6-18-2022

Sustainability by Default? Nudging Carbon Offsetting Behavior in E-Commerce

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SUSTAINABILITY BY DEFAULT? – NUDGING CARBON OFFSETTING BEHAVIOR IN E-COMMERCE

Research Paper

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Abstract

The continuous rise of e-commerce and the resulting global transportation activities lead to an increased environmental load, specifically in the form of carbon emissions. While carbon offset donations offer the potential to mitigate the ecological harm, these voluntary options are not yet prevalent among e-commerce customers. Prior research has shown that information systems (IS) can be utilized to encourage more sustainable behavior by digitally nudging people into offsetting their carbon emissions. Therefore, this study intends to examine the influence of defaults on carbon offsetting in e-commerce checkout processes. A digital experiment with 125 participants revealed that higher default donation values significantly increase people's carbon offset contributions in an e-commerce checkout process. Participants in the treatment group (high default) donated, on average, 33 percent more for carbon offsetting compared to the control group (low default). As a result, this research contributes to the fields of behavioral economics in IS, digital nudging as well as green IS and has valuable implications for IS practitioners and designers.

Keywords: Carbon Offset, Sustainability, Green Information Systems, Behavioral Economics, Digital Nudging

1 Introduction

Life is about choices. Apple or Android – bike or bus – pizza or pasta. With the ongoing digital transformation of our world, a plethora of those choices is shifted toward online environments. People order food and cabs through digital applications, they subscribe to various online service providers, and also relocate a substantial amount of their consumption decisions to online surroundings.

One inevitable corollary of this rise in online consumption is the concurrent increase of global shipping (Grewal, Roggeveen, & Runyan, 2013; Ma, 2017). Since this increase in shipping activities has a substantial ecological impact, more and more concerns about its negative effects on the climate have been expressed (Oláh et al., 2019). Even though some e-commerce providers have started to address the negative environmental effects of global shipping, increasing sustainability in this field remains crucial (Escursell, Llorach-Massana, & Roncero, 2021; Ingaldi & Ulewicz, 2019; Oláh et al., 2019). This is further emphasized by the events surrounding the global COVID-19 pandemic, which led to a record-breaking increase in e-commerce sales (Escursell et al., 2021; Haller, Lee, & Cheung, 2020). Hence, it is important to consider a variety of approaches to make e-commerce more sustainable. For example, carbon offsets offer the possibility to alleviate the negative environmental effects of e-commerce shipping in the short term. In general, carbon offsets are purchasable compensations, which compensate arising emissions of one activity by mitigating the emissions of another activity to remain carbon neutral (Brouwer, Brander, & van Beukering, 2008; Székely, Weinmann, & vom Brocke, 2016). Although this

option has already found application in the aviation industry and in some e-commerce stores, prior studies indicate that consumers are reluctant to pay voluntary carbon offsets even though they often express a willingness to pay for sustainability premiums (Eijgelaar, 2011; Haller et al., 2020). This creates a need for novel research on changing consumers' behavior to increase the success rate of carbon offsets in online purchasing processes and ultimately make e-commerce more sustainable.

People's choices are not always solely formed through rational decision-making but are also influenced by heuristics and rules of thumb in order to accelerate decision-making processes (Hutchinson & Gigerenzer, 2005; Simon, 1955). Weinmann, Schneider, and vom Brocke (2016) ascertain that due to this lack of rationality, humans are subconsciously affected "by the design of the choice environment in which information is presented" (p. 433). Johnson et al. (2012) echo this sentiment by affirming that "what is chosen often depends upon how the choice is presented" (p. 488). Even minor alterations in the choice design can nudge people into certain behaviors and resultingly influence their choices (Thaler & Sunstein, 2008; Weinmann et al., 2016). One of the most prominent studies in this field was conducted by Goldstein and Johnson (2003), who managed to double the percentage of organ donors by adapting the default in a choice architecture for organ donation from opt-in to opt-out. In behavioral economics research, this detected effect is called status quo bias or default bias, which describes people's tendencies to stick with the current option or the status quo instead of shifting (Kahneman, Knetsch, & Thaler, 1991; Samuelson & Zeckhauser, 1988). Various researchers could already identify this bias toward defaults in a diverse set of contexts. For example, Acquisti, Gritzalis, Lambrinoudakis, and De Capitani di Vimercati (2008) discovered that the majority of people do not alter the intrusive default privacy settings in social networks but instead remain with the status quo. Another study was able to corroborate these findings by showcasing how merely changing the default option in the mobile payment app Square from "no tipping" to "tipping" significantly increased the total tipping amount (Weinmann et al., 2016). Examples like these highlight the power of defaults and allow for the inference that this effect is at play in other contexts such as e-commerce sustainability, which emphasizes the need for further research. Previous studies have already revealed that information systems (IS) can be utilized to make people behave in a more sustainable manner. For instance, Loock, Staake, and Thiesse (2013) discovered that customers' household energy consumption is significantly lowered when goals and defaults are set for them. A similar result was shown in a study by Araña and León (2013), where an opt-out choice architecture increased people's contributions toward environmental policies. Additionally, people showed a tendency to pay more carbon offsets in flight booking processes when higher anchor values were preselected in the choice architecture (Székely et al., 2016). Although prior research has already targeted the applicability of sustainable nudging in IS, this issue has been neglected in the field of e-commerce delivery. Therefore, we intend to fill this gap by investigating the effect of the status quo bias on carbon offset donations in e-commerce checkout processes by answering the following research question:

Can higher defaults increase carbon offset donations in e-commerce checkout processes?

We have conducted an experimental study through the online platform Prolific, which revealed that defaults have a significant effect on carbon offsetting behavior in e-commerce checkout processes. Consequently, the findings of this research provide valuable contributions to IS research as well as recommendations for IS practitioners and designers to improve online choice environments.

The remainder of this paper is structured as follows. We base our study on a review of the literature on sustainable nudging and digital choice architectures. Drawing on the knowledge attained through the analysis of existing theories, the developed hypothesis of this research study is introduced. Then, the methodological section illustrates the employed research design. The penultimate section of this study presents the results by outlining descriptive as well as inferential statistics. This research paper then proceeds with a discussion of the obtained results, the theoretical and practical implications as well as the potential limitations and opportunities for future research, followed by a conclusion.

2 Research Background

2.1 Sustainable Nudging

Prior research on decision-making and human reasoning highlights the occasional absence of rationality in people's choices, which can often be backtracked to the usage of heuristics and its concomitant systematic errors in judgments (Simon, 1955; Tversky & Kahneman, 1974). A prominent instrument for overcoming resulting biases and inducing a preferred behavior is nudging (Forberger, Reisch, Kampfmann, & Zeeb, 2019). Nudging, a term coined in the seminal book Nudge by Thaler and Sunstein (2008), "alters people's behavior in a predictable way without forbidding any options or significantly changing their economic incentives" (p. 6). In general, nudging is mostly used to improve people's choices in regard to health, well-being, pro-societal activities, and sustainability. Due to the increasing need for sustainability, nudging is becoming a prime tool to aid the mitigation of negative environmental effects in a variety of fields (Thaler & Sunstein, 2008). For example, nudges have been implemented to help the adoption of environmentally friendly energy providers (Pichert & Katsikopoulos, 2008), guide people toward sustainable travel behavior (Kim, Tanford, & Book, 2021), or reduce household energy consumption (Loock et al., 2013).

Similarly, the growth of e-commerce leads to an increasingly high ecological impact, which calls for sustainability improvements in this field (Ingaldi & Ulewicz, 2019; Oláh et al., 2019). Hence, among other sustainability improvement initiatives, nudging can be used as a way to make online shopping more sustainable. In this regard, prior research has already started to target this opportunity. For instance, Demarque, Charalambides, Hilton, and Waroquier (2015) utilized descriptive norms to nudge sustainable consumption in a realistic online shopping environment. Another study successfully used online shopping context cues to influence consumers' purchase intentions (Xiao, Guo, Yu, & Liu, 2019). These studies already highlight the effectiveness of nudging for improving sustainability and showcase the need for more work on sustainable nudging in e-commerce.

2.2 Digital Choice Architecture

Human choices are also influenced by the presentation of different options. Scholars have already showcased that individuals' decisions do not solely rely on the substance of the choices but also on their respective presentation (Weinmann, Schneider, & vom Brocke, 2018). Designing the context of choices, and therefore their form of presentation, can be done in a panoply of ways and is generally summarized under the term choice architecture. In choice architectures, just like in traditional architectures, there is no neutral way of designing and presenting choices (Johnson et al., 2012; Thaler & Sunstein, 2008; Weinmann et al., 2016). Everybody who is involved in the presentation of choices can be referred to as a choice architect. Parents discussing career options with their kids, election workers planning the placement of candidate names on a ballot, or doctors proposing certain treatment options are all choice architects, who can drastically influence people's behavior with their presentation of choices (Thaler, Sunstein, & Balz, 2013). Even the smallest alterations can entail prodigious effects and Thaler and Sunstein (2008) propose that, in regard to choice architectures, "a good rule of thumb is to assume that everything matters" (p. 3). Choice architects can choose from a variety of design options such as selecting defaults or changing the order of available alternatives, which could potentially be used as nudges (Johnson et al., 2012).

Nowadays, an increasing number of people's choices are shifting toward online environments, where everybody decides what to participate in, what to attend to or what to buy on a daily basis (Johnson et al., 2012; Murray, Liang, & Häubl, 2010). Hence, the design of choice architectures in online environments, so-called digital choice architectures, is gaining more and more relevance. The designers of such systems, the digital choice architects, have the power and the responsibility to make specific design decisions that can guide users' choices by nudging them toward a particular alternative

(Schneider, Weinmann, & vom Brocke, 2018; Weinmann et al., 2016). Analogous to the way offline choice architects place high markup products at eye level in supermarkets, digital choice architects have their own set of potential nudges to change the user interface and affect user behavior (Schneider et al., 2018). This form of nudging within online environments is referred to as digital nudging, a term coined by Weinmann et al. (2016) and defined as "the use of user-interface design elements to guide people's behavior in digital choice environments" (p. 433). Other scholars have also described digital nudges as nudges that are enabled by information technology (Gregor & Lee-Archer, 2016). Even the subtlest alterations in the choice architecture can, intentionally or unintentionally, influence users' choices. Since the prediction of their outcomes is not always feasible, digital nudges have to be implemented with care (Schneider et al., 2018; Weinmann et al., 2016). It is also paramount to consider the ethical ramifications of implementing digital nudges. These online decision aids and interface designs are generally helpful, but they can also be hazardous at times. Choice architectures can be engineered to make certain options more salient, which is only beneficial when those options are in the interest of individuals or society as a whole (Johnson et al., 2012; Sunstein, 2015).

3 Hypothesis Development

Drawing on the insights attained through the analysis of existing literature and theory, arguments for the following hypothesis are developed and presented. The conceptual foundations for this hypothesis are established by building on the dual-process theory, which proposes a dichotomous way of human reasoning. More precisely, it states that decisions can either happen with intuitive, automatic, unconscious, and fast System 1 thinking or with deliberate, analytic, conscious, and slow System 2 thinking (Evans, 2003; Stanovich & West, 2000). As a result of employing System 1 reasoning, people tend to occasionally deviate from rational behavior and use rules of thumb as well as mental shortcuts to cope with the overabundance of information online (Goel, 2009; Simon, 1955). Although these heuristics proved to be useful in certain situations, they can also lead to systematic biases in people's judgments (Tversky & Kahneman, 1974). The effect of one of these cognitive biases, the status quo bias, is examined in this study. The status quo bias, or default bias, describes decision makers' tendency to prefer an option that is framed as the designated status quo (i.e., default option) over other alternatives (Samuelson & Zeckhauser, 1988). Preceding research has already scrutinized this effect in different scenarios. Scholars have found compelling evidence for people's tendency to remain at the default position, for example, in the contexts of organ donation (Goldstein & Johnson, 2003), investment decisions (Samuelson & Zeckhauser, 1988), or energy consumption behavior (Loock et al., 2013). In all of those situations, the mere alteration of the default option had substantial consequences, exemplifying how people are affected by choice design (Johnson et al., 2012; Székely et al., 2016).

Hence, using defaults (i.e., higher starting value) in the design of checkout processes on e-commerce platforms offers the potential to nudge people toward higher carbon offset donations. Increased carbon offset donations, in turn, would mitigate the negative environmental effects of global shipping and contribute to greater sustainability in e-commerce. Therefore, this research project extends the current knowledge base by finding an answer to the research question of whether higher defaults can increase voluntary carbon offset donations in e-commerce checkout processes. In order to sufficiently answer this research question, the specification of a fitting scientific methodology and the development of a testable hypothesis are indispensable. This hypothesis forms the nexus between the theoretical knowledge base and the practical experiment. The insights obtained from the analysis of theory allow for the formulation of the following hypothesis:

H1: Setting a higher default value increases carbon offset donations in e-commerce checkout processes.

This research project aims to test the previously mentioned hypothesis in an experimental setting to contribute to the existing discourse. The subsequent section outlines the methodological approach of the research project and explains the fundamentals of the experiment.

4 Research Design

4.1 Participant Recruitment

Since the experimental study was carried out within a digital environment, online recruitment platforms offer the opportunity to gather an appropriate sample in a short period of time. Such platforms allow researchers to access a huge pool of diverse participants, which increases the generalizability of the results (Mason & Suri, 2012). In our study, the online platform Prolific was used to administer the experiment and recruit the necessary participants. Prior research has found that data collected through this kind of recruitment platform are "at least as reliable as those obtained via traditional methods" (Buhrmester, Kwang, & Gosling, 2011). In addition, the recruited subjects tend to be more representative of the general public compared to convenience samples (Berinsky, Huber, & Lenz, 2012). According to Peer, Brandimarte, Samat, and Acquisti (2017), Prolific performs especially well in regard to data quality, participant diversity, reproducibility, and honesty compared to other online crowdsourcing platforms such as MTurk. Another beneficial aspect of Prolific is its ability to facilitate custom pre-screening of participants. Individuals who wanted to participate in the study had to meet a certain set of criteria. More specifically, participants had to be over the age of eighteen and verify that their first language is English to ensure that they were able to comprehend the task at hand. To disseminate the survey to all the recruited participants in a fast and simple way, the online survey tool Qualtrics was utilized. With these prerequisites in place, a total sample of 125 participants was collected through Prolific. To incentivize attentive participation the subjects received a dichotomous compensation for completing the experimental study. This is especially important to ensure that participants go through the experiment intently, act conscientiously and answer honestly (Singer & Couper, 2008). On the one hand, they received a predefined show-up fee of £0.75 that could be redeemed with the completion code provided at the end of the study. On the other hand, a variable bonus payment, depending on the donation amount within the experiment, could be earned. More specifically, £0.10 was paid out for every coin someone had left at the end of the study. Thus, donating more to offset carbon emissions reduced the respective compensation of a participant. Fourteen participants had to be excluded from the initial sample of 125 subjects for the final analysis, as they did not fulfill all exclusion criteria. Possible exclusions could have a number of reasons. First, subjects were eliminated when their entered completion code on Prolific was NOCODE or an incorrect code, or when they failed to provide a valid Prolific ID. Second, participants were excluded when they spent less than 16 seconds on all three questions of the CRT, which indicates a lack of cognitive attentiveness. After excluding insufficient entries, the final sample comprises 111 participants, where 54 of the 111 subjects were allocated to the treatment condition while the remaining 57 participants were in the control group.

4.2 Experimental Design

The experimental study in this research project employed a between-subjects design, where participants were randomly allocated to one of two conditions, either the treatment condition or the control condition. Subjects in the treatment group were confronted with a choice architecture that had a high default carbon offset donation preselected for them, which leads to an opt-out design. Conversely, the choice architecture for participants in the control group followed an opt-in design with zero carbon offset payment selected at the start. Since the experiment aimed to measure the effect of the choice architecture design on the participants' carbon offset donation, the dependent variable was specified as the carbon offset donation while the independent variable was defined as the default value in the choice architecture (low = 0, high = 5). The group allocation that represents the two different choice architecture designs was coded as a binary variable (0 or 1) and the carbon offset donation was captured on a continuous scale (0 to 5). Previous research in the area of dictator games and donation behavior indicates that certain control variables should be considered in such settings (Székely et al., 2016). In general, dictator games encompass studies that allow participants to voluntarily donate a part of the money they receive in the

course of the experiment (Aguiar, Brañas-Garza, & Miller, 2008). A meta-study by Engel (2011) ascertained that, on average, almost 30 percent of the available money is donated in dictator games and that various variables can play a role. For instance, age (Engel, 2011; Lee & Chang, 2007), gender (Eckel & Grossman, 1998; Engel, 2011; Lee & Chang, 2007), whether someone has children (Lee & Chang, 2007), or environmental concern (Brouwer et al., 2008) influence donation behavior. Hence, these four variables are considered as control variables in this study. While age, gender, and children are all captured from the participants' demographic data, the individual level of environmental concern is calculated with the New Ecological Paradigm (NEP) that is utilized to evaluate the level of pro-environmental attitude. More specifically, the NEP consists of a set of fifteen five-point Likert items (strongly disagree, mildly disagree, unsure, mildly agree, strongly agree) that revolve around humans' relationship to nature, which serves as a unidimensional measure for environmental attitude (Dunlap, van Liere, Mertig, & Jones, 2000). For this purpose, odd questions of the NEP were coded from 1 to 5 while even questions were inversely coded 5 to 1 in order to calculate the overall NEP score.

4.3 Materials and Procedure

Since it was the aim of this study to measure people's behavior within e-commerce processes, mimicking a real e-commerce process within the experimental mock-up setting was crucial. For this purpose, the online survey tool Qualtrics was employed since it offers the necessary functionality and allows researchers to design their experimental studies in a convenient and straightforward way. Aside from the administered treatment (different default values), both groups were confronted with exactly the same experimental design. To highlight the difference in the carbon offset donation decision, Figure 1 illustrates the choice architecture presented to the treatment group, where the initial donation amount defaulted to five coins. In contrast, the control group encountered the same carbon offset donation choice architecture with their default set to zero.

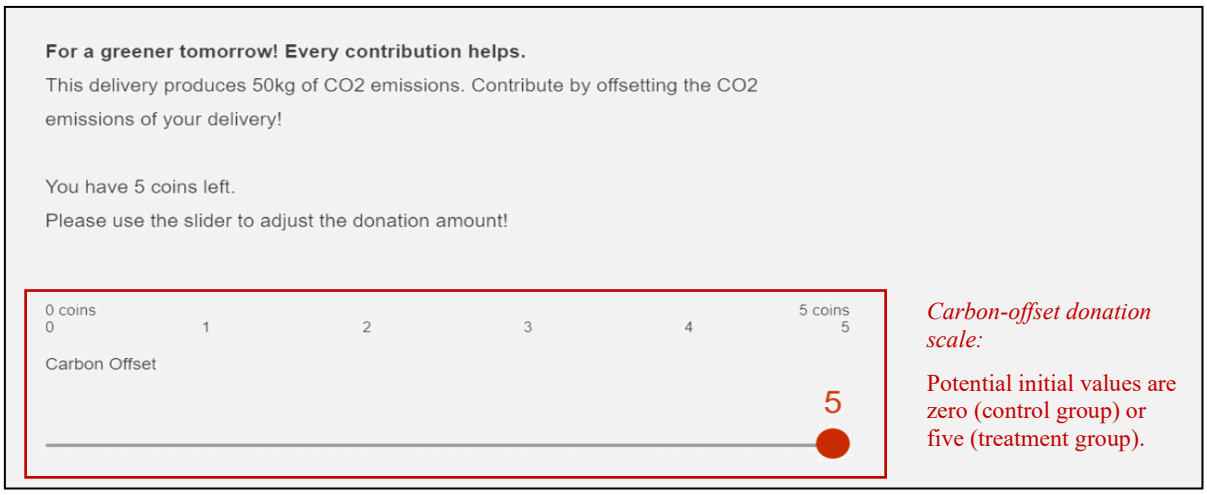

Figure 1. Design of Carbon Offset Donation Decision.

The overall design of the carbon offset donation decision utilized a slider to adjust the donation amount. This type of choice architecture was deliberately chosen to create a continuous scale, which is well-suited for testing default values. This architecture design is based on the recommendations issued by Schneider et al. (2018), who state that the usage of default slider positions is appropriate to nudge people's behavior with the status quo bias or the anchoring and adjustment heuristic (Schneider et al., 2018).

Apart from the utilized materials, it is also imperative to outline the experimental procedure that was employed to carry out the study. First of all, the experiment was distributed via a URL link to the

Qualtrics study over the recruitment platform Prolific. By following this link, the participants were confronted with the starting page of the study that asked for their unique Prolific ID to ensure the validity of the entries. To commence the experiment, participants received a brief introduction to familiarize them with the general prerequisites and to explain the task. It was also reaffirmed that all collected data would be handled in an anonymous and confidential way. In addition, the introductory screen informed the subjects about their compensation for participation. Subsequently, participants received the experimental instruction, where they were told to go through a purchasing process within a fictitious e-commerce store and buy a product of their choice (e-reader, speaker, or digital camera) with a budget of 100 coins. Next, the preferred shipping option could be selected (premium or standard). After this point in the experiment, each respondent was randomly assigned to the control or the treatment group, where they were confronted with one of two choice architectures for the carbon offset donation decision, which is depicted in Figure 1. The randomization process was controlled with the Randomizer function within the survey tool Qualtrics. An additional option made it possible to evenly present the elements, which ensured that both groups were approximately the same size. As previously mentioned, the slider for the control group was preset to zero coins (minimum) while the treatment group had a default of five coins (maximum) preselected for them. Since all of the product options presented previously cost 95 coins, the subjects were left with five coins when they arrived at the carbon offset donation decision. After the carbon offset donation decision, the subjects answered the Cognitive Reflection Test (CRT) by Frederick (2005), the NEP, which was introduced to determine people's level of environmental concern (Dunlap et al., 2000), and some demographic follow-up questions. To finalize the study, the participants received a completion code that was utilized to verify the successful completion of the entire experiment.

4.4 Model Specifications

After successfully carrying out the experiment itself, all the gathered data is examined in a detailed manner. For this purpose, we apply dichotomous data preparation and analysis. First, descriptive statistical analyses are conducted to summarize the main features of the data, such as means, standard deviations, or medians. Second, methods of inferential statistics are utilized to answer our research question of whether carbon offsets in e-commerce checkout processes can be increased through higher defaults and test the hypothesis. Selecting statistical methods mainly depends on three things: "aim and objective of the study, type and distribution of the data used, and nature of the observations (paired/unpaired)" (Mishra, Pandey, Singh, Keshri, & Sabaretnam, 2019, p. 298). Data types can, for instance, be nominal, ordinal, binary, and continuous while the nature of the observations is often associated with the experimental design (between-subject or within-subject). This study aims to measure the effect of an alteration in the choice architecture – which is presented to two groups (between-subject design) – on the carbon offset donation (continuous variable). In addition, control variables are utilized to appropriately fit the model. Therefore, we employ a linear regression to be able to compare the mean carbon offset donation of the two groups (treatment and control) while also facilitating the addition of the control variables age, gender, children, and environmental concern. To clarify further notations, the utilized linear regression can be specified by the following model:

$$Carbon\ Offset\ Donation_i = \beta_0 + \beta_1 \cdot Default\ Value_{ij} + \Sigma\, \beta_v \cdot Controls_{iv} + \varepsilon_i$$

In this model, $Carbon\ Offset\ Donation_i$ designates the respective amount that was donated to offset the carbon emissions by participant i (i = participant 1, 2, ..., 125). β_1 represents the effect that can be attributed to the $Default\ Value_{ij}$, where j (j = 0, 5) describes the respective default level for participant i, which can either be high (£5) or low (£0). Lastly, β_v indicates the effect of control variable v (v = 1, 2, 3, 4), which stands for the four control variables gender, age, children, and environmental concern. For the statistical computation of the model, we utilized the software environment R. More specifically, the *stats* package and its *lm* function are used to fit the linear model (R Core Team, 2020). To create a holistic view of the results, the packages *sjPlot* and *stargazer* were used for the calculation of additional

key figures such as confidence intervals, R-squared values, the Akaike information criterion (AIC), or F-statistics (Hlavac, 2018; Lüdecke, 2021). Moreover, the package *ggplot2* was employed to visualize the obtained results (Wickham, 2016).

5 Results

5.1 Descriptive Results

As a result of the experiment's between-subject design, the participants were confronted with one of two choice architectures when deciding about offsetting the carbon emissions of their delivery. The default values were either set to zero (control group) or five coins (treatment group). Apart from the differing status quo values, the choice architectures were identical. Hence, the descriptive analysis of the carbon offset donations mainly focuses on presenting a dichotomous comparison between the treatment and the control group. Firstly, the mean carbon offset contribution in the control group was 2.25 out of 5 coins while the average donation in the treatment group was 2.99 coins. Thus, people in the treatment group donated, on average, £0.74 or 33 percent more from their remaining budget of £5 for carbon offsetting, which provides first support for our hypothesis. To support the comprehensibility of the group differences visually, the violin chart in Figure 2 illustrates all the individual data points, the resulting density distribution as well as an embedded boxplot including the median, the 25^{th,} and the 75th quartile and the mean (red dot) for both experimental conditions.

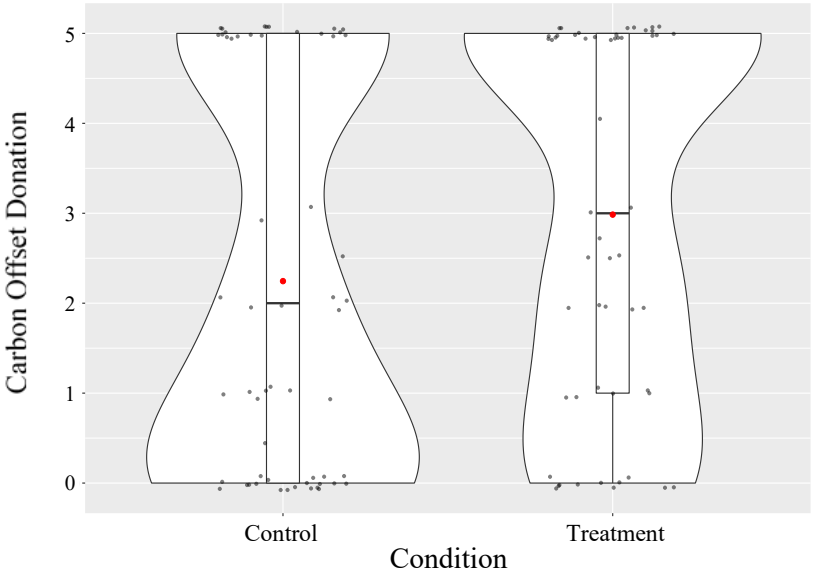

Figure 2. Carbon Offset Donations.

Taking a closer look at Figure 2 reveals a number of interesting details. First of all, it becomes obvious that the median, the 25th quartile, and the mean are higher in the treatment group. In addition, the density curve reveals that, within the treatment group, more data points are located at the high end of the carbon offset donation scale while fewer values are gathered around the lower end compared to the control group. In the context of the present study, this indicates that the administered treatment nudged people to donate more for carbon offsetting. Combined with the higher mean and median donations, these findings further substantiate the initial support for the hypothesis that a higher default value increases carbon offset donations in e-commerce checkout processes.

5.2 Hypothesis Testing

Apart from the descriptive statistical analysis, which summarizes the data in regard to its key figures, this study also utilized procedures of inferential statistics. The following chapter scrutinizes the obtained data by introducing a linear regression model to test whether higher defaults lead to significantly higher carbon offset donations in e-commerce checkout processes (H1). The results are presented with two models, where the first model only analyzes the effect of the default setting while the second model includes relevant control variables. An effect of the default value (independent variable) on the carbon offset donation (dependent variable) is expected. The results of the linear regression are presented in Table 1, which offers a comparison of the linear models with and without the relevant control variables. The model including the control variables is used for further discussion while the model without the control variables is only presented for reference and completeness. This decision was purposely made because a juxtaposition of common goodness-of-fit measures shows that adding the control variables gender, age, children and environmental concern improves the model. As Table 1 illustrates, both R-squared values and the AIC strongly favor the model that includes the four control variables.

DV: Carbon Offset	**Linear Model**			**Linear Model with Controls**		
Predictors	*Estimates*	*CI*	*P*	*Estimates*	*CI*	*P*
Default Value	0.74	-0.06 – 1.54	0.071*	0.85	0.09 – 1.61	**0.029****
Gender				-0.02	-0.70 – 0.66	0.955
Age				0.03	-0.01 – 0.07	0.168
Children				0.74	-0.13 – 1.62	0.096
Environmental Concern				1.05	0.50 – 1.60	**<0.001*****
Observations	111			111		
R^2 / R^2 adjusted	0.030 / 0.021			0.184 / 0.145		
AIC	487.598			476.381		
F Statistic	3.320* (df = 1; 109)			4.730*** (df = 5; 105)		

Table 1. Linear Regression Results.

Taking a closer look at the results of the linear regression reveals a number of valuable insights that can be utilized to test the presented hypothesis and answer the research question of this study. To find evidence for H1, a significant effect of the default value ($\beta 1$) on the carbon offset donation and, thus, a p-value smaller than 0.05 (α = 5 percent), was expected. This would indicate that the status quo bias affects people's carbon offset choices in e-commerce checkout processes. The statistical analysis disclosed that $\beta 1$ was significant in the linear model with control variables, where a p-value of 0.029 for the default setting was found. Even in the model without control variables, the default setting was marginally significant with a p-value of 0.071. These findings corroborate the first support for the hypothesis of this study found through the descriptive statistical analysis. A closer inspection of the confidence intervals showcases that 0 (*H0*) is not within the 95-percent confidence interval for the default setting. This indicates that there is a significant difference of means between the two experimental groups, which provides further support for H1. In regard to the effect size for a continuous

outcome such as the carbon offset donation, the mean differences are commonly used (Cohen, Cohen, West, & Aiken, 2003). The linear model without control variables shows that people in the treatment group donated, on average, £0.74 or 33 percent more from their remaining budget of £5 for carbon offsetting. In the model including the control variables, this effect of mean difference is 0.85. Moreover, a prevalent measure for the effect size is Cohen's d. For this study, Cohen's d is approximately 0.35, which is tantamount to a small to medium effect according to common interpretations (Cohen, 1988). The F Statistic of the linear model with control variables is also highly significant.

As a summary, the findings of the inferential statistical analysis provide extensive evidence that supports H1. Hence, H0 is rejected and it can be stated that a higher default setting in e-commerce checkout processes increases carbon offset donations. For a more detailed delineation of the linear regression results, Table 1 offers a comprehensive overview.

6 Discussion and Outlook

6.1 Summary of Findings

Our results confirm previous studies on the effect of defaults and show that the status quo bias also affects carbon offset donation amounts in the context of e-commerce checkouts. The descriptive statistical analysis disclosed that people, who had a high default preselected for them, donated, on average, 33 percent or £0.74 more from their five-pound budget compared to participants in the low default group. This already provided first support for hypothesis 1. The subsequent inferential statistical analysis employed a linear regression model, which confirmed the significance of these results and yielded further evidence that supports H1. Thus, as a conclusion, H0 can be rejected since enough evidence for the alternative hypothesis (H1) was found. In line with prior research findings, our experimental study revealed that higher defaults significantly increase carbon offset donations in the context of an e-commerce checkout process. Combined with the results available in existing literature, this allows for the assumption that digital nudges such as utilizing defaults have the potential to influence online behavior in a variety of contexts. All in all, we provide evidence that sustainability in e-commerce can be improved by using digital nudging to increase carbon offset donations.

6.2 Theoretical and Practical Contributions

This study makes important theoretical and practical contributions. From a theoretical perspective, our research findings confirm previous studies while also providing valuable new insights to advance the knowledge in the field. Multiple prior studies have ascertained the effectiveness of employing defaults in offline scenarios. Hence, the findings of the present study corroborate preceding research in the offline contexts of charitable donations (Goswami & Urminsky, 2016), willingness-to-pay for environmental policies (Araña & León, 2013), or judicial sentencing decisions (Danziger, Levav, & Avnaim-Pesso, 2011), where the status quo bias also had a significant effect on people's choices. The findings of our research also substantiate the results of previous studies in digital environments on energy consumption (Loock et al., 2013), search engine choices (Henkel, Seidler, Kranz, & Fiedler, 2019), or online tipping apps (Weinmann et al., 2016). Additionally, our study supports prior findings of Székely et al. (2016), who successfully nudged people toward higher carbon offset contributions in flight booking processes with the anchoring and adjustment heuristic. We also effectively demonstrated the usage of nudging to support sustainability in e-commerce, which corroborates and extends existing work in this field (e.g., Demarque et al., 2015; Xiao et al., 2019). Apart from confirming extant research on the effectiveness of defaults, our study contributes to the discourse by producing new knowledge. We showed that defaults are an effective tool for increasing carbon offset donations in the previously unexplored context of e-commerce. Since e-commerce becomes more and more prominent, our findings provide a valuable

addition to the knowledge base. These results offer a promising outlook for digital nudging approaches to increase sustainability contributions in a variety of fields. Since improvements in sustainability are as important as ever, other scholars are called on to solidify these findings by applying other digital nudges in novel contexts.

Aside from these theoretical implications, the results of this study also provide valuable implications for practice. Firstly, the findings of this research study shed light on the importance of sustainability in e-commerce and propose carbon offsetting as a way of combatting the detrimental environmental effects of e-commerce delivery. As a first step, e-commerce stores such as Amazon could implement an option that allows users to offset their carbon emissions, which is not yet common practice. Subsequently, it would also be important to consider the design of this choice architecture and the digital nudges that might be at play to potentially increase sustainability contributions in e-commerce or other possible application contexts. Another implication for practice is the possibility of making promising recommendations for e-commerce interface designers. It is crucial that the choice designers are aware of the fact that digital nudges exist and that they impact people's choices. Moreover, the findings of this study further highlight the relevance of choice architecture design in digital environments and its impact on users' choices. This research project followed the recommendations of the digital nudging design cycle proposed by Schneider et al. (2018), which allowed for a seamless implementation of the correct nudge in this setting and, thus, supports the applicability of this framework for future studies. However, when observing the extensive effects that digital nudging can have on people's choices, it also becomes evident that comprehensive ethical considerations are indispensable. Hence, it would seem advisable for choice architects to carefully scrutinize nudges before implementing them in real-world scenarios to avoid the promotion of choices that are not in the interest of individuals or society as a whole (Sunstein, 2015).

6.3 Limitations and Opportunities

Since this study, like any other research project, only scrutinizes a particular portion of reality, it is accompanied by certain limitations that need to be addressed. First of all, it has to be mentioned that the participant recruitment was administered with the online recruitment platform *Prolific*, which might have delivered a sample that is not representative of the entire population of e-commerce users. However, as previously mentioned, prior research has shown that this method of recruitment is as reliable as traditional methods of data collection and it was deemed suitable for the representation of random samples (Berinsky et al., 2012; Buhrmester et al., 2011). The experiment was conducted with 125 participants, which is appropriate to receive significant results. Nonetheless, increasing the sample size would be recommendable for future studies to test multiple different scenarios with more than two groups, which could improve the validity and the expressiveness of the results. With respect to the methodological limitations, the experimental design might have influenced the results of this study. Since the experiment was carried out in a constructed setting that might not replicate a real e-commerce process, the underlying choice architecture presented to participants in this study could have differed from the choice environment found on real e-commerce websites. To alleviate this problem, defaults could be tested in various choice architectures such as radio buttons, checkboxes, and dropdown menus to increase the robustness of the findings. Future studies could apply a similar method in mock-up e-commerce stores, in field experiments with real e-commerce websites, or by carrying out a design science research study to prevent these limitations. These approaches could be used to corroborate the results of this research project by enhancing the external validity. Furthermore, the participants did not donate real money to offset their carbon emissions. However, to incentivize attentive participation, the subjects received a fixed show-up fee as well as a variable bonus payment. Nevertheless, respondents might behave differently when they encounter a similar situation in the real world, where they have to spend their own money. Additionally, it is possible that people might be more prone to intuitive thinking in a constructed experiment and, therefore, experience its biases more frequently than e-commerce users in real-world scenarios. Users browsing on real e-commerce websites could arguably be more vigilant

and careful with their choices, thus avoiding biased judgments by utilizing deliberate thinking more often.

Since the respondents in this experimental study had to spend exactly £95 on one of three proposed items, the carbon offset donation behavior was only tested for orders of that magnitude. However, the total amount of money being spent might also influence people's willingness to pay for carbon offsets, and smaller or larger scales of purchases might lead to different outcomes. Future research could expand the present study by testing people's carbon offsetting behavior for a variety of purchasing amounts. In addition, the products available for selection were all electronic devices, which might potentially also affect people's behavior in terms of their sustainability contributions. For example, other scholars could replicate this study with different types of products such as organic or sustainable items and ascertain whether the findings of this research project can be corroborated.

7 Conclusion

In our research, we aimed to contribute to the discourse in literature as well as to practice by exploring the effect of the status quo bias on people's carbon offset donations in e-commerce checkout processes. More specifically, it was the objective of this study to answer the research question: *Can higher defaults increase carbon offset donations in e-commerce checkout processes?* For this purpose, an experimental study with 125 participants and a between-subject design was carried out through the online recruitment platform Prolific. In conclusion, the statistical analyses of the obtained data yielded ample evidence for the hypothesis that setting a higher default value increases carbon offset donations in e-commerce checkout processes (H1). We showed that people who were confronted with a higher default setting donated, on average, £0.74 or 33 percent more than the respondents in the low-default group. The employed linear regression confirmed that a higher default value significantly increases carbon offset donations. These findings support previous research on the status quo bias and showcase the potential of digital nudging. As a result, this research adds to the current discourse in the existing literature and contributes to the research fields of green IS, digital nudging, and behavioral economics in IS. As a practical contribution, recommendations for e-commerce providers can be deduced to improve the design of their processes and choice environments in a way that increases carbon offsets and promotes sustainability. These findings allow for the assumption that digital nudging can be utilized to guide behavior in a plethora of other digital choice environments as well. Other scholars can build on the results of this study and deepen the knowledge in these fields of research by conducting further studies on digital nudging in the future.

Acknowledgment

This research has profited from funding provided by the Research Fund Liechtenstein (FFF) within the project "Digital Nudging – The Power of Defaults" [wi_18_2].

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