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Sustainable Behaviour through Nudging?

An Experimental Study on Nudging, Climate Change Denial
and Political Orientation

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Abstract

Can nudging promote sustainable consumption behaviour? This study investigates if nudging promotes more environmentally-friendly purchases when applying either a default option or adding a product to elicit the attraction effect in a consumption situation of electronic products. The study further investigates sustainable consumption behaviour by looking at political orientation and the degree of climate change denial. The results show that nudging can promote significantly more environmentally-friendly purchases. The attraction effect was found to have positive effects, but not the default option. A higher proportion of environmentally-friendly purchases was further carried out by participants having a lower denial towards climate change. Climate change denial was also correlated with political orientation; participants evaluating themselves as right-wing oriented showed higher climate change denial, and proceeded with less sustainable purchases. Despite identifying positive effects of nudging on sustainable consumption behaviour, data also indicate an interaction effect between nudging and the sequenced presentation order of condition. This can be interpreted as a carry-over effect moderating the effect of nudging when it is presented after a control condition. This moderating effect is discussed as a potential limitation of nudging as a tool to affect people's behaviour.

Key words: Nudging, Climate Change Denial, Political Orientation, Sustainable Consumption Behaviour.

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Introduction

Promoting Sustainable Behaviour

Why are people not making environmentally-friendly choices?

Climate studies are showing that humans must change their behaviour by making more sustainable choices. Since pre-industrial time human activities have caused global warming with approximately 1.0 degrees Celsius. If this behaviour continues, temperature will further increase with 1.5 degrees by 2030 (The Intergovernmental Panel on Climate Change [IPCC], 2018). The Intergovernmental Panel on Climate Change states the risks of global warming as: species loss combined with changes in eco-systems, drought, and rising of sea level threatening both small islands and low-lying coastal areas.

Considering the consequences of global warming, the United Nations have identified 17 goals for a more sustainable future. The goals involve extinction of poverty, hunger, sickness and inequality, as well as promoting sustainable consumption, innovation and green energy (United Nations sustainable development goals). The 12th goal, which is relevant for this thesis, states that more awareness must be put behind consumption. In addition to reducing their consumption, people must also start buying more environmentally-friendly products. Current statistics show that households consume 29% of the global energy. Living up to the 12th goal, one of the sub targets is to provide information about environmentally-friendly choices through labelling and more, hence improving sustainable consumption behaviour (United Nations 12th goal of sustainable development).

Even though more information is provided, and new technology promoting energy efficiency is developed, statistics show that energy use in OECD countries will rise with 35% by 2020 (UN 12th goal). Why are people still not making environmentally-friendly choices to the extent that is necessary? The answer may, at least in part, lie within classic judgement psychology - humans are not fully rational in their decision making. But how can we then create a surrounding that pushes people in to making the necessary rational and environmentally-friendly choices? A potential answer to that question will be presented in this study.

The purpose of this study is to analyse how “nudging” can be used as a tool when encouraging people to make more environmentally-friendly choices in a consumption situation. The study will further investigate the correlation between political orientation and climate change denial, since the recognition of climate change is a fundamental condition for one to act against it.

The Psychology of Nudging

Even if nudging is a quite new concept, it is often present in everyday life. Being served free peanuts to a beer can be conceived as a nudge, as well as footprints on the ground towards the litter bin and 3D-printed crosswalk for pedestrians. These three examples demonstrate situations in which people are being “gently pushed” in to a certain behaviour.

According to Hertwig and Grüne-Yanoff (2017; Grüne-Yanoff & Hertwig, 2016), nudging emphasises the dual system as architecture for human cognition. The dual system explains the cognition of decision making by two systems; System 1 featuring intuitive and fast thinking, and System 2 which involves slower and more analytical thinking processes. Kahneman (2003) states that decision making relies on the heuristics of System 1, due to the limitations of rational thinking. When changing behaviour through nudging, harnessing the limitations of System 1 is therefore more common than engaging and fostering System 2 (Hertwig & Grüne-Yanoff, 2017; Kahneman, 2003; Thaler & Sunstein, 2009).

The basic idea of nudging is to make the wrong decision harder, and the right decision easier to make. Although striving towards the same goal – establishing a desirable behaviour – nudging is distinguished from laws and rules. Instead of being forcing, nudging enables the individual to have freedom of choice (Sunstein, 2014). Steering behaviour while still giving a sense of freedom is made possible by utilising System 1 in human’s cognitive thinking. Humans often feel a lack of time or motivation to put too much effort into their decision making. This leads to less deliberate and conscious decision making, where intuition steers the decision of choice (Kahneman, 2011; Smith & DeCoster, 2000; Grüne-Yanoff & Hertwig, 2016).

Nudging in Policy Interventions. In recent years it has become more common for governments to use Behavioural Insights Team (BIT) when carrying out governmental interventions in society. BIT provides nudging as an alternative to laws and social- or economic sanctions (Marchiori, Adriaanse & De Ridder, 2017). Examples of countries operating such teams are the United Kingdom and the United States. The EU commission is also using BIT as support for applying nudge theory in policy-making (Kosters & van der Heiden, 2015).

Nudging in governmental interventions have been successful. Countries having a presumed consent to organ donation, such as Sweden and Australia, have a range of donations from 85.9% to 99.98%, while countries who are not presuming consent to organ donation have a lower rate of donations. Examples of such countries are Denmark and the Netherlands, having a range of donations from 4.25% to 27.5% (Johnson & Goldstein, 2003).

Although nudging has been effective, it has also received critique. When applying nudging in governmental interventions one can discuss the ethics, legitimacy and transparency behind it. The risk is that citizens feel exploited (Kosters & van der Heiden, 2015). In addition, one can question the legitimacy of granting choice-architects the responsibility of defining and promoting desirable behaviour (Grüne-Yanoff & Hertwig, 2016).

Nudging as a Tool. The original idea of nudging was to steer behaviour by making *changes in the physical environment* (Marchiori et al., 2017). Changes in the physical environment have been efficient tools when improving individuals' sustainable behaviour. For example, grocery stores have increased the consumption of healthy food by placing such groceries at eye level (Marchiori et al., 2017), and hotels in Norway have reduced food waste with a fifth by reducing plate size (Nielsen et al., 2017).

Other kinds of nudges that have been used are *framing of information* and *social norms*. Framing statistical information has had a significant effect on people's decision making. In a study by McNeil, Pauker, Sox and Tversky (1982) patients were presented with the probable outcome of either a surgery or a radiation treatment. One group of the patients were provided with information about the risks of dying, while the other group were provided with the opportunities of surviving. Patients that were provided with information in terms of surviving found the surgery's long-term aspects more attractive, while patients that were provided with information about dying found the radiation treatment's short-term aspects more attractive. In other words, the same statistical information was interpreted differently depending on how it was framed.

Most people feel uncomfortable acting outside social norms and pleasant when they hear that they are better than average (Lapinski, 2005; Cialdini & Goldstein, 2004). Companies have made use of this human instinct when improving sustainable behaviour. For example, studies have shown that electricity consumption is reduced in households that are provided with real-time information about their energy usages (Kosters & van der Heiden, 2015; Nielsen et al., 2017). In addition to comparing the household's energy usage with others in the same neighbourhood, households can also compare their energy usage on a national level (Kosters & van der Heiden, 2015; Nielsen et al., 2017).

Swedish grocery stores have also used the concept of nudging sustainable behaviour through social norms. By providing the mobile phone application "Mitt klimatmål" (*translation: My climate goal*) costumers are able to compare their ecological footprint of

grocery shopping to the average Swedish citizen and the European commission's climate goals. The purpose of the application is to make more costumers aware of their consumption behaviour (ICA, mitt klimatmål).

However, nudging is not only used when improving sustainable behaviour. To make a profit many companies use nudging to increase costumers' consumption, resulting in a non-sustainable behaviour. One example of such a company is Scandinavian Airlines. The company provides a bonus system that makes it beneficial to fly more. Still, the total number of flights per Swedish citizen is counted to 1.3 per year, and the emission from international flying by Swedish citizens count to 10.5 million-ton CO₂ per year (Kamb, Larsson, Nässén & Åkerman, 2016). Clothing stores are also using nudging to increase consumption. By placing cheap products by the pay desk, clothing stores utilise the impulsive characteristics of System 1. This results in many costumers buying more than necessary, due to the lack of time of making a reasoned decision whether it is a good purchase or not.

The Default Option

Even if nudging sometimes result in a non-sustainable behaviour, there are examples of how nudging is used as a goal-oriented tool when creating more sustainable societies. In a natural experiment carried out in Germany 1999, costumers of an energy company were presented with three new energy tariffs; a green middle priced tariff, a green highly priced tariff and a non-green low-priced tariff. The green tariff of middle cost was presented as a default option, and the costumers were informed to contact the energy company if they wished to change tariff. After two months 95 % of the costumers still used the default option (Nielsen et al., 2017; Pichert & Katsikopoulos, 2008).

In the example above, the *default option* turned out to be an efficient tool when influencing the costumer's choice of green electricity. Using the default option as a nudge means that the costumer must choose between two ways of acting: actively choosing another option than the default one, or passively keep the default option. Often people choose the last-mentioned alternative of action.

The efficiency of default options can be explained by humans' desire to remain in the same state. Status quo bias influence one's judgements by emphasizing the possible risks of changing state, and the lesser risk of not changing. Thus, the potential loss looms larger than the potential gains (Samuelson & Zeckhauser, 1988).

Although the default option has shown great efficiency (Nielsen et al., 2017; Johnson & Goldstein, 2003; Madrian & Shea, 2001; DellaVigna, 2007), it is not implemented without challenges. Critique against default options concern the assessment of right choice, as well as violating the principle of individual freedom. Even if individuals have freedom of choice when nudging is present, it has been argued that it violates the principle of having the right to make one's own decision (Kosters & van der Heiden, 2015).

There are also cases of less effective implementations of nudging. In Sweden, the government funded expensive media campaigns to encourage citizens to make their own choice about their retirement plan. In the meantime, resources were put into creating a default option for those citizens who did not have a retirement plan, working contra productive to the money being put in media campaigns. A similar situation occurred in the United States. The default option for those citizens who did not choose their own retirement plan was to be randomly assigned to one, leading to less optimal retirement plans for the individual (Thaler & Sunstein, 2009).

The Attraction Effect

According to the *attraction effect*, context creates the frame of reference in which humans make their decisions. This means that judgements are based on the option's value in relation to the other presented options, and not by its intrinsic value (Ok, Ortoleva & Riella, 2015; Huber, Payne & Puto, 1982; Hadar, Danziger & Hertwig, 2018). When using the attraction effect as a nudge, an option that is less attractive is added to the original alternatives in a situation of decision. The presence of a lesser attractive option is intended to make another option relatively more attractive (Huber et al., 1982; Simonson, 1989; Kim & Hasher, 2005; Noguchi & Stewarts, 2014; Ronayne & Brown, 2017).

By adding an alternative that is dominated in one feature, but not dominated in another, the preference for an option can shift (Ok et al., 2015; Huber et al., 1982). Consider the following example as an illustration of the attraction effect: A consumer buying a mobile phone face the options of either buying Mobile 1, an expensive and environmentally-friendly product, or Mobile 2, a cheap and non-environmentally friendly product. The consumer decides to buy Mobile 2 but chooses to wait until the next day to make the purchase. However, during next day the store has received a new mobile-phone in stock. The new product, Mobile 3, is more expensive than Mobile 1 but less environmentally-friendly. The consumer now changes the decision of buying Mobile 2, and purchases Mobile 1 instead.

In the example above, Mobile 3 represents a decoy that is added to a binary set of options. By adding Mobile 3, the original preference shifts. The decoy's characteristics of being the most expensive but not the most environmentally-friendly product makes Mobile 1 appear relatively more appealing. The heightened attractiveness of Mobile 1 lies in its characteristics of still being the most environmentally-friendly product, but no longer the most expensive due to the presence of Mobile 3. This effect violates fundamental assumptions in many rational choice models. For example, the principle of regularity states that the preference for one option should be maintained when other options are added to the binary set. However, this is not always the case according to the attraction effect (Huber et al., 1982).

The attraction effect has been especially large in selection tasks. Compared to rejection tasks, where the choice maker sequentially eliminates the options considered unattractive, selection tasks refer to a decision task type where the choice maker directly strives to pick the most advantageous option (Chang, Chang & Liao, 2015). By being more sensitive to the advantages, rather than the disadvantages, of each option in the binary set of options, the choice maker tends to evaluate the dominating option more favourably, hence heightening the attraction effect (Chang et al., 2015).

Earlier research has also identified a diversification in the attraction effect. Depending on the consumer's knowledge about a product, the attraction effect varies. The attraction effect has a bigger impact on consumers with less knowledge about a product, and lesser impact on those with higher expertise (Sen, 1998; Chang et al., 2015).

Critique has been brought forth against the attraction effect. Studies that have attempted to replicate earlier significant effects of the attraction effect have sometimes failed, leading to some researchers questioning the attraction effect's robustness (Yang & Lynn, 2014; Frederick, Lee & Baskin, 2014).

Climate Change Denial and Political Orientation

Previous research has found a significant correlation between political orientation and climate change denial, where people with right-wing oriented political views show a higher tendency of scepticism towards climate change (McCright, 2011; McCright & Dunlap, 2011; Jylhä & Akrami, 2015; Carrus, Panno & Leone, 2018). Whitman, Zhao, Roberts and Todd (2018) state that attitudes about climate change are determined by the exposure of climate-related information and the aspects that the individual chooses to acknowledge of that information. Those who are exposed to climate change scepticism in media have more negative

attitudes toward environmental-related issues, compared to those who are exposed to media that acknowledge the risks of climate change (Greitemeyer, 2003).

The risk-perception regarding climate change are diversified between different groups in society. In a Canadian study, right-wing oriented citizens were reported to be less concerned about climate changes in their geographical area than citizens having left-wing political preferences (Whitman et al., 2018). McCright (2011; McCright & Dunlap, 2011) explains similar tendencies in the United States by referring to the tension between industrial capitalism and the acknowledgement of global warming. Especially white males with conservative political preferences are reported to have a divergent risk-perception of global warming. The reason for this is explained as socio-political, rather than biological. Due to their socio-political status in society, a higher amount of conservative white males are sceptic towards climate change. Their higher status gives extended control over technology and institutions, and further a more dominant position in the industrial capitalism (Marshall, Picou, Formichella & Nicholls, 2006; Kahan, Braman, Gastil, Slovic & Mertz, 2007). When this privilege of control is threatened by climate change, potential risks of global warming are denied.

While earlier studies have found a correlation between right-wing political orientation and climate change denial, this study further aims to investigate whether these two variables are related to people's preferences for purchasing environmentally-friendly products or not. To investigate political orientation in relation to climate change denial, many studies have used the same kind of structure – measuring political orientation on a self-reporting scale between left and right-wing political preferences, and attitudes toward climate change through surveys addressing different aspects of climate change denial (Whitman et al., 2018; Carrus et al., 2018; McCright, 2011). For instance, the different aspects of climate change denial allude to people's attitudes toward human impact on global warming, as well as the degree of denial one has toward the seriousness of climate change (Häkkinen & Akrami, 2014).

The Experiment

This study will investigate the efficiency of nudging drawing on a *default option* and on the *attraction effect*. The investigation takes the form of a simulated buying situation, where participants of the study are choosing which electronic product they want to purchase. The products are presented in three different conditions: one condition with the presence of a default option, one condition with an added option to elicit the attraction effect, and one control condition with the absence of nudging. The efficiency of nudging on sustainable consumption behaviour is measured by the proportion of environmentally-friendly products a participant

chooses to purchase in each condition. Further, a survey will be used to analyse the correlation between climate change denial and political orientation in relation to sustainable consumption behaviour.

The Study's Hypotheses

The hypotheses for the study are:

- The consumer will stick to the more environmentally-friendly product when a default option is present.
- The consumer will choose the more environmentally-friendly product when the attraction effect is present.
- Participants of the study with right-wing political orientation will show a greater tendency in climate change denial, and therefore a lower tendency to buy environmentally-friendly products.

Method

Participants

Participants ($n = 128$, 63.3% female, age: $M = 27.23$, $SD = 9.234$) were recruited through convenience sampling, using posters on noticeboards around different campuses of Uppsala University. As compensation the participants were either given one to two movie tickets depending on the amount of time it took to carry out the experiment, or a certificate confirming their participation in a psychological study. One participant was excluded from the climate change denial and political orientation analysis, due to incomplete data.

Material

LimeSurvey was used to create a simulated buying situation and further analyse nudging's efficiency on sustainable consumption behaviour. The participants faced multiple buying situations, in which they had to choose which electronic product they preferred to purchase. The electronic products used in the experiment was: mobile phones, mobile screens and portable amplifiers

Each electronic product varied in both eco-labelling and price. The eco-labelling consisted of one to three eco-stars, one eco-star representing a non-environmentally friendly product and three eco-stars representing a highly environmentally-friendly product. The price class of the products was divided in to three ranges: low priced, middle priced and highly priced. Four consumption scenarios were presented within each price range, resulting in 12 consumption scenarios per product (see Table 1 for example), and 36 items per experimental

survey. Within each price range, one consumption scenario was presented with a price difference of either 150, 100, 50 or 25 Swedish krona (SEK) between the products.

Table 1.

Simulated Buying Situation Design with Mobile Phone as an Example of Product.

Electronic product: mobile phone			
Price range (SEK)	150 - 249	250 - 349	350 ~
Eco-stars	I - III		
Consumption	1	5	9
situation	2	6	10
	3	7	11
	4	8	12

Furthermore, a paper survey was used to measure climate change denial and political orientation. The survey measuring climate change denial is composed by Häkkinen and Akrami (2014) (see Appendix A) and consists of 16 statements, on which the participants evaluated themselves on a Likert scale with five levels. The 16 items captured different aspects of climate change denial, such as the degree of denial towards human impact on global warming and the seriousness of climate changes. Examples of such statements are “*Climate change, as it is talked about today, is due to human activities, not natural variation*” and “*Climate change will not affect the life on Earth in any significant way.*”

The material used to analyse political orientation was a self-reporting seven-step scale. Participants evaluating themselves on step 1 indicated highly left-wing orientated political views, and positioning themselves on 7 indicated highly right-wing orientated political views.

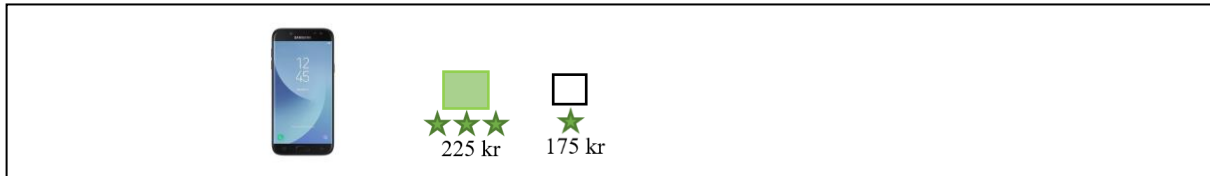
Procedure

The experiment was carried out in the same session as two other experiments, being placed in the middle of these two. The other experiments investigated a different topic and applied a different format, hence minimizing carry over-effects.

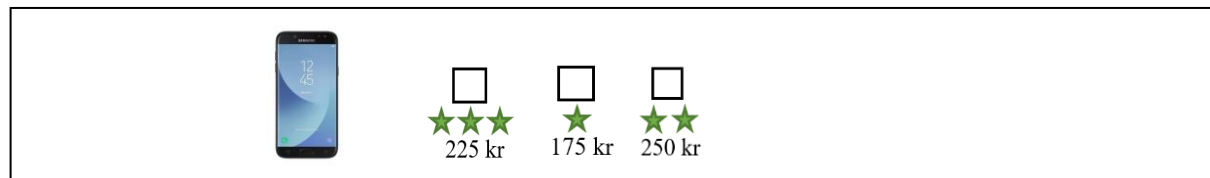
The first part of the current experiment was conducted as a computer-based experiment, using Lime Survey. The participants faced different situations of consumption, in which they had to choose which electronic product they preferred to buy. Before proceeding with the simulated consumption situation, the participants got the instruction to make the same decisions as if they were making a real purchase on the internet. To investigate the efficiency of nudging

on sustainable consumption behaviour, the consumption situation was manipulated by applying different kinds of nudges. A product was either presented with a default option, a dominated inferior product to elicit the attraction effect, or with the absence of nudging (control). To illustrate the application of nudging, see the following three examples of a consumption situation with a mobile phone.

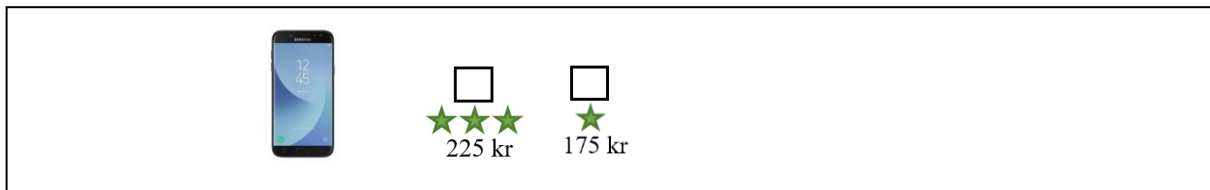
Example 1 – Default Option Applied.



Example 2 – Attraction Effect Applied.



Example 3 – Control (no nudging applied).



When the participants were done with purchasing electronic products, they went on to the second part of the experiment. In this part a survey in paper-format was used to measure the participants' climate change denial and political orientation. The purpose of having a survey in paper-format was to set the participants in a different mode compared to the first part of the experiment.

Design

The study was carried out as a within-subjects-design with three levels of the independent variable *nudge* (a default option, the attraction effect and control), were each level was measured in one of the electronic products: mobile phone, mobile screen and portable amplifier. The dependent variable *sustainable consumption behaviour* was measured on interval scale and is determined by the proportion of eco-labelled products a participant decided to purchase.

The conditions of the experiment were counterbalanced according to a Latin square. This resulted in following three sequences: (Default/Attraction/Control),

(Control/Default/Attraction) and (Attraction/Control/Default). Participants were randomly assigned to one of three different surveys, each applying one of the three sequenced orders of nudging. The order of the electronic products was the same in all three surveys (mobile phone, mobile screen, portable amplifiers). A within-group one-way Analysis of Variance (ANOVA) was used to analyse nudging’s efficiency on sustainable consumption behaviour.

Measurements of the correlation between political orientation and climate change denial were done by using Pearson’s r. The degree of climate change denial was measured on interval scale, and political orientation on ordinal scale.

Results

Hypothesis I and II - the effect of nudging

Hypothesis I and II of the study was:

- The consumer will stick to the more environmentally-friendly product when a default option is present.
- The consumer will choose the more environmentally-friendly product when the attraction effect is present.

The descriptive statistics associated with the proportion of purchased eco-labelled products depending on nudge is reported in Table 2. The mean proportion of purchased eco-labelled products was highest when the attraction effect (.689) was applied. The presence of control (.641) and the default option (.630) further led to a lesser but approximately similar proportion of purchased eco-labelled products. Concerning the condition of electronic product, the proportion of purchased eco-labelled products was highest in the consumption scenario of mobile phones ($M = .750, SD = .288$), and lower in the scenarios of mobile screens ($M = .658, SD = .289$) and portable amplifiers ($M = .554, SD = .263$).

Table 2
Means and Standard Deviations (within parenthesis) for the Proportion of Purchased Eco-Labelled Products for the Default Option, the Attraction Effect and the Control Condition.

Nudge		
The default option	The attraction effect	Control (absence of nudge)
.630 (.278)	.689 (.299)	.641 (.284)
n = 128		

A one-way ANOVA was conducted to investigate the main effect of nudging on sustainable consumption behaviour, $F_{2, 254} = 3.675, p = .027, \eta^2 = .028$. Following the one-way ANOVA, Fischer’s LSD was used to interpret the significant main effect of nudging and further localise the differences between the default option, the attraction effect and control. The LSD test revealed a significant difference between the attraction condition and the control condition ($p = .035$) and the attraction condition and the default condition ($p = .008$), but no significant difference between the control condition and the default condition ($p = .670$).

However, inspection of the three different presentation orders for the nudging condition suggests the presence of a carry-over effect. Entering the presentation order as a between-subject independent variable in a mixed factorial ANOVA with repeated measurements across the nudging condition demonstrated once more a main effect of the nudging condition, $F_{2, 250} = 5.440, p = .005, \eta^2 = .042$, but also an interaction effect between nudging and the sequenced presentation order of nudging, $F_{4, 250} = 28.209, p < .001, \eta^2 = .311$. As presented in Figure 1 (see Appendix B for a detailed report of the post hoc analysis), the attraction effect and the default option led to significantly more environmentally-friendly purchases than the control in Condition 1 (sequence order Default/Attraction/Control); the attraction effect elicited a significantly higher proportion of purchased eco-labelled products in Condition 3 (sequence order Attraction/Control/Default); and no significant effects of nudging was found in Condition 2.

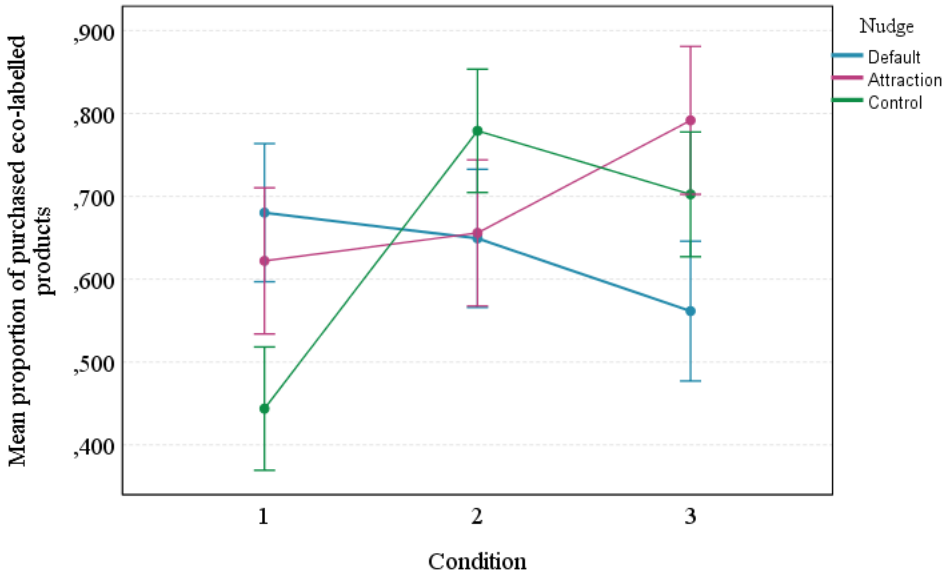


Figure 1. Mean Proportion of Purchased Eco-Labelled Products within each Condition and Level of Nudge. Condition 1 (Default/Attraction/Control), Condition 2 (Control/Default/Attraction), Condition 3 (Attraction/Control/Default). Error Bars Refer to a 95% Confidence Interval.

In addition to the main effect of the nudging condition with more environmentally-friendly purchases in the attraction condition, data also indicate sequence effects. The sequence effects concern the first condition of electronic product (mobile phones), which elicited more environmentally-friendly choices than the other conditions of electronic products presented later in the sequence. The highest mean of purchased eco-labelled products within each level of the nudging variable was in the condition where it was presented first. The default option had the highest effect when it was presented in the sequenced order of Default/Attraction/Control, the attraction effect when it was presented in the sequenced order of Attraction/Control/Default, and the control when it was presented in the sequenced order of Control/Default/Attraction. Further, the mean rate of environmentally-friendly purchases seems to be especially low when the control condition appeared last, after the default option and the attraction effect.

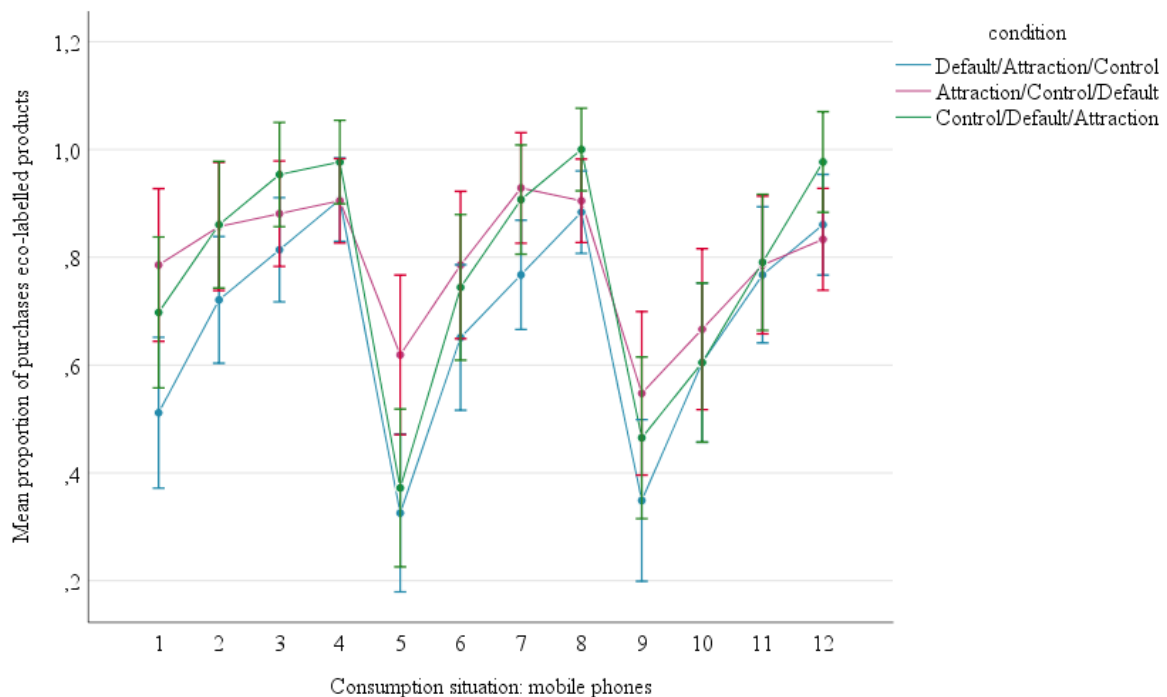


Figure 2. Mean Proportion of Purchased Eco-Labelled Products in the First Condition of Electronic Product: Mobile Phone, Depending on Nudging Condition. Error Bars Refer to a 95% Confidence Interval.

A mixed factorial ANOVA was used in order to investigate the effect of nudging when data was not affected by sequence- or order effects. The analysis compared the first presented product (mobile phones) in a between-subjects design, eliminating participants prior experience with the other conditions of electronic product. The mixed ANOVA stated a significant effect of nudging on the purchases of eco-labelled mobile phones, $F_{11, 1375} = 2.124, p = .002, \eta^2 = .033$, and a significant interaction effect between the product mobile phone and nudging, $F_{11,$

$F_{1375} = 45.593, p < .001, \eta^2 = .267$. The analysis further demonstrated a larger effect of nudging when the price difference between environmentally-friendly products and non-environmentally-friendly products was large. As presented in Figure 2, the positive effect of the attraction effect on sustainable consumption behaviour was largest in the consumption situations 1, 5 and 9 for mobile phones. These consumption situations were also the situations with the largest price difference and lowest proportion of environmentally-friendly purchases. The attraction effect therefore seems to have a positive effect when applied on consumption situations with a large price difference between the presented products, resulting in an interaction effect. The other consumption situations suggest a ceiling effect, where the participants purchased eco-labelled products regardless of the presence of nudging.

Concerning the analysis above on nudging, the results provide support to reject the null hypotheses relevant to Hypothesis II. However, there is not sufficient evidence to reject the null-hypothesis corresponding to Hypothesis I.

Hypothesis III – climate change denial and political orientation

Hypothesis III of the study was:

- Participants of the study with right-wing political orientation will show a greater tendency in climate change denial, and a lower tendency to buy environmentally-friendly products.

A statistically significant correlation between climate change denial and political orientation was found. The participants could score between 16 and 60 on the survey measuring climate change denial – 16 indicating low denial and 60 indicating high denial ($M = 25.11, SD = 7.84$). According to Cohen's guidelines, there is a strong positive correlation between climate change denial and political orientation, $r(127) = .511, p < .001$. The participants who evaluated themselves higher on the political orientation scale, hence indicating right-wing oriented political views, scored higher on the climate change denial test.

Further, a statistically significant correlation was found between the degree of climate change denial and the number of eco-labelled products a participant chose to purchase. Participants who had high scores on climate change denial purchased a lower amount of eco-labelled products, $r(127) = -.308, p < .001$. On basis of these results, there is support for Hypothesis III.

Discussion

Reviewing Hypothesis I and II

The results demonstrate a significant main effect of nudging. The attraction effect had a higher proportion of environmentally-friendly purchases than both the default option and the control condition. Based on these results, there is support for Hypothesis II but not Hypothesis I. The attraction effect has a positive effect on sustainable consumption behaviour, while the effect of the default option is limited.

Even if the positive effect in the attraction condition was complicated by the presence of order effects, it still appeared when the data for the first condition of electronic product (mobile phones) was analysed. Besides proceeding with a higher proportion of environmentally-friendly purchases when consuming mobile phones, the proportion of environmentally-friendly choices also seems to depend on the price difference between the present products in a consumption situation. A larger price difference resulted in fewer environmentally-friendly purchases, and a smaller price difference in a ceiling effect were consumers proceeded with the choice of eco-labelled products regardless of nudging condition.

Considering the above, there seems to be a carry-over effect moderating the effect of nudging. Participants purchased a higher proportion of eco-labelled mobile phones, compared to mobile screens and portable amplifiers, which indicates a confound between electronic product and the presentation order of product. The confound further leads to ambiguity whether the higher proportion of purchased eco-labelled mobile phones depends on the participants' tiredness of the experiment over time, or just a higher environmental concern when purchasing mobile phones compared to the other products. Future studies can therefore apply nine conditions counterbalancing both electronic product and nudging to investigate this further.

Despite the possibility of a carry-over effect moderating the effect of nudging, the attraction effect came out strong in the experiment. However, the effect of the default option was lower than expected. Earlier research on the default option has confirmed its efficiency (Samuelson & Zeckhauser, 1988; Thaler & Sunstein, 2009; DellaVigna, 2007) as well as demonstrated a great number of practical situations where it has been successfully applied (Johnson & Goldstein, 2003; Nielsen et al., 2017; Pichert & Katsikopoulos, 2008). This study does not therefore argue against the functionality of the default option. Rather, the moderating effect may be due to the carry over-effects, and another study design might have revealed an effect of the default option.

The carry-over effect should not only be considered as a limitation of the study, even if it decreased the impact of nudging. Rather, the carry-over effect says something important about nudging as a phenomenon. One interpretation of the moderating effect of a nudge when presented after the control condition is how expertise undermines nudging. According to Chang et al. (2015) and Sen (1998), knowledge about a product weakens the effect of the attraction effect as a nudge. It is possible that the same scenario took place in this experiment – more expertise about the electronic products was gained during the experiment, which decreased the effect of nudging over time.

Another interpretation of the carry-over effect is nudging's sensitivity to exposure. When a participant faces decisions without any presence of nudging followed by decisions applied with a default option, he or she might see through the purpose of the experiment and the difference between the conditions. This kind of awareness seems to counteract the effect of nudging.

Reviewing Hypothesis III

Earlier research states a correlation between right-wing political orientation and climate change denial (McCright, 2011, McCright & Dunlap, 2011; Jylhä & Akrami, 2015; Carrus et al., 2018). This study found a significant correlation between these two variables and can further confirm Hypothesis III. Besides confirming the correlation between political orientation and climate change denial, the data also showed a significant correlation between the degree of climate change denial and the proportion of purchased environmentally-friendly products.

McCright and Dunlap (2011) discuss the tension between industrial capitalism and the acknowledgement of climate changes as one reason for people with right-wing political views having a higher tendency of climate change denial. This study has not had the aim to establish such reasons behind the established correlation, and cannot therefore enounce such causes. However, one can argue that - based on earlier research - it makes intuitive sense for people who show less consideration for the environment to value price higher than the eco-label of a product. The differences in consumption behaviour might therefore be explained by different interests and different values of what is considered important.

Discussing the method used to analyse Hypothesis III, measuring political orientation with a simple seven-step scale between left and right can be considered limited and “unfashionable”. Political orientation is a variable with many nuances, and several tools are usually used to measure its spectrum. Earlier research has combined simple scales, similar to

this study's, with statements reflecting a wider dimension of political orientation such as ideology, degree of right-wing authoritarianism and social dominance orientation (Carrus et al., 2018; Jylhä, 2016; McCright & Dunlap, 2011). An even more elaborate tool to measure political orientation is the GAL/TAN-scale. The GAL/TAN-scale is frequently used in European political studies and measures green-alternative-libertarian views to traditional, authoritarian and nationalist political views (Hooghe, Marks & Wilson, 2002; Bergström, Johansson, Oscarsson, Oskarson & Oscarsson, 2015).

Despite using a simpler measurement tool than the GAL/TAN-scale, the data from this study confirms earlier research about climate change denial and political orientation. However, there is a chance that a broader spectrum of political orientation would have been captured with a more elaborated tool.

Back to Nudging, Climate Change Denial and Political Orientation

Based on the results of this study and earlier research, nudging can be used as a complementary tool when creating a surrounding that supports sustainable consumption behaviour and further realising UN's 12th goal for a sustainable future. Looking back at Greitemeyer's (2013) research, people who are surrounded by media promoting a sceptical tone towards climate change have a higher tendency of climate change denial. In such cases, one can investigate whether nudging is a possible tool to support more environmentally-friendly choices for those stuck in the Filter Bubble of climate change denial, or not.

However, ethical aspects have to be considered when implementing nudging as a goal-oriented tool to realise sustainable behaviour. As discussed in the introduction, there are ethical challenges when granting choice-architects the power to form environments that steer people into the behaviour considered "right". One can further question the processes when those in power establish which characteristics the "right" behaviour is made up of, and the transparency of these processes. The risk is that people will feel like they are taken advantage of.

The implementation of the attraction effect can be considered as a more substantial ethical challenge. There is a pronounced difference between steering people's decision making by appointing one of the already existing options as a default option and adding a new constructed option with the sole purpose to steer behaviour. Considering this, there is a risk that people will feel tricked when exposed to the attraction effect in their decision making. Further risks are that they will lose trust in the choice-architects that have designed the scenario.

Looking back at the carry-over effect, there seems to be a divergence between the transparency of nudging and the ethics of implementing it in society. The participants of this experiment were less affected by nudging when they were presented with the control first, enabling them to figure out the purpose of the experiment and possibly realise that they were exposed of nudging. Consciousness seems to undermine the effect of nudging, but not making people aware of the presence of nudging will lead to ethical dilemmas. The question therefore arises: how can nudging be used in practice? Also, is it an enduring tool for a sustainable future, or will its efficiency either decline or lead to mistrust among citizens towards the authorities, not only including companies but also politicians that are implementing nudging as a goal-oriented tool?

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Appendix

Appendix A

Climate change denial scale (Häkkinen & Akrami 2014)

1. I do not find it to be obvious that the Earth's climate has warmed up during the last century.
 2. I find it hard to believe that the earth's climate is really changing.
 3. My opinion is that Earth's climate shows a pronounced increase in temperature.
 4. Climate change, as it is talked about today, is due to human activities, not natural variation.
 5. Warming of the climate on Earth is natural and not due to human influence.
 6. The temperature on Earth varies naturally and human activity has nothing to do with this variation.
 7. Climate change will affect the Earth negatively.
 8. Climate change will not affect the life on Earth in any significant way.
 9. My opinion is that we will not even notice the effects of climate change.
 10. The so-called "climate threat" is exaggerated.
 11. The seriousness of climate change is exaggerated in the media.
 12. A few degrees here or there in climate change don't do so much.
 13. Many people underestimate the seriousness of climate change.
 14. I do not believe that scientists are in agreement on the issue of climate change.
 15. I believe that there is enough scientific evidence to confirm the changes in Earth's climate.
 16. I think the evidence for climate change is far too weak.
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Appendix B

LSD test; Within; Pooled MS = .07416, df = 193.91											
Cell No.	Order	Nudge	{1}	{2}	{3}	{4}	{5}	{6}	{7}	{8}	{9}
			.444	.680	.622	.779	.649	.656	.702	.562	.792
1	1	MECtrl		0.000	0.000	0.000	0.001	0.000	0.000	0.048	0.000
2	1	MEDf	0.000		0.080	0.094	0.598	0.678	0.708	0.046	0.061
3	1	MEAtt	0.000	0.080		0.008	0.645	0.567	0.176	0.306	0.005
4	2	MECtrl	0.000	0.094	0.080		0.000	0.000	0.196	0.000	0.831
5	2	MEdf	0.001	0.598	0.645	0.000		0.842	0.369	0.239	0.017
6	2	MEAtt	0.000	0.678	0.567	0.000	0.842		0.432	0.112	0.023
7	3	MECtrl	0.000	0.708	0.176	0.196	0.369	0.432		0.000	0.008
8	3	MEDf	0.048	0.046	0.306	0.000	0.139	0.112	0.000		0.000
9	3	MEAtt	0.000	0.061	0.005	0.831	0.017	0.023	0.008	0.000	