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Jana Eßer
Daniela Flörchinger
Manuel Frondel
Stephan Sommer

Avoiding Cognitive Dissonance: Experimental Evidence on Sustainable Online Shopping

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Ruhr-Universität Bochum (RUB), Department of Economics
Universitätsstr. 150, 44801 Bochum, Germany

Technische Universität Dortmund, Department of Economic and Social Sciences
Vogelpothsweg 87, 44227 Dortmund, Germany

Universität Duisburg-Essen, Department of Economics
Universitätsstr. 12, 45117 Essen, Germany

Editors

Prof. Dr. Thomas K. Bauer
RUB, Department of Economics, Empirical Economics
Phone: +49 (0) 234/3 22 83 41, e-mail: thomas.bauer@rub.de

Prof. Dr. Wolfgang Leininger
Technische Universität Dortmund, Department of Economic and Social Sciences
Economics – Microeconomics
Phone: +49 (0) 231/7 55-3297, e-mail: W.Leininger@tu-dortmund.de

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University of Duisburg-Essen, Department of Economics
International Economics
Phone: +49 (0) 201/1 83-3655, e-mail: vclausen@vwl.uni-due.de

Prof. Dr. Ronald Bachmann, Prof. Dr. Almut Balleer, Prof. Dr. Manuel Frondel,
Prof. Dr. Ansgar Wübker
RWI, Phone: +49 (0) 201/81 49-213, e-mail: presse@rwi-essen.de

Editorial Office

Sabine Weiler
RWI, Phone: +49 (0) 201/81 49-213, e-mail: sabine.weiler@rwi-essen.de

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Jana Eßer, Daniela Flörchinger, Manuel Frondel and Stephan Sommer*

Avoiding Cognitive Dissonance: Experimental Evidence on Sustainable Online Shopping

Abstract

Cognitive dissonance may arise from the inconsistency between an individual's behavior and her self-image. We investigate whether the provision of information that induces cognitive dissonance can increase sustainable consumption, and specifically whether individuals avoid cognitive dissonance by (a) a change in behavior to comply with own attitudes and by (b) two types of self-deception: the denial of attitudes and the denial of knowledge about the criticism of conventional online shopping. To this end, we develop a rational choice model and embed an incentivized discrete-choice task in a large-scale survey conducted in Germany in 2021, with the choice being between a voucher for either a conventional or a sustainable online market place. In an experimental setting, we aim to induce cognitive dissonance by either randomly reminding participants of their previously stated attitudes towards sustainable production or by informing them about the typical criticism of conventional online shopping. Results indicate that individuals adapt their behavior after having received the reminder of their stated attitudes and the criticism about conventional online shopping. Yet, participants do not deceive themselves by aligning their attitudes with their behavior or by denying to have been aware of the criticism.

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* *Jana Eßer, RWI and RUB; Daniela Flörchinger, RWI and RUB; Manuel Frondel, RWI and RUB; Stephan Sommer, RWI and Bochum University of Applied Sciences.*

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– All correspondence to: Jana Eßer, RWI, Hohenzollernstr. 1-3, 45128 Essen, Germany, e-mail: jana.esser@rwi-essen.de

1 Introduction

In everyday life, people sometimes act against their own moral principles – with the result that their behavior is not in line with their attitudes. For example, individuals choose to eat meat despite being aware of the negative health, environmental, and ethical consequences (Rothgerber & Rosenfeld, 2021). Such a discrepancy between individual attitude and behavior may cause cognitive dissonance, which in social psychology denotes the inner conflict that arises when a person holds two conflicting cognitions (Festinger, 1962).

In general, cognitive dissonance may arise from the inconsistency between an individual's behavior and her self-image (Aronson, 1969). If, for instance, someone thinks of herself as a moral person and believes that lying is immoral, this individual experiences cognitive dissonance when lying. Since the feeling of cognitive dissonance is unpleasant (Rabin, 1994), individuals try to avoid this inner conflict. In principle, there are two basic mechanisms to avoid cognitive dissonance: individuals can either align their behavior with their attitudes or they can adjust their attitudes to match their behavior, the latter leading to self-deception (Festinger, 1962).

In this paper, we investigate whether we can close the attitude-behavior gap by inducing cognitive dissonance and thereby improve social outcomes in the context of sustainable consumption behavior, which is considered here as a form of prosocial action. To this end, we develop a rational choice model on alternative ways to induce cognitive dissonance and analyze the answers of roughly 3,000 respondents of a survey conducted in Germany in summer 2021, in which we measured the participants' attitudes toward sustainability through a series of questions on sustainable production.

Thereafter, in an incentivized discrete-choice task, respondents could opt for a voucher from either a conventional or a sustainable online market place. To induce incentive-compatible response behavior (Murphy et al., 2005), one out of 20 respon-

dents had the chance to win a voucher worth 20 euros that was valid for either a conventional or a sustainable online shop.

We combine the discrete-choice task with an experimental setting in which we induce cognitive dissonance by either randomly reminding participants of their previously stated attitudes towards sustainable production and asking them to confirm these (reminder treatment), or by providing information about the negative aspects of conventional online shopping and asking them about their prior knowledge of these aspects (information treatment). While a proportion of the participants received one of the questions prior to their voucher choice (pre-decision groups), another proportion encountered the questions afterwards (post-decision groups), making an adjustment of behavior impossible and self-deception the only alternative to avoid the experience of cognitive dissonance.

In the pre-decision groups, we study whether the share of sustainable voucher choices is larger in the treatment than in the control groups. In the post-decision groups we investigate whether respondents in the treatment groups are less likely to confirm their previously stated attitude (reminder treatment) or indicate to not have been informed about common criticism of conventional online shopping (information treatment) than the control group.

On this basis, we empirically investigate the issue of cognitive dissonance avoidance through (a) a change in behavior to comply with one's own attitudes and (b) two types of self-deception, either a change in attitudes or the denial of knowledge about the criticism of conventional online shopping.

The experimental design builds on Flörchinger et al. (2022), where the authors examined whether individuals act pro-environmentally to avoid cognitive dissonance after being reminded of their own attitude. In the present study, we expand upon this work by introducing the information treatment and the post-decision groups to compare the effectiveness of the two treatments in promoting sustainable behavior and

to additionally investigate whether individuals use self-deception as an alternative means to avoid cognitive dissonance.

Numerous empirical studies have confirmed that treatments designed to arouse cognitive dissonance through priming (e.g., Kessler & Milkman, 2018; Gosnell, 2018; Flörchinger et al., 2022) or highlighting hypocrisy (Dickerson et al., 1992; Pelt et al., 2020; Stone et al., 1994; see Stone & Fernandez (2008) for an overview) can be effective in fostering prosocial behavior in general and sustainable behavior in particular, because individuals aim at avoiding cognitive dissonance. However, other studies find that when cognitive dissonance is aroused by informing individuals about the negative aspects of their behavior, they attempt to ignore this information (e.g., Dana et al., 2007; Matthey & Regner, 2011; Edenbrandt et al., 2021; Onwezen & van der Weele, 2016). Similarly, individuals deny or adapt their attitudes if it becomes evident that these are not in line with their past behavior (e.g., Fried, 1998; Artiga González et al., 2022; McKimmie et al., 2003; Tanford & Montgomery, 2015; Beasley & Joslyn, 2001).

There is a large literature that investigates cognitive dissonance avoidance through changes in attitude or behavior, with many of these studies being based on small samples, frequently consisting of students (Dickerson et al., 1992; McKimmie et al., 2003; Tanford & Montgomery, 2015; Fried, 1998; Dana et al., 2007; Matthey & Regner, 2011), and using stated-preferences designs (Edenbrandt et al., 2021; Onwezen & van der Weele, 2016). Yet, the received literature has not compared different types of cognitive dissonance arousal, including priming, highlighting hypocrisy, or providing information on the negative effects of own actions, nor the mechanisms for avoiding cognitive dissonance through a change in behavior or in the attitude.

Based on a rational choice model on alternative ways to induce cognitive dissonance, we contribute to this literature by, first, comparing two types of cognitive dissonance arousal: either by informing about negative consequences of one's behavior or by appealing to previously stated attitudes. Second, we are able to simultaneously analyze whether this information induces self-deception or whether the information

provided leads individuals to align their behavior with their attitudes. Third, to our knowledge, this is the first study that examines the effects of cognitive dissonance in the context of sustainable online shopping.

Our empirical results suggest that if individuals are informed about the negative aspects of conventional online shopping before choosing a voucher, they tend to act in line with their previously stated positive attitudes and choose the sustainable voucher. Similarly, survey participants are more likely to behave in line with their attitudes when they are reminded of their previously stated attitudes towards sustainable production. Empirically comparing the effects, we find evidence that providing information about criticism is more effective in increasing the proportion of sustainable voucher choices than reminding of previously stated attitudes. In contrast, respondents do not appear to deceive themselves by adjusting their attitudinal statements to their behavior or by denying their awareness of negative aspects of conventional online shopping. In sum, our results suggest that in the context of online shopping, individuals tend to avoid cognitive dissonance by changing their behavior, but they seem to accept cognitive dissonance when behavioral change is impossible, as for the post-decision groups.

The subsequent Sections 2, 3, and 4 explain the underlying theoretical model, the experimental design and the hypotheses, respectively. Section 5 describes the data employed for our empirical analysis. Section 6 provides the results, while the last section summarizes and concludes.

2 Rational Choice Model

Our theoretical analysis builds upon Rabin (1994), as well as Konow (2000), who developed rational choice models in which cognitive dissonance negatively affects people's utility "because it is unpleasant" (Rabin, 1994, p. 178). Accordingly, individuals try to avoid cognitive dissonance, either by adjusting their behavior to fit their beliefs

about what is moral, or by modifying these beliefs to fit their behavior, that is, by deceiving themselves. Both options come at a cost: Adapting behavior may reduce utility, whereas changing beliefs causes cognitive unease because "there is likely to be a natural [...] set of beliefs about the morality of an activity" (Rabin, 1994, p. 180) and an "intellectually honest view of what is fair" (Konow, 2000, p. 1077). Individuals therefore try to balance the material utility derived from their actions and the affective disutility that stems from either cognitive dissonance or dishonest beliefs.

Contrasting with Rabin (1994) and Konow (2000), we argue that, in addition to individuals' attitudes, their knowledge about whether an action is in line with their attitudes also needs to be taken into account. For example, if an individual is opposed to the exploitation of workers, but does not know that workers are exploited in the production of a certain product, purchasing this product will not cause cognitive dissonance. Thus, in what follows, we develop a model similar to those of Rabin (1994) and Konow (2000), but we add individuals' knowledge about whether their actions are in line with their values, whereas Rabin (1994) and Konow (2000) focus on moral values alone, i.e., the personal view of individuals on what is the correct behavior. The purpose of our theoretical model is to demonstrate that by increasing the salience of both moral concerns and the knowledge of the own moral standards, as well as by increasing the salience of an action itself, the likelihood of selecting the sustainable of two consumption options, or, more generally, of behaving prosocially, can be raised.

2.1 Setup

In our model, individuals can choose between a purely selfish and a prosocial action $a \in \{0, 1\}$, where 0 denotes the selfish action and 1 the prosocial action. Individuals derive material utility $U(a)$ from both actions, but it is assumed that the material utility of the selfish action exceeds that of the prosocial action: $U(0) > U(1)$, for instance, because the selfish action is cheaper. Therefore, if an individual only considers the material utility, she chooses the selfish activity.

However, individuals also hold moral values, which are their own norms of right and wrong. Examples of moral values include refraining from causing harm to others or from inflicting pain on animals. These values may conflict with a decision that is based exclusively on material utility, thereby inducing cognitive dissonance and, hence, affective disutility. For example, if an individual has to choose between a sustainable and a less costly non-sustainable action, the sustainable action yields lower material utility due to higher costs, so that the individual will only have an incentive to prefer the sustainable action if she expects less affective disutility due to avoided cognitive dissonance.

A central element of the model is that we assume that individuals are able to hold beliefs about their moral values that differ from their true values. At first glance, one might expect that beliefs about moral values should always be equal to the true values. However, if individuals experience cognitive dissonance because their chosen action is not in line with their true values, they might lie to themselves about their values to fit them to their action. For instance, people who actually value sustainable production because it prevents harm to other people and the environment, but who still purchase conventional products may tell themselves that they are against sustainable production because it increases product prices, or they may convince themselves that sustainability is not a priority in their current situation.

This modification of beliefs represents a form of self-deception and, therefore, entails psychological costs C_v (Rabin, 1994). These costs depend on the moral values v, an individual's beliefs $\hat{v}$ about these values, and on the importance or salience s_v of moral concerns. Salience may be interpreted as the extent to which an individual is aware of her moral concerns in a given situation.

$$C_v(v, \hat{v}, s_v) = |v - \hat{v}| \cdot c_v(s_v), \tag{1}$$

where $v, \hat{v} \in \{0, 1\}$ equal 1 if an individual has high moral values or believes to have high moral values, respectively, and zero otherwise. If the beliefs about the moral values are consistent with true values, there is no need for self-deception and, hence, the cost of self-deception is zero; otherwise these costs are greater than zero. It seems natural to assume that the cost of self-deception increases in the salience or awareness of moral concerns, that is, for the function $c_v(s_v)$ of salience, it is $\frac{\partial c_v}{\partial s_v} > 0$.

Likewise, individuals may or may not know whether an action is consistent with their own moral standards. As with the beliefs about moral values, to avoid cognitive dissonance, individuals may willfully ignore their knowledge about whether an action is in line with their moral standards. This manipulation of beliefs about knowledge results in psychological costs C_k due to self-deception.

These costs depend on the true knowledge, denoted by k, as well as on the beliefs about this knowledge, denoted by $\hat{k}$, and on the salience of the true knowledge, s_k:

$$C_k(k, \hat{k}, s_k) = \left| k - \hat{k} \right| \cdot c_k(s_k), \tag{2}$$

where $k, \hat{k} \in \{0, 1\}$ take on the value one if an individual knows about the moral value of her action or believes to know about it, respectively, and zero otherwise. In other words, $k = 1$ ($k = 0$) if the individual knows (does not know) whether the chosen action matches her attitudes. Similarly, $\hat{k} = 1$ ($\hat{k} = 0$) if the individual believes to (not) know that the chosen action matches her attitudes. The costs of self-deception are equal to zero if beliefs about knowledge are in line with true knowledge and larger than zero otherwise. Again, $c_k(s_k)$ is a function of salience, with $\frac{\partial c_k}{\partial s_k} > 0$.

We assume that the experienced degree of cognitive dissonance, D, depends on the chosen action, a, the salience of this action, s_a, the individual's beliefs about her

values and knowledge, $\hat{v}$ and $\hat{k}$, as well as the salience of moral concerns and the true knowledge, s_v and s_k:

$$D(a, \hat{v}, \hat{k}, s_a, s_v, s_k) = |a - \hat{v}| \cdot \hat{k} \cdot d(s_a, s_v, s_k). \tag{3}$$

From Definition (3) follows that an individual does not experience cognitive dissonance if the chosen action is in line with her beliefs about her moral values, that is, if $a = \hat{v}$, or if she believes not to know about the morality of her action, that is, if $\hat{k} = 0$. $d(s_a, s_v, s_k)$ is a function of all salience parameters for which it is assumed that $\frac{\partial d}{\partial s_a} > 0$, $\frac{\partial d}{\partial s_v} > 0$, and $\frac{\partial d}{\partial s_k} > 0$. That is, cognitive dissonance increases with the salience of the action, the salience of moral concerns and the salience of true knowledge. All salience parameters are assumed to be situation-dependent and can be varied, for example through the provision of information, as in our experiment.

Combining material and affective utility and taking account of cognitive dissonance and psychological costs of self-deception yields the following utility function $\tilde{W}$:

$$\tilde{W}(a, v, \hat{v}, k, \hat{k}, s_a, s_v, s_k) := U(a) - D(a, \hat{v}, \hat{k}, s_a, s_v, s_k) - C_v(v, \hat{v}, s_v) - C_k(k, \hat{k}, s_k), \tag{4}$$

where cognitive dissonance and psychological costs diminish the utility $\tilde{W}(a)$ derived from action a.

2.2 Behavior

Throughout, we assume that individuals have prosocial values, i.e., $v = 1$, and are informed about the morality of the selfish and the prosocial action, i.e., $k = 1$. Ab-

breviating $\tilde{W}(a, v = 1, \hat{v}, k = 1, \hat{k}, s_a, s_v, s_k)$ by $W(a, \hat{v}, \hat{k}, s_a, s_v, s_k)$, rational individuals maximize their utility by solving the maximization problem

$$\max_{a,\hat{v},\hat{k}} \; W(a, \hat{v}, \hat{k}, s_a, s_v, s_k). \tag{5}$$

The salience parameters s_a, s_v, and s_k are presumed to be exogenous and, thus, cannot be changed by the individuals. Moral values and knowledge about the morality of an action are assumed to be fixed in the short-run. Therefore, individuals can adapt either their actions a, their beliefs $\hat{v}$ about their values, or the beliefs $\hat{k}$ about their knowledge, so that maximization problem (5) is solved for the following variables: a, $\hat{v}$, and $\hat{k}$.

There is often a gap between an individual's attitude and her actual behavior (Nyborg et al., 2006; Rothgerber & Rosenfeld, 2021). Given this empirical fact, as our baseline, we take the situation in which the individual believes to have a positive attitude towards prosocial behavior and holds congruent beliefs about the morality of each action, but still behaves selfishly: $a = 0, \hat{v} = 1, \hat{k} = 1$. We now analyze the incentives to deviate from this baseline situation.

For the three binary variables a, $\hat{v}$, and $\hat{k}$, there are $2^3 = 8$ combinations, one of which describes the baseline situation: $(a, \hat{v}, \hat{k}) = (0, 1, 1)$. From these 8 combinations, only the 4 combinations presented below are relevant for our further analysis. One of these four combinations is $(a, \hat{v}, \hat{k}) = (1, 1, 1)$, i.e., the individual chooses the prosocial action, believes to have high moral values, and believes to be informed about the morality of the action. As can be seen from Definition (4), this combination strictly dominates all combinations in which the individual chooses the prosocial action ($a = 1$) and at the same time deceives herself by choosing either $\hat{v} = 0$ or $\hat{k} = 0$, or both. This is because material utility is the same in all combinations $(a, \hat{v}, \hat{k}) = (1, 0, 1)$, $(a, \hat{v}, \hat{k}) = (1, 1, 0)$, and $(a, \hat{v}, \hat{k}) = (1, 0, 0)$, whereas psychological costs, $C_v + C_k$, are smaller for $(a, \hat{v}, \hat{k}) = (1, 1, 1)$. Moreover, from Definition (4), it follows that it would be irrational to choose the combination $(a, \hat{v}, \hat{k}) = (0, 0, 0)$. This combination implies higher psychological costs, $C_v + C_k$, compared to a situation in which either $\hat{v} = 1$ or $\hat{k} = 1$, as with the

combinations $(a, \hat{v}, \hat{k})$=(0, 1, 0) and $(a, \hat{v}, \hat{k})$=(0, 0, 1). Cognitive dissonance and the material utility, however, are the same in all these situations. Thus, $(a, \hat{v}, \hat{k}) = (0, 0, 0)$ is strictly dominated by both, $(a, \hat{v}, \hat{k})$=(0, 1, 0) and $(a, \hat{v}, \hat{k})$=(0, 0, 1).

Therefore, the only rational combinations are

$$(a, \hat{v}, \hat{k}) \in \{(0,1,1), (1,1,1), (0,0,1), (0,1,0)\},$$

for which we now report the utilities $W(a, \hat{v}, \hat{k}, s_a, s_v, s_k)$. First, for the baseline situation, $(a, \hat{v}, \hat{k}) = (0, 1, 1)$, W reads:

$$\begin{aligned} &W(a = 0, \hat{v} = 1, \hat{k} = 1, s_a, s_v, s_k) \\ &= U(0) - D(0, 1, 1, s_a, s_v, s_k) - C_v(1, 1, s_v) - C_k(1, 1, s_k) \\ &= U(0) - d(s_a, s_v, s_k), \end{aligned} \tag{6}$$

as $C_v(1, 1, s_v) = 0$ because $v = \hat{v} = 1$, $C_k(1, 1, s_k) = 0$, since $k = \hat{k} = 1$, and $D(0, 1, 1, s_a, s_v, s_k) = d(s_a, s_v, s_k)$, since $|a - \hat{v}| = |0 - 1| = 1$.

Second, for similar reasons, when $(a, \hat{v}, \hat{k}) = (1, 1, 1)$, it is:

$$\begin{aligned} &W(a = 1, \hat{v} = 1, \hat{k} = 1, s_a, s_v, s_k) \\ &= U(1) - D(1, 1, 1, s_a, s_v, s_k) - C_v(1, 1, s_v) - C_k(1, 1, s_k) \\ &= U(1). \end{aligned} \tag{7}$$

Third, when $(a, \hat{v}, \hat{k}) = (0, 0, 1)$, it is

$$\begin{aligned} &W(a = 0, \hat{v} = 0, \hat{k} = 1, s_a, s_v, s_k) \\ &= U(0) - D(0, 0, 1, s_a, s_v, s_k) - C_v(1, 0, s_v) - C_k(1, 1, s_k) \\ &= U(0) - c_v(s_v), \end{aligned} \tag{8}$$

as $C_v(1, 0, s_v) = |1 - 0| \cdot c_v(s_v) = c_v(s_v)$.

Fourth, in a similar vein, when $(a, \hat{v}, \hat{k}) = (0, 1, 0)$, it is:

$$\begin{aligned} & W(a = 0, \hat{v} = 1, \hat{k} = 0, s_a, s_v, s_k) \\ & = U(0) - D(0, 1, 0, s_a, s_v, s_k) - C_v(1, 1, s_v) - C_k(1, 0, s_k) \\ & = U(0) - c_k(s_k). \end{aligned} \tag{9}$$

In the baseline situation, an individual experiences cognitive dissonance because she is aware that her behavior is not in line with her moral values. Starting from this baseline, it is straightforward to see that the individual is more likely to choose the prosocial action, i.e., to adapt her behavior to her values, the larger is the material utility from this action (see Expressions (6) and (7)). Furthermore, her choice depends on the salience of the action, s_a, the salience of moral concerns, s_v, and the salience of her knowledge, s_k. In what follows, we separately analyze the implications of increases in each of the salience parameters s_a, s_v, s_k, starting with parameter s_v.

Proposition 1: Departing from the baseline situation $(a, \hat{v}, \hat{k}) = (0, 1, 1)$, an individual is more likely to either adapt her behavior to her values, i.e., to switch to $(a, \hat{v}, \hat{k}) = (1, 1, 1)$, or to deceive herself by pretending not to be informed about the morality of each action, i.e., to switch to $(a, \hat{v}, \hat{k}) = (0, 1, 0)$, when moral concerns are more salient, i.e., when s_v increases.

Proof: We now demonstrate that an increase in the salience parameter s_v decreases the utility obtained from the baseline combination $(a, \hat{v}, \hat{k}) = (0, 1, 1)$ relative to the utility obtained from $(a, \hat{v}, \hat{k}) = (1, 1, 1)$ and $(a, \hat{v}, \hat{k}) = (0, 1, 0)$. In fact, from Expression (6) follows that

$$\frac{\partial W(a = 0, \hat{v} = 1, \hat{k} = 1, s_a, s_v, s_k)}{\partial s_v} = -\frac{\partial d(s_a, s_v, s_k)}{\partial s_v} < 0, \tag{10}$$

whereas from Expressions (7) and (9) it follows:

$$\frac{\partial W(a=1,\hat{v}=1,\hat{k}=1,s_a,s_v,s_k)}{\partial s_v}=0,$$
$$\frac{\partial W(a=0,\hat{v}=1,\hat{k}=0,s_a,s_v,s_k)}{\partial s_v}=0,$$

as $W(a=1,\hat{v}=1,\hat{k}=1,s_a,s_v,s_k)=U(1)$ and $W(a=0,\hat{v}=1,\hat{k}=0,s_a,s_v,s_k)=U(0)-c_k(s_k)$, which is independent of s_v. □

Proposition 2: Departing from baseline situation $(a,\hat{v},\hat{k})=(0,1,1)$, an individual is more likely to either adapt her behavior to her values, i.e., to switch to $(a,\hat{v},\hat{k})=(1,1,1)$, or to deceive herself by modifying her beliefs about her values, i.e., to switch to $(a,\hat{v},\hat{k})=(0,0,1)$, when her knowledge about the morality of each action is more salient, i.e., when s_k increases.

Proof: We now show that an increase in s_k decreases the utility obtained from $(a,\hat{v},\hat{k})=(0,1,1)$ relative to the utility obtained from $(a,\hat{v},\hat{k})=(1,1,1)$ and $(a,\hat{v},\hat{k})=(0,0,1)$. In fact, from Expressions (6) and (9) follows that

$$\frac{\partial W(a=0,\hat{v}=1,\hat{k}=1,s_a,s_v,s_k)}{\partial s_k}=-\frac{\partial d(s_a,s_v,s_k)}{\partial s_k}<0, \tag{11}$$

whereas from Expressions (7) and (8) follows

$$\frac{\partial W(a=1,\hat{v}=1,\hat{k}=1,s_a,s_v,s_k)}{\partial s_k}=0,$$
$$\frac{\partial W(a=0,\hat{v}=0,\hat{k}=1,s_a,s_v,s_k)}{\partial s_k}=0.$$

□

Proposition 3: Departing from the baseline scenario, the individual is less likely to choose $(a,\hat{v},\hat{k})=(0,1,1)$ relative to all other possible choices when s_a is larger.

Proof: We no show that an increase in s_a decreases the utility obtained from $(a, \hat{v}, \hat{k}) = (0, 1, 1)$ relative to the utility obtained from all other possible choices. In fact, from Expression (6), it follows that

$$\frac{\partial W(a = 0, \hat{v} = 1, \hat{k} = 1, s_a, s_v, s_k)}{\partial s_a} = -\frac{\partial d(s_a, s_v, s_k)}{\partial s_a} < 0,$$

whereas from Expressions (7), (8), and (9) follows

$$\begin{aligned}
\frac{\partial W(a = 1, \hat{v} = 1, \hat{k} = 1, s_a, s_v, s_k)}{\partial s_a} &= 0, \\
\frac{\partial W(a = 0, \hat{v} = 0, \hat{k} = 1, s_a, s_v, s_k)}{\partial s_a} &= 0, \\
\frac{\partial W(a = 0, \hat{v} = 1, \hat{k} = 0, s_a, s_v, s_k)}{\partial s_a} &= 0.
\end{aligned}$$

□

3 Experimental Design

To empirically investigate the effect of cognitive-dissonance-inducing information on individuals' behavior and beliefs, we conducted an incentivized discrete-choice experiment that was embedded in a survey. At the outset of the questionnaire, we informed participants that for some years now, more and more ecologically sustainable and fairly produced goods have been on offer, and asked them whether they are in favor of sustainable production – for more details, see Section 5 on the data description. After a passage with questions on topics that are unrelated to sustainable production, the participants had to decide whether they would prefer to win a voucher worth 20 euros for a conventional online shop or for an online shop focusing on sustainable products. To induce incentive-compatible response behavior, we informed all participants that one out of 20 respondents would actually receive their chosen voucher. We chose Amazon as the conventional market place and memolife as the sustainable market place. The retailer memolife offers a wide range of products, like food, clothing,

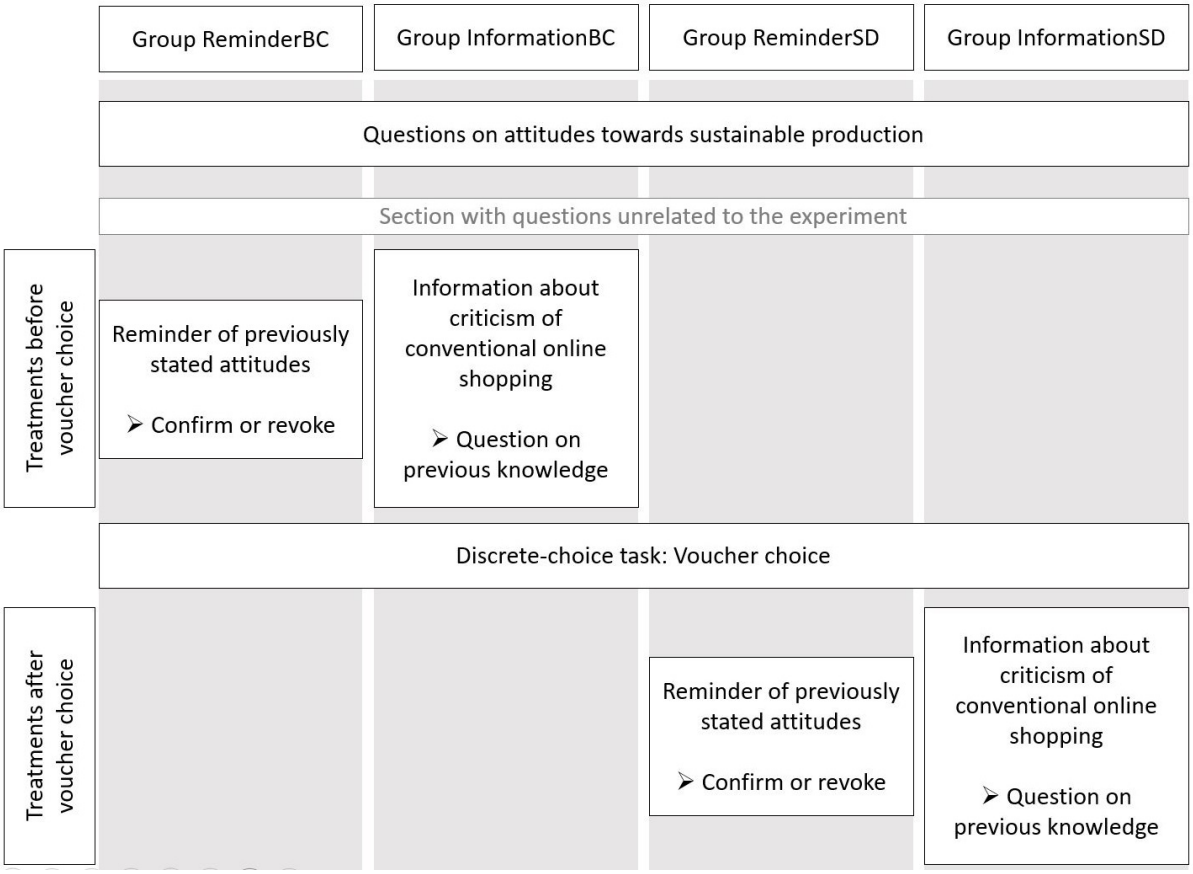
electronics, and furniture. The retailer attaches great importance to resource-efficient production, socially responsible working conditions during the production process, resource-saving and recyclable packaging, as well as reparability and longevity of the products. For more information, see `https://www.memolife.de/`. Amazon is one of the largest online retailers and offers a large variety of products and brands, including sustainably produced products. However, Amazon has no particular focus on sustainability. On the contrary, it is frequently criticized for poor working conditions, systematic destruction of returned products, and pollution of marine ecosystems with its packaging waste (Oceana, 2020; The Washington Post, 2021; Forbes, 2020).

In a discrete-choice experiment we randomly assigned participants to four equally-sized experimental groups (see Figure 1): Group ReminderBC and Group InformationBC, with BC denoting behavioral change, as well as Group ReminderSD and Group InformationSD, where SD stands for self-deception. The experiment aimed at arousing cognitive dissonance by either randomly reminding participants of their previously stated attitude towards sustainable production in general or by informing them about the negative aspects of conventional online shopping.

We asked subjects of Group ReminderBC whether they would confirm or revoke (not) being in favor of or neutral towards sustainable production, depending on their previously stated attitude. Thereby, we indirectly reminded them of their attitudes and increased the salience s_v of their attitudes and underlying values (see Items ExpA in the Supplementary Materials, Section 7 for the exact wording). This reminder may cause cognitive dissonance if participants choose a voucher that is not in line with their attitudes (reminder treatment). Since we reminded participants of their attitudes before they chose the voucher, they had the opportunity to avoid cognitive dissonance by aligning their choice with their attitude and values.

Subjects of Group InformationBC received information on the common criticism of conventional online shopping, such as the systematic destruction of returned products, packaging waste ending up in the ocean, as well as bad working conditions (see

Figure 1: Experimental Design



Item ExpA4 in the Supplementary Materials, Section 7). When providing this information, we immediately asked respondents whether they had already been familiar with this criticism prior to the survey. The information on negative aspects of conventional online shopping may cause cognitive dissonance when participants have a positive attitude towards sustainable production in general, but choose the conventional voucher (information treatment): The information raises their awareness s_k that their voucher choice is not in line with their values. As subjects of Group InformationBC received the information before their voucher choice, they had the opportunity to avoid cognitive dissonance by aligning their choice with this information. Former studies have found that when cognitive dissonance is aroused by informing people about the negative aspects of their behavior, they tend to ignore this information (e.g., Dana et al., 2007; Matthey & Regner, 2011; Edenbrandt et al., 2021; Onwezen & van der Weele,

2016). In our study, however, participants have to actively confirm or deny to have known the information before, which makes it harder to ignore this information.

Group ReminderSD and Group InformationSD received exactly the same information and questions as the respective BC groups, but only after having chosen a voucher (see Figure 1). With this design, we aimed at causing cognitive dissonance as well by increasing the salience s_a of the action, but since subjects of these groups had already chosen a voucher when receiving the information, they were unable to align their behavior with their attitudes. As an alternative way of avoiding cognitive dissonance, subjects of Group ReminderSD could deceive themselves by changing their attitudes so that they are in accordance with their behavior. To capture this reaction, we analyze whether participants revoke their general attitude towards sustainable production that they stated at the outset of the questionnaire after having chosen a voucher.

In a similar vein, participants of Group InformationSD could deceive themselves by denying their knowledge about the criticism of conventional online shopping. To capture this type of self-deception, we compare the stated knowledge about criticism of conventional online shopping between participants of Group InformationSD, who received the question after their voucher choice, and participants of Group InformationBC, who received the question before the discrete-choice task.

4 Hypotheses

Assuming that many participants exhibit a discrepancy between their attitude and behavior, our objective is to increase the salience of this gap through information provision, subsequently elevating cognitive dissonance levels. We expect that these interventions may help individuals to close the attitude-behavior gap by adjusting either their behavior or attitudes to avoid cognitive dissonance.

Based on our theoretical model and experimental design, we pursue two major lines of investigation. First, we aim at measuring the effect of cognitive dissonance-inducing information on behavior, here on the choice of either kind of voucher. Second, we investigate the impact of cognitive-dissonance inducing information on two forms of self-deception: attitude adaptation and knowledge denial.

Both mechanisms of cognitive dissonance avoidance, adaption of behavior and self-deception, come with a lower level of cognitive dissonance, but with decreased material utility or higher psychological costs, respectively. Whether a participant decides to bear cognitive dissonance, accepts lower material utility, or bears the psychological costs of self-deception depends on the relative costs of each option.

We pre-specified all of the following hypotheses in the AEA RCT Registry[1], but deviated slightly from our pre-analysis plan in some respects to increase power and allow the estimation of causal effects. We will detail these adjustments in the relevant sections. For each of the two lines of investigation, we establish two hypotheses, yielding four hypotheses altogether.[2] To investigate the effect of reminding respondents of their attitude on their behavior, we compare the voucher choice of Group ReminderBC, whose subjects are asked to confirm or revoke their previously stated attitudes before the voucher choice, with that of Group ReminderSD and Group InformationSD, in which respondents do not receive any information before their voucher choice (Figure 2). Both these groups thus form the control group for the first hypothesis.[3] Note that while we expect that participants with a positive attitude may change

[1]Trial number: AEARCTR-0007882

[2]In our pre-analysis plan, we pre-specified two further hypotheses on the relation between uncertainty regarding one's attitudes and voucher choice, as well as on the heterogeneity of the effects with respect to uncertainty. For the presentation of these hypotheses and the respective results, see Supplementary Materials, Section 1.

[3]Here, we deviate from our pre-specified hypothesis in that we expand the control group. Instead of comparing the treated Group ReminderBC to the control Group ReminderSD only, we combine the latter with Group InformationSD that does not receive any information or reminder before the voucher choice. Doing so, we increase the sample under investigation and, thus, the power of our analysis (see Supplementary Materials, Section 6 for our power analyses). To check the robustness with respect to the change of the control group and stick to our pre-analysis plan, we additionally test the pre-specified hypothesis. We find that the results only change marginally (see Supplementary Materials, Section 3, Table 7).

their behavior, we expect the behavior of participants with a neutral or negative attitude to remain unchanged due to a lack of cognitive dissonance.

Figure 2: Experimental groups used for testing the hypotheses

	Group ReminderBC	Group InformationBC	Group ReminderSD	Group InformationSD
H.BC1	Treatment Group		Control Group	
H.BC2		Treatment Group	Control Group	
H.SD1	Control Group		Treatment Group	
H.SD2		Control Group		Treatment Group

By reminding the respondents of their previously stated attitude immediately before their voucher choice, we increase the salience s_v of moral concerns. This increase in salience raises the level of cognitive dissonance that the respondent experiences when not acting in accordance with these concerns. Therefore, based on Proposition 1, we expect that respondents with a positive attitude toward sustainable production who are reminded of these attitudes will be more likely than the control group to choose the sustainable voucher to avoid cognitive dissonance.

Hypothesis BC1: The share of individuals who choose a sustainable voucher is higher in Group ReminderBC than in the control group, consisting of Group ReminderSD and Group InformationSD.[4]

Next, we focus on the effect of information about the criticism of conventional online shopping, which is provided to the subjects of Group InformationBC prior to the voucher choice. This information exacerbates cognitive dissonance if an individual chooses the conventional voucher by increasing the salience of true knowledge, s_k.

[4]Note that according to Proposition 1, this pre-decision reminder also increases the likelihood that the individual adapts her beliefs about her knowledge of the morality of each action. However, this implication cannot be tested empirically in our setting.

Thus, following Proposition 2, we expect that respondents with a positive attitude towards sustainable production will be more likely to choose the sustainable voucher after receiving the information than subjects of the control group, which consists of the Group InformationSD and Group ReminderSD.[5] Note that while we expect that participants with a positive attitude will change their behavior, we expect the behavior of participants with a neutral or negative attitude to remain unchanged due to a lack of cognitive dissonance.

Hypothesis BC2: The share of individuals choosing a voucher for sustainable online shopping is higher in Group InformationBC than in the control group, consisting of Group InformationSD and Group ReminderSD.[6]

While the first two hypotheses focus on the voucher choice as the outcome variable, our attention now turns to self-deception. One of the two outcomes of interest is the percentage of participants who confirm their previously stated attitude towards sustainable production. In this respect, we examine whether selecting a voucher prior to receiving a reminder results in self-deception through the retraction of the previously stated attitude. To this end, we compare the share of participants confirming their attitude in the post-decision reminder for Group ReminderSD to the share in Group ReminderBC, which now functions as the control group.

Hypothesis SD1: Respondents are less likely to confirm their attitude in the post-decision reminder of Group ReminderSD compared to the pre-decision reminder in Group ReminderBC.[7]

[5] As with *Hypothesis BC1*, we deviate from our pre-specified hypothesis in that we combine groups Group InformationSD and Group ReminderSD to a larger control group. Again, results only change marginally if we stick to our pre-specified hypothesis (see Supplementary Materials, Section 3, Table 8.)

[6] The pre-decision information about the negative aspects of conventional production also increases the likelihood of self-deception through manipulation of beliefs about true moral values which can, however, not be measured empirically in our setting.

[7] To be able to estimate the causal effect of choosing a voucher on confirmation of attitudes, we look at the whole sample in our main regression. In Table 9 in the Supplementary Materials, Section 3, we show results for participants with a positive attitude only, as pre-specified. Restricting the sample does not change our results.

Lastly, we examine whether choosing the voucher before receiving the reminder or information leads to the denial of knowledge about the negative aspects of conventional production and online shopping. To this end, we compare the stated knowledge of Group InformationSD with that of Group InformationBC, which now serves as the control group.

Hypothesis SD2: Respondents of Group InformationSD are less likely to state that they have heard about any criticism of conventional online shopping compared to subjects of the Group InformationBC.

Both hypotheses *SD1* and *SD2* can be derived from Proposition 3. In Group ReminderSD and Group InformationSD, subjects choose a voucher right before they have to confirm or revoke their attitude or knowledge. This increases the salience s_a of the choice relative to Group ReminderBC and Group InformationBC, where subjects are not yet aware of the upcoming choice when they confirm or revoke their attitude or knowledge. Therefore, participants of the self-deception groups may experience a higher level of cognitive dissonance when confirming their attitude or knowledge after having chosen a voucher that is not in line with these. This increases the likelihood of self-deception.[8]

While our design allows identifying the effects of the information and reminder on voucher choice, and of choosing a voucher on self-deception, it is not straightforward to identify whether these effects are mediated by cognitive dissonance. Whether an individual experiences cognitive dissonance when choosing a voucher or when receiving the reminder or the information depends on her prior confirmation of attitudes or knowledge, or on her voucher choice, respectively, which cannot be randomized. Yet, our theoretical model indicates that the effects of the reminder and information on behavior are mediated by cognitive dissonance. That is, the reminder and the infor-

[8]Proposition 3 additionally states that increased salience of the action of voucher choice increases the likelihood to choose the morally superior action, that is, the sustainable voucher. In our setting, however, the voucher has already been chosen at this stage, such that adapting behavior to true moral values is not a feasible strategy for the avoidance of cognitive dissonance.

mation induce cognitive dissonance for individuals who do not act in line with their attitudes, which leads to a change in behavior or beliefs.

5 Data

For our empirical analysis, we rely on data collected in a survey that was conducted from June 11 to June 30, 2021, in collaboration with forsa, a survey institute that maintains a panel of more than 100,000 individuals who are representative of the German-speaking internet users aged 14 and older in Germany. Panel members are recruited offline, with each individual of the population having the same probability to become a panel member.[9]

The present study was part of a larger survey to which 12,625 adult panel members were invited to participate. In the end, 8,026 participants completed the questionnaire, resulting in a response rate of 63.4%. 4,009 participants, that is, about half of those who completed the questionnaire, were randomly assigned to take part in our experiment. Of these, we dropped 506 participants who did not answer the questions that are essential to our experiment, that is, they either did not choose a voucher, did not state their attitude towards sustainable production, or did not answer the reminder or criticism questions. We also excluded approximately 50 who did not answer all questions regarding the importance of sustainability aspects, approximately 500 who did not specify their socioeconomic characteristics (primarily income), and roughly 200 due to missing environmental attitudes or psychological characteristics, yielding a final sample of 2,994 observations.

Data was collected using a state-of-the-art tool that allows panelists to fill out the questionnaire online (for an extract, see Supplementary Materials, Section 7). Participants could retrieve and return the questionnaire from home or from mobile devices

[9]Voluntary participation in the panel is impossible. For more information on forsa, see `http://www.forsa.com`.

connected to the internet. While respondents could interrupt and resume the survey at any time, the median duration for completing the entire questionnaire in the final sample was 20.9 minutes.

In addition to information needed for the experiment, such as the general attitude towards sustainable production, we requested participants to provide us with standard socioeconomic and demographic characteristics – see Table A.1 in Appendix A for the descriptive statistics. Compared with the German population, we find that, on average, survey participants are somewhat older, better educated, and have higher incomes (Table A.2). The mean age is about 55 years and nearly 56% of all participants are male. More than 41% of the respondents have a (technical) college degree, about 55% are employed either full- or part-time. Net monthly household income is measured in intervals of 500 euros, starting at 700 euros and top-coded at an income of 5,700 euros. For our analysis, we summarize the intervals in four categories: low income ($<$ 1200 Euro), medium income ($1200 - 2700$ Euro), high income ($2700 - 4200$ Euro), very high income ($>$ 4200 Euro). Around 6% of the households exhibit a net monthly household income of below 1200 Euro, while sample households split roughly equally across the remaining three income categories.

We randomly assigned respondents to four experimental groups such that they are roughly equally split with sample sizes varying between 740 and 757 participants. Exclusion due to item non-response is not significantly related to group assignment, and except for small statistically significant differences in monthly income, the experimental groups do not differ systematically with respect to their socioeconomic and demographic characteristics, their attitudes towards sustainable production, and their psychological characteristics (Table A.1).

With respect to our experiment, we asked the respondents about their general attitude towards sustainable products. We informed them that for some years now, more and more ecologically sustainable and fairly produced goods have been on offer, in the manufacture of which consideration is given to the environment and value is placed

on occupational safety and fair payment. Using a 5-point Likert scale, we then asked whether they are in favor of sustainable production (see Question ExpA1 in the Supplementary Materials, Section 7, for the exact wording) and define a corresponding variable named *attitude sustainable production*. Overall, a large majority of about 91% of respondents indicates to have a (very) positive attitude towards sustainable production in general (Table 1).

Table 1: Attitudes towards Sustainable Production

	ReminderBC	InformationBC	ReminderSD	InformationSD	Total
Very negative	0.3 %	1.2 %	0.5 %	0.7 %	0.7 %
Negative	1.5 %	0.8 %	0.4 %	1.1 %	0.9 %
Neutral	6.6 %	7.7 %	8.5 %	8.9 %	7.9 %
Positive	36.3 %	32.7 %	36.5 %	33.5 %	34.7 %
Very positive	55.4 %	57.6 %	54.1 %	56.0 %	55.7 %
Total	757	740	741	756	2994

Moreover, we asked whether it is important to the respondents that a) no animal habitats are destroyed in the production of goods, b) attempts are made to repair damaged products instead of immediately throwing them away and replacing them with new ones, c) when packaging products, care is taken to ensure that the material used is recyclable and that as little packaging material as possible is used overall, d) the people who make the products they buy can live well on their wages, and e) they can understand where and under what conditions the goods they buy were produced. In addition, we asked f) whether the price is first and foremost important to them when making purchase decisions. Responses to all these questions are again measured on a 5-point Likert scale (see Question ExpA2 in the Supplementary Materials, Section 7, for the exact wording). By combining the two response options "rather/fully agree" into a single category, our results indicate that between 85 and 90% of the respondents believe that it is crucial that production processes do not harm animal habitats, products can be repaired, packaging is reduced and recyclable, and workers receive fair compensation (as shown in Table 2). Additionally, 77% of the respondents express agreement on the importance of traceability of production in their purchasing

decisions. By contrast, only about 36% indicate the price to be their primary consideration.

Table 2: Importance of Sustainability Aspects

	ReminderBC	InformationBC	ReminderSD	InformationSD	Total
Non-destruction of habitats	85.1 %	83.5 %	85.1 %	85.4 %	84.8 %
Repair	90.8 %	88.0 %	93.2 %	89.9 %	90.5 %
Little and recycable packaging	86.8 %	87.7 %	87.4 %	87.6 %	87.4 %
Living wage	86.9 %	86.6 %	87.4 %	88.6 %	87.4 %
Traceability of production	73.8 %	78.1 %	76.8 %	78.6 %	76.8 %
Price	36.1 %	34.5 %	38.2 %	33.2 %	35.5 %

Note: Percentages give the share of participants who stated that the respective aspect of sustainable production is (very) important for their consumption decision. For the exact wording of the questions see Appendix 7.

By calculating the mean response value of items a) to e) of Question ExpA2, we construct the index variable *importance of sustainable aspects* (Cronbach's $\alpha = 0.81$) to capture the respondents' attitude towards the respective aspects of sustainable production, which is used as a covariate in our analyses. Correspondingly, we define the variable *importance of price*, which captures the importance of the product price on a 5-point Likert scale, where a higher value indicates higher importance.[10]

In addition, we asked whether participants have *shopped at the sustainable market place* before their participation in the survey and collected data on two psychological characteristics: First, we asked participants about their preference for internal consistency (von Collani & Blank, 2007) in their attitudes and behavior (Question PK6), which is a sub-scale of the scale for the preference for consistency developed by Cialdini et al. (1995). We define the index variable *internal consistency* by calculating the mean response value of all items for each participant.[11] Second, we elicited the locus of control, that is, the degree to which respondents believe that they have control over the outcome of events in their lives (Question PK4) (Gatz & Karel, 1993; Rotter, 1966; Pearlin & Schooler, 1978), and defined the index variable *locus of control* by calculating the mean response value of all items of that question (see Supplementary Materials,

[10]Since including the importance of price reduces α and due to the low factor loading of *importance of price*, we decided to not include this item in the index. This is also more intuitive, because the price affects material utility, while all other items affect affective utility.

[11]Since the Cronbach's alpha for the preference for internal consistency is low (α=0.31), we checked whether our regression results change when including all three items separately instead of an index. However, results with respect to our hypotheses remain unchanged.

Section 5 for more details on the measurement of preference for consistency and locus of control).

As a higher preference for consistency may lead to a higher degree of cognitive dissonance avoidance, and a higher internal locus of control may be positively correlated with sustainable behavior (Andor et al., 2022), we include both psychological characteristics as control variables in our analyses. Similarly, because a positive environmental attitude may lead to more sustainable behavior, we define the index variable *environmental attitude*, which is based on the four items on environmental attitudes of Question PK2, serving as an indicator of whether participants are aware of environmental problems (Cronbach's $\alpha = 0.81$).

To test the four hypotheses presented in the previous section, we define three outcome variables. First, for the analysis of *Hypothesis BC1* and *Hypothesis BC2*, the outcome measure of interest is the share of sustainable vouchers chosen in the discrete-choice task. Accordingly, we define the variable *sustainable voucher* to equal unity if a participant chose the sustainable voucher and zero if the conventional voucher was chosen. Those participants who preferred not to answer the question, and thus did not choose any voucher, are excluded from our analysis. Overall, a share of almost 49% of the respondents chose the sustainable voucher, with a range of 44.7% in Group ReminderSD to 53.8% in Group InformationBC (Table 3).

Second, to examine *Hypothesis SD1*, we define the indicator variable *confirm*, which indicates whether a participant confirmed the previously stated attitude (*confirm*$= 1$) towards sustainable production in general (Question ExpA1). *confirm* equals zero if a participant revoked her attitudes or preferred not to answer. Overall, more than 95%, that is, almost all participants confirmed their previously stated attitude (Table 3). Third, to verify *Hypothesis SD2*, we define the binary variable *criticism*, equalling unity if a participant stated to have heard about the criticism of conventional online shopping and zero otherwise. A share of almost 98% stated to have already heard about the criticism (Table 3).

Table 3: Outcome Variables

	ReminderBC	InformationBC	ReminderSD	InformationSD	SD Groups
Sustainable voucher	50.3 %	53.8 %	44.7 %	45.8 %	45.3 %
Attitudes confirmed	95.2 %	–	96.5 %	–	–
Informed about criticism	–	97.3 %	–	98.1 %	–
Number of observations	757	740	741	756	–

6 Empirical Results

To test our hypotheses presented in Section 4, it suffices to simply compare the means of the outcome variables across groups, as study participants were randomly assigned to either of the four experimental groups. To check the robustness of the empirical results, in addition to comparing means across experimental groups, we estimate a Linear Probability Model (LPM) in which the outcome variables are regressed on the respective group assignment, as well as a variety of control variables, such as socio-economic and psychological characteristics. As expected, we obtain only minor differences between the coefficient estimates of interest, leaving our key results virtually unchanged. To check the robustness with respect to model choice, we also conduct probit regressions, rather than estimating Linear Probability Models. The results, presented in Tables 10 - 13 in the Supplementary Materials, Section 4, confirm the estimates from the Linear Probability Models.

6.1 Key Results

Starting with the analysis of *Hypothesis BC1*, we find that in line with this hypothesis the share of sustainable vouchers is 5 percentage points higher in Group ReminderBC (50.3%), in which respondents were reminded of their previously stated attitude immediately before having to choose a voucher, than in the control group (Group ReminderSD + Group InformationSD), in which this share amounts to 45.3% (Table 3). This difference is statistically different from zero at the 5% significance level and robust to the inclusion of control variables (Table 4, Models I & II). Therefore, we can

confirm *Hypothesis BC1*. This result implies that individuals do not seem to be fully aware of their attitudes and thus experience only a low level of cognitive dissonance if they are not reminded of their attitudes prior to their voucher choice because cost of self-deception is low.

The reminder might affect participants differently depending on their previously stated attitude. Therefore, we conduct an exploratory heterogeneity analysis with respect to the participants' attitude towards sustainable production in general. While the reminder increases the share of sustainable vouchers by 6 percentage points for respondents with a positive attitude, there is a decrease of about 30 percentage points for those with a negative attitude (Table 4, Model III). The difference between these effects is statistically significant. This indicates that reminding individuals of their negative attitudes towards sustainable production may increase the share of conventional vouchers. However, this result is based on only 33 observations and should be viewed with caution.

A heterogeneity analysis with respect to gender shows that there is a significant increase of about 9 percentage points in the share of sustainable vouchers for male study participants in Group ReminderBC (Table B.2 in Appendix B), while there is a small, statistically insignificant decrease for female participants. The difference between male and non-male participants is statistically significant at the 5% level. The effectiveness of the reminder, thus, seems to be driven by male participants. This heterogeneity may be due to the higher proportion of women (53%) compared to men (39%) choosing the sustainable voucher in the control group, leaving more room for this proportion to increase among men.

Claiming that the share of sustainable vouchers is higher in Group InformationBC than in Groups InformationSD and ReminderSD, *Hypothesis BC2* is confirmed by the data as well (Table 5). Asking participants whether they are aware of the criticism regarding conventional online shopping, and thereby indirectly informing them about those negative aspects of online shopping, increases the likelihood of choosing the

Table 4: Hypothesis BC1: Effect of reminder on voucher choice - Linear Probability Model

	Model I		Model II		Model III	
	Coeff.	SE	Coeff.	SE	Coeff.	SE
Group ReminderBC	0.051*	(0.022)	0.047*	(0.020)	0.058**	(0.022)
Shopped at sust. marketplace	–	–	0.270***	(0.082)	0.271**	(0.083)
Age	–	–	0.001	(0.001)	0.001	(0.001)
Male	–	–	-0.056**	(0.020)	-0.056**	(0.020)
College	–	–	0.054**	(0.020)	0.054**	(0.020)
Medium income	–	–	-0.014	(0.044)	-0.013	(0.044)
High income	–	–	-0.016	(0.044)	-0.014	(0.044)
Very high income	–	–	0.007	(0.046)	0.008	(0.046)
Children	–	–	-0.013	(0.021)	-0.014	(0.021)
Negative attitude	–	–	-0.011	(0.069)	0.131	(0.095)
Neutral attitude	–	–	-0.133***	(0.030)	-0.109**	(0.034)
Importance sust. aspects	–	–	0.088***	(0.017)	0.087***	(0.017)
Importance price	–	–	-0.076***	(0.010)	-0.076***	(0.010)
Environmental attitude	–	–	0.116***	(0.012)	0.116***	(0.012)
Internal consistency	–	–	0.010	(0.016)	0.010	(0.016)
Locus of control	–	–	0.026**	(0.010)	0.026**	(0.010)
Group ReminderBC x negative att.	–	–	–	–	-0.361***	(0.106)
Group ReminderBC x neutral att.	–	–	–	–	-0.083	(0.058)
Constant	0.453***	(0.013)	-0.310*	(0.123)	-0.309*	(0.123)
Observations	2253		2253		2253	
R-Squared	0.00		0.19		0.19	
Adjusted R-Squared	0.00		0.18		0.18	
F-Statistic: p-value	0.02		0.00		0.00	

Note: The control group is Group ReminderSD + Group InformationSD; *, ** and *** indicate statistical significance at the 5%, 1% and 0.1% level, respectively.

sustainable voucher by roughly 9 percentage points, from 45.3% to 53.8% (Table 3). This difference is statistically significant at the 0.1%-level and robust to the inclusion of a large suite of socioeconomic and attitudinal control variables (Table 5, Models I & II). Similar to *Hypothesis BC1*, we find a statistically significant increase of 9 percentage points in the share of sustainable vouchers for respondents with a positive attitude, while respondents with a negative attitude tend to be less likely to choose the sustainable voucher after having received the information (roughly -18 percentage points) (Table 5, Model III). The effect for respondents with a negative attitude significantly differs from that for respondents with a positive attitude. Again, due to the low number of participants with a negative attitude, this result needs to be treated with caution.

Similar to our analysis of *Hypothesis BC1*, an exploratory analysis shows that there is a somewhat larger increase of almost 10 percentage points in the share of sustainable vouchers among male participants after receiving the information on criticism about conventional online shopping, while the effect for female participants only amounts to 7 percentage points (Table B.3 in Appendix B). Again, this heterogeneity may be due to the higher proportion of women (56%) compared to men (37%) choosing the sustainable voucher in the control group, leaving more room for this proportion to increase among men. However, the difference between male and non-male participants is not statistically significant. Against the background that more than 97% of the participants state to have heard about the negative aspects of conventional online shopping before, the results suggest that people are informed about this criticism, but they may not be fully aware of it or suppress their knowledge when making their consumption decision because of the low cost of self-deception.

Comparing the reminder and the provision of information about criticism shows that the latter is more effective in increasing the share of sustainable vouchers by about 4 percentage points. This difference is, however, only significant at the 10% level (Table B.1).

Assuming that attitudes are adapted to behavior, our first hypothesis on self-deception, *Hypothesis SD1*, is not supported by the data: There is no evidence that subjects are less likely to confirm their previously stated attitudes towards sustainable production after having chosen a voucher (Table 6, Models I & II). Rather, our results point to the opposite direction: Participants seem to be more likely to confirm their attitude after having decided on one of the vouchers. While in the control group 95% of the participants confirm their attitudes, the share increases by roughly 1 percentage point in the treatment group (Tables 3 & 6, Model II). The relationship is, however, weak and not statistically significant, both when simply comparing means and when including covariates. Further, we do not have enough power to detect an effect below 3.1% and

Table 5: Hypothesis BC2: Effect of information on voucher choice - Linear Probability Model

	Model I		Model II		Model III	
	Coeff.	SE	Coeff.	SE	Coeff.	SE
Group InformationBC	0.086***	(0.022)	0.087***	(0.020)	0.093***	(0.021)
Shopped at sust. marketplace	–	–	0.191**	(0.067)	0.191**	(0.068)
Age	–	–	0.000	(0.001)	0.000	(0.001)
Male	–	–	-0.073***	(0.020)	-0.073***	(0.020)
College	–	–	0.094***	(0.020)	0.093***	(0.020)
Medium income	–	–	-0.009	(0.044)	-0.010	(0.044)
High income	–	–	-0.012	(0.045)	-0.012	(0.045)
Very high income	–	–	-0.035	(0.046)	-0.035	(0.046)
Children	–	–	0.009	(0.021)	0.009	(0.021)
Negative attitude	–	–	0.030	(0.069)	0.144	(0.097)
Neutral attitude	–	–	-0.087**	(0.031)	-0.085*	(0.035)
Importance sust. aspects	–	–	0.082***	(0.017)	0.080***	(0.018)
Importance price	–	–	-0.076***	(0.010)	-0.076***	(0.010)
Environmental attitude	–	–	0.129***	(0.012)	0.129***	(0.012)
Internal consistency	–	–	0.015	(0.015)	0.017	(0.016)
Locus of control	–	–	0.037***	(0.010)	0.037***	(0.010)
Group InformationBC x negative att.	–	–	–	–	-0.272*	(0.115)
Group InformationBC x neutral att	–	–	–	–	-0.009	(0.060)
Constant	0.453***	(0.013)	-0.385**	(0.122)	-0.383**	(0.122)
Observations	2237		2237		2237	
R-Squared	0.01		0.21		0.22	
Adjusted R-Squared	0.01		0.21		0.21	
F-Statistic: p-value	0.00		0.00		0.00	

Note: The control group is Group ReminderSD + Group InformationSD; *, ** and *** indicate statistical significance at the 5%, 1% and 0.1% level, respectively.

therefore must be cautious in interpreting the results (see Section 6 in the Supplementary Materials for a power analysis).

Results do not change when we exclude those participants from the regression who preferred not to answer the question, that is, when we compare those who confirmed their previously stated attitudes to those who actively revoked their attitudes instead of to those who simply did not confirm their attitudes (see Table 20 in the Supplementary Materials). In contrast to the two hypotheses regarding behavior change, there is no heterogeneity with respect to gender or attitudes (Tables B.4 & B.6 in Appendix B). We do not find any heterogeneity with respect to voucher choice either (Table 6, Model III).

There is likewise no confirming evidence for *Hypothesis SD2*, which states that people tend to deny their knowledge about the criticism of conventional online shopping

Table 6: Hypothesis SD1: Effect of voucher choice on confirmation of attitudes - Linear Probability Model

	Model I		Model II		Model III	
	Coeff.	SE	Coeff.	SE	Coeff.	SE
Group ReminderSD	0.012	(0.010)	0.009	(0.009)	0.016	(0.017)
Age	–	–	-0.000	(0.000)	-0.000	(0.000)
Male	–	–	0.011	(0.009)	0.011	(0.009)
College	–	–	0.004	(0.009)	0.004	(0.009)
Medium income	–	–	0.009	(0.023)	0.009	(0.023)
High income	–	–	0.020	(0.022)	0.020	(0.022)
Very high income	–	–	0.019	(0.023)	0.018	(0.023)
Children	–	–	-0.012	(0.011)	-0.012	(0.011)
Negative attitude	–	–	-0.604***	(0.108)	-0.602***	(0.108)
Neutral attitude	–	–	-0.041	(0.035)	-0.042	(0.035)
Importance sust. aspects	–	–	0.042**	(0.015)	0.042**	(0.015)
Importance price	–	–	-0.010*	(0.005)	-0.010*	(0.005)
Environmental attitude	–	–	0.011	(0.007)	0.011	(0.007)
Internal consistency	–	–	0.003	(0.007)	0.003	(0.007)
Locus of control	–	–	0.001	(0.005)	0.001	(0.005)
Sustainable voucher	–	–	0.018*	(0.007)	0.026*	(0.013)
Group ReminderSD x sust. voucher	–	–	–	–	-0.016	(0.018)
Constant	0.952***	(0.008)	0.757***	(0.074)	0.755***	(0.075)
Observations	1497		1497		1497	
R-Squared	0.00		0.20		0.20	
Adjusted R-Squared	0.00		0.19		0.19	
F-Statistic: p-value	0.23		0.00		0.00	

Note: The control group is Group ReminderBC; *, ** and *** indicate statistical significance at the 5%, 1% and 0.1% level, respectively.

after having chosen one of the vouchers (Table 7, Model I). In contrast to our hypothesis, the share of confirmation of knowledge increases from 97.3 to 98.1% (Table 3). However, we do not have enough power to identify an effect below 2.3% and should therefore interpret the results with caution (see Section 6 in the Supplementary Materials for a power analysis). The results remain unchanged when including control variables (Table 7, Model II) and when excluding participants who preferred not to answer the question (see Table 20 in the Supplementary Materials, Section 4). There is again no effect heterogeneity with respect to gender, attitudes or voucher choice (Tables B.5 & B.6 in Appendix B, Table 7, Model III).

With respect to the relationship between voucher choice and covariates, we find that individuals who have shopped at the sustainable market place before as well as those who have a stronger environmental attitude and consider sustainability aspects as more important for their consumption decision are significantly more likely

Table 7: Hypothesis SD2: Effect of voucher choice on stated knowledge - Heterogeneity wrt. voucher choice

	Model I		Model II		Model III	
	Coeff.	SE	Coeff.	SE	Coeff.	SE
Group InformationSD	0.008	(0.008)	0.011	(0.008)	0.018	(0.014)
Age	–	–	0.000	(0.000)	0.000	(0.000)
Male	–	–	0.017	(0.009)	0.017	(0.009)
College	–	–	0.009	(0.007)	0.009	(0.008)
Medium income	–	–	-0.009	(0.014)	-0.009	(0.014)
High income	–	–	-0.019	(0.015)	-0.019	(0.015)
Very high income	–	–	-0.025	(0.016)	-0.025	(0.016)
Children	–	–	-0.007	(0.008)	-0.007	(0.008)
Negative attitude	–	–	0.058***	(0.016)	0.060***	(0.016)
Neutral attitude	–	–	0.016	(0.019)	0.016	(0.019)
Importance sust. aspects	–	–	0.013	(0.009)	0.013	(0.008)
Importance price	–	–	-0.009	(0.005)	-0.009	(0.005)
Environmental attitude	–	–	0.001	(0.005)	0.001	(0.005)
Internal consistency	–	–	0.015*	(0.006)	0.015*	(0.006)
Locus of control	–	–	0.006	(0.004)	0.006	(0.004)
Sustainable voucher	–	–	0.017*	(0.007)	0.024	(0.012)
Group InformationSD x sust. voucher	–	–	–	–	-0.015	(0.016)
Constant	0.973***	(0.006)	0.836***	(0.060)	0.834***	(0.061)
Observations	1497		1497		1497	
R-Squared	0.00		0.03		0.03	
Adjusted R-Squared	0.00		0.02		0.02	
F-Statistic: p-value	0.27		0.03		0.04	

Note: The control group is Group InformationBC; *, ** and *** indicate statistical significance at the 5%, 1% and 0.1% level, respectively.

to choose the sustainable voucher, while those ascribing a higher importance to the price of goods are less likely to do so (Tables 4 & 5). Further, a higher level of internal locus of control is significantly related to a higher probability of choosing the sustainable voucher, while the internal preference for consistency seems not to be related to voucher choice. Regarding the socio-demographic characteristics, regression results show that female participants as well as those having obtained a college degree are significantly more likely to choose the sustainable voucher. With respect to the relationship between the confirmation of one's previously stated positive attitude and covariates, we find that confirmation is significantly positively related to having chosen the sustainable voucher, having a strong environmental attitude, and ascribing high importance to sustainability aspects, while there is a significant negative relationship with the importance of product prices (Table 6). Choosing the sustainable voucher as well as having a higher preference for internal consistency are significantly positivley

related to admitting to have known about the negative aspects of online shopping. (Table 7).

6.2 Discussion and further analyses

Overall, our results indicate that study participants tend to adapt their behavior to their attitudes when they are reminded of their previously stated positive attitudes towards sustainable production or when being informed about the negative aspects of conventional online shopping. Yet, they do not deceive themselves, neither by adapting their stated attitudes to their behavior nor by denying being informed about negative aspects of conventional online shopping. Based on these results and our theoretical model, according to which the effect of the information and the reminder on behavior and beliefs is mediated by cognitive dissonance, these results suggest that, in the context of (sustainable) online shopping, individuals tend to avoid cognitive dissonance by changing their behavior if possible, but they accept cognitive dissonance if behavioral change is not possible and self-deception is the only alternative. That is, at least for 5 to 9 percent of respondents, adjusting their behavior to match their attitudes appears to be less costly than enduring the psychological costs of self-deception or cognitive dissonance. For those respondents who cannot adjust their behavior because they have already chosen a voucher at the time of the intervention, enduring cognitive dissonance appears to be less costly than self-deception.

One potential concern with respect to our results on behavior change may be the presence of experimenter demand effects. That is, participants may be more likely to choose the sustainable voucher when receiving the reminder or information because they think the experimenter expects them to do so (Zizzo, 2010). However, experimenter demand effects are usually small (de Quidt et al., 2018), and play only a negligible role in online surveys (Mummolo & Peterson, 2019). Similarly, there could be a bias toward the socially desirable option when selecting the voucher. However, since this bias should be equally present among all experimental groups, it is unlikely to

impact our results. Another concern may be that participants who speeded through the questionnaire bias our results. We thus checked the robustness of our results when those 31 respondents with a survey response time below 1/2 of the median response time, i.e., those with a response time of less than 10.5 minutes, are excluded from the estimation sample. This does not change our results (see Table 21 in the Supplementary Materials).

The result that individuals do not seem to deceive themselves when being asked to confirm or revoke their attitudes may be due to the fact that the time span between reporting one's attitudes and the reminder is rather short. Thus, the previously stated attitudes may still be very salient to the participants, which leads to high costs of self-deception. Another reason for the ineffectiveness of both the reminder and the information may be that choosing the voucher in advance does not increase cognitive dissonance enough to exceed the cost of self-deception. With respect to the reminder, one reason for this may be that although the conventional marketplace is not known for offering or promoting sustainable products, consumers can purchase sustainably produced products on the platform in addition to many conventional products. Thus, individuals with positive attitudes towards sustainable production may not consider the voucher for the conventional market place to be in conflict with their attitudes, so there is no need for self-deception. Furthermore, the lack of self-deception can be attributed to a potential defiant response from participants who understand our intentions.

In the main analyses presented in this section, we focused on the effect of reminding participants of their previously stated attitudes or providing them with information on the consequences of their behavior on their voucher choice and their stated beliefs about their attitudes and knowledge. The random assignment to the four experimental groups allows us to identify the causal average treatment effect (ATE) of the reminder and the information on voucher choice, as well as the causal ATE of choosing a voucher on beliefs. Based on our theoretical model, we argue that these

effects are mediated by cognitive dissonance. However, whether individuals experience cognitive dissonance when receiving the reminder or information, before or after choosing a voucher, depends on their behavior and attitudes. That is, the reminder and the information provided do not necessarily induce cognitive dissonance. Therefore, with our previous analyses, we cannot identify the causal ATE of induced cognitive dissonance on behavior and beliefs, but only the ATE of providing the reminder and the information. This is equivalent to the intention-to-treat effect (ITT) of induced cognitive dissonance on behavior and beliefs. To further investigate whether there is an effect of induced cognitive dissonance on behavior and beliefs for those who really experienced cognitive dissonance, we use a matching approach, which allows us to identify the ATE of experiencing cognitive dissonance in terms of a conflict between attitude, knowledge, and behavior (see Appendix C). The estimated effects differ only marginally from those of our main specifications (Tables C.5 & C.6 in Appendix C).

7 Conclusion

Cognitive dissonance as a result of individual behavior that is not in line with own moral attitudes is a widely recognized phenomenon (Festinger, 1962; Aronson, 1969; Rabin, 1994), not least in the context of prosocial and sustainable behavior (e.g. Dickerson et al., 1992; Edenbrandt et al., 2021; Gosnell, 2018; Matthey & Regner, 2011). Investigating whether compliance with own moral standards can be achieved through arousing cognitive dissonance, this paper has explored cognitive dissonance avoidance by (a) a change in behavior to comply with one's attitudes and (b) by self-deception. In an experimental setting, we aimed to arouse cognitive dissonance by either randomly reminding participants of their previously stated attitude towards sustainable production or by informing them about the negative aspects of conventional online shopping. Participants received one of these interventions either prior

to or after their voucher decision, yielding four experimental groups altogether: two pre-decision groups and two post-decision groups.

In the two pre-decision groups, the introduction of cognitive dissonance is effective in triggering behavioral change. The reminder increases the share of sustainable vouchers by 5 percentage points and information provision leads to an increase of 9 percentage points, indicating that information provision is more effective in increasing the share of sustainable vouchers. Our empirical results further indicate that when being reminded of their previously stated positive attitude towards sustainable production or when being informed about the common points of criticism on conventional online shopping, male study participants are more likely to adapt their behavior to their attitudes than females.

If a change in behavior is impossible, as for the two post-decision groups, individuals might nonetheless try to avoid cognitive dissonance by denying either their positive attitude towards sustainable production or their knowledge about the criticism of conventional online shopping. However, we do not find any evidence for such self-deception. We thus conclude that in our setting, individuals do not appear to deceive themselves when exposed to information that can cause cognitive dissonance. On the other hand, if possible, as for the two pre-decision groups, individuals tend to change their behavior when receiving such information, rather than withstanding the unpleasant feeling of not behaving in line with their attitudes.

From a policy perspective, our results suggest that policymakers can improve social outcomes by increasing compliance with personal moral standards through arousing cognitive dissonance. Reminding individuals of their positive attitudes toward sustainable production, as well as informing them about the negative aspects of conventional online shopping, can encourage individuals to choose more sustainable alternatives.

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Appendices

A Descriptive statistics

Table A.1: Balance Table

	RemBC (1)	RemSD (2)	InfBC (3)	InfSD (4)	Total	1 vs 2 (p)	3 vs 4 (p)	1 vs 2&4 (p)	3 vs 2&4 (p)
Male	0.546	0.574	0.541	0.557	0.554	0.263	0.541	0.368	0.275
Age	55.210	54.642	55.557	55.243	55.164	0.486	0.703	0.709	0.393
At least technical college	0.420	0.430	0.408	0.390	0.412	0.706	0.493	0.639	0.921
Employed	0.537	0.560	0.552	0.559	0.552	0.368	0.781	0.309	0.730
Has children	0.631	0.607	0.592	0.620	0.613	0.326	0.269	0.411	0.334
Monthly income									
<1,200 Euro	0.070	0.053	0.062	0.053	0.059	0.163	0.446	0.101	0.369
1,200 - 2,700 Euro	0.255	0.327	0.316	0.299	0.299	0.002	0.480	0.004	0.887
2,700 - 4,200 Euro	0.358	0.301	0.344	0.339	0.336	0.020	0.822	0.072	0.257
> 4,200 Euro	0.317	0.319	0.278	0.310	0.306	0.938	0.181	0.890	0.080
Attitude sust. production									
Positive attitude	0.017	0.009	0.020	0.017	0.016	0.194	0.664	0.478	0.218
Neutral attitude	0.066	0.085	0.077	0.089	0.079	0.162	0.412	0.085	0.423
Positive attitude	0.917	0.905	0.903	0.894	0.905	0.440	0.580	0.192	0.817
Mean	2.900	2.896	2.883	2.877	2.889	0.837	0.775	0.404	0.818
Importance sust. aspects									
Non-destruction of habitats	0.851	0.851	0.835	0.854	0.848	0.973	0.307	0.889	0.277
Repair	0.908	0.932	0.880	0.899	0.905	0.076	0.227	0.512	0.007
Little & recycable packaging	0.868	0.874	0.877	0.876	0.874	0.711	0.928	0.633	0.882
Living wage	0.869	0.874	0.866	0.886	0.874	0.768	0.244	0.448	0.347
Traceability of production	0.738	0.768	0.781	0.786	0.768	0.192	0.839	0.043	0.804
Mean of Index	4.206	4.221	4.195	4.213	4.209	0.653	0.596	0.697	0.454
Importance of price	0.361	0.382	0.345	0.332	0.355	0.383	0.582	0.863	0.593
Insecurity	0.003	-0.016	0.037	-0.023	0.000	0.715	0.248	0.611	0.214
Shopped at sust. marketplace	0.009	0.008	0.011	0.011	0.010	0.812	0.968	0.979	0.746
Commitment to environment	0.139	0.124	0.129	0.139	0.133	0.400	0.544	0.632	0.823
Environmental attitude	3.739	3.706	3.697	3.729	3.718	0.474	0.486	0.595	0.600
Pref. for internal consistency	3.720	3.716	3.778	3.718	3.733	0.906	0.065	0.922	0.031
Locus of control	5.109	5.144	5.135	5.159	5.137	0.498	0.655	0.348	0.716
Number of observations	757	740	741	756	2994	1497	1497	2253	2237

Table A.2: Socioeconomic characteristics

	Study sample	German micro census 2020
Male	55%	50%
Age		
< 25	2%	24%
$25 - 34$	11%	13%
$35 - 44$	14%	12%
$45 - 54$	19%	14%
$55 - 64$	22%	15%
$65 - 74$	20%	10%
$75 - 84$	11%	8%
> 84	1%	2%
At least technical college	41%	35 %
Monthly income in Euro		
Low income	6% ($< 1,200$)	15.5% ($< 1,250$)
Medium income	30% ($1,200 - 2,700$)	33.5% ($1,250 - 2,500$)
High income	50% ($2,700 - 5.200$)	36.6% ($2,500 - 5,000$)
Very high income	15% ($> 5,200$)	13.6% ($> 5,000$)

Source of German micro census data: Destatis (2021)

B Heterogeneity analyses

Table B.1: Comparison of effect of reminder and information on voucher choice - LPM

	Coeff.	SE
Reference Group Reminder BC		
Control Group	-0.047*	(0.020)
Group InformationBC	0.041	(0.023)
Observations	2994	
R-Squared	0.21	
Adjusted R-Squared	0.20	
F-Statistic: p-value	0.00	

Note: The control group is InformationSD + Group ReminderSD. Control variables are socioeconomic characteristics, attitudes toward sustainable production, environmental attitude, whether one has shopped at the sustainable market place before, preference for internal consistency and locus of control. *, ** and *** indicate statistical significance at the 5%, 1% and 0.1% level, respectively.

Table B.2: Hypothesis BC1: Effect of reminder on voucher choice - Heterogeneity wrt. gender - LPM

	Male		Female		Comparison	
	Coeff.	SE	Coeff.	SE	Coeff.	SE
Group ReminderBC	0.090***	(0.027)	-0.008	(0.031)	-0.007	(0.030)
Male	–	–	–	–	-0.089***	(0.025)
Group ReminderBC x male	–	–	–	–	0.097*	(0.041)
Constant	-0.468**	(0.159)	-0.166	(0.199)	-0.277*	(0.124)
Observations	1259		994		2253	
R-Squared	0.18		0.19		0.19	
Adjusted R-Squared	0.17		0.17		0.18	
F-Statistic: p-value	0.00		0.00		0.00	

Note: The control group is Group ReminderSD + Group InformationSD. Control variables are socioeconomic characteristics, attitudes toward sustainable production, environmental attitude, whether one has shopped at the sustainable market place before, preference for internal consistency and locus of control. *, ** and *** indicate statistical significance at the 5%, 1% and 0.1% level, respectively.

Table B.3: Hypothesis BC2: Effect of information on voucher choice - Heterogeneity wrt. gender - LPM

	Male		Female		Comparison	
	Coeff.	SE	Coeff.	SE	Coeff.	SE
Group InformationBC	0.101***	(0.027)	0.066*	(0.029)	0.069*	(0.029)
Male	–	–	–	–	-0.084***	(0.025)
Group InformationBC x male	–	–	–	–	0.033	(0.040)
Constant	-0.601***	(0.152)	-0.189	(0.208)	-0.375**	(0.123)
Observations	1247		990		2237	
R-Squared	0.20		0.20		0.21	
Adjusted R-Squared	0.19		0.19		0.21	
F-Statistic: p-value	0.00		0.00		0.00	

Note: The control group is Group InformationSD + Group ReminderSD. Control variables are socioeconomic characteristics, attitudes toward sustainable production, environmental attitude, whether one has shopped at the sustainable market place before, preference for internal consistency and locus of control. *, ** and *** indicate statistical significance at the 5%, 1% and 0.1% level, respectively.

Table B.4: Hypothesis SD1: Effect of voucher choice on confirmation of attitudes - Heterogeneity wrt. gender - LPM

	Male		Female		Comparison	
	Coeff.	SE	Coeff.	SE	Coeff.	SE
Group ReminderSD	0.019	(0.014)	-0.003	(0.012)	-0.003	(0.012)
Male	–	–	–	–	0.001	(0.014)
Group ReminderSD x male	–	–	–	–	0.021	(0.019)
Constant	0.705***	(0.097)	0.787***	(0.111)	0.760***	(0.074)
Observations	838		659		1497	
R-Squared	0.17		0.30		0.20	
Adjusted R-Squared	0.16		0.28		0.19	
F-Statistic: p-value	0.00		0.00		0.00	

Note: The control group is Group ReminderBC. Control variables are socioeconomic characteristics, attitudes toward sustainable production, environmental attitude, preference for internal consistency and locus of control. *, ** and *** indicate statistical significance at the 5%, 1% and 0.1% level, respectively.

Table B.5: Hypothesis SD2: Effect of voucher choice on stated knowledge - Heterogeneity wrt. gender - LPM

	Male		Female		Comparison	
	Coeff.	SE	Coeff.	SE	Coeff.	SE
Group InformationSD	0.003	(0.010)	0.020	(0.013)	0.021	(0.013)
Male	–	–	–	–	0.026*	(0.013)
Group InformationSD x male	–	–	–	–	-0.019	(0.015)
Constant	0.806***	(0.071)	0.906***	(0.112)	0.833***	(0.061)
Observations	822		675		1497	
R-Squared	0.04		0.05		0.03	
Adjusted R-Squared	0.02		0.03		0.02	
F-Statistic: p-value	0.44		0.30		0.04	

Note: The control group is Group InformationBC. Control variables are socioeconomic characteristics, attitudes toward sustainable production, environmental attitude, preference for internal consistency and locus of control. *, ** and *** indicate statistical significance at the 5%, 1% and 0.1% level, respectively.

Table B.6: Hypotheses SD1 & SD2: Effect of voucher choice on stated knowledge - Heterogeneity wrt. attitudes - LPM

	H.SD1		H.SD2	
	Coeff.	SE	Coeff.	SE
Group ReminderSD	0.013	(0.008)	–	–
Group InformationSD	–	–	0.008	(0.008)
Negative attitude	-0.502***	(0.140)	0.068***	(0.018)
Neutral attitude	-0.034	(0.049)	-0.001	(0.031)
Group ReminderSD x negative att.	-0.288	(0.200)	–	–
Group ReminderSD x neutral att.	-0.012	(0.064)	–	–
Group InformationSD x negative att.	–	–	-0.021	(0.014)
Group InformationSD x neutral att.	–	–	0.032	(0.034)
Constant	0.753***	(0.074)	0.839***	(0.061)
Control variables	YES		YES	
Observations	1497		1497	
R-Squared	0.21		0.03	
Adjusted R-Squared	0.20		0.02	
F-Statistic: p-value	0.00		0.05	

Note: The control group is Group ReminderBC for H.SD1 and Group InformationBC for H.SD2. Control variables are socioeconomic characteristics, attitudes toward sustainable production, environmental attitude, preference for internal consistency and locus of control. *, ** and *** indicate statistical significance at the 5%, 1% and 0.1% level, respectively.

C Matching

In the main analyses we focused on the effect of reminding participants of their previously stated attitudes or providing them with information on the consequences of

their behavior on their voucher choice and their stated beliefs about their attitudes and knowledge. Due to random assignment, we can identify the causal average treatment effect (ATE) of the reminder and the information on voucher choice, as well as the causal ATE of choosing a voucher on beliefs. Based on our theoretical model, we argue that these effects are mediated by cognitive dissonance. However, whether individuals experience cognitive dissonance when receiving the reminder or information, before or after choosing a voucher, depends on their behavior and attitudes. That is, the reminder and the information provided do not necessarily induce cognitive dissonance. Therefore, with our previous analyses, we cannot identify the causal ATE of induced cognitive dissonance on behavior and beliefs, but only the ATE of providing the reminder and the information. This is equivalent to the intention-to-treat effect (ITT) of induced cognitive dissonance on behavior and beliefs. To further investigate whether there is an effect of induced cognitive dissonance on behavior and beliefs for those who really experienced cognitive dissonance, we use a matching approach. Due to the high common support of treated and untreated individuals, this approach allows us to identify the ATE of experiencing cognitive dissonance in terms of a conflict between attitude, knowledge, and behavior. That is, it allows us to compare those who experience cognitive dissonance when confronted with the reminder or the information to those for whom this would be true if they were treated.

In the two behavior change groups participants may experience cognitive dissonance if they are reminded of their positive attitude towards sustainable production or have a positive attitude and are informed about the criticism of conventional online shopping but plan to choose the conventional voucher. Similarly, they may experience cognitive dissonance if they are reminded of their negative attitude but plan to choose the sustainable voucher. In the two self-deception groups participants with a positive attitude may experience cognitive dissonance if they choose the conventional voucher and afterwards are reminded of their positive attitude or informed about the criticism. Similarly, respondents with a negative attitude may experience cognitive dissonance if they choose the sustainable voucher and afterwards are reminded of their nega-

tive attitude. To identify the effect of this induced cognitive dissonance on voucher choice and beliefs, we need to compare individuals in the respective control groups to those in the treatment groups who would have behaved the same in a counterfactual scenario without treatment. To this end, we match participants of the control and treatment groups based on their socioeconomic characteristics, attitudes, and psychological characteristics.

We compare several matching methods and specifications including radius matching on the propensity score using the Stata commands *psmatch2* and *pstest* (Leuven & Sianesi 2018), and a logit model to estimate the propensity score. There is a very high common support (see Figures C.1 - C.4, and matching leads to a substantial reduction in the standardized bias of the covariates (Tables C.1 - C.4). Results are very robust across all specifications and barely differ from our key results presented in section 6.1. With respect to behavior change, results of propensity score matching indicate a positive effect of 5.0 percentage points of cognitive dissonance on the share of sustainable vouchers after receiving the reminder (Table C.5). The cognitive dissonance induced by the information increases the share of sustainable vouchers by 8.9 percentage points. These results indicate that the information causes a higher level of cognitive dissonance compared to the reminder, and that this induced cognitive dissonance causes changes in behavior. Regarding self-deception, matching results show no effect of the induced cognitive dissonance on beliefs (Table C.6). Since we do not measure the degree of cognitive dissonance participants experience, it remains unclear whether this null effect indicates that individuals do not deceive themselves in order to avoid cognitive dissonance, or whether our treatments were not successful in inducing cognitive dissonance.

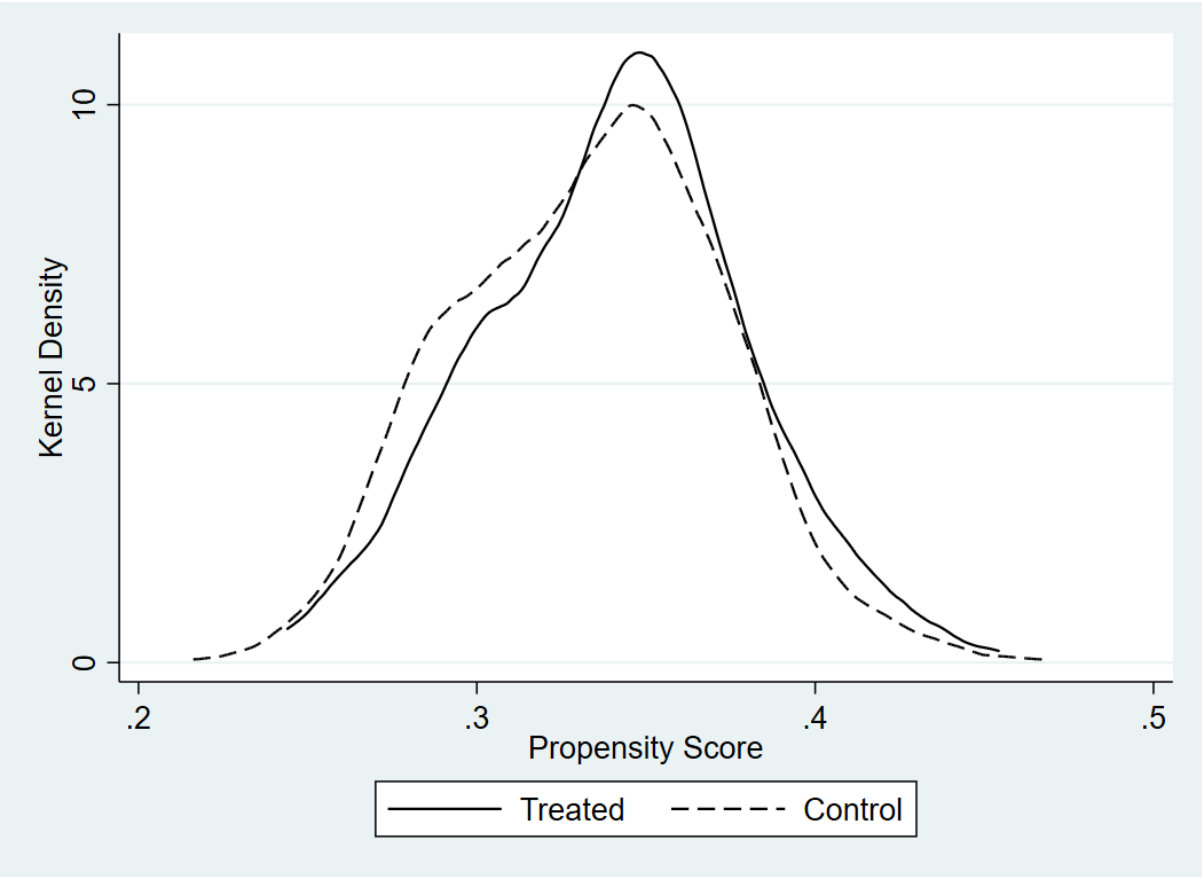

Figure C.1: Common support for analysis of *Hypothesis BC1* based on propensity score matching

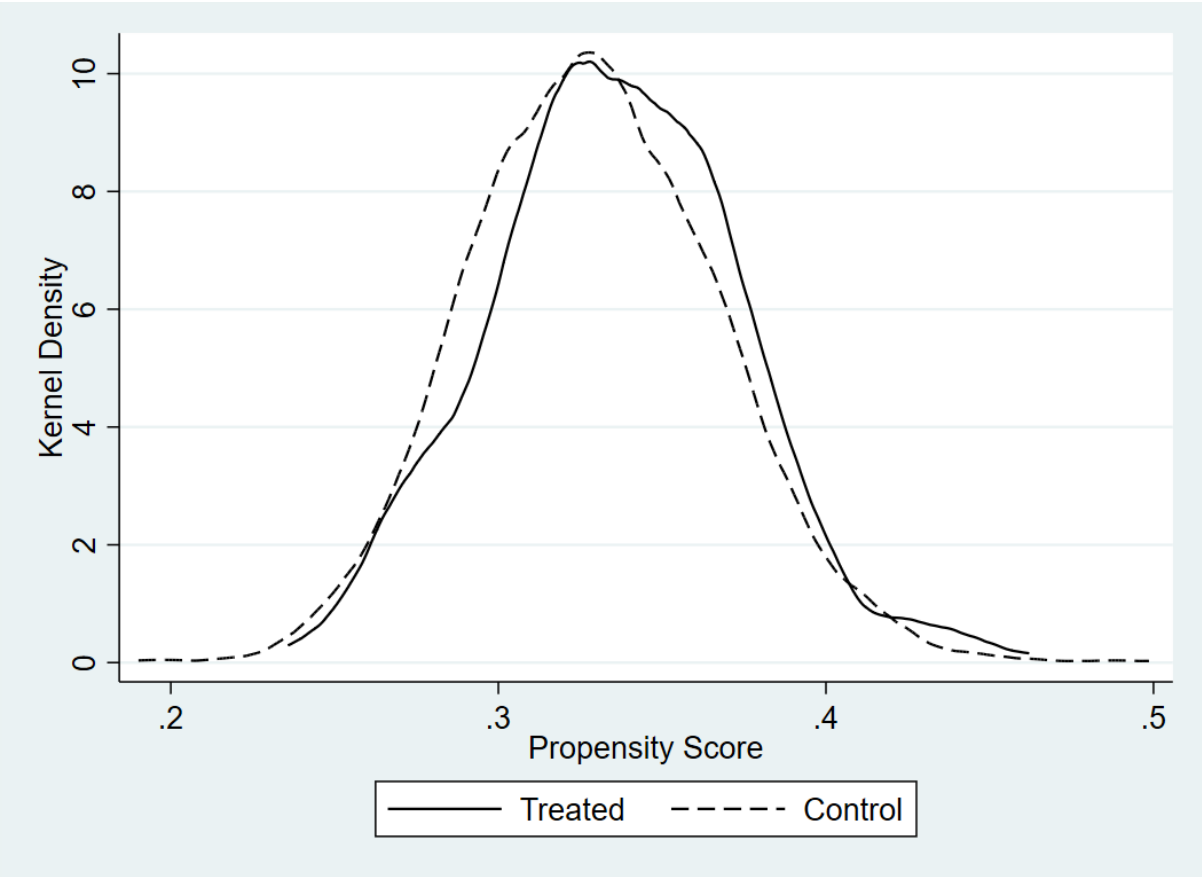

Figure C.2: Common support for analysis of *Hypothesis BC2* based on propensity score matching

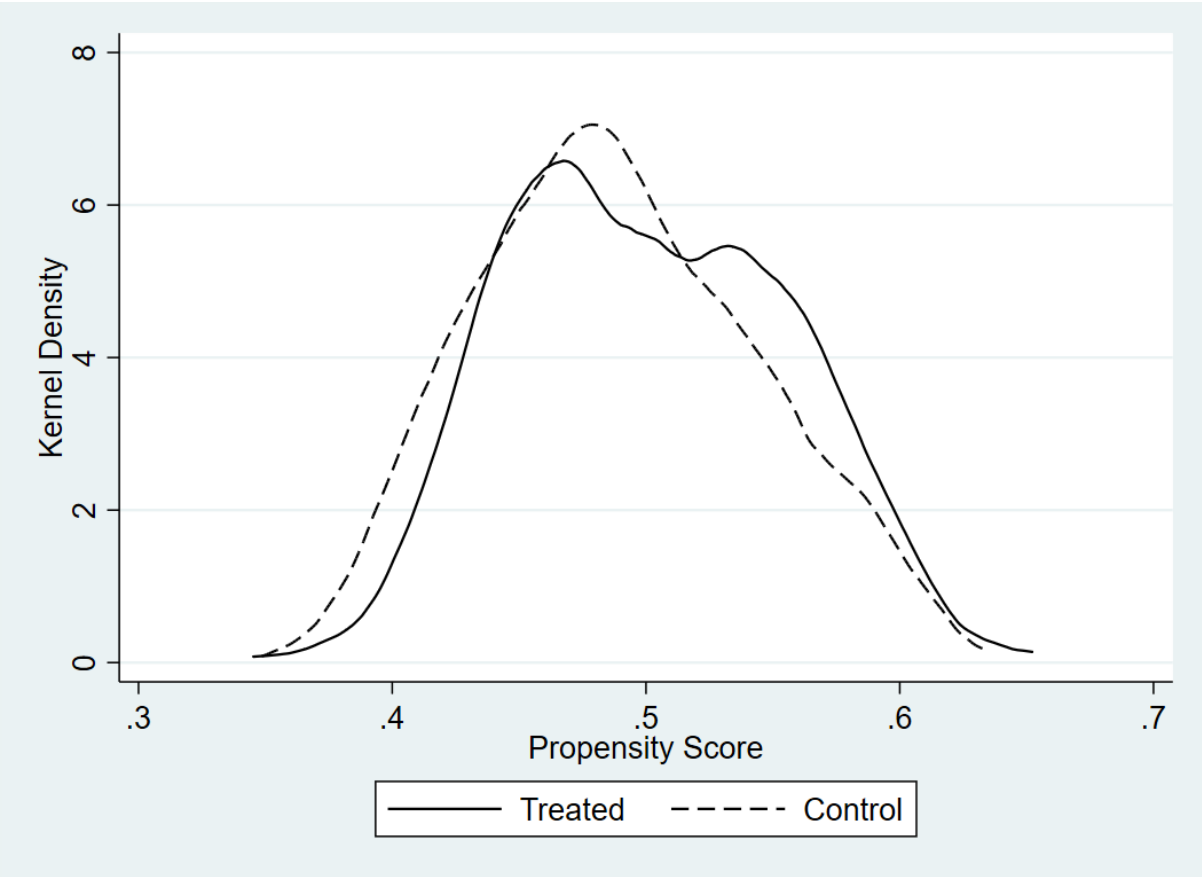

Figure C.3: Common support for analysis of *Hypothesis SD1* based on propensity score matching

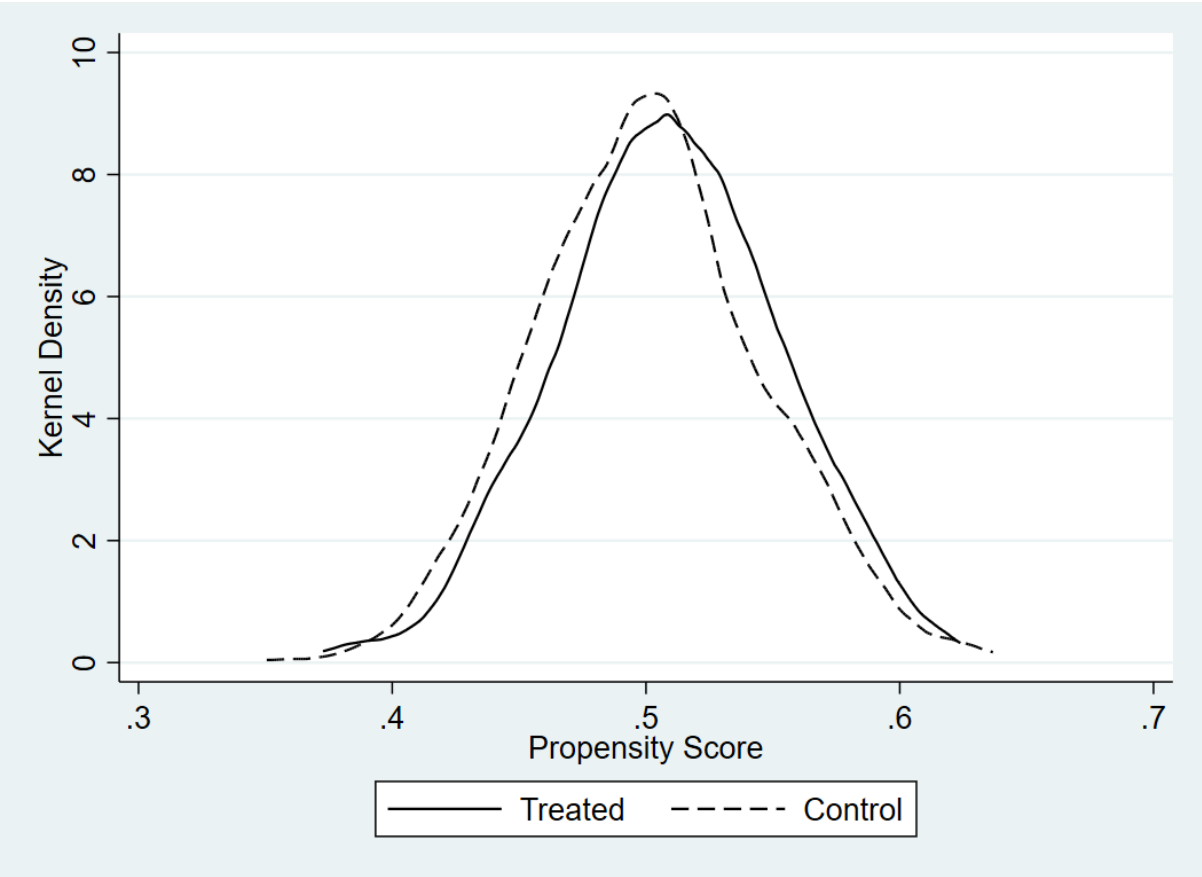

Figure C.4: Common support for analysis of *Hypothesis SD2* based on propensity score matching

Table C.1: Test statistics for success of radius matching on the propensity score ($caliper = 0.2 * SD$) for *Hypothesis BC1*

		Means		Bias		t-test		Variance ratio
Variable		Treated	Control	%bias	%reduct |bias|	t	p>|t|	V(T)/V(C)
Shopped at sust. Marketplace	Unmatched	0.01	0.01	-0.1		-0.03	0.979	.
	Matched	0.01	0.01	0.1	5.1	0.02	0.983	.
Age	Unmatched	55.21	54.95	1.7		0.37	0.709	0.94
	Matched	55.21	55.20	0.1	95.7	0.01	0.989	0.95
Male	Unmatched	0.55	0.57	-4.0		-0.90	0.368	.
	Matched	0.55	0.55	-1.6	61.3	-0.30	0.763	.
College	Unmatched	0.42	0.41	2.1		0.47	0.639	.
	Matched	0.42	0.42	-0.5	74.6	-0.10	0.918	.
Medium income	Unmatched	0.25	0.31	-12.9		-2.85	0.004	.
	Matched	0.25	0.25	0.9	92.7	0.19	0.849	.
High income	Unmatched	0.36	0.32	8.0		1.80	0.072	.
	Matched	0.36	0.36	0.6	93.0	0.11	0.915	.
Very high income	Unmatched	0.32	0.31	0.6		0.14	0.890	.
	Matched	0.32	0.32	-1.5	-141.5	-0.29	0.773	.
Children	Unmatched	0.63	0.61	3.7		0.82	0.411	.
	Matched	0.63	0.63	0.0	99.5	0.00	0.997	.
Attitude sust. prod.	Unmatched	2.90	2.89	3.7		0.83	0.404	0.98
	Matched	2.90	2.90	0.2	93.8	0.05	0.963	1.11
Importance sust. aspects	Unmatched	4.21	4.22	-1.7		-0.39	0.697	1.08
	Matched	4.21	4.21	0.1	94.1	0.02	0.984	1.05
Importance price	Unmatched	3.02	3.01	1.1		0.25	0.799	1.04
	Matched	3.02	3.02	0.4	61.2	0.09	0.932	1.04
Environmental attitude	Unmatched	3.74	3.72	2.4		0.53	0.595	1.00
	Matched	3.74	3.74	0.4	81.4	0.09	0.931	1.03
Pref. internal consistency	Unmatched	3.72	3.72	0.4		0.10	0.922	0.91
	Matched	3.72	3.72	0.5	-10.1	0.09	0.924	0.92
Locus of control	Unmatched	5.11	5.15	-4.2		-0.94	0.348	0.95
	Matched	5.11	5.11	-0.1	96.7	-0.03	0.978	0.94

Note: %bias refers to the standardized percentage bias, which is the difference of the sample means of treated and non-treated individuals in percent for the matched and unmatched sub-samples as a percentage of the average standard deviation over both groups (Rosenbaum and Rubin, 1985). The achieved percentage bias reduction in absolute values is denoted by |bias|. * indicates if variance ratio lies outside the interval [0.87; 1.15]

Table C.2: Test statistics for success of radius matching on the propensity score ($caliper = 0.2 * SD$) for *Hypothesis BC2*

		Means		Bias		t-test		Variance ratio
Variable		Treated	Control	%bias	%reduct |bias|	t	p>|t|	V(T)/V(C)
Shopped at sust. Marketplace	Unmatched	0.01	0.01	1.4		0.32	0.746	.
	Matched	0.01	0.01	-0.5	67.7	-0.09	0.932	.
Age	Unmatched	55.56	54.95	3.9		0.85	0.393	0.96
	Matched	55.56	55.64	-0.5	87.4	-0.09	0.926	0.95
Male	Unmatched	0.54	0.57	-4.9		-1.09	0.275	.
	Matched	0.54	0.54	0.2	96.0	0.04	0.970	.
College	Unmatched	0.41	0.41	-0.4		-0.10	0.921	.
	Matched	0.41	0.40	0.7	-47.2	0.13	0.899	.
Medium income	Unmatched	0.32	0.31	0.6		0.14	0.887	.
	Matched	0.32	0.32	-0.2	67.2	-0.04	0.968	.
High income	Unmatched	0.34	0.32	5.1		1.13	0.257	.
	Matched	0.34	0.34	0.2	96.5	0.03	0.973	.
Very high income	Unmatched	0.28	0.31	-7.9		-1.75	0.080	.
	Matched	0.28	0.28	0.3	96.7	0.05	0.959	.
Children	Unmatched	0.59	0.61	-4.3		-0.97	0.334	.
	Matched	0.59	0.59	0.3	92.4	0.06	0.950	.
Attitude sust. prod.	Unmatched	2.88	2.89	-1.0		-0.23	0.818	1.13
	Matched	2.88	2.88	-0.2	85.1	-0.03	0.977	1.11
Importance sust. aspects	Unmatched	4.20	4.22	-3.3		-0.75	0.454	1.21*
	Matched	4.20	4.20	-0.4	89.0	-0.07	0.945	1.16*
Importance price	Unmatched	3.02	3.01	1.3		0.29	0.771	1.01
	Matched	3.02	3.03	-1.0	23.4	-0.19	0.847	1.00
Environmental attitude	Unmatched	3.70	3.72	-2.3		-0.52	0.600	1.08
	Matched	3.70	3.71	-1.0	56.9	-0.19	0.846	1.08
Pref. internal consistency	Unmatched	3.78	3.72	9.7		2.16	0.031	0.99
	Matched	3.78	3.77	0.5	94.9	0.10	0.923	1.03
Locus of control	Unmatched	5.13	5.15	-1.6		-0.36	0.716	0.98
	Matched	5.13	5.13	0.8	51.3	0.15	0.879	0.96

Note: %bias refers to the standardized percentage bias, which is the difference of the sample means of treated and non-treated individuals in percent for the matched and unmatched sub-samples as a percentage of the average standard deviation over both groups (Rosenbaum and Rubin, 1985). The achieved percentage bias reduction in absolute values is denoted by |bias|. * indicates if variance ratio lies outside the interval [0.87; 1.16]

Table C.3: Test statistics for success of radius matching on the propensity score ($caliper = 0.2 * SD$) for *Hypothesis SD1*

		Means		Bias		t-test		Variance ratio
Variable		Treated	Control	%bias	%reduct |bias|	t	p>|t|	V(T)/V(C)
Age	Unmatched	54.64	55.21	-3.6		-0.70	0.486	1.05
	Matched	54.72	54.55	1.1	69.4	0.21	0.833	1.02
Male	Unmatched	0.57	0.55	5.8		1.12	0.263	.
	Matched	0.57	0.58	-0.5	91.6	-0.09	0.925	.
College	Unmatched	0.43	0.42	2.0		0.38	0.706	.
	Matched	0.43	0.43	-0.2	87.6	-0.05	0.963	.
Medium income	Unmatched	0.33	0.25	15.9		3.08	0.002	.
	Matched	0.32	0.32	1.0	94.0	0.18	0.860	.
High income	Unmatched	0.30	0.36	-12.1		-2.33	0.020	.
	Matched	0.30	0.32	-2.6	78.4	-0.51	0.611	.
Very high income	Unmatched	0.32	0.32	0.4		0.08	0.938	.
	Matched	0.32	0.32	0.9	-114.7	0.17	0.868	.
Children	Unmatched	0.61	0.63	-5.1		-0.98	0.326	.
	Matched	0.61	0.61	0.6	87.8	0.12	0.906	.
Attitude sust. prod.	Unmatched	2.90	2.90	-1.1		-0.21	0.837	0.90
	Matched	2.90	2.90	-1.0	6.7	-0.19	0.849	0.89
Importance sus. Apsects	Unmatched	4.22	4.21	2.3		0.45	0.653	0.87
	Matched	4.22	4.23	-1.1	53.8	-0.21	0.833	0.94
Importance price	Unmatched	3.03	3.02	1.1		0.21	0.837	1.01
	Matched	3.03	3.04	-1.2	-11.5	-0.23	0.819	1.01
Environmental attitude	Unmatched	3.71	3.74	-3.7		-0.72	0.474	0.99
	Matched	3.71	3.72	-1.0	71.7	-0.20	0.841	0.98
Pref. internal consistency	Unmatched	3.72	3.72	-0.6		-0.12	0.906	1.10
	Matched	3.71	3.72	-0.6	-5.1	-0.12	0.902	1.10
Locus of control	Unmatched	5.14	5.11	3.5		0.68	0.498	1.05
	Matched	5.14	5.15	-0.5	86.5	-0.09	0.927	1.05

Note: %bias refers to the standardized percentage bias, which is the difference of the sample means of treated and non-treated individuals in percent for the matched and unmatched sub-samples as a percentage of the average standard deviation over both groups (Rosenbaum and Rubin, 1985). The achieved percentage bias reduction in absolute values is denoted by |bias|. * indicates if variance ratio lies outside the interval [0.87; 1.16]

Table C.4: Test statistics for success of radius matching on the propensity score ($caliper = 0.2 * SD$) for *Hypothesis SD2*

		Means		Bias		t-test		Variance ratio
Variable		Treated	Control	%bias	%reduct |bias|	t	p>|t|	V(T)/V(C)
Age	Unmatched	55.24	55.56	-2		-0.38	0.703	1.06
	Matched	55.24	55.34	-0.6	70.8	-0.11	0.910	1.08
Male	Unmatched	0.56	0.54	3.2		0.61	0.541	.
	Matched	0.56	0.56	-0.2	94.6	-0.03	0.973	.
College	Unmatched	0.39	0.41	-3.5		-0.68	0.493	.
	Matched	0.39	0.39	-0.7	79.6	-0.14	0.888	.
Medium income	Unmatched	0.30	0.32	-3.6		-0.71	0.480	.
	Matched	0.30	0.29	1.4	60.4	0.28	0.777	.
High income	Unmatched	0.34	0.34	-1.2		-0.22	0.822	.
	Matched	0.34	0.34	-0.9	24.6	-0.17	0.865	.
Very high income	Unmatched	0.31	0.28	6.9		1.34	0.181	.
	Matched	0.31	0.31	-0.5	92.9	-0.09	0.925	.
Children	Unmatched	0.62	0.59	5.7		1.11	0.269	.
	Matched	0.62	0.63	-2.1	62.5	-0.42	0.674	.
Attitude sust. prod.	Unmatched	2.88	2.88	-1.5		-0.29	0.775	0.99
	Matched	2.88	2.88	-1.3	11.3	-0.26	0.797	1.02
Importance sus. Apsects	Unmatched	4.21	4.20	2.7		0.53	0.596	0.88
	Matched	4.21	4.22	-0.7	72.6	-0.15	0.883	0.92
Importance price	Unmatched	2.99	3.02	-3.5		-0.68	0.495	0.94
	Matched	2.99	2.98	0.2	94	0.04	0.967	0.95
Environmental attitude	Unmatched	3.73	3.70	3.6		0.70	0.486	0.93
	Matched	3.73	3.72	1.1	69.2	0.22	0.830	0.93
Pref. internal consistency	Unmatched	3.72	3.78	-9.6		-1.85	0.065	1.01
	Matched	3.72	3.72	-0.5	94.4	-0.10	0.917	0.99
Locus of control	Unmatched	5.16	5.13	2.3		0.45	0.655	1.02
	Matched	5.16	5.16	-0.4	80.8	-0.09	0.931	1.05

Note: %bias refers to the standardized percentage bias, which is the difference of the sample means of treated and non-treated individuals in percent for the matched and unmatched sub-samples as a percentage of the average standard deviation over both groups (Rosenbaum and Rubin, 1985). The achieved percentage bias reduction in absolute values is denoted by |bias|. * indicates if variance ratio lies outside the interval [0.87; 1.15]

Table C.5: ATE based on radius matching on the propensity score ($caliper = 0.2$)

Hypothesis	Treated	Controls	Difference	S.E.	T-stat
BC1	0.503	0.454	0.050*	0.023	2.21
BC2	0.539	0.450	0.089***	0.023	3.91

Note: *, ** and *** indicate statistical significance at the 5%, 1% and 0.1% level, respectively.

Table C.6: ATE based on radius matching on the propensity score ($caliper = 0.2$)

Hypothesis	Treated	Controls	Difference	S.E.	T-stat
SD1	0.965	0.953	0.012	0.011	1.13
SD2	0.982	0.971	0.011	0.008	1.34

Note: *, ** and *** indicate statistical significance at the 5%, 1% and 0.1% level, respectively.