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**The influence of digital nudging on sustainable consumption in the purchasing of householding products**

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# Preface

Here, I present you the end result of this research about digital nudging of sustainable consumption behavior. I was engaged in writing and researching this thesis from January 2020.

From a young age, I have an interest in entrepreneurship and I am very passionate about sustainability. Therefore, I wanted to craft this research on my own. I wanted to choose for a topic that would help me further in the next phase of my life. After graduation I am starting a sustainable, zero-waste webshop. Therefore, I have chosen for the topic ‘digital nudging’, because I would like to apply the knowledge I gained from this research into practice. Writing this thesis was an interesting, and very informative journey. I cannot deny it was easy, but looking back I am very proud.

First of all, I would like to thank my supervisor Amanda Porter, who always gave me very valuable feedback, which brought my thesis to the next level. She taught me how to stay critical and not take everything for granted in the academic world. I also would like to thank Joey van Angeren, who helped me to revise my quantitative skills during the quant course, but also for giving feedback about my experimental design.

Last, I would like to thank my family, friends, roommates, and fellow students, for the support throughout the whole process.

I hope you enjoy reading!

Simone Kuijer

Amsterdam, July 15, 2020

# Abstract

Household consumptionin industrial countries is identified as one of the main causes of environmental problems. At the same time, e-commerce is growing at an unprecedented rate and online shopping is swiftly becoming a preferred way to shop for consumers. The majority of consumers are willing to change their consumption behavior, but there is an inconsistency between the consumers’ attitude and their consumption behavior. This study aims to narrow this so-called attitude-behavior gap by researching the influence of digital nudging. Building on existing literature of nudging, this study asks: How is sustainable consumption influenced by digital nudging in the purchasing of householding products? Digital nudging can be defined as a tool to influence decision-making in a predictable way by counteracting the cognitive boundaries that hinder individuals from acting to their own benefit in a digital environment.

Based on the review of the literature on sustainable consumption and digital nudging, an online experiment and a survey were conducted. This research conducted an online experiment and examined the effect of digital nudging on sustainable consumption in a realistic shopping environment. Participants were randomly assigned to a control condition and four nudging conditions: control, default, descriptive norms, descriptive norms plus feedback, and feedback condition. Furthermore, this research investigated the moderating role of green self-identity. The findings demonstrated that all nudging conditions had a significant positive influence in the purchasing of sustainable householding products, compared to the control condition. Green self-identity does not influence sustainable consumption. The results highlight the potential of digital nudging as a tool to influence sustainable consumption. It also suggests that digital nudging is almost more prevalent than the green self-identity of a consumer. Further research is needed to examine different ways to perform digital nudging in e-commerce and the ethical implications.

Keywords: digital nudging, sustainable consumption behavior, e-commerce, householding products

# Introduction

The decisions people make about their consumption behavior have a direct and indirect impact on the environment, our personal and our collective well-being. Unilever estimates that almost 70% of its carbon dioxide footprint depends on the customers’ product choice and whether they use and dispose of them in a sustainable way (White, Hardisty, & Habib, 2019). This is one of the reasons why the topic of ‘sustainable consumption’ has become a central focus in national and international policy (Jackson, 2005; Barbarossa & De Pelsmacker, 2016). In addition, the United Nations ‘Sustainable Development Goals’ (SDG) number twelve also addresses the need for sustainable production and consumption. Specifically, household consumptionin industrial countries is identified as one of the main causes of environmental problems (UNEP, 2010). On top of that, the European Environment Agency (2012) even described household consumption as “the mother of all environmental issues” (p.1).   
 E-commerce is growing at an unprecedented rate all over the globe. As a consequence, consumer shopping habits have changed drastically over the last few years. Online shopping is swiftly becoming a preferred way to shop for consumers. This trend is expected to continue growing. In 2020, the number of people buying digitally is expected to be 2.05 billion (Statista, 2017). That makes 26,28% of the 7,8 billion people in the world. In other words, one out of four of the worldwide population can be considered as an online shopper.  
 But as the e-commerce industry grows, so does its environmental impact. The majority of consumers are willing to change their consumption behavior, “yet a frustrating paradox remains at the heart of green businesses” (White et al., 2019, p.1). One recent survey shows that 65% of the people want to buy purpose-driven brands that advocate sustainability, yet only about 26% actually do so (White et al., 2019). However, despite the consumers and policy maker’s increased concerns about environmental issues, the current market shares of environmentally friendly products are still fairly low: approximately 1–6% (Barbarossa & De Pelsmacker, 2016; Nielsen, 2011). This illustrates the presence of the attitude-behavior intention gap, which means that consumers are willing to buy green products, but they end up not buying these products (Vermeir & Verbeke, 2006). To close this gap, researchers are increasingly studying how the consumer can be influenced to sustainable consumption behavior. This study aims to explore the important issue of how to promote sustainable household consumption through digital nudging. Specifically, this study focuses on householding products (e.g., eco-friendly washing detergent). Until recently, prior research has primarily focused on investigating nudges in offline choice environments (Schneider, Weinmann, & Vom Brocke, 2018). Thaler and Sunstein (2003) describe nudging as *“[...] an approach that preserves freedom of choice but that authorizes both private and public institutions to steer people in directions that will promote their welfare*” (p. 179). Today, there is an increasing interest in the topic of digital nudging by researchers, as more decisions are taken on screens (Djurica & Figl 2017; Mirsch, Lehrer, & Jung, 2018; Weinmann, Schneider, & Vom Brocke, 2016). The adoption of nudging in a digital environment is denoted as digital nudging and described by Mirsch, et al., (2018) *“Digital nudging can be defined as the attempt to influence decision-making, judgment, or behaviour in a predictable way by counteracting the cognitive boundaries, biases, routines, and habits that hinder individuals from acting to their own benefit in the digital sphere” (p.3).* However, digital nudging is still in its early stages (Weinmann et al., 2016).   
 The goal is to develop insights about the influence of digital nudging on sustainable consumption of householding products. This study will be performed by testing several digital nudging strategies in an online shopping environment. The digital nudges used in this study are (1) default, (2) descriptive norms, a combination of (3) descriptive norms, and feedback. Last, (4) feedback is tested on its own as well. A example of a digital nudge, like ‘descriptive norms’, is that you are told how other people behave to the norm, which in order influences your behavior. A specific example of such a nudge that is presented in a digital choice environment: ‘9 out of 10 people in the Netherlands contribute to a better environment by buying sustainable householding products, are you in?’. Later in this research will the digital nudges be discussed in detail.   
 Nudge has been recently promoted as a promising tool for advancing sustainable consumption (Sunstein, 2014), because nudge tools do not restrict consumer choice as much as other measures, e.g. choice editing, which is actively limiting the consumers’ product choice (Lehner, Mont, & Heiskanen, 2016). Most of the studies concerning nudging were conducted in an offline setting, so it is not yet clear which digital nudge would succeed in a digital environment. As we buy more products online, consumers can be nudged digitally in the right direction to make more sustainable consumption decisions. In addition, there is a wide range of digital nudging principals available, which can be applied and customized to specific use cases. For this reason, digital nudging becomes very important to improve sustainable online consumption decisions. Therefore, this research aims to investigate the following question:

*RQ: How is sustainable consumption influenced by digital nudging in the purchasing of householding products?*

In light of the research aim, a quantitative study will be presented by means of a survey and experiment which measures the influence of digital nudging on the consumption of sustainable householding products for consumers (n=201) in the Netherlands. The study will be conducted in a realistic online shopping environment in a webshop called *The Store*. The data is analyzed using a general linear model.

The contribution of this paper is twofold. From a theoretical perspective, this study contributes to the digital nudging literature by showing the effectiveness of several digital nudges in a digital experiment in an e-commerce setting. As mentioned before, digital nudging is still in its early stages (Weinmann et al., 2016). This research explores the potential of digital nudges executed in a webshop and to what extent it can enhance sustainable consumption online. By this means, this research helps to close the attitude-behavior gap by indicating how digital consumption can be designed to help initiate sustainable consumption behavior. Moreover, a deeper understanding of the psychological effects at play in human decision making and behaviors helps UI designers to develop theoretically-based nudges to increase the sales of sustainable products.   
 From a practical perspective, the concept of digital nudging provides new stimuli for online business owners, UI, and UX designers (Weinmann, et al. 2016). As discussed before, nudging is a promising tool for advancing sustainable consumption (Sunstein, 2014) and there is an increasing interest in the topic of digital nudging by researchers, as more decisions are taken on screens (Djurica & Figl 2017; Mirsch, Lehrer, & Jung, 2018; Weinmann et al., 2016). This research provides new insights for these practitioners about digital nudging how they could design their webshop in a specific manner, with the goal to promote sustainable products online. Finally, this research shows creative ways of how UI and UX designers could experiment with digital nudging in a fast and cost-effective way.

This paper proceeds as follows. The first chapter presents the theoretical background of sustainable consumption behavior and digital nudging. Subsequently, this thesis continues by formulating the hypothesis, which leads to the conceptual framework. The following chapter discusses the methodology and the subsequent chapter gives a representation of the results. Last, this paper concludes with the results and discussion, including implications for theory and practice.

# Literature Review and Conceptual Framework

This chapter provides an overview of the theoretical literature used in the development of the research model. Furthermore, the hypotheses for this study are developed in order to set a conceptual foundation for the research.

**Sustainable consumption behavior** Sustainable consumption behavior relates to consumption activities that benefit, or cause less harm to the environment than substitutable activities (Ebreo, Hershey, & Vining, 1999; Pieters, 1991). As mentioned before, there is an inconsistency between the consumers’ attitude and their consumption behavior, the so-called attitude-behavior gap (Vermeir & Verbeke, 2006). Consumers have the intention to behave pro-environmental, but many of them do not engage in actual green behavior (Hanss, Böhm, Doran, & Homburg, 2016; Peattie, 2010). For example, 46–67% of UK citizens showed a favorable attitude toward organic foods, but the actual purchases were around 4–10% (Hughner, McDonagh, Prothero, Shultz, & Stanton, 2007; Young, Hwang, McDonald, &, Oates, 2009). The attitude-behavior gap explains why sustainable products often have a low market share. For example, sustainable householding products, such as laundry detergent and floor cleaner, have a market share below 5% in the USA. (Kronthal-Sacco & Whelan, 2009).   
 There is a lack of consensus in the literature about the factors causing the attitude-behavior gap (Shaw, McMaster, & Newholm, 2016). Davie, Lee, & Ahonkhai (2012) elaborate that the literature can be split into two distinct groups: those who believe that the gap is associated with research errors, and those identifying barriers to cognitive decision-making. In addition, there is considerable ambiguity in the understanding of how consumers actually choose products (Tukker, Cohen, Hubacek, & Mont, 2010). However, the goal of this research is not to elaborate on the factors that explain sustainable consumption behavior, but how to influence such behavior. Questions related to how consumers can change towards sustainable consumption behavior and how they can be influenced to make more sustainable choices have been investigated over the last couple of decades (Tukker et al., 2010). According to Tukker et al. (2010), the various factors, which influence environmentally conscious behavior that attracted attention, are:

The first factor that influences environmentally conscious behavior is to increase consumer’s environmental knowledge. Many studies have shown that environmental knowledge generally influences pro-environmental attitudes, which consequently motivates environmentally responsible consumption behavior (Haron, Paim, & Yahaya, 2005: Moisander, 2000). In contrast, providing consumers with information has not been proven a successful means to promote environmentally behavior (Ölander & Thøgersen, 2014). Moreover, Ölander and Thøgersen (2014) discuss that too much information can even counteract environmentally behavior. In addition, some scholars agree that only a small fraction of pro-environmental behavior can be directly linked to environmental knowledge and awareness (Kollmuss & Agyeman, 2002). Last, it might also be necessary to make a distinction between consumers’ level of knowledge about an environmental issue, because it has a significant impact on decision making (Kaplan, 1991). All in all, there is ambiguity about whether environmental knowledge influences environmentally conscious behavior.

The second factor is to shift consumers attitudes through awareness campaigns. Research indicates that consumer awareness and sustainability-focused value orientation have a direct positive influence on sustainable consumption behavior (Buerke, Straatmann, Lin-Hi, & Müller, 2017). Hansen and Schrader (1997) argue that consumer awareness is a necessary prerequisite for a change in sustainable consumption behavior. According to this research, a certain level of awareness was already realized among German consumers on an abstract level. Two decades ago, research has shown that 75% of German consumers strongly believed that users are able to exercise considerable pressure on producers (Imug, 1997). Despite the awareness among consumers, it failed to gain ground over the past decades, since consumption is still an important topic in the sustainability debate. Overall, this study illustrates that it remains an important task to turn this awareness into sustainable action.

The third factor is to alter the symbolic meaning of consumption by making sustainability a value. For example, attach new sustainability values ​​to certain consumer goods, such as equality, human rights, and care for nature (Tukker et al., 2010). Alternative, sustainable values should be articulated to consumption through activities of the government, NGO’s and consumer associations e.g. actions by the government to set the standard by promoting anti-smoking campaigns (Tukker et al., 2010). Comparably, the efforts of prominent figures such as Al Gore (2006), Nicholas Stern (2007), and Greta Thunberg (2019) have called for action on the climate crisis through effective use of the media. In addition, the United Nations also contributed to change the public opinion towards climate change through the Millenium Goals. These examples of actions by different people and groups have moved the consumer’s mind towards a greater urgency to act on climate change (Tukker et al., 2010). Unfortunately, there is still a need to translate this urgency into action.

The fourth factor that influences environmentally conscious behavior is to change consumers’ habits and routines. Changing a habit is difficult, even if this new behavior has advantages over the old one (Kollmuss & Agyeman, 2002). An example to change habits and routines is through public campaigns. According to Gram-Hanssen (2008), it appears to have a positive influence on sustainable behavior, for instance by shutting of standby power. However, Verplanken and Wood (2006) give some reasons why communication measures might not be effective in influencing habitual behavior. First of all, people with strong habits expect prior experiences to be repeated. Moreover, the automatic activation of habits is probably also the reason why habitual performance is so often perpetuated instead of taking an alternative course of action (Orbell & Verplanken, 2010). Taken together, the ‘automaticity’ of everyday consumption activities and the stability of the daily context make it difficult to trigger consumers to change unsustainable consumption behavior (Schäfer, Jaeger-Erben, & Bamberg, 2012).

The fifth and the last factor is to create a window of opportunity for behavioral changes. According to social scientists, habits and routines are often changed by disruptive events or other ‘windows of opportunities’ (Tukker et al., 2010). These life events can provide a new foundation for an alternative - and more sustainable - consumption behavior (e.g., Schäfer et al., 2012). A contemporary example is the *Covid-19 crisis*. This life event has disrupted our everyday lives, which could give a positive stimulant for sustainable behavior change. Sustainable consumption has gained momentum over the last years and the Covid-19 crisis could be a tipping point towards more sustainable consumption choices (Boons et al., 2020). However, it is still uncertain how this will evolve in the future because we do not have control over disruptive life events.

Given the diversity of these viewpoints, there might not be one broadly applicable solution to influence sustainable consumption behavior. Previously discussed literature on sustainable consumption assumes rational decision making. This means that the consumer has perfect information to make the right product choice. However, the idea of rational choice is a misconception (Simon, 1955). At least 80% of the motives for sustainable or unsustainable behavior appears to be situational factors and other internal factors, such as economic constraints or social pressure (Fliegenschnee & Schelakovsky, 1998; Kollmuss & Agyeman, 2002). The focus on changing behavior through a rational model could be the reason why we have failed so far to significantly narrow the attitude-behavior gap. Understanding sustainable consumption behavior is complex and, therefore, asks for a situational approach, because consumption behavior is the most unstable and unpredictable part of the entire supply chain (Terlau & Hirsch, 2015). Nudging offers a tool that instantly overcomes the barriers in cognitive decision-making. Moreover, digital nudging provides customizable principles to change the digital decision environment in, for example, e-commerce. It can offer a digital solution to the problem and, thereby, reduces the attitude-behavior gap.

**Nudging** Nudging is rooted in a growing body of academic research in the field of behavioral economics, which has shown that individuals often make irrational decisions because of cognitive, emotional, and social factors (Thaler & Sunstein, 2009). This is in contrast with the traditional economic theory, which suggests that human behavior is fully rational. Prior research has shown that humans are bounded by their own cognitive limits (Simon, 1955) and heuristics and biases have an influence on our decision-making (Tversky & Kahneman, 1974). The dual-process theory provides the theoretical foundation for nudging (Kahneman & Frederick, 2002). This Nobel Prize-Winning theory explains that humans use two cognitive systems to assess information during decision-making: System 1 and System 2. Sometimes people rely on System 1, which is fast, heuristic-based, intuitive, and effortless. In other situations, people rely on System 2, which is slower, rule-based, analytical, and controlled (Evans & Stanovich, 2013). Nudge theorists discuss that the reason why people make poor lifestyle decisions is usually because System 1 is activated (Sunstein, 2014; Thaler & Sunstein, 2009). Based on these insights from behavioral economics, Thaler and Sunstein (2009) introduce nudging as a notion that influences human behavior by consciously designing choice environments. In agreement with libertarian paternalism, nudges should benefit the decision-maker, retain the full freedom of choice, and be easily avoidable (Thaler & Sunstein 2009). Libertarian paternalism is the idea that the government can positively influence the behavior of its citizens, while also respecting freedom of choice (Sunstein, 2014). In addition, these features contribute to the fact that individuals often not actively perceive nudges, which is for example not the case with choice editing. Thaler and Sunstein (2009) provide the following definition:

*“A nudge, as we will use the term, is 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. To count as a mere nudge, the intervention must be easy and cheap to avoid. Nudges are not mandates. Putting fruit at eye level counts as a nudge. Banning junk food does not”* (p.6).

Researchers argue that the decision environment influences the choice made. The way an option is presented can also cause individuals to act in a predictable manner because they have the tendency to construct their preferences with regards to the immediate choice situation (Thaler & Sunstein, 2009). Therefore, a situational approach is needed that can instantly respond to different decision environments and the unpredictability of the consumer. This also applies to the digital environment according to Weinmann et al. (2016). They discuss that there is no neutral way to present choices in offline environments and in online environments because the design of digital choice environments always influences people’s choices.

**Digital Nudging**   
 There is a growing body of nudging, but digital nudging is still in development (Weinmann et al., 2016). “While a number of researchers have suggested guidelines for selecting and implementing nudges in offline contexts (Datta & Mullainathan, 2014; Ly, Mazar, Zhao, & Soman, 2013; Thaler & Sunstein, 2013; etc.) information systems present unique opportunities for harnessing the power of nudging” (Schneider et al., 2018, p.70). This type of nudge in the digital environment is called a ‘digital nudge’. Digital nudging can be defined as *“the attempt to influence decision-making, judgment, or behavior in a predictable way by counteracting the cognitive boundaries, biases, routines, and habits that hinder individuals from acting to their own benefit in the digital sphere”* (Mirsch et al., 2018, p.3). Digital nudging has already been applied by different actors, such as the government, and in different industries, like energy consumption.

**Digital nudging principles** There are multiple digital nudges available, and it has a wide variety in how this is executed. Little research has been done about digital nudging and its application to the field of e-commerce. Table 1 provides a literature overview of a selection of digital nudging principles that are, amongst others, applicable to e-commerce: default, feedback, and descriptive norms.

**Table 1.** Literature overview of digital nudging principles

|  |  |  |  |
| --- | --- | --- | --- |
| **(Digital) nudging principle** | **Authors** | **Definition** | **Example** |
| **Status Quo (Defaults)** | Weinmann et al. (2016); Thaler et al. (2013); Mirsch et al. (2018); Bonini, Hadjichristidis, & Graffeo (2018); Schneider et al. (2018) | “Preselecting options by setting default options.” (Weinmann et al., 2016, p.435). | “Changing default (from opt-in to opt-out) to increase the percentage of people who consent to be organ donors” (Weinmann et al., 2016, p.435).  “Often used where defaults are set, such as on e-commerce websites with pre-selected insurance or delivery options and online product-configuration tools with pre-selected packages and options (e.g. Tesla.com)” (Mirsch et al., 2018, p.11). |
| **Giving Feedback** | Weinmann et al. (2016); Thaler et al. (2013); Bonini et al. (2018) | “Providing users with feedback when they are doing well or making mistakes” (Weinmann et al., 2016, p.435). | “Electronic road signs with smiling or sad faces depending on the vehicle’s speed” (Weinmann et al., 2016, p.435). |
| **Social Norms** | Mirsch et al. (2018); Bonini et al. (2018); Schneider et al. (2018) | “Rules and standards formed and understood by members of a group that controls social behavior. These arise, for example, through interaction with others and can, but not have to, be formulated explicitly. Individuals tend to follow others and seek approval” (Mirsch et al., 2018, p.11). | “Amazon’s recommendations for other products given on product pages based on items bought by other customers (“Customers who bought this item also bought…”). The reference to other customers sets a standard or a rule for the user to follow” (Mirsch et al., 2018, p.11). |
| **Descriptive Norms** | Demarque et al. (2015) | “The perception of the prevalence of a behavior (what most others do, what is done)” (Demarque et al., 2015, p.167). | Presenting descriptive norm information in a realistic online shopping environment: “For your information, on average, previous participants purchased at least two ecological products”. (Demarque et al., 2015, p.170). |

**The influence of digital nudges on sustainable consumption**   
 Very few studies have investigated the influence of digital nudges on sustainable consumption. Table 2 shows that only one study researched the influence of digital nudging on the consumption of sustainable products. While analyzing existing research, varying results can be derived on the impact of digital nudging on sustainable consumption (see Table 2). In general, these studies show a positive effect of digital nudging on sustainable consumption. However, these studies have tested digital nudging through online experiments under highly controlled conditions. Furthermore, given the wide range of nudges and possibilities, most of the studies concerning nudging were conducted in a conventional, offline setting, so it is not yet clear which nudges succeed in a digital environment. Due to the growth of e-commerce in which more decisions are taken digitally, digital nudging becomes extremely important in order to achieve more sustainable consumption decisions.

**Table 2**. Literature overview of the influence of digital nudging in sustainable consumption

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Paper** | **Dependent variable** | **Digital Nudge** | **Findings** | **Context** |
| **Demarque et al. (2015)** | Number of sold organic food products | Descriptive norms | “Participants presented with descriptive norms were willing to add, approximately one eco-product in their basket and to spend 10% more money.” (p.172) | Online supermarket |
| **Hedlin & Sunstein (2016)** | Enrolment rate green energy | Defaults | “In an experiment with a green default, 76% stayed with the default.” (p.172) | Energy |
| **Esposito, Hernández, van Bravel, & Vila (2017)** | The number of incompatible products purchased | Feedback (warning message) | “Results show that an emotive warning message (as opposed to no warning message) reduced the purchase of incompatible goods.” (p.11) | Gaming |
| **Székely, Weinmann, & vom Brocke (2016)** | Absolute donation and relative donation | Defaults | “Higher levels of default payments on an online flight-booking platform significantly increases the amount of carbon offset payments.” (p.1) | Carbon-offset donations |
| **Meske, Amojo, & Mohr (2020)** | Number of participants of a charity program | Defaults | “We assessed that the forced-choice nudge is significantly more effective in nudging participants to utilize charity features on an e-commerce platform.” (p.1) | E-commerce\* |

\* A charity program for a fictional platform, based on Amazon.   
  
 This research encompasses five hypotheses. First, this research hypothesizes that participants would buy more products and spend more money on sustainable householding products in the presence of the default nudge compared to the control condition. Moreover, it hypothesizes the same in the presence of two other types of digital nudges: descriptive norms and feedback. Moreover, this research hypothesizes that a combination of the descriptive norms and feedback condition would also lead to more sustainable consumption, compared to the control condition. Lastly, green self-identity moderates the relationship between digital nudge conditions and sustainable consumption. As Table 2 illustrates, most of the studies about digital nudges and sustainable consumption are conducted in different settings. An understanding of the effect of digital nudges in a digital environment can help designers lead users to the most desirable choices (Weinmann et al., 2016). This will be discussed in the following paragraphs.   
 Defaults are regarded as one of the most popular and powerful nudges (Johnson et al., 2012). Default options, i.e. ‘standard option’, are defined as pre-set courses of action that take effect when nothing is specified by the decision-maker (Thaler & Sunstein, 2009). In other words, the default option is the option in which the decision-maker will be assigned when he or she does nothing. This means that there is no effort required for the decision-maker. An example of a default option that is proven to be effective is to increase organ donors. Johnson and Goldstein (2003) showed that changing the default options (from opt-in to opt-out) nearly doubled the percentage of the number of organ donors. In the Netherlands, a similar law has been adopted in the context of organ donation, starting July 1, 2020, where inhabitants automatically are registered as donors compared to the other way around. Multiple studies have implemented defaults in a large variety of digital contexts, e.g. to nudge individuals to compensate their CO2 emissions (Araña & León, 2013; Székely et al., 2016), consent to receive e-mail marketing (Johnson, Bellman, & Lohse, 2002). In light of sustainable household consumption, the default nudge has been researched primarily in the context of energy choice (Hedlin & Sunstein, 2006). All these studies indicated a significant effect. Hence, this research proposes the following hypothesis:

**H1**: Digital ‘default’ nudge has a positive influence on sustainable consumption compared to the control condition.

**The role of descriptive norms**

According to Reno, Cialdini, & Kallgren (1993), social norms can be separated into injunctive norms and descriptive norms. Descriptive norms refer to what most people do in a particular situation. It describes what is normal to do: “if everyone is doing it, it must be something sensible to do” (Cialdini, Reno, & Kallgren, 1990, p. 1015). On the other hand, injunctive norms specify what ought to be done. Injunctive norms are about what people approve and disapprove of within a culture, which is motivated by promising social rewards and punishments (Reno et al., 1993).   
 Several researches investigated in different contexts how the use of these norms can lead to pro-environmental behavior. The effectiveness of a specific norm depends on the choice environment and the receiver. Descriptive norms turned out to be effective in influencing sustainable behavior, like energy consumption (e.g., Kantola, Syme, & Campbell, 1984), littering (Cialdini et al., 1990), recycling (Schultz, 1999) and transportation behavior (Kormos, Gifford, & Brown, 2015). One study researched a new field of the direct influence of descriptive norms on the purchasing of sustainable grocery products (Demarque et al., 2015). They highlighted the potential of descriptive norms as incentivizing nudging tool for online shopping. The descriptive norms, which were shown in the fictional webshop of their research was amongst others: “For your information, 90% of previous participants purchased some ecological products” (Demarque et al, 2015, p.171). Participants, with a €25 budget, who were presented with these norms were willing to spend 10% more money. In congruence with the literature, the social norms used in this experiment are descriptive norms. Hence, this research expected that participants would be more likely to buy sustainable products when a social norm is given. This leads to the second hypothesis:

**H2:** Digital nudge ‘descriptive norms’ has a positive influence on sustainable consumption compared to the control condition.

Another tool to nudge people towards more sustainable choices is to provide feedback. This feedback gives the customer information on whether they make the right decision or if they make a mistake (Thaler et al., 2013). This can be similar to a warning, which shows only the negative consequences of a decision. This digital nudge can be applied in different ways, such as information about environmental impact or comparison with an average. Multiple scholars have investigated the feedback nudge within the energy consumption domain (Dünnhoff & Duscha, [2008](https://link.springer.com/article/10.1007/s12053-008-9009-7#ref-CR16); Darby, 2006). Darby (2006) compared multiple studies that show that feedback nudges could reduce energy consumption by up to 20%. There are multiple implications of a feedback nudge in trying to reduce energy consumption. For example, in one research, the feedback nudge was incorporated in the electricity meter, which shows the information on the display if the household consumes less or more energy than the previously recorded period of consumption. Furthermore, negative feedback, or warning, can trigger people’s attention because it evokes loss aversion (Sunstein, 2014). Hence, this study assumes that feedback could positively influence the purchase of sustainable products by motivating sustainability and warning the non-sustainable options.

According to Fischer (2008), a successful feedback nudge has to capture the customer’s attention and show a direct link between action and result. Fischer (2008) also emphasizes that feedback is often combined with other instruments because information on consumption will not work without a motivation to conserve. This could be provided by instruments such as goal setting (McCalley & Midden, 2002), personal commitment (Mack & Hallmann, 2004) or social norms (Schultz, Estrada, Schmitt, Sokoloski, & Silva-send, 2015). Adding social norms to the feedback nudge resulted in a significantly reduced energy use, while solely applying the feedback nudge did not reduce energy use significantly (Schultz et al., 2015). Therefore, this research is also interested in testing a strong condition by combining two nudges. As the feedback nudge is often combined with other instruments, descriptive norms could be a possible tool to strengthen the manipulation. This study hypothesizes that the feedback nudge in combination with descriptive norms will have a positive influence on sustainable consumption compared to the control condition. Consequently, the third and fourth hypotheses are:

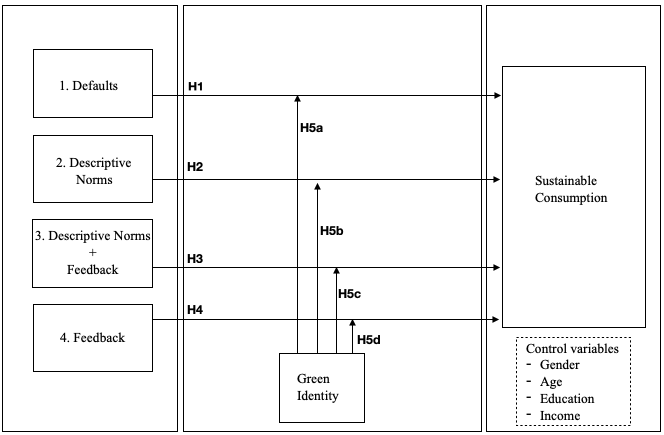
**H3:** Digital nudge ‘descriptive norms’ in combination with the digital nudge ‘feedback’ has a positive influence on sustainable consumption compared to the control condition.

**H4**: Digital nudge ‘feedback’ has a positive influence on sustainable consumption compared to the control condition.

**The moderating role of green self-identity** There is an ongoing debate in the understanding whether the consumer chooses to buy a certain product. “Yet there is considerable ambiguity in the contemporary understanding of how consumers actually choose products or services in a diverse and abundant marketplace” (Tukker, 2010, p.20).   
 Research shows that if consumers engage in a set of green behaviors for pro-environmental reasons, they are more willing to purchase environmentally friendly products (Barbarossa & De Pelsmacker, 2016). In doing so, the adoption of eco-friendly behaviors strengthens the positive motivations for an individual to adopt other pro-environmental related behaviors, such as lowering the thermostat (Thøgersen & Ölander 2003). In addition, Lades (2014) argues that self-identity plays a role in impulsive ethical consumption behavior. This means that, consumers purchase products for self-expression because they identify themselves with it. Therefore, ethical products are a part of the green self-identity. In other words, ethical consumers buy ethical products in order to express themselves (Lades, 2014). This research is interested in the moderating effect of green self-identity between a digital nudging condition and sustainable consumption. It is hypothesized that a high green self-identity would enhance sustainable consumption. Moreover, this research is aiming to find out whether there is a difference in nudge condition and the moderator effect of green self-identity. Therefore, this hypothesis is divided in one main category and four sub categories. Lastly, the fifth hypothesis is:

**H5**: Green self-identity positively moderates the relationship between a digital nudging condition and sustainable consumption.   
**H5a**: Green self-identity moderates the relationship between the default condition and sustainable consumption.   
**H5b:** Green self-identity moderates the relationship between the descriptive norms condition and sustainable consumption.   
**H5c:** Green self-identity moderates the relationship between the descriptive norms plus feedback condition and sustainable consumption.   
**H5d:** Green self-identity moderates the relationship between the feedback condition and sustainable consumption.

Figure 1 shows the conceptual framework in which all the hypotheses are incorporated.

**Figure 1.** Conceptual Framework

# Methods

Quantitative research was conducted through an online experiment and a survey. The purpose of the experiment was to examine whether digital nudging would have a positive influence on sustainable consumption compared to the control condition (H1, H2, H3, H4). Moreover, this study aimed to examine the moderating effect of green self-identity (H5) between the four digital nudge conditions and sustainable consumption behavior. The green self-identity was measured through the online survey.

**Research Context** In the experiment of this study, participants received €22 in the form of a voucher, which they could spend at a fictional webshop, called *The Store*. With this budget, the participants could either buy all sustainable products, or all non-sustainable products, or a combination of these products. By this means, the participant had to choose between the products, because the budget was limited. Participants were randomly assigned to different nudging conditions and the influence of the digital nudging condition on sustainable consumption was measured through the number of products bought and the money spend on sustainable products in a single shopping session. The participants were asked to spend the money realistically, as they would also do in real life and they were asked to take the time to explore the webshop.   
 In the control condition, no manipulations were executed in the webshop environment and the customer reviews were neutral (Appendix A1). In the default condition, products were shown in a different order. The sustainable products were pre-selected and shown on the home page (Appendix A2). Whereas in the descriptive norms condition, only the text was manipulated inspired by the research of Demarque et al. (2015). The text in the banner was changed to ‘9 out of 10 Dutch people contribute to a better environment by buying sustainable householding products, are you in?’ (Appendix A3). The text of the customer reviews below the products was also adapted (Appendix A3). In the feedback condition, only a smile face ‘:)’ or a sad face ‘:(’ was added to the product image whether the product is sustainable or not (Appendix A5). In the descriptive norms plus feedback condition, both the text as the product images through smileys were manipulated, resulting in a strong mix of the two conditions (Appendix A4).   
 The webshop’s design was based on a typical online retailer’s interface, including features such as a picture and description of the product, customer reviews, and an ‘add to cart’ button. Previous research suggested that prior evaluations of a real brand could lead to potential biases (Barcelos, Dantes, & Sénécal, 2018). This was controlled for by using a fictional retailer. A combination of sustainable and non-sustainable householding products was shown (total of twelve), for example, washing detergent, toilet cleaner, and hand soap. The products were sourced from the website of the supermarket *Albert Heijn*. For each sustainable product, a comparable counterpart to a non-sustainable product was incorporated in the same price category. It was also made sure that the products had the same ‘flavor’, e.g. all-purpose cleaner with lemon flavor. There was a lack of comparable products in the same price category, so therefore a relatively small selection of twelve products was chosen. Exact the same prices were taken from the website of *Albert Heijn* on the 15th of April, 2020. There was not a larger difference of €0.50 between sustainable and regular products in order to prevent product choice based on price. To decide what is sustainable, the packaging and the ingredients were examined. A condition for a sustainable product was sustainable packaging, e.g. recycled plastic or biodegradable packaging. In addition, a sustainable product should largely consist of natural ingredients. In contrast, the non-sustainable products were made out of plastic and consisted of chemicals or microplastics that were not biodegradable.

**Procedure and Measures**   
 After the experiment, a survey was conducted by the participants. The survey was after the experiment in order to prevent bias and it consisted of eight closed-ended questions. (See Appendix E for the survey layout). The survey guided the participant through different stages. First, the participant was introduced to the research with some background information. Second, the participant had to fill in a (fictional) name and was directed to the experiment environment. After this, the participant was redirected back to the survey, where demographics were asked about his or her gender, income, and education as the control variables. In the last four questions of the survey, the participant was asked about the moderator effect ‘green self-identity’ in order to gain more insights about the participant’s characteristics. This was to find out whether the moderator ‘green self-identity’ would enhance the effect of the digital nudge. The measures of the constructs were based on the literature review and will be discussed below.   
 The dependent variable was *sustainable consumption,* which is a numerical variable. This construct was measured by the absolute number of sustainable householding products purchased in one single shopping session (GreenProduct) and the money spend on sustainable products in one single shopping session (GreenMoney) (See Table 3).   
 The independent variable *default (1)* is based on the principles of the default nudge, but then applied to an e-commerce context. As far as I know, that has not been studied before in such a digital environment*.* The condition *descriptive norms (2)* was inspired by the communication of Demarque’s et al. (2015) experiment. Furthermore, the combination of the conditions *descriptive norms plus feedback (3)* was based on the results of the research by Schultz et al. (2015), which showed a significant reduction in energy consumption. Last, the *feedback (4)* nudge provided users with feedback when they were doing well or making mistakes by adding a smile or a sad face. In this case, a smile was presented on the product image when the participant bought a sustainable product and vice versa. As far as I know, this type of feedback nudge has not been studied before in an ecommerce setting. The aforementioned independent variables were categorical variables with four levels (1,2,3,4).  
 This study also included *green self-identity (GSI)* as the hypothesized moderator effect. The green self-identity was measured by a four-item scale. This was based on the two-item scale generated from the qualitative study from Sparks and Shepherd (1992). Two items were added from Barbarossa and Pelsmacker’s (2016) survey. Their research examined eco-friendly tissue paper products, therefore this scale was replaced by this study’s product focus: householding products. Hence, this component was built out of four different statements based on a 7-point Likert scale. The participant could choose between ‘strongly disagree’, ‘somewhat disagree’, ‘disagree’, ‘neither agree nor disagree’, ‘somewhat agree’, ‘agree’, and ‘strongly agree’ for all four items.   
 This study included gender, education, and income as control variables. These variables were measured on different scales which is shown in Appendix B. Gender and education were included as a control variable, because scholars have investigated that women show relatively stronger environmental concern and behavior than men (Dietz, Kalof, & Stern, 2002; Xiao & McCright, 2015). In addition, many studies found a relationship between higher education levels and pro-environmental behavior (e.g., Meyer 2015). Last, there were relationships found between income and sustainable consumption behavior. For example, one study found that the profile of an organic food customer is dependent on their socio-demographic characteristics, such as income (Kranjac, Vapa-Tankosic, & Knežević, 2017). However, as a general rule, a higher income leads to an increase in consumption, which in turn leads to a higher ecological footprint (Syse & Mueller, 2014).

**Table 3.** Multiple-item scales used to measure the various constructs.

|  |  |  |  |
| --- | --- | --- | --- |
| **Construct** |  | **Items** | **Source** |
| **Digital Nudging:**  **- Defaults**  **- Descriptive Norms**  **- Feedback** |  | Sustainable products are preselected and shown on the homepage  Display: ‘9 out of 10 Dutch people contribute to a better environment by buying sustainable householding products, are you in?’  Display: ‘:)’ for sustainable products  :’(‘ for non-sustainable products | Theotokis & Manganari (2015)  Demarque et al. (2015)   n/a |
| **Sustainable Consumption** | Green Money  Green Product | The money spend on sustainable householding products in one single shopping session  The absolute number of sustainable householding products purchased in one single shopping session | n/a  n/a |
| **Green Self-Identity** | (GSI1)  (GSI2)  (GSI3)  (GSI4) | I think of myself as someone who is concerned about environmental issues I think of myself as a ‘green’ consumer  Buying sustainable householding products would make me feel like a green consumer  I would feel totally satisfied with myself if I bought sustainable householding products | Sparks and Shepherd (1992) |

**Research Method**   
 The online survey software *Qualtrics* was used to collect the data for the survey. The online store was built with *Wix*, a cloud-based platform for web design. This platform was selected, because of the researcher’s experience with the platform. In addition, it enabled to build a webshop fast and representative. The webshop, as the control condition, is approachable via an URL, which can be found in Appendix A. The digital environment was manipulated in several scenarios. Hence, this resulted in five conditions, which can be found in Appendix A. In the control condition, no digital nudge was presented in the webshop. The second condition presented the default nudge. The third scenario displayed the descriptive norm nudge. The fourth condition showed the feedback nudge plus descriptive norms nudge. The last condition tested the feedback nudge. The price was held constant in this study.  
 After the data collection, the data was analyzed using *Rstudio*. Before conducting the linear model, assumption checks of multicollinearity and homoscedasticity were carried out, which will be discussed in the results chapter.

**Pre-test** To provide confidence that the focus manipulation showed the desired effects, a pre-test was conducted (Table 4). This research was shown to ten students enrolled in the master’s Digital Business & Innovation at the *Vrije Universiteit Amsterdam*. They were asked to fill in the survey and to complete the experiment online. The target group consisted of anyone who was willing to participate in the experiment. This means that two people, consisting of one man and one woman, were randomly assigned to each of the five conditions. Appendix D provides an overview of the demographics of the participants of the pre-test. To make sure that the experiment was blinded, the students were asked after they completed the experiment if they knew what the purpose of the study was. It turned out that no one of the students knew what was being tested. Good blinding can minimize or eliminate experimental [biases](https://en.wikipedia.org/wiki/Bias) that arise from the respondents' expectations (Holman, Head, Lanfaer, & Jennions, 2015).   
 Table 4 below shows the results of the pre-test. These findings show that more sustainable products were sold in the digital nudge condition compared to when no digital nudge was present. In addition, the GSI was slightly above average with 3.65. However, the number of sustainable products sold in the control condition were already relatively high. One plausible explanation for this is that the experiment was conducted by students. According to a recent survey of 10,000 people aged 18-25 in 22 countries all over the world, found that climate change was number one of the most important issue in the world (Amnesty International, 2019). Their environmental concern could have been a reason for sustainable consuming decisions. On top of that, it is a controlled environment and a fictional webshop so it might not representative of what the students would buy in a real-life setting.

**Table 4.** Pre-test results

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Condition** | Total amount of sold goods | Total GreenMoney | Total GreenProduct | Total Non-GreenProduct |
| Control condition | € 30,66 | € 16,14 | 6 | 4 |
| 1. Default condition | € 33,20 | € 33,20 | 10 | 0 |
| 2. Descriptive norms | € 33,85 | € 27,91 | 9 | 2 |
| 3. Feedback + descriptive norms | € 40,28 | € 40,28 | 12 | 0 |
| 4. Feedback | € 55,77 | € 54,88 | 12 | 1 |

**Sample** An a priori calculation was performed by a statistical power analysis using the *G\*Power 3.1 tool*. Conducting an ANOVA test, with alpha = .05 and power = .80, the projected sample size needed for a medium effect size (.25) is approximately N = 200. This means that 40 people were assigned to each of the five conditions. The experiment was conducted in Dutch. The participants were Dutch and voluntarily recruited through online channels, such as LinkedIn and Facebook. Moreover, participants were asked to “take your time to discover the webshop”. This was done to ensure the validity of the responses and to make sure that the participants would experience the full manipulation of the condition, including reading the customer reviews. The following paragraph will discuss how validation checks were done to guarantee the validity and reliability of the data.

**Sample statistics** In total, 290 participants finished the survey, and 201 participants completed the experiment as well. A possible reason for this is that some people did not click on the link which led to the webshop due to digital ability or because the participant did not pay attention. This was especially the case for older participants (age > 50). To guarantee quality, the dataset was carefully screened. First, the participants who spend less than 3 minutes on the research were removed from the dataset. In addition, participants who filled in extreme values for the survey that was not coherent were also left out of the statistics. For example, a participant below 18 years old with the highest income, who also filled in the exact same values for each question of the survey. In addition, in order to produce valid results, two validation checks were incorporated. First, the participants were asked to fill in the same (fictional) name in the survey as well as the experiment. If the participant failed to do so, the data would not be used. Second, after the demographics participants were shown a reminder to not forget to place an order at *The Store.* After that, the participant could continue with the remaining survey questions about the green self-identity.   
 This resulted in a total of 201 respondents who completed the experiment and survey successfully. Each of the five conditions held a total of 40 respondents, except for the fifth condition, which held 41 respondents. To summarize, Appendix D represents a demographic overview of the respondents of the pre-test and the main study. The sample consisted of 138 females and 63 males. Almost 58% of the sample consisted of people between 18 and 24 years old. More than a half of the respondents indicated that they graduated with a university degree (66.2%), 58 respondents graduated with an ‘HBO’ degree (28.9%), 4 people obtained an MBO degree (2%), and 6 people only finished high school (3%). Furthermore, almost half of the respondents have an income of less than €10,000 (47.3%). We can conclude from this that this sample is not representative for an average population.

**Data preparation** *Recoding.* To measure GSI, two original statements were used from Sparks and Shepherd (1992) and two from Barbarossa and Pelsmacker (2016), which did not consist of reversed statements. Therefore, no recoding was needed. Each item was valued on a 7-point Likert Scale.   
 *Reliability.* To test the reliability of the constructs, the Cronbach’s Alpha was calculated. The Cronbach’s Alpha of GSI (0.8) was above the thresholds (Cronbach’s alpha > .70), which ensures the reliability of the scales (Nunnaly, 1978).   
 *Correlation.* The multi-item scaled constructs have been investigated to measure validity. Therefore, correlations were calculated for green self-identity (GSI) (See Appendix C for the correlation matrix). GreenMoney and GreenProduct are positively high (0.70 < *r* < 0.90) correlated. GSI is weak negatively correlated with GreenMoney (*r=-*.27) and GreenProduct (*r=-*.26). The correlations are all relatively low, which indicates that there is no sign of multicollinearity. GSI is centered (GSIc) to ensure that no correlation is created between the main effects and the moderation effects. By this means, the problem of multicollinearity between the main effects and the moderation effects was fixed.   
 *Normality.* A Kolmogorov-Smirnov test was used to test the normality of the residuals of GreenProduct without control variables (D(201) = 0.09, p=0.688) and GreenProduct with control variables (D(201) = 0.05, p=0.612), indicating that the data was normally distributed. For GreenMoney without control variables (D(201) = 0.09, p=0.057) and GreenMoney with control variables (D(201) = 0.07, p=0.352), the test indicates normality of the residuals as well.

**Ethics**

Digital nudging can raise ethical concerns. Nudging has been accused to be manipulative. This ongoing debate is also intertwined with the broader notion of libertarian paternalism, on which nudging is built (Sunstein, 2015). Discussions entail whether policymakers should make decisions for individuals, such as a digital ‘default option’ for donor registration. This raises objections from the standpoint of both autonomy and dignity (Sunstein, 2015). Nudging may not be desirable because some nudges intrude on people’s autonomy. In addition, Bovens (2009) argues that nudging can lead to the ‘fragmented self’. This is that individuals will make different decisions under the influence of a nudge than he or she would make in a regular environment. As a consequence of constantly being nudged, individuals can become morally lazy, because they do not learn how to make certain decisions by themselves (Selinger & Whyte, 2011). On the other hand, the general aim of a nudge is to help people making better choices (Thaler & Sunstein, 2018). However, we should be aware of unethical nudging. Unethical nudges can push customers toward undesirable purchases, which leads to short term gains for the company, but not for the society as a whole in the long term. In the case of sustainable consumption behavior, it is in the best interest of the whole society. Under the condition that a nudge is ethically designed, we can argue that it is acceptable.  
 Transparency of nudging tools can be a solution for ethical concerns. If a nudge is transparent, is said to be important that consumers know the types of the applied nudges and that they are able to recognize them (Lehner et al., 2016). But, the problem is that nudging tools work most effectively when the receiver is unaware of it. The more transparency, the less effective these techniques are (Bovens, 2009). Therefore, in this research, there will be no transparency about the used digital nudging tools, because this is in contradiction with the research goal. Nevertheless, it is important to take the ethical implications of nudging into consideration when designing the choice architecture in a real-life setting. In this research, the respondents were voluntarily recruited. The confidentiality of data will be strictly maintained by anonymizing the participants’ names. To ensure that the respondents participated voluntarily, the respondents’ consent was asked at the beginning of the survey. If the respondent did not agree with the conditions, he or she was not able to proceed with the research. By this means, this research aimed to take ethics into consideration.

# Results

**Descriptive Statistics** Table 5 presents the descriptive statistics. It illustrates that people spend on average €16.16 in the webshop and bought 4.35 products. This is below the maximum of €22, which was the fictional amount that was given as a voucher. The GSI is on average 2.87 with a possible maximum score of 6. This means that the average participant of the sample had a moderate green self-identity.

**Table 5.** Descriptive statistics

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Construct** |  | **Min** | **Max** | **Median** | **Mean** | **SD** |
| **GreenMoney** |  | 0.00 | 25.64 | 16.16 | 14.74 | 6.41 |
| **GreenProduct** |  | 0.00 | 11.00 | 4.00 | 4.35 | 1.95 |
| **GSI** |  | 1.00 | 6.00 | 2.75 | 2.87 | 0.97 |

In Table 6, the results of the experiment are presented. It is observed that the percentage of participants who bought at least two sustainable products is higher in de nudge conditions, compared to the control condition. It is also shown that, compared to the control condition, participants were willing to spend more money on sustainable products. These observations are in line with H1, H2, H3, and H4.

**Table 6.** Results of the experiment

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Condition** | **Percentage of participants who bought at least two sustainable products** | **Means (SD) of purchased sustainable products** | **Percentage spent on sustainable products** | **Total amount of sold goods** | **Total amount of sustainable products** |
| Control condition | 67.5 | 3.80 (2.27) | 78.5 | € 672.39 | € 527.78 |
| 1. Default condition | 90.0 | 4.25 (1.51) | 86.0 | € 683.48 | € 588.00 |
| 2. Descriptive norms | 85.0 | 4.75 (2.24) | 81.1 | € 763.36 | € 619.30 |
| 3. Feedback + descriptive norms | 87.5 | 4.53 (1.77) | 84.9 | € 725.51 | € 615.99 |
| 4. Feedback | 85.0 | 4.50 (1.80) | 81.3 | € 771.37 | € 627.14 |

**Hypothesis testing**   
 A general linear model was conducted to assess which of the conditions are important in predicting sustainable consumption. The independent variables were the four nudging conditions, which are categorical variables. The dependent variable was *GreenMoney* and *GreenProduct,* which is a numerical value. This resulted in two models. After this, the control variables gender, education, and income were added to the models. This resulted in a total of four models, namely GreenMoney and GreenProduct with and without control variables. The following list summarizes all the models:

**Model 1** (see Table 7)   
Dependent variable: *GreenMoney*Independent variables: *Default, Descriptive Norms, Descriptive Norms plus Feedback, Feedback, GSIc, GSIc(1), GSIc(2), GSIc(3), GSIc(4)*

**Model 2** (see Table 8)   
Dependent variable: *GreenProduct*   
Independent variables: *Default, Descriptive Norms, Descriptive Norms plus Feedback, Feedback, GSIc, GSIc(1), GSIc(2), GSIc(3), GSIc(4).*

**Model 3** (see Table 9)   
Dependent variable: *GreenMoney*Independent variables: *Default, Descriptive Norms, Descriptive Norms plus Feedback, Feedback, GSIc, GSIc(1), GSIc(2), GSIc(3), GSIc(4)*Control variables: *Age, Gender, Education, Income*

**Model 4** (see Table 10)   
Dependent variable: *GreenProduct*Independent variables: *Default, Descriptive Norms, Descriptive Norms plus Feedback, Feedback, GSIc, GSIc(1), GSIc(2), GSIc(3), GSIc(4)*Control variables: *Age, Gender, Education, Income*

First, the models were tested without the control variables to see whether there is a main effect or a moderator effect. In addition, the models were tested twice: once with GreenMoney as a dependent variable and second with GreenProduct as a dependent variable.   
 An important assumption of a linear model is homoscedasticity. The Levene’s test for equality of variance indicated a non-significant effect for GreenMoney (*F*(4,197)= 1.8145, *p* = .128) and for GreenProduct (*F*(4,197)= 2.0236, *p* = .093). For both models, the homoscedasticity assumption was confirmed. This means that it has sufficiently homogeneous variance across treatment levels. A second assumption a linear model is normality of residuals. As discussed before, the Kolmogorov-Smirnov test indicated normality of residuals across all models.

*GreenMoney and GreenProduct without control variables*   
 Two linear models were estimated with GreenMoney and GreenProduct as the dependent variable and the four nudging conditions as the independent variables. The results show a significant effect of the nudge condition on GreenProduct without control variables (F(4,192) = 2.461 , p=0.047). However, the nudge condition reveals a non-significant effect on GreenMoney (F(4,192)= 1.603, p=0.175). GSIc shows a non-significant effect (F(1,192) = 2.177, p=0.054) and on GreenMoney as well (F(1,192)=1.877, p=0.172). This is the first evidence to partially accept H1, H2, H3, and H4 but to reject H5. To see which of the conditions have the largest effect on the dependent variable in comparison to the control condition, an ANCOVA was conducted for both models.   
 Table 7 below, shows an overview of the results of Model 1. This analysis showed a significant model (*F*(9,192)= 3.823, *p* = .000). The analysis showed a low probability of multicollinearity (VIF <10). The multiple R-squared is low, namely 0.139. This indicates that the independent variable is partially explaining the variation of the dependent variable. Looking at the independent variable, the analysis revealed that the ‘descriptive norms plus feedback’ condition and the ‘feedback’ condition have a significant impact on GreenMoney. ‘Descriptive norms’ and ‘default’ conditions did not show a significant effect. Interestingly, GSI showed a negative, but not significant, effect on GreenMoney.  **Table 7**. Results Model 1: GreenMoney without control variables

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **DV=GreenMoney** | 𝞫 | **SE**𝞫 | ***t*** | ***p-value*** | ***VIF*** |
| Intercept | 12.44\*\*\* | 1.11 | 11.20 | 0.000 |  |
| 1. Default | 2.28 | 1.47 | 1.55 | 0.123 |  |
| 2. Descriptive norms | 2.76 | 1.47 | 1.88 | 0.062 |  |
| 3. Descriptive norms + Feedback | 3.04\* | 1.47 | 2.07 | 0.040 |  |
| 4. Feedback | 3.43\* | 1.47 | 2.33 | 0.021 |  |
| GSIc | -2.18 | 1.59 | -1.37 | 0.172 | 3.593 |
| as.factor(Conditie)1:GSIc | 1.66 | 1.84 | 0.91 | 0.366 |  |
| as.factor(Conditie)2:GSI | -1.11 | 2.05 | -0.54 | 0.591 |  |
| as.factor(Conditie)3:GSIc | 1.40 | 1.90 | 0.73 | 0.464 |  |
| as.factor(Conditie)4:GSIc | -1.01 | 1.76 | -0.58 | 0.565 |  |
| Multiple R-squared | 0.139 |  |  |  |  |

\*Correlation is significant at the 0.05 level (2-tailed). \*\*Correlation is significant at the 0.01 level (2-tailed).  
\*\*\*Correlation is significant at the 0.001 level (2-tailed).

Model 2 (Table 8) with the dependent variable GreenMoney showed a significant model (*F*(9,192)= 3.442, *p* = .001) with a low probability of multicollinearity (VIF < 10). However, the analysis showed low explanatory power of the model, because of the low multiple R-squared. The general linear model showed that the second condition ‘descriptive norms’ and the fourth condition ‘feedback’ has a significant effect on GreenProduct. The third condition ‘descriptive norms plus feedback’ even showed significance at 0.01 level. Last, ‘descriptive norms’ did not show a significant effect as the only condition.  
 **Table 8**. Results Model 2: GreenProduct without control variables

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **DV=GreenProduct** | 𝞫 | **SE**𝞫 | ***t*** | ***p-value*** | ***VIF*** |
| Intercept | 3.48\*\*\* | 0.33 | 10.40 | 0.000 |  |
| 1. Default | 0.78 | 0.44 | 1.75 | 0.081 |  |
| 2. Descriptive norms | 1.18\*\* | 0.44 | 2.65 | 0.009 |  |
| 3. Descriptive norms + Feedback | 1.07\* | 0.44 | 2.41 | 0.017 |  |
| 4. Feedback | 1.21 \*\* | 0.44 | 2.74 | 0.007 |  |
| GSIc | -0.93 | 0.48 | -1.94 | 0.054 | 3.593 |
| as.factor(Conditie)1:GSIc | 0.83 | 0.55 | 1.50 | 0.135 |  |
| as.factor(Conditie)2:GSIc | -0.19 | 0.62 | -0.31 | 0.760 |  |
| as.factor(Conditie)3:GSIc | 0.71 | 0.57 | 1.25 | 0.215 |  |
| as.factor(Conditie)4:GSIc | 0.03 | 0.53 | 0.06 | 0.955 |  |
| Multiple R-squared | 0.152 |  |  |  |  |

\*Correlation is significant at the 0.05 level (2-tailed). \*\*Correlation is significant at the 0.01 level (2-tailed).  
\*\*\*Correlation is significant at the 0.001 level (2-tailed).

*Green Money and GreenProduct with control variables* The following two linear models were fitted with control variables. The dependent variables are GreenMoney and GreenProduct and the independent variables are the four nudging conditions. The results revealed a significant effect of the nudging condition on GreenMoney with control variables (F(4,188) = 3.178 , p=0.015), and the same holds for GreenProduct (F(4,188)= 2.677, p=0.033). The effect of GSIc on GreenProduct showed a non-significant effect (F(1,188) = 3.087, p=0.081) and on GreenMoney as well (F(1,188)= 2.171, p=0.142). This provides evidence to partially accept H1, H2, H3, and H4, but to reject H5.  
 An ANCOVA was conducted of model 3 (Table 9), which revealed a significant model (*F*(13,188)= 3.362, *p* = .000) and showed a low probability of multicollinearity (VIF < 10). This time, the results showed a significant effect of all conditions on GreenMoney while controlling for the control variables in the model. Moreover, the R-squared slightly increased. The moderating variable GSIc does not have a significant influence on GreenMoney. Also, the control variables do not impact the dependent variable GreenMoney.

**Table 9**. Results Model 3: GreenMoney with control variables

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **DV=GreenMoney** | 𝞫 | **SE**𝞫 | ***t*** | ***p-value*** | ***VIF*** |
| Intercept | 4.01 | 3.86 | 1.06 | 0.291 |  |
| 1. Default | 3.84\* | 1.52 | 2.52 | 0.013 |  |
| 2. Descriptive norms | 4.34\*\* | 1.55 | 2.80 | 0.005 |  |
| 3. Descriptive norms + Feedback | 4.84\*\* | 1.56 | 3.11 | 0.002 |  |
| 4. Feedback | 4.92\*\* | 1.53 | 3.21 | 0.001 |  |
| GSIc | -2.33 | 1.58 | -1.47 | 0.142 | 3.650 |
| Age | 0.41 | 0.41 | 0.99 | 0.320 | 1.365 |
| Gender | 0.82 | 0.94 | 0.87 | 0.388 | 1.073 |
| Education | 0.82 | 0.66 | 1.24 | 0.217 | 1.071 |
| Income | 0.40 | 0.23 | 1.74 | 0.082 | 1.327 |
| as.factor(Conditie)1:GSIc | 2.17 | 1.82 | 1.19 | 0.234 |  |
| as.factor(Conditie)2:GSIc | -1.00 | 2.03 | -0.49 | 0.621 |  |
| as.factor(Conditie)3:GSIc | 1.72 | 1.88 | 0.91 | 0.363 |  |
| as.factor(Conditie)4:GSIc | -0.76 | 1.73 | -0.44 | 0.660 |  |
| Multiple R-squared | 0.189 |  |  |  |  |

\*Correlation is significant at the 0.05 level (2-tailed). \*\*Correlation is significant at the 0.01 level (2-tailed).  
\*\*\*Correlation is significant at the 0.001 level (2-tailed).

Last, an ANCOVA was conducted for model 4 (Table 10). The general linear model showed a significant model (*F*(13,188)= 3.052, *p* = .000) with a low probability of multicollinearity (VIF < 10). Compared to the first models without the control variables, model 4 showed a slightly higher R-Squared. The results of the fourth model showed a significant effect of all conditions on GreenProduct after controlling for Age, Gender, Education, and Income. GSIc showed a negative, but not a significant impact on GreenProduct. Moreover, the control variables did not influence the dependent variable GreenProduct.

**Table 10**. Results Model 4: GreenProduct with control variables

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **DV=GreenProduct** | 𝞫 | **SE**𝞫 | ***t*** | ***p-value*** | ***VIF*** |
| Intercept | 1.27 | 1.18 | 1.08 | 0.283 |  |
| 1. Default | 0.94\* | 0.47 | 2.02 | 0.045 |  |
| 2. Descriptive norms | 1.30\*\* | 0.47 | 2.74 | 0.007 |  |
| 3. Descriptive norms + Feedback | 1.35\*\* | 0.48 | 2.84 | 0.005 |  |
| 4. Feedback | 1.32\*\* | 0.47 | 2.81 | 0.005 |  |
| GSIc | -0.85 | 0.48 | -1.76 | 0.081 | 3.651 |
| Age | 0.10 | 0.12 | 0.82 | 0.414 | 1.365 |
| Gender | -0.05 | 0.29 | -0.19 | 0.849 | 1.073 |
| Education | 0.39 | 0.20 | 1.91 | 0.058 | 1.071 |
| Income | 0.03 | 0.07 | 0.41 | 0.683 | 1.327 |
| as.factor(Conditie)1:GSIc | 0.86 | 0.56 | 1.54 | 0.125 |  |
| as.factor(Conditie)2:GSIc | -0.24 | 0.62 | -0.38 | 0.704 |  |
| as.factor(Conditie)3:GSIc | 0.76 | 0.58 | 1.32 | 0.189 |  |
| as.factor(Conditie)4:GSIc | 0.01 | 0.53 | 0.02 | 0.986 |  |
| Multiple R-squared | 0.174 |  |  |  |  |

\*Correlation is significant at the 0.05 level (2-tailed). \*\*Correlation is significant at the 0.01 level (2-tailed).  
\*\*\*Correlation is significant at the 0.001 level (2-tailed).

To sum up, the table below (Table 11) provides an overview of the result. For model 1 and 2 without the control variables, H1 can be rejected for GreenMoney and GreenProduct. H2 can be rejected when GreenMoney is the dependent variable, but it can be accepted when GreenProduct is the dependent variable. However, H1 and H2 are both accepted for models 3 and 4 with control variables incorporated. Moreover, there is enough evidence to suggest that H3 and H4 can be accepted for all models. Last, H5 is not significant and therefore not supported for all models.

**Table 11.** Overview of Results of Models 1, 2, 3, and 4.

|  |  |  |
| --- | --- | --- |
| **Hypothesis** | **Conclusion without control variables** | **Conclusion with control variables** |
| **H1** Digital nudge ‘Default’ will have a positive influence on sustainable consumption compared to the control condition. | Rejected | Accepted |
| **H2** Digital nudge ‘Descriptive Norms’ will have a positive influence on sustainable consumption compared to the control condition. | Mixed | Accepted |
| **H3** Digital nudge ‘Feedback + Descriptive Norms’ will have a positive influence on sustainable consumption compared to the control condition. | Accepted | Accepted |
| **H4** Digital nudge ‘Feedback’ will have a positive influence on sustainable consumption compared to the control condition. | Accepted | Accepted |
| **H5** Green self-identity moderates the relationship between digital nudging and sustainable consumption. | Rejected | Rejected |

# 

# Discussion & Conclusion

The chapter of this research ends with a discussion and a conclusion. The following paragraph discusses the theoretical and practical implications, which shows the added value of this research. Last, this research discusses the limitations with recommendations for future research.

**Discussion and theoretical implications** The aim of the current research was to explore the important issue of how to promote online sustainable household consumption with the following research question: *How is sustainable consumption influenced by digital nudging in the purchasing of householding products?* As e-commerce will grow over the coming years, consumers make more consumption decisions online. The goal was to examine the influence of digital nudging on online sustainable consumption behavior, which is measured in the amount of money spend and the number of householding products bought in the fictional webshop *The* *Store*. This study focused on the following digital nudge conditions: (1) default, (2) descriptive norms, and (4) feedback. The latter two nudges, (3) descriptive norms and feedback, were also combined in one condition. In addition, the control variables were age, gender, income, and education. In this section, we will dive deeper into the results of models 3 and 4 which incorporated the control variables. Overall, this study proved that digital nudging has a significant effect on sustainable consumption compared to the control condition. Therefore, H1, H2, H3, and H4 can be accepted (Table 11). Lastly, the moderator GSI does not show a significant effect, so H5 can be rejected.

First, the default nudge (H1) showed a significant effect on sustainable consumption compared to the control condition. This means that consumers are likely to choose for more sustainable options when they are influenced by setting the sustainable product choice as the standard. This study extends existing research because it integrates the default nudge in a webshop environment, which has never been tested before. However, this condition showed the least significant effect in comparison to the other nudges tested in this study. This finding is in contrast to the literature because the default nudge was claimed to be the most powerful one (Johnson et al., 2012). A potential explanation for why this digital nudge is less effective is because it was tested in a webshop environment. While shopping, consumers need to take a lot more decisions. They are likely to scroll quickly through a webshop and to switch between the homepage and the shopping page, which makes decision making more complex. On top of that, setting the default is also more difficult, because you need to make a clear distinction between sustainable and non-sustainable products. In contrast, the default nudge might not be as effective as, for example, a one-page website for organ registration. In such a decision environment only two options need to be considered, namely yes or no.

Second, the influence of the digital nudge descriptive norms (H2) on sustainable consumption was examined, which shows a significant effect on the amount spend and products bought. This means that adding descriptive norms to the webshop positively influenced the consumer in the purchasing of sustainable householding products. This is in line with one similar research, which also confirms that the use of descriptive norms leads to more online sustainable grocery shopping (Demarque et al., 2015). In general, this nudge has been predominantly investigated in an offline setting, where it appears to work quite effectively in encouraging pro-environmental behavior, like littering (Cialdini et al., 1990). The question remains whether descriptive norms would also work as effective as in an online setting because it is less realistic. People tend to behave according to the social norm in a real-life setting because these norms are based on the observations around you. However, this is less sensible in an online setting because you do not see what, for example, your neighbors are doing online. According to the results, there is evidence to suggest that the nudge descriptive norms also works as a digital nudge in a webshop environment.   
 Third, this research investigated a combination of two separate nudges, namely the descriptive norms and the feedback nudge (H3). The results show a significant effect of the positive influence on sustainable consumption for both GreenProduct and GreenMoney. So, the hypothesis is accepted. Prior research has proven that these two nudges separately have a positive effect, but these two combined was never studied before in a webshop environment. This condition represents the strongest significant effect with GreenProduct as the dependent variable. This is partially in line with the literature because adding social norms to the feedback nudge resulted in a significantly reduced energy use, while solely applying the feedback nudge did not reduce energy use significantly (Schultz et al., 2015). However, this research has proven that the feedback nudge on its own also has a significant effect. Altogether, we can argue that a combination of both nudges could potentially lead to a stronger effect of the manipulation.   
 The last condition, the feedback nudge, also has a significant effect on sustainable consumption (H4). This shows that providing feedback through smileys triggered the participant’s attention, which resulted in sustainable action. Previous research mentions that the feedback nudge will not be effective on its own if a consumer does not know what the impact is on his/her consumption (Fischer, 2008; Schultz et al., 2015). This problem could be resolved by giving information on the environmental impact. However, this research merely posted a smile or a sad face on the image of the product without giving extra information about its impact. Thereby, this research illustrates that it is not needed to provide the participant with extra information in order to have a positive influence on sustainable consumption. But, it could be that the consumption was even higher when the information was provided. The feedback condition shows the highest significant effect with GreenMoney as the dependent variable, which means that the participants spend the most amount of money on sustainable products. This highlights the great potential of the feedback nudge in a digital environment in e-commerce. This study shows a creative, cost-effective, and simple way to implement this type of nudge in a webshop. Just adding a simple smiley to a product image could evoke more than words can possibly do. The feedback nudge has been studied before as an effective nudge to enhance sustainable household consumption in for example energy consumption. Hence, this research contributes to the literature by being the first who added a smile of the sole application of the feedback nudge in an ecommerce setting. In addition, this research complements the existing theory by showing the positive effect of this feedback nudge within the household consumption domain.   
 Green self-identity (H5) appears to have a negative and non-significant moderator effect on sustainable consumption. Thus, H5 can be rejected. The participants were willing to add more sustainable products to the shopping cart in a nudge condition, but it appears it had nothing to do with their green self-identity. This means perhaps that digital nudging is more prevalent than the green self-identity. Interestingly, this is not in line with the theory, because research showed that if consumers engage in a set of green behaviors for pro-environmental reasons, they are more willing to purchase sustainable products (Barbarossa & De Pelsmacker, 2016). The literature would suggest that if the green self-identity from a consumer dominates, it results in buying more sustainable products. The aforementioned factors that influence pro-environmental behavior were, amongst others, increasing consumer’s environmental knowledge and awareness campaigns (Tukker, 2010). We can say that this might be a misguided assumption. The prevailing thought that making people aware of a problem, or informing people does not mean necessarily that people adopt a greener identity, which could result in sustainable consumption. Besides, as mentioned before, consumption behavior is the most unstable and unpredictable of the entire supply chain (Terlau & Hirsch, 2015). The literature about the attitude-behavior gap confirms this as well since the majority of people do not put their environmental concerns into action by consuming sustainably. This has also to do that people do not make rational choices (Simon, 1955), which means that they do not have perfect information to make the right consumption choice. The theory of nudging is questioning the rationality of human beings. From the perspective of individual agency, a sustainability problem would never get solved through rational behavior. Therefore, we need people with a system’s perspective, in one where we are interdependent with other actors around the world. From a system’s perspective, actors can foresee how they relate to the rest of the world and how their consumption impacts others. However, a lot of people cannot grasp this. It is hard for them to see how their individual behavior impacts others and how other people’s behavior impacts them. This shows that informing people about environmental issues is trying to give people facts and information in order to let them see that they are part of a bigger system, might never be effective. This has to do with habits and routines, which are difficult to change, because of the ‘automaticity’ of everyday consumption activities (Schäfer, et al., 2012). As unsustainable consumption is still increasing, it shows that we have failed to tackle this issue. All in all, this research contributes to the theory of the attitude-behavior gap literature because it highlights the importance of digital nudging as a means to enhance sustainable consumption.   
 The control variables, gender, education, income did not show a significant effect on the dependent variables GreenMoney and GreenProduct. This means that there are no relationships found between the measured demographic variables on the number of sustainable products or the money spend on sustainable products. This is in contrast with the literature because it was expected to have an effect. In particular, it was researched that women show stronger environmental behavior than men ([Dietz et al., 2002](https://www.sciencedirect.com/science/article/pii/S0959652617330160?casa_token=2WdePCENfysAAAAA:kO-C6KLoHz_n4uCYLBQg91tMGkQMUjqay3kP-iuozmKXDYBnUmILh2Dx7MKZtka2jyEAR4Hy9RE#bib11); [Xiao & McCright, 2015](https://www.sciencedirect.com/science/article/pii/S0959652617330160?casa_token=2WdePCENfysAAAAA:kO-C6KLoHz_n4uCYLBQg91tMGkQMUjqay3kP-iuozmKXDYBnUmILh2Dx7MKZtka2jyEAR4Hy9RE#bib55)). Prior research found that higher education levels could lead to pro-environmental behavior (e.g. Meyer, 2015). Last, there were relationships found between high incomes and sustainable consumption behavior (Kranjac et al., 2017). Again, we can maybe argue that digital nudging is more prevalent than gender, age, education, or income. Another possible explanation for this could be that the sample was randomized. The participants were randomly assigned to each condition, so it is difficult to find an effect on sustainable consumption. In general, the control variables were used to check for certainty and to increase the power of the hypothesis test, because it explains a part of the variance and the dependent variables.   
 In the digital era, there are new ways in terms of how we can use affordances of technology to tackle sustainability issues. As we are living in a market economy, we need to find ways to consume better. As consumers make irrational decisions, digital nudging could stimulate consumers in the right direction, which could narrow the attitude-behavior gap. However, this also questions the individual agency of a consumer. To what extent is a consumer able to make a decision when he or she is being nudged digitally? And to what extent is this outside the scope of the consumer’s power? Should a nudge be transparent for ethical purposes, even if this counteracts the effectiveness of the nudge? With digital nudging, a lot of ethical implications come into play, such as ‘the fragmented self’ (Bovens, 2009). In addition, it is important to touch upon this issue because people can also misuse digital nudging in e-commerce for non-sustainable products. This could eventually lead to the opposite effect which nudging is aiming for. Since this research highlights the effectiveness of digital nudging, there is a greater urge to dive into the ethical implications.   
 In conclusion, this study aimed to research how sustainable consumption is influenced by digital nudging in the purchasing of householding products. This research has been built predominantly on literature about nudging in an offline setting because prior studies were mostly conducted in conventional settings. This research extends the literature of digital nudging by using the principles of nudging but then incorporated in a digital context. All digital nudging principles used in this study appear to have a significant positive influence on sustainable consumption compared to the control condition. However, GSI did not show a significant moderator effect between digital nudging and sustainable consumption. All in all, the present study provides new perspectives and opportunities in the field of digital nudging of sustainable consumption in e-commerce. In particular, this study showed that predominantly the 'feedback' nudge and ‘descriptive norms plus feedback’ nudge have the most potential to use as an effective tool in stimulating sustainable consumption behavior. In addition, since this study found multiple results that are in contrast to existing literature, this study highlights that digital nudging is almost more prevalent than self-identity and therefore suggests alternative perspectives to scholars.

**Managerial implications** The findings from this research have shown that every digital nudge is effective, but with different degrees of effectiveness. As e-commerce grows, the potential of digital nudging could open up more perspectives. Within the growing online shopping domain, immediate applications of digital nudging can be considered. According to the results and the literature review, it has the potential to support the shift toward sustainable consumption in the long-term.  
 First, this study provides practitioners with new insights into how they can more effectively influence consumers to make more sustainable choices. As mentioned before, the concept of digital nudging provides new stimuli for online business owners, UI, and UX designers (Weinmann et al., 2016). According to the results of this research, practitioners are recommended to add the ‘descriptive norms plus feedback’ nudge or the ‘feedback’ nudge to their webshop. This recommendation is also confirmed by other scholars in household consumption, like Schultz et al., 2015, who found a significant effect of adding social norms to a feedback nudge. In addition, Darby et al. (2006) confirmed the effectiveness of the feedback nudge because multiple studies indicated that it could reduce energy consumption by up to 20%. Furthermore, it is recommended to consider experimenting with several nudges in isolation or mixed together in order to see which nudge is the most effective. Every decision environment is different, so the effectiveness of these digital nudge could vary. What makes digital nudging interesting for practitioners is its customizability. You can customize a digital nudge accordingly to the digital decision environment. If a digital nudge appears not to be sufficiently effective, it is easy to adapt it in a digital environment. Ultimately, this could help to increase the sales of sustainable products. Finally, this research shows creative ways of how UI and UX designers could implement digital nudging in a fast and cost-effective way in a webshop.

**Limitations and suggestions for further research** The findings of this research constitute novel and practical contributions to the literature, but some limitations need acknowledgment, and important issues for future research need to be identified. Digital nudging is an exciting, relatively new, concept that is worth researching in order to make a larger impact on the environment.   
 First of all, the sample size and representativeness of the sample could be considered. The sample consisted mainly of students with a low-income and represents only one part of the population. Therefore, we should take the results with some caution. Future research could replicate this study by using a larger and more diverse sample.   
 Secondly, as discussed above, the ethical implications of digital nudging should be examined. As digital nudging holds great potential to influence sustainable consumption, we should not forget about the individual agency of consumers. In addition, we need to make sure that people do not abuse digital nudging. Digital nudging applied in e-commerce has overlap with increasing conversion rates in e-commerce, except for that digital nudging aims to benefit the society. People are already manipulated online through different tools, such as the way the shopping cart is always located right above in your screen and the way Google Ads shows you exactly what you are interested in. In addition, Booking.com is continuously running A/B tests and changing the website’s interface in order to increase conversion. What is decided as ‘ethical’ digital nudging and who should be in charge of that would be interesting topics to be considered for future research.   
 Moreover, the multiple R-squared remained low across the four different models, which indicates that there are variables that are not included in the model. A possible explanation for this is that consumption behavior is complex and it will not be feasible to incorporate all possible variables to the model. However, as the control variables were added, model 3 and model 4 show a higher multiple R-squared, as the statistical power increased. For future research, more variables could be added to the model to give a holistic view of consumption behavior.   
 With respect to the default nudge, its applicability to ecommerce could be reconsidered. The default nudge is usually applied in a more simplistic decision environment (e.g. organ donor). In this experiment, the consumer is exposed to multiple options, which makes decision-making more complex. The consumer’s first impression is the homepage full of sustainable products, but if they go to the shopping page, the consumer sees both sustainable and non-sustainable products. Since the default nudge is one of the most powerful nudges (Johnson et al., 2012), future research could further investigate the effectiveness and implications of different default nudge options for e-commerce.   
 Last, concerning the descriptive norms condition. The descriptive norm used in this research, which consisted ‘9 out of 10 people in the Netherlands…’, might not be representative of the population and therefore not credible. Nevertheless, this study has shown a positive influence of descriptive norms on sustainable consumption. There are countless other ways of adding descriptive norms to a condition, so future research could try other forms to see which one leads to the most desired effect. It would be interesting to investigate the potential of descriptive norms customized to the consumer because research has shown that descriptive norms are the most effective when people could identify to the norm (Cialdini et al., 1990). Currently, more data of users are collected and used to provide an individual shopping experience. It would be possible to add personalized descriptive norms to a webshop, which the consumer can totally identify with. For example, information about friends and family, who also bought a certain sustainable product online. However, this should be in line with the GDP and executed in an ethical way.

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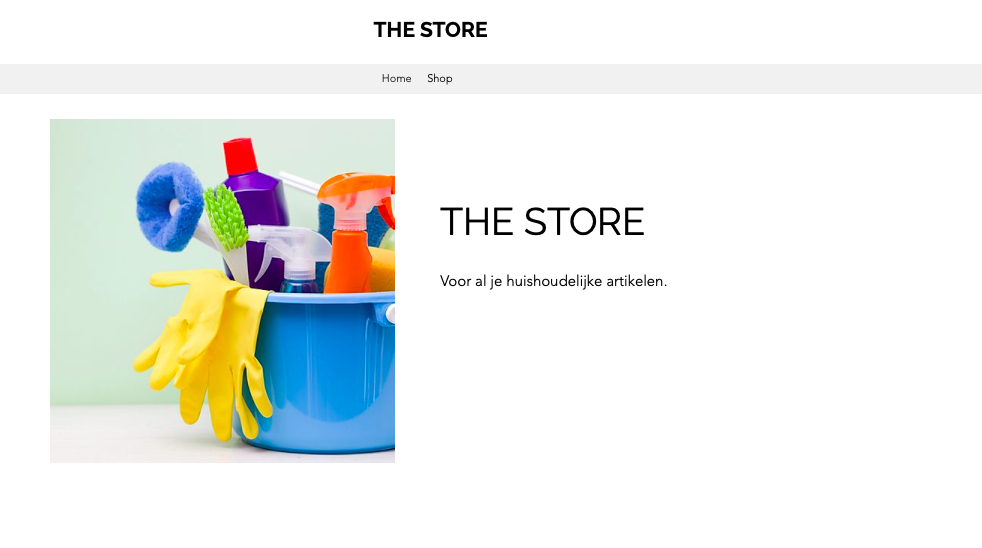
# Appendices

## Appendix A Conditions

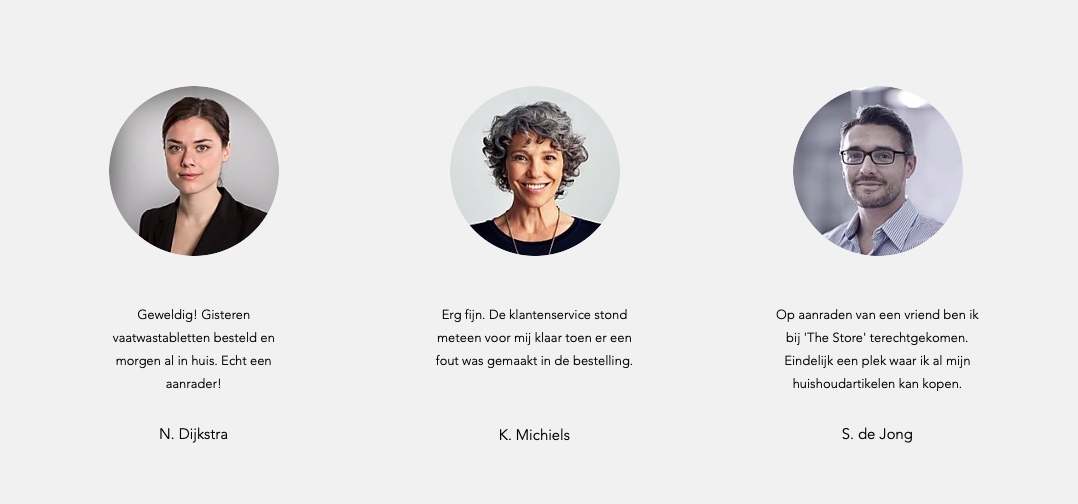
* URL: <https://www.thehouseholdingstore.nl/> (available until August 15, 2020)

1. **Control condition**

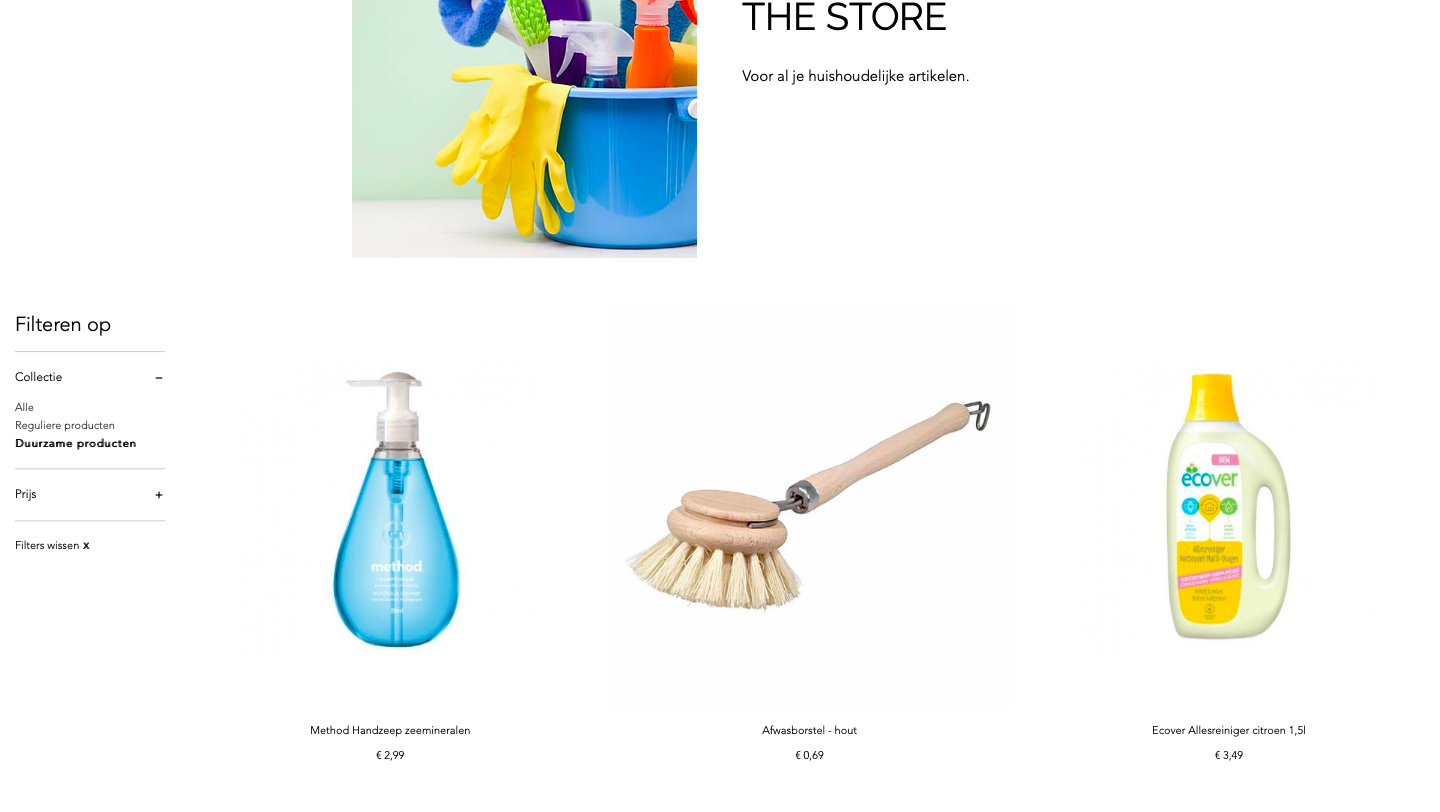
* Banner



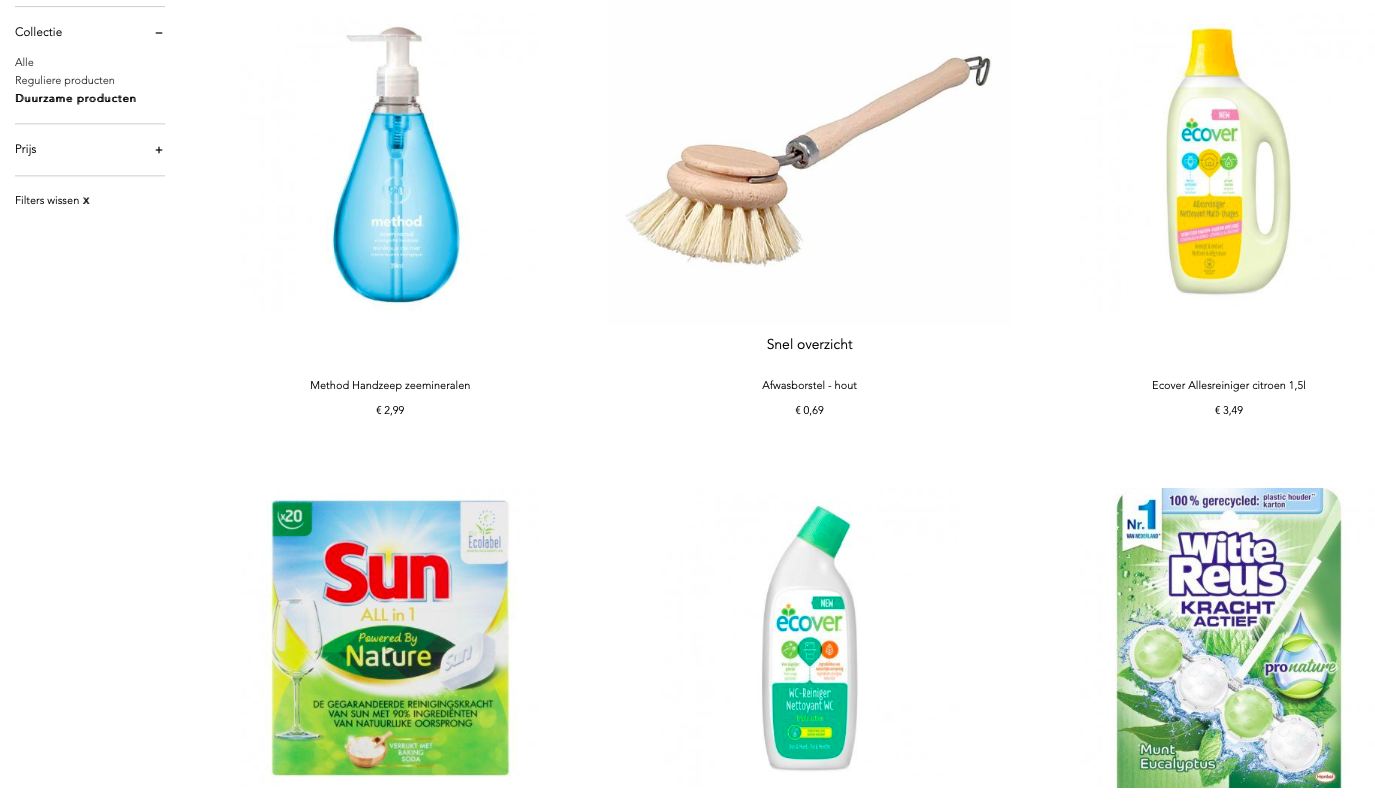
* Neutral customer reviews



1. **Default condition**

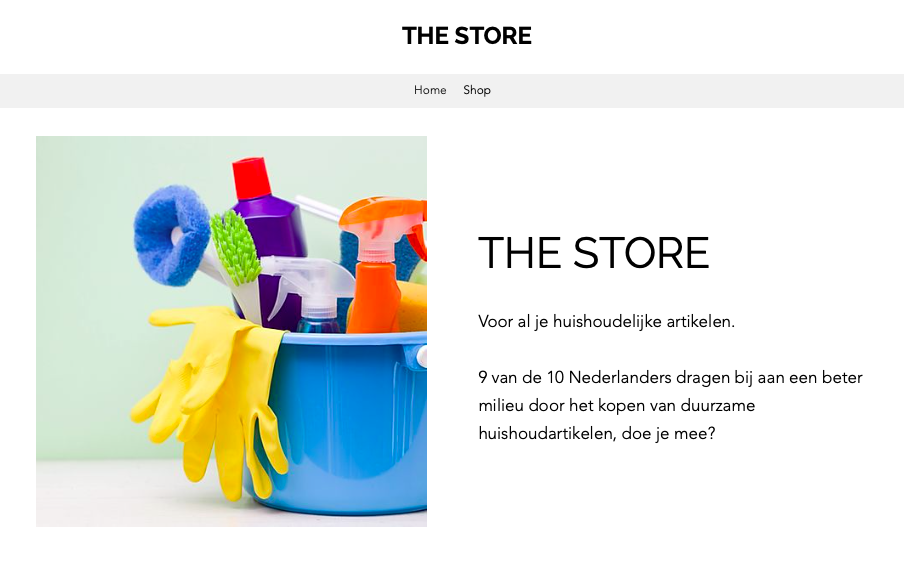


* Screenshot of the homepage

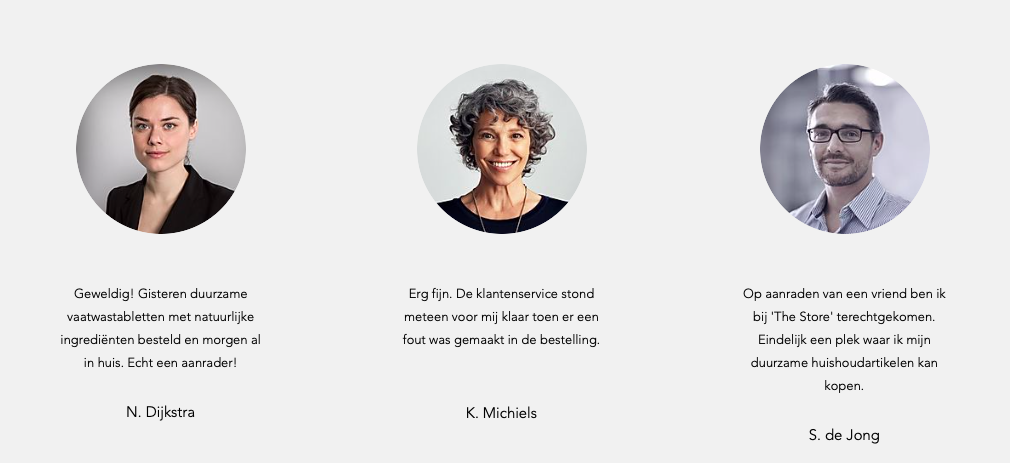


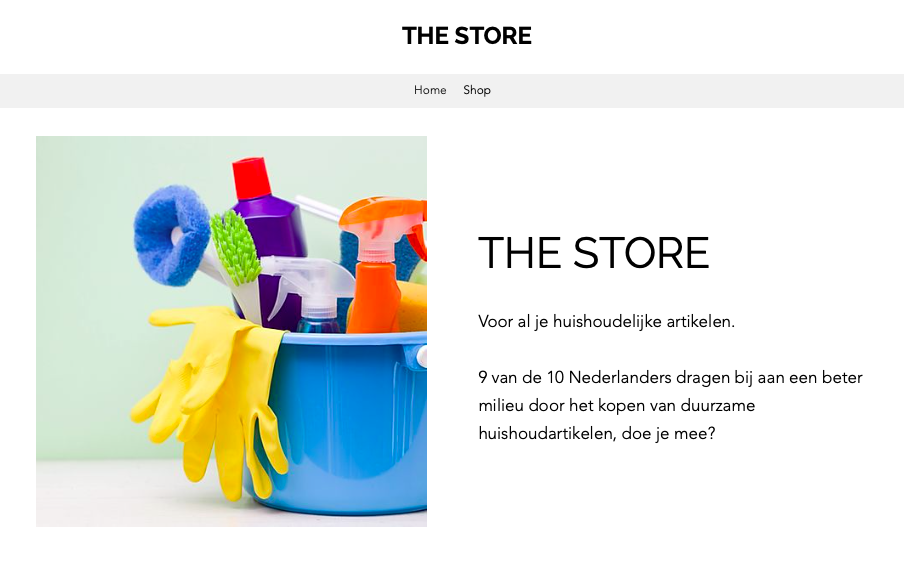
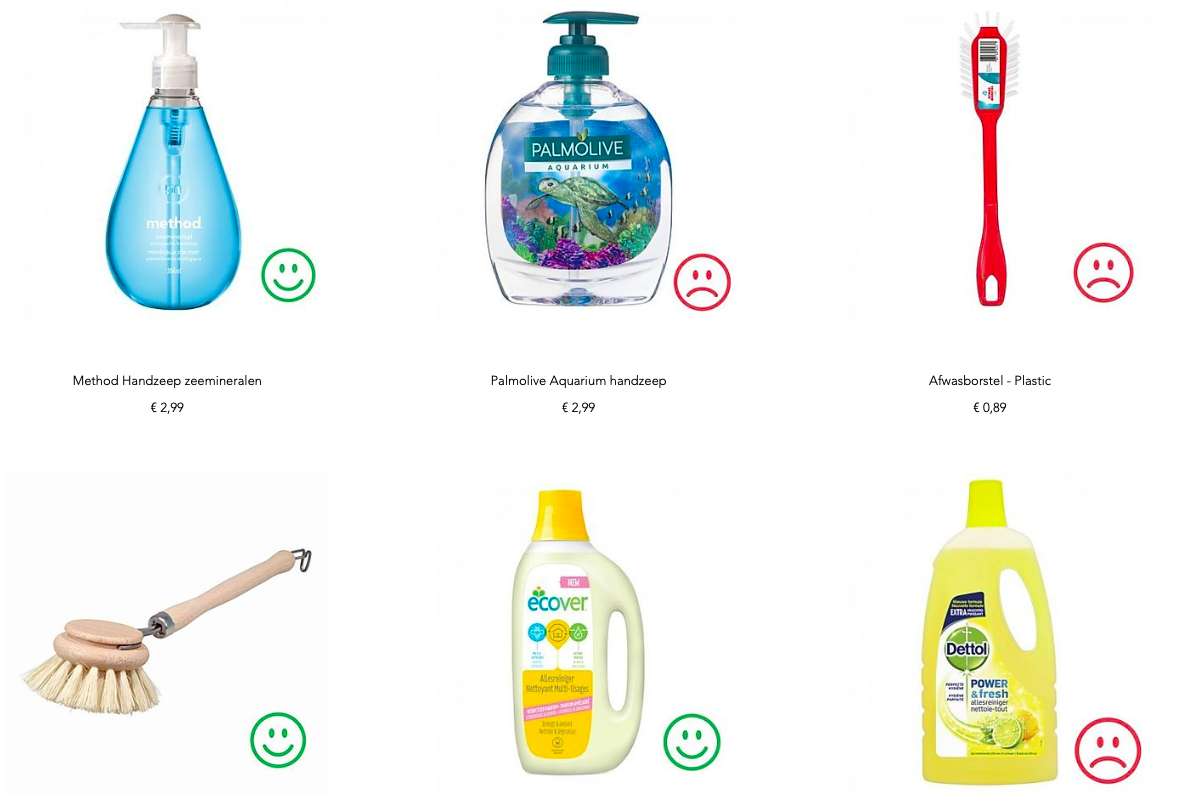
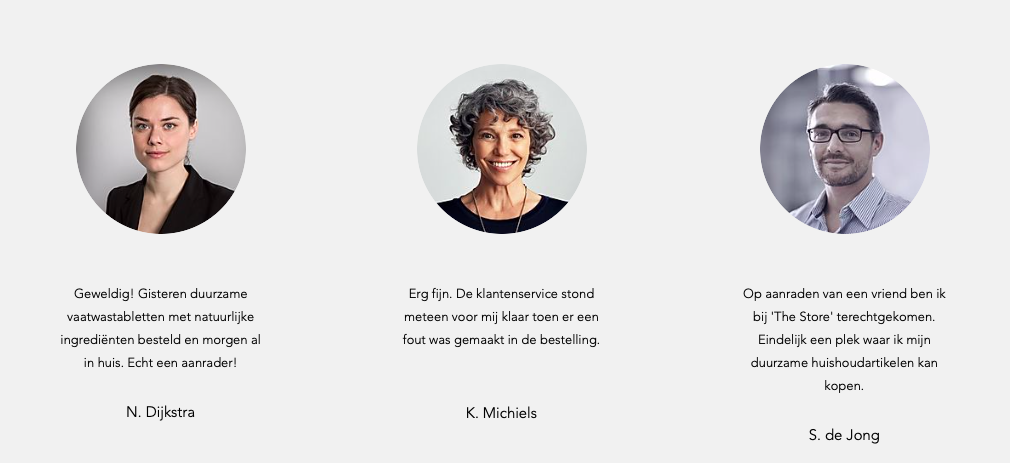
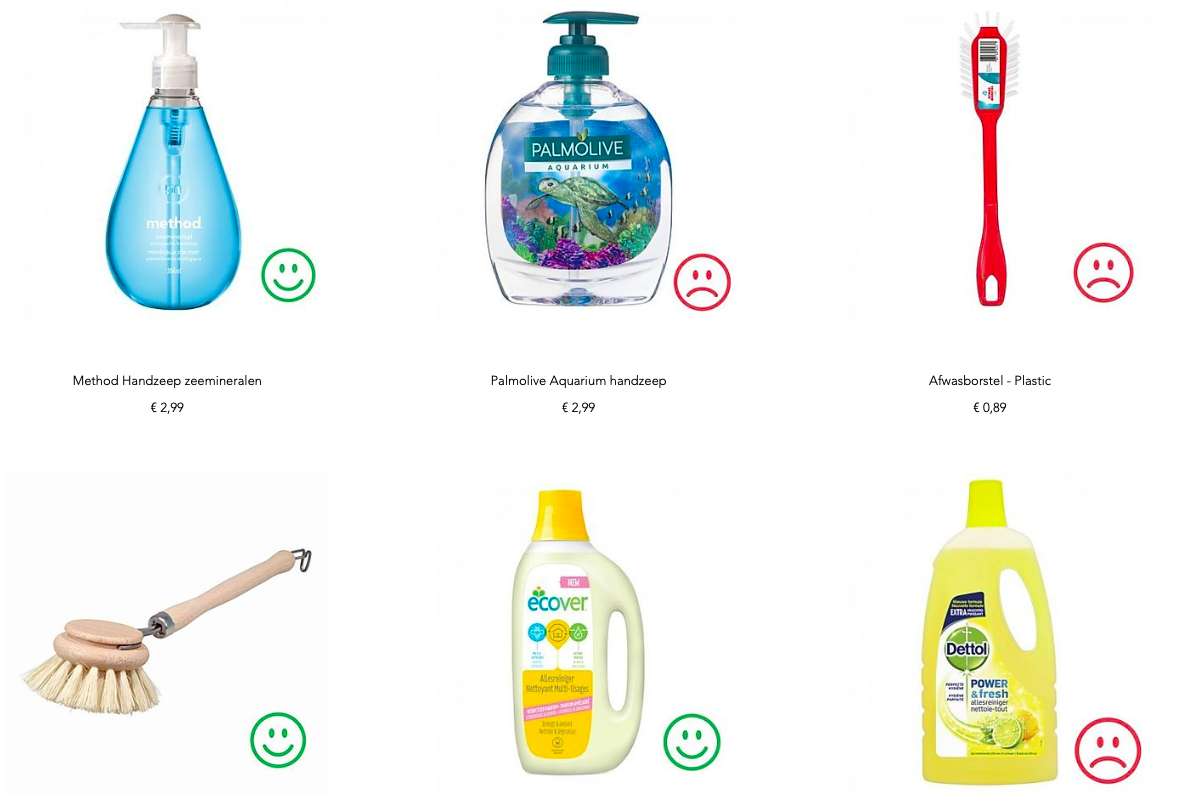
1. **Descriptive Norms condition**

* Banner



* Customer review with descriptive norms embedded.



1. **Feedback + Descriptive Norms condition**  
   
2. **Feedback condition**

## Appendix B Measuring Items

|  |  |
| --- | --- |
| **Demographics** |  |
| 1. Gender | * Women * Man * Prefer not to say |
| 2. Age | * <18 * 18-24 * 25-34 * 35-44 * 45-54 * 55-64 * 65 and over |
| 3. Education | * Primary school * High school * MBO * HBO * University |
| 4. Income | * Less than €10,000 * €10,000 - €19,999 * €20,000 - €29,999 * €30,000 - €39,999 * €40,000 - €49,999 * €50,000 - €59,999 * €60,000 - €69,999 * €70,000 - €79,999 * €80,000 - €89,999 * €90,000 - €99,999 * €100,000 - €149,999 * More than €150,000 |
| **Green Self-Identity (GSI)** |  |
| I think of myself as someone who is concerned about environmental issues (GSI1) | 7-point Likert scale of 1 = very low & 7 = very high |
| I think of myself as a ‘green’ consumer (GSI2) | 7-point Likert scale of 1 = very low & 7 = very high |
| Buying sustainable householding products would make me feel like a green consumer (GSI3) | 7-point Likert scale of 1 = very low & 7 = very high |
| I would feel totally satisfied with myself if I bought sustainable householding products (GSI4) | 7-point Likert scale of 1 = very low & 7 = very high |

## Appendix C Correlation Matrix

|  |  |  |  |
| --- | --- | --- | --- |
|  | GreenMoney | GreenProduct | GSIc |
| **GreenMoney** | 1.000 |  |  |
| **GreenProduct** | 0.828 | 1.000 |  |
| **GSIc** | -0.271 | -0.266 | 1.000 |

\*Correlation is significant at the 0.05 level (2-tailed).  
\*\*Correlation is significant at the 0.01level (2-tailed).

## Appendix D Demographic Overview

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Category** | **Pre-test** |  | **Study** |  |
|  | N(n=10) | Percentage (%) | N (n=201) | Percentage (%) |
| **Gender**  Women  Man  Neutral | 5  5  0 | 50.0  50.0 0 | 138 63 0 | 68.6 31.9 0.0 |
| **Age** <18 18-24 35-34 35-44 45-54 55-64 65 and over | 0 4 6 0 0 0 0 | 0 40.0 60.0 0 0 0 0 | 2 117 51 6 1 17 7 | 1.0 58.2 25.3 2.9 0.5 8.4 3.5 |
| **Education** Primary school  High school  MBO HBO University | 0 0 0 0 10 | 0 0 0 0 100.0 | 0 6 4 58 133 | 0.0 3.0 2.0 28.9 66.2 |
| **Income** Less than €10,000 €10,000 - €19,999 €20,000 - €29,999 €30,000 - €39,999 €40,000 - €49,999 €50,000 - €59,999 €60,000 - €69,999 €70,000 - €79,999 €80,000 - €89,999 €90,000 - €99,999 €100,000 - €149,999 More than €150,000 | 10 0 0 0 0 0 0 0 0 0 0 0 | 100.0 0 0 0 0 0 0 0 0 0 0 0 | 95 43 16 14 11 4 8 2 3 0 1 4 | 47.3 21.4 8.0 7.0 5.5 2.0 4.0 1.0 1.5 0.0 0.5 2.0 |

## Appendix E Layout Survey

**Start of Block: Default Question Block**

Beste respondent,

Mijn naam is Simone Kuijer en ik doe de master Digital Business & Innovation aan de Vrije Universiteit Amsterdam. Mijn scriptie gaat over het online consumentengedrag van huishoudelijke artikelen. Onder huishoudelijke producten worden verstaan: allesreiniger, afwasborstel, wc reiniger, etc.

Hieronder volgt een online experiment die vervolgens afsluit met een survey. Het experiment duurt ongeveer 3 minuten en de survey duurt ook 3 minuten. Uw gegevens worden vertrouwelijk behandeld en worden uitsluitend voor dit onderzoek gebruikt.

Als u vragen hebt over het onderzoek, kunt u mij een e-mail sturen op: simone\_kuijer@hotmail.com

Bij voorbaat dank voor uw deelname!

Door deel te nemen aan dit onderzoek, stemt u ermee in om zo eerlijk mogelijk antwoord te geven. Alle antwoorden worden geanonimiseerd en uw gegevens worden vertrouwelijk behandeld.  
  
Gaat u akkoord met de bovenstaande voorwaarden? Door op Ja te klikken, gaat u ermee akkoord dat u de vragen in deze enquête wilt beantwoorden.

* Ja
* Nee

*Skip To: End of Survey If Door deel te nemen aan dit onderzoek, stemt u ermee in om zo eerlijk mogelijk antwoord te geven.... = Nee*

Om de data van de survey met het experiment te linken, heb ik enkel uw (fictieve) naam nodig. Vul aub dezelfde naam in bij het voltooien van de bestelling.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
In het eerste gedeelte van het onderzoek gaat u huishoudelijke producten kopen in de webwinkel 'The Store' voor een fictief budget van €22. Probeer dit bedrag zo realistisch mogelijk te besteden, zoals u dat in het dagelijks leven ook zou doen. Neem de tijd om de webshop te ontdekken. U kunt de kortingsvoucher **'thestore'** gebruiken tijdens het afrekenen. Voor het adres kunt u enkel een X invullen, want deze gegevens zijn niet relevant voor het onderzoek.

**Ga nu naar de volgende link en vergeet niet af te rekenen:**

https://www.thehouseholdingstore.nl

Keer vervolgens terug naar de survey.

Q1 Wat is uw leeftijd?   
oJonger dan 18 (1)   
o18-24 (2)  
o25-34 (3)   
o35-44 (4)  
o45-54 (5)   
o55-64 (6)   
o65+ (7)

Q2 Wat is uw geslacht?   
oVrouw (1)   
oMan (2)   
oNeutraal (3)

Q3 Wat is uw hoogst genoten opleiding?   
oBasisschool (1)   
oVoortgezet onderwijs (VMBO, HAVO, VWO) (2)   
oMBO (3)   
oHBO (4)   
oUniversitair (5) 

Q4 Wat is uw gemiddelde inkomen per jaar?   
oLess than €10,000 (1)   
o€10,000 - €19,999 (2)  
o€20,000 - €29,999 (3)   
o€30,000 - €39,999 (4)   
o€40,000 - €49,999 (5)   
o€50,000 - €59,999 (6)   
o€60,000 - €69,999 (7)   
o€70,000 - €79,999 (8)   
o€80,000 - €89,999 (9)   
o€90,000 - €99,999 (10)   
o€100,000 - €149,999 (11)   
oMore than €150,000 (12)

Q22 \*REMINDER\* Heb je al een bestelling geplaatst: https://www.thehouseholdingstore.nl ?

Een nieuw tabblad wordt geopend met de webshop 'The Store'. U kunt voor een fictief bedrag van €22 shoppen. Vergeet niet af te rekenen en keer vervolgens terug naar deze survey.

Page Break



Q5 Ik zie mezelf als iemand die bezorgd is over milieukwesties.   
oHelemaal mee eens (1)   
oMee eens (2)   
oRedelijk mee eens (3)   
oNeutraal (4)   
oRedelijk mee oneens (5)   
oOneens (6)   
oHelmaal oneens (7)

Q6 Ik zie mezelf als een 'groene' consument.   
oHelemaal mee eens (1)   
oMee eens (2)   
oRedelijk mee eens (3)   
oNeutraal (4)   
oRedelijk mee oneens (5)   
oOneens (6)   
oHelemaal oneens (7)



Q7 Als ik duurzame huishoudelijke producten koop, voel ik me een groene consument.   
oHelemaal mee eens (1)   
oMee eens (2)   
oRedelijk mee eens (3)   
oNeutraal (4)   
oRedelijk mee oneens (5)   
oOneens (6)   
oHelemaal oneens (7)

Q8 Ik zou helemaal tevreden met mijzelf zijn als ik duurzame huishoudelijke artikelen koop.   
oHelemaal mee eens (1)   
oMee eens (2)   
oRedelijk mee eens (3)   
oNeutraal (4)   
oRedelijk mee oneens (5)   
oOneens (6)   
oHelemaal oneens (7)



Q9 Hoe huishoudelijke producten het milieu kunnen beïnvloeden, is belangrijk voor mij.   
oHelemaal mee eens (1)   
oMee eens (2)   
oRedelijk mee eens (3)   
oNeutraal (4)   
oRedelijk mee oneens (5)   
oOneens (6)   
oHelemaal oneens (7)

Q10 Ik vind het belangrijk of huishoudelijke producten de uitputting van bossen veroorzaken.   
oHelemaal mee eens (1)   
oMee eens (2)   
oRedelijk mee eens (3)   
oNeutraal (4)   
oRedelijk mee oneens (5)   
oOneens (6)   
oHelemaal oneens (7) 

Q11 Ik vind het belangrijk of huishoudelijke producten waterverontreiniging kunnen veroorzaken.   
oHelemaal mee eens (1)   
oMee eens (2)   
oRedelijk mee eens (3)   
oNeutraal (4)   
oRedelijk mee oneens (5)   
oOneens (6)   
oHelemaal oneens (7)

Q12 De hoeveelheid energie die wordt gebruikt voor de productie van huishoudelijke producten is voor mij niet belangrijk.   
oHelemaal mee eens (1)   
oMee eens (2)   
oRedelijk mee eens (3)   
oNeutraal (4)   
oRedelijk mee oneens (5)   
oOneens (6)   
oHelemaal oneens (7)   
**End of Block: Default Question Block**