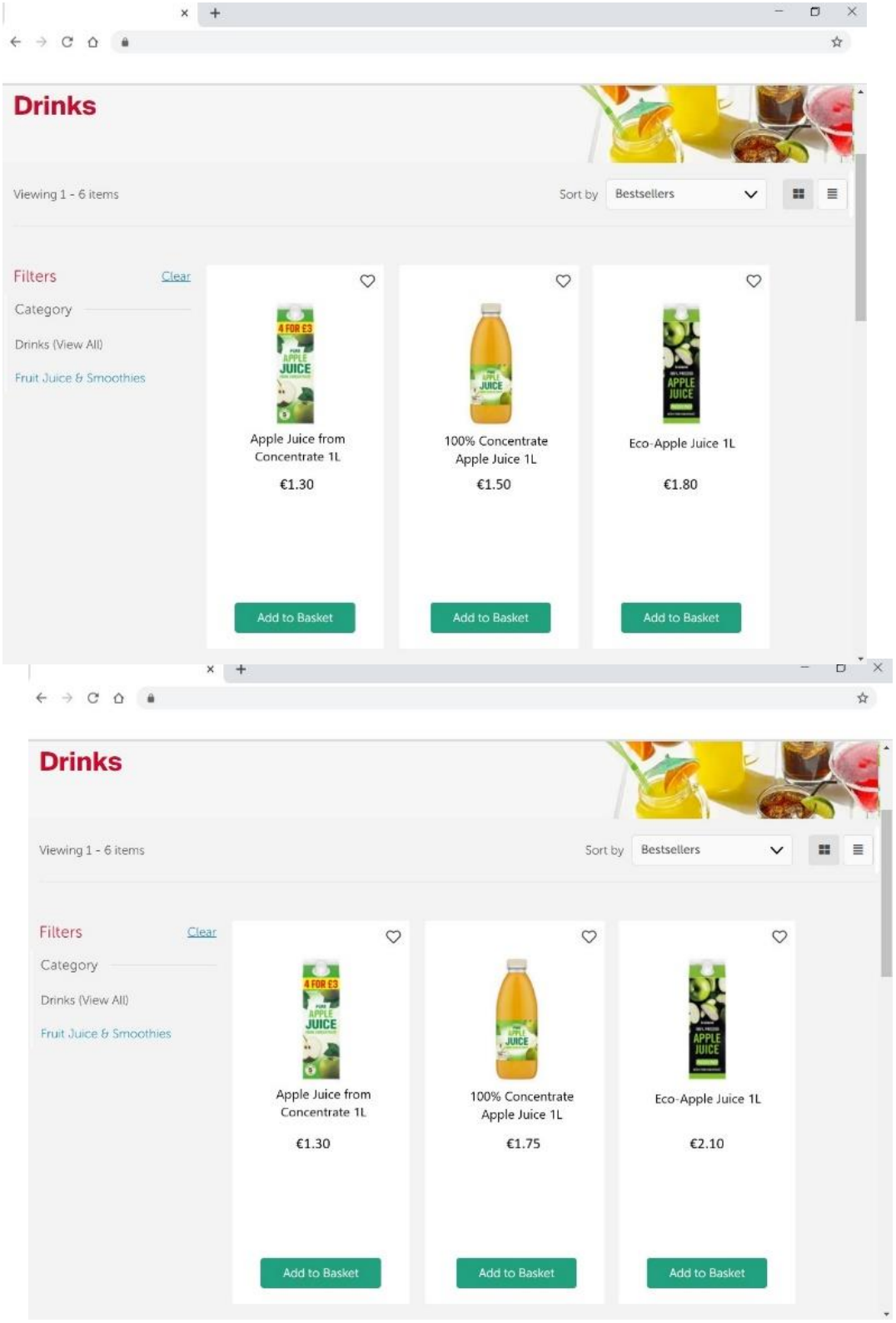


Appendix C – *Examples of social norm nudge (top) and information nudge (below)*





Appendix D – *Example of price difference (in this case: control group), small difference (left) & large difference (right)*



Appendix E – *Overview of distribution of prices per product category (left: highpdif = 1, right: highpdif = 0)*

Category	Left	Center	Right
Tomatoes	€2.30	€3.05	€3.65
Milk	€1.90	€1.15	€1.60
Bananas	€1.80	€1.20	€1.50
Cheese	€3.80	€3.05	€4.60
Sausage	€2.90	€3.80	€4.80
Mixed Pepper	€2.15	€2.50	€1.80
Biscuits	€1.15	€0.75	€0.95
Olive Oil	€5.70	€4.60	€3.75
Cereal	€2.50	€3.20	€2.80
Apple juice	€1.30	€1.75	€2.10

Category	Left	Center	Right
Tomatoes	€2.30	€2.50	€2.80
Milk	€1.60	€1.15	€1.40
Bananas	€1.50	€1.20	€1.35
Cheese	€3.40	€3.05	€3.80
Sausage	€2.90	€3.35	€3.70
Mixed Pepper	€2.00	€2.20	€1.80
Biscuits	€0.95	€0.75	€0.85
Olive Oil	€4.70	€4.20	€3.75
Cereal	€2.50	€3.00	€2.70
Apple juice	€1.30	€1.50	€1.80

Appendix F – *Survey Design (shortened)*

Page 1: Introduction

You are invited to participate in this study about online grocery shopping. Your participation in this study is completely voluntary. If you feel uncomfortable answering any questions, you can withdraw from the survey at any point.

Your responses will be strictly confidential and anonymous and used for purposes of this research only. If you have questions at any time about the survey or the procedures, you may contact the researcher by email at the address specified at the end of the survey.

This research consists of two parts. In part 1 (the experiment) you are asked to make ten product choices, in part 2 questions are asked regarding different topics. In total the survey will take 5-6 minutes to finish.

Thank you very much for your time and support, it means a lot to me. Please start with the survey now by clicking on the button below.

Page 2: Important information about Part 1

*Imagine yourself wanting to buy some groceries. You decide to buy your groceries online this time. You have a budget of **30 euros**.*

There are ten different products on your shopping list, and you want to buy one product in each product

category. In the next section these choices are displayed. Please make your choices as you would do in real life as well. Good luck!

Control Question: What is your budget?

A. €30, B. €40, C. €25

Page 3: 10 Product decision making questions (examples in previous appendices)

Example Question: You want to buy some tomatoes, which option do you prefer?

A…Left, B. Center, C. Right

Page 4: Questions regarding other variables:

You have just completed part 1, this means that you are almost there! In part 2 questions regarding various topics are asked. This will take approximately 3-5 minutes.

Sustainability
The next set of questions refer to you attitudes towards sustainability.

Q65 I am concerned about the environmental problem because of the consequences for...

	Strongly disagree (1)	*Disagree (2)*	*Neither agree nor disagree (3)*	*Agree (4)*	*Strongly agree (5)*
Plants (1)	○	○	○	○	○
Animals (2)	○	○	○	○	○
My Lifestyle (3)	○	○	○	○	○
My health and future (4)	○	○	○	○	○
Other people (5)	○	○	○	○	○
Future generations (6)	○	○	○	○	○

Online grocery shopping

The next set of questions refer to your attitudes and experiences with online grocery shopping.

How often do you use online grocery services?

A. Always, B. Occasionally, C. Sometimes, D. Rarely, E. Never

Please rank the following statements from 1 to 5 (Strongly disagree - Strongly agree)

	Strongly disagree (1)	*Somewhat disagree (2)*	*Neither agree nor disagree (3)*	*Somewhat agree (4)*	*Strongly agree (5)*
Sustainable products are of lower quality than unsustainable products (1)	○	○	○	○	○
Online grocery shopping is more convenient than regular supermarket shopping (2)	○	○	○	○	○

Please rank the following statements from 1 to 5 (Strongly disagree - Strongly agree)

	Strongly disagree (1)	*Somewhat disagree (2)*	*Neither agree nor disagree (3)*	*Somewhat agree (4)*	*Strongly agree (5)*
I like to shop with my family and/or friends (1)	○	○	○	○	○
If others shop online, I am more likely to do that as well (2)	○	○	○	○	○
When I make a purchase my friend's opinion is important to me (3)	○	○	○	○	○
I will have no problem in buying sustainable products if I get to know that my friends and relatives are doing it as well (4)	○	○	○	○	○

Please rank the following statements from 1 to 5 (Strongly disagree - Strongly agree)

	Strongly disagree (1)	*Somewhat disagree (2)*	*Neither agree nor disagree (3)*	*Somewhat agree (4)*	*Strongly agree (5)*
When grocery shopping, I always end up with the same products in my basket (1)	○	○	○	○	○
I love to try new alternatives for previously bought products (2)	○	○	○	○	○
In grocery shopping I have become more sustainable-minded (3)	○	○	○	○	○
I always buy groceries at a real supermarket (4)	○	○	○	○	○

Page 4: Personal Characteristics

This last set of questions refer to your personal characteristics.

What is your age?

_____

How would you describe your gender?

▼ *Male (1) ... Other (3)*

How would you describe your living environment?

▼ *Urban (1) ... Rural (2)*

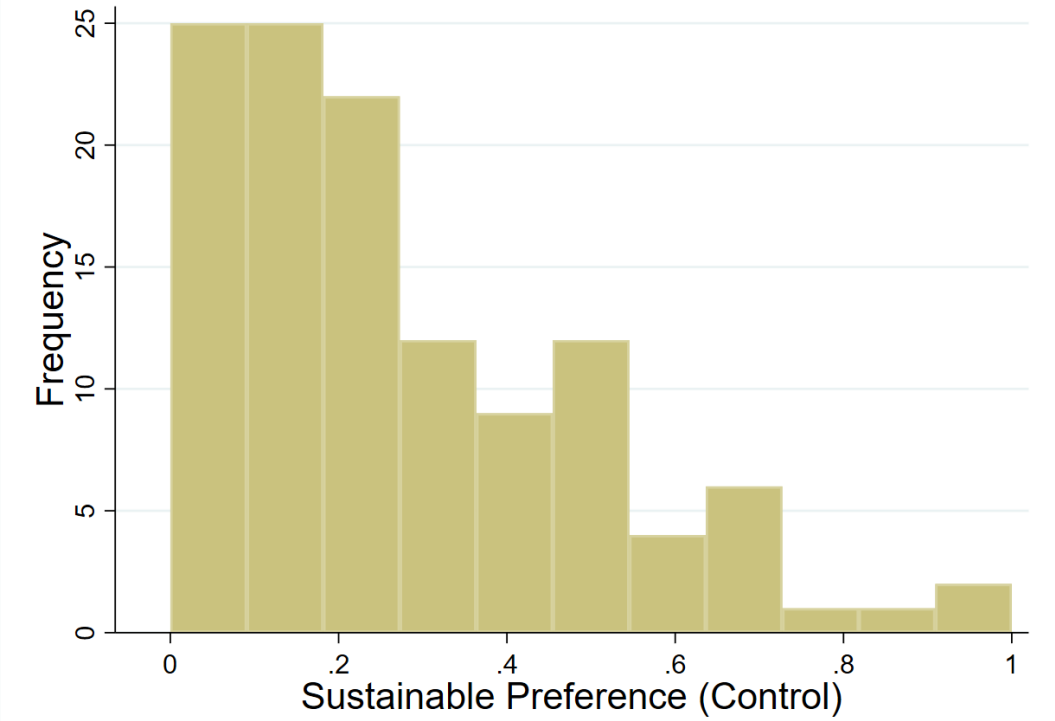
What is the highest degree or level of educational you have completed?

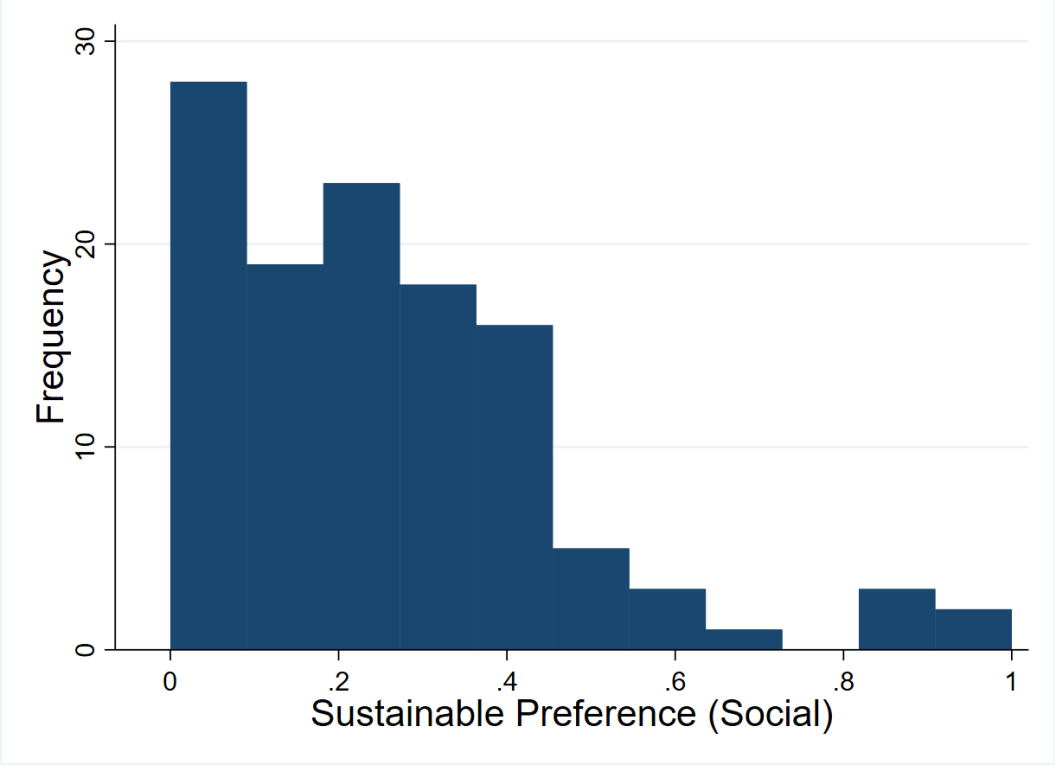
▼ *High school or below (1) ... Other (6)*

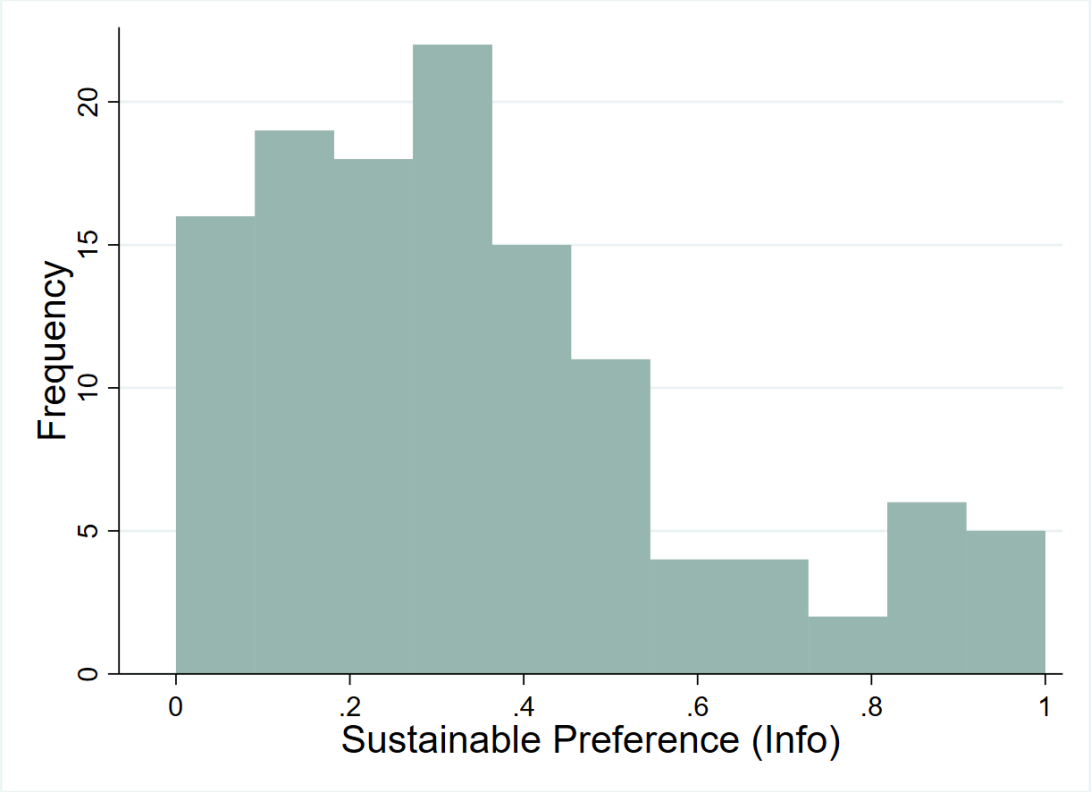
What is your current employment status?

▼ *Employed full-time or part-time (1) ... Unable to work (7)*

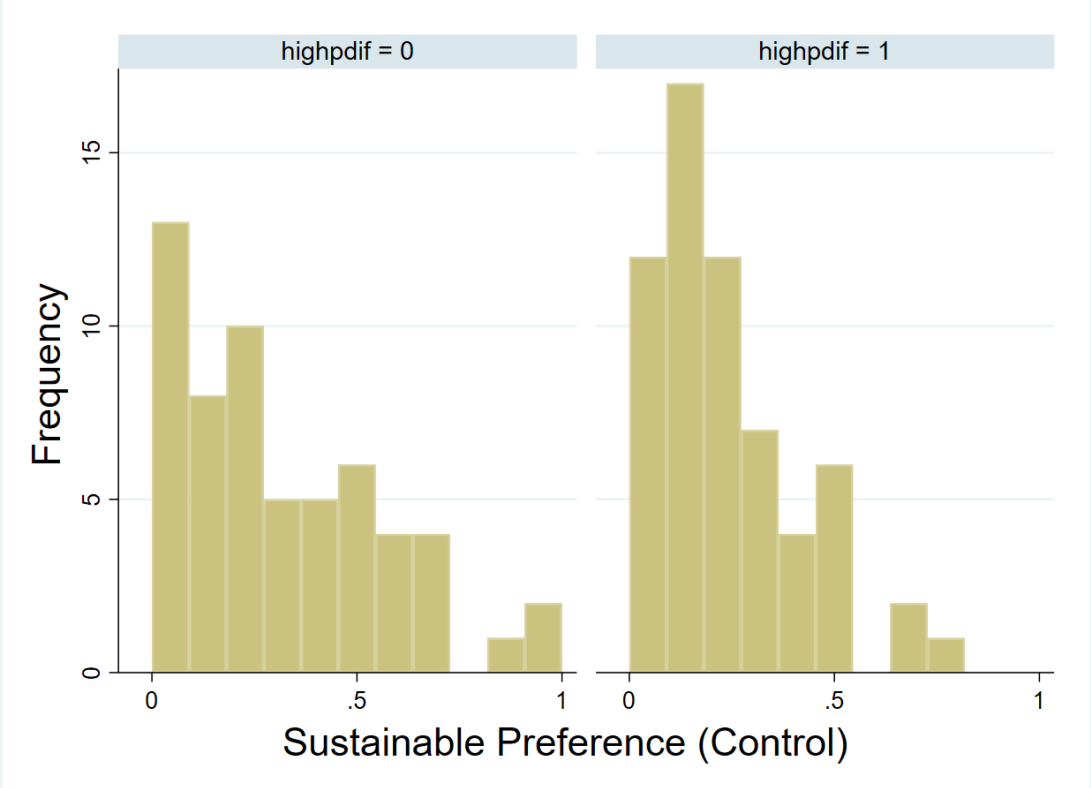
Appendix G – Frequency histograms of sustainable preference per group (Control, Social and Info)

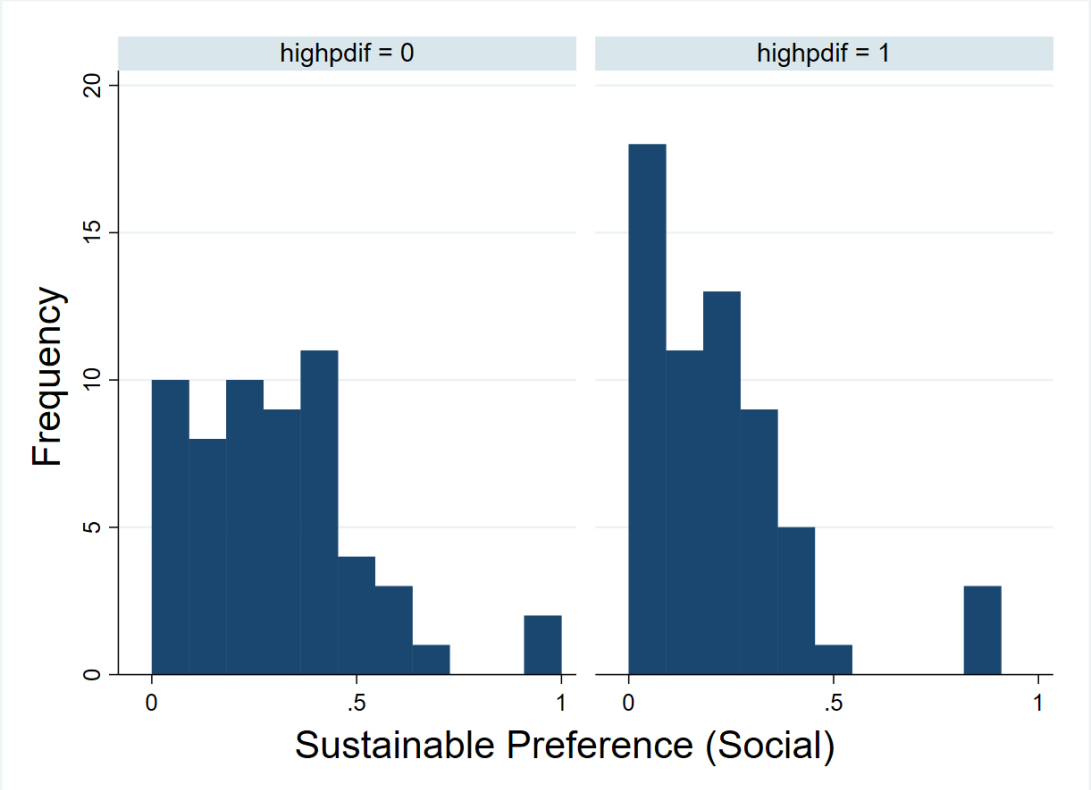






Appendix H – Frequency histograms of sustainable preference per group (Control, Social and Info) distinguished by the variable *highpdif*

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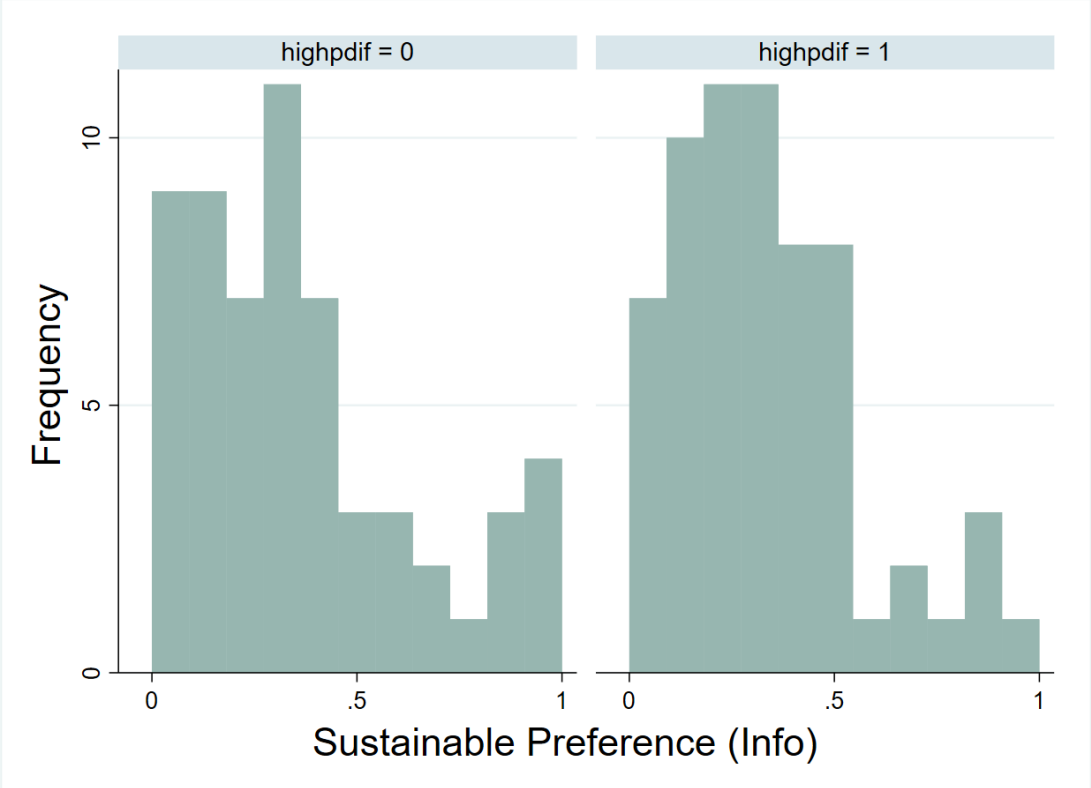
highpdif = 1
Frequency
0
5
10
15
20
0
.5
1
Sustainable Preference (Social)


highpdif = 0
highpdif = 1
Frequency
0
5
10
0
.5
1
Sustainable Preference (Info)

Appendix I – Price elasticities for each product category

Product category	*Control*	*Social*	*Info*
Tomatoes	-2.86	-5.01	0.86
Milk	1.00	-1.58	-0.53
Bananas	-4.50	-7.71	-0.27
Cheese	-14.38	-2.46	-7.67
Sausage	-3.27	-2.18	1.39
Mixed Pepper	-1.96	-0.56	1.49
Biscuits	-3.14	-2.40	-1.82
Olive Oil	-2.28	-5.70	-1.43
Cereal	-0.94	-2.29	2.37
Apple juice	3.94	-1.56	-0.61
Average	**-2.84**	**-3.14**	**-0.62**

Appendix J – Comparison between conceptual model and experiment conditions

Conceptual Model	How used in this experiment?
Price	Using *highpdif*, participants either received either large or small differences between prices
Information availability	Controlled for by not including
Time	Controlled for by not including
Environmental Concern	Measured and used in linear regression
Habits	Measured and used in linear regression
Personal characteristics	Categorical variables measured and used in linear regression
Perceived inconvenience	Measured and used in linear regression