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Interested, indifferent or active information avoider of climate labels: Cognitive dissonance and ascription of responsibility as motivating factors
Interested, indifferent or active information avoider of climate labels: Cognitive dissonance and ascription of responsibility as motivating factors

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Abstract

Active avoidance of information is gaining attention in behavioral sciences, and recently also its’ relevance from an economic theory perspective. We explore motivations and policy implications of active avoidance of carbon emission information. In a stated preference survey respondents were asked to indicate if they wished to access carbon emission information (info-takers) or not (info-decliners) when selecting protein source in a first stage. In a second stage all respondents were provided carbon emission information. The info-takers reduced their CO\textsubscript{2}-emissions from their food choices with 32\%, while the info-decliners also reduced their CO\textsubscript{2} emissions (12\%). This provides evidence of active information avoidance among at least some info-decliners. We explore cognitive dissonance and responsibility feelings and personal norms as motivations for actively avoiding carbon emission information on meat products, and how these motivations affect the reaction if imposed information. Our results show that carbon emission information increases choice task uncertainty most among individuals that experience climate related cognitive dissonance and/or responsibility feelings. These findings point to the potential of carbon emission information as a measure for changing food consumption towards less carbon emitting products. The study also highlights the importance of how the information is provided and presented.

\textit{Keywords}: Climate label; information avoidance; cognitive dissonance; carbon emission reduction; consumer behavior, strategic avoidance

\textit{JEL-codes}: D12, D83, Q18, Q54

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Introduction

The global food system is a significant contributor to climate change, causing approximately 25-30% of the total greenhouse gas emissions (Mbow and Rosenzweig 2019). Meat products have the highest environmental impact (Tukker et al. 2006), and present consumption patterns contribute to increasing emission levels and therefore constitute a growing concern with respect to climate impact (Hedenius, Wirsenius, and Johansson 2014; Wellesley, Happer, and Foggatt 2015). Consumers can reduce carbon emissions by adapting their food purchases towards products that have lower climate impact (de Boer and Aiking 2011). Labels with Carbon dioxide (CO$_2$) information and other means of climate labelling can aid the consumers in their purchase decisions. Another means of changing the consumers’ choices could be to use taxes that internalizes the negative externalities of the CO$_2$ emissions (CO$_2$E) (Bonnet and Bouamra-Mechemache 2018).

There are currently few established labels that inform about CO$_2$E from each product in grocery stores, although label initiatives have been initiated in different store-chains and countries (Liu, Wang, and Su 2016). There is some evidence of consumers’ interest in climate labels on food, although the evidence is mixed (Camilleri et al. 2019). To obtain insights regarding the behavioral impacts climate labels are likely to have, it is important to understand the information seeking process.

In general, consumers have low levels of knowledge about the climate impact from different food products (Hartmann and Siegrist 2017). This points to the potential of providing more information to direct consumers towards more sustainable food choices. While providing information as a way of changing consumer behavior is a relatively easy and cheap instrument, its’ effects rely on consumers’ willingness to access and process the information and ultimately, to incorporate it in their purchase decisions. Typically, information is assumed to be processed and incorporated in the decision process when found useful and ignored otherwise (Stigler 1961). There are, however, occasions when individuals actively avoid information, and this may be attributed to motivations that are rational for the individual. Examples include desire to avoid unwanted information (e.g. disease condition), or desire to be surprised (Hertwig and Engel 2016; Golman, Hagmann, and Loewenstein 2017). While active avoidance of information has gained increased attention in other fields (Sharot and Sunstein 2020) and the relevance from an economic theory perspective is discussed in Golman, Hagmann and Loewenstein(2017), it is of interest to explore the mechanism and policy implications of such information avoidance behavior in a food context. It is particularly relevant to explore active information avoidance when analyzing consumer purchase behavior and sustainability information such as CO$_2$E.

Active information avoidance has been explored in the area of CO$_2$E-information by Thunström with co-authors (2014), who develop a theoretical model on willful avoidance of CO$_2$E-information on transport, and how this is affected by social norms and feelings of guilt. In the area of food choices, two studies find evidence of consumers actively avoiding food product information related to animal welfare (Onwezen and van der Weele 2016; Bell, Norwood, and Lusk 2017). Both studies are based on individuals self-indicated avoidance (‘If I buy cheap chicken/meat I’d rather not think about the possibility that it is a fast-growing chicken/has used an antibiotic’ and ‘So long as pork is safe, healthy, and delicious, I would rather NOT know how the pig/hog was raised’). Importantly, such direct questioning may be associated with concerns with social desirability bias. Moreover, these studies do not explore individuals’ behavior following the imposition of information among individuals who state that they prefer to avoid the information. Three recent studies target these concerns with experimental approaches to explore active information avoidance regarding country of origin and calories respectively. They find that a fairly large share of participants decline to access information about calories (60% (Thunström et al. 2016) 46% (Nordström et al. 2019)) and country of origin (~20% (Beiermann et al. 2017). There is, hence, some evidence of individuals actively avoiding certain types of information when making food choices. However, the motivation for such behavior is sparsely explored. An exception being Nordström et al. (2019) who find that active information avoidance is motivated by optimal expectations, i.e., individuals

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2 Also referred to as willful information avoidance.
chose not to know the calorie content such that they can downplay the probability that their preferred meal is high-calorie.

In this article, we investigate if consumers actively avoid information about the climate impact from food products, and we explore motivations for such active avoidance. We test if conflicting cognitions and responsibility feelings in the domain of climate change and food affects choices when exposed to CO$_2$E-information. This can provide insights that are of interest for policy makers, regarding expected impacts from carbon labels, and how different types of consumers are affected by such labels. We identify consumers that wish to avoid climate information, but when imposed such information change purchase behavior towards less emitting products. These findings highlight the importance of policy regimes that disable avoidance. Moreover, we find that consumers with high levels of conflicting cognitions and responsibility feelings become more uncertain in their choices when imposed climate information, suggesting potentials to influence these consumers towards more climate friendly food choices.

Theoretical framework

We follow the definition of *active information avoidance* by Golman, Hagmann, and Loewenstein (2017), stating that an individual has to be aware of that the information in question exists, and should choose not to get the information even if it is without any cost, or even costly to avoid. We here refer to costs as defined in a neoclassical framework, including monetary and search costs. There are many motivations for active avoidance of information, and individuals may use different methods for avoiding readily available information. Importantly, actively avoiding information need not be irrational, if e.g. the individual expects that the information will cause discomfort of any kind. Two broad motivational categories of active information avoidance relevant for food choices and climate information can be distinguished:

1. **Dissonance avoidance** occurring as a result of the *cognitive dissonance* (discomfort) from being exposed to information that conflicts with ones prior beliefs (Golman, Hagmann, and Loewenstein 2017), or cause unpleasant emotions or diminish pleasant emotions (Sweeny et al. 2010). This is also termed “emotion-regulation” in the psychology field (Hertwig and Engel 2016).

2. **Strategic avoidance**. This is an intrapersonal strategic device for eschewing responsibility (Hertwig and Engel 2016) which arises when information is expected to cause feelings of responsibility to change behavior that one rather does not undertake (Sweeny et al. 2010). An example would be individuals who like to appear altruistic for themselves, and consequently, if information can be avoided this generates “moral wiggle room”, where the individual can allow herself to act selfishly (Dana, Weber, and Kuang 2007).

In the following, a theoretical basis is outlined and this is used to form the hypothesis.

**Dissonance avoidance**

The theory of cognitive dissonance (Festinger 1957) provides a basis for understanding dissonance avoidance as an emotion regulation device. Cognitive dissonance arousal related to food consumption and climate impact can be caused by (a) cognitive discrepancy (conflicting cognitions), and (b) dissonance (psychological tension as a result from the cognitive discrepancy) (Ong, Frewer, and Chan 2017). The cognitive discrepancy can in turn be either in the same domain (intra-attitudinal), e.g. “red meat is nutritious and good for me” vs. “red meat may cause cancer”, or it can be in different domains.

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3 *Intrapersonal* strategic information avoidance is a device to disable one’s own possibility of making certain decisions (e.g. altruistic choices). *Interpersonal* strategic information avoidance is rather a device to eschew that other individuals/actors rely on your knowledge in making their own decisions. This is mainly exemplified with bargaining situations (Golman, Hagmann, and Loewenstein 2017).
(inter-attitudinal); “consuming red meat is an important part of my culture” vs. “red meat is bad for the climate”.

**Strategic avoidance**

The Norm Activation Model (NAM) (Schwartz 1977) provides a theoretical basis for strategic avoidance of climate information. The NAM proposes a sequential model: **problem awareness → ascription of responsibility → personal norm → pro-social intention/behavior** (Han 2014). A person that attributes responsibility to self for taking action, and that has personal moral norms that suggest action may want to access information that increases the problem awareness. However, for some, it is also possible that they want to avoid being exposed to information about the first stage (problem awareness), as an internal strategic device to eschew responsibility.

**Behavior following the imposition of information**

With the introduction of additional information, a choice situation becomes more complex. An exception is individuals that are indifferent to the additional information, to whom the choice complexity is expected to be unchanged. A result from the larger cognitive burden that increased choice complexity implies is that individuals’ choices become less consistent (DeShazo and Fermo 2002; Dellaert, Donkers, and Soest 2012; Caussade et al. 2005). Moreover, there is evidence of heterogeneity in consistency between individuals depending on their self-stated certainty (Lundhede et al. 2009). We expect that individuals that experience conflicting beliefs and/or emotions with regard to climate impact and food consumption will find that climate information increases the choice task complexity more than individuals with less cognitive dissonance do. We also expect that individuals with high degree of responsibility and personal norms that oblige them to change behavior will find the choice tasks more difficult when provided carbon information. Following this, we expect that the introduction of climate information increase choice uncertainty more for individuals that experience higher cognitive dissonance and/or responsibility feelings norms that oblige changed behavior. The choice uncertainty takes the form of inconsistent choices, as measured by larger error variance in econometric choice models.

**Hypothesis**

We divide individuals in two groups based on their choice to access free (non-costly) information or not (upper box in Figure 1); **info-takers** and **info-decliners**. In the middle box in Figure 1 are the motivations for the wish to access information or not. Info-takers can be divided into two sub-groups based on the motivation; those that choose to access information out of interest, to increase their awareness, and those that choose to access information out of indifference (it is non-costly to access). 4 Info-decliners can also be divided into two sub-groups based on their motivation for declining information; out of indifference and out of active information avoidance.

The interest-individuals are expected to hold responsibility feelings and personal norms (R&N) that suggest them to act on climate information (stage 2 and 3 in the NAM). We do not know a priori if individuals in the interest-group anticipate CD to a large degree or not; they may be worried about the climate but not necessarily hold positive perceptions of meat (and hence not experience conflicting cognitions). The indifference group do not anticipate CD or R&N that makes them feel obliged to change behavior if exposed to climate information on food products. In contrast to the indifference group, avoiders anticipate CD and/or R&N that oblige them to react to climate information.

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4 Following expected utility theory, individuals would choose to ignore costless information only if they anticipate that it would not change their behavior, making them exactly indifferent about learning the information or not.
The bottom box shows the behavioral implications when individuals are imposed climate information, and this is divided into those that change behavior following the information (adapters), and those that do not (unchanged behavior). For the interest-group, climate information increases their problem awareness (first stage in NAM) and they will change behavior towards less carbon emitting products (adapters). We note that it is possible that some individuals in this group do not change behavior if they already make climate friendly choices.

The indifference group do not change behavior if imposed climate information (unchanged behavior). Finally, for individuals who decline information out of avoidance, we do not know a priori if they will change behavior if they are imposed climate information. This is an empirical question, as it depends on the importance of the CD and/or the extent of R&N relative to the positive preferences for foods that are high emitters of carbon. When exposed to climate information, avoiders may change behavior to reduce CD or follow their R&N (Adapters). It is also possible that avoiders do not change behavior following the information exposure, but do experience disutility caused by cognitive dissonance or from the failure to act in accordance with their responsibility feelings. We make the following predictions: H1. There are individuals that actively avoid climate information (“Info-DECLiners”), and H2. The behavior predicted in H1 is explained by active information avoidance (rather than indifference). We test this by investigating if info-decliners change behavior when provided climate information. The rationale behind this is that if individuals are indeed indifferent to the information offered it is not rational to react to the information if provided it. We will test if info-decliners change behavior following information in the form of altered preferences for the product types.

We expect that anticipated CD is largest for individuals that find the competing attitudes/values of importance; i.e. hold positive perceptions of meat consumption (tasty, nutritious, familiar, part of tradition and identity) and experience negative emotions when presented with information about climate impacts. We predict that CD is a motivation for changing behavior: H3a. Individuals that experience high CD are more likely to change choice behavior following climate information compared to individuals with little or no CD.
Following the theory of CD, we predict that CD is a motivation for avoiding information: $H3b$. Info-decliners (H1) that experience high CD are more likely to change choice behavior following climate information compared to info-decliners with little or no CD.

We expect that individuals that find personal carbon reduction important and feel moral obligations to act accordingly will anticipate that climate information will demand that they change behavior. If such changes in behavior are undesired (Sweeney et al. 2010), or cause them feelings of guilt if they do not act on the information, avoidance of information can be used as a strategic device to feel better. Here, moral norms play a central part, as they are grounded in concepts such as others’ welfare and rights, considerations of fairness and justice (Kaiser et al. 1999). We test if $H4a$. Individuals with high levels of R&N that oblige action are more likely to change choice behavior following climate information than individuals with lower R&N.

Following the NAM we will test for strategic reasons for declining to access climate information: $H4b$. Info-decliners (H1) with high levels of R&N that oblige action are more likely to change choice behavior following climate information than info-decliners with lower R&N.

Next, we explore how CD and R&N affect choices following climate information on meat products, for both info-decliners and info-takers. We hypothesize that individuals that have strong positive attitudes and beliefs towards the product (meat lovers) while strong negative feelings for consumption of the product (climate anxiety) will expect CD if exposed to climate information. Following this, we hypothesize that the introduction of climate information makes the choice task more difficult for respondents that experience CD compared to those that do not experience CD. We predict that: $H5$. CD increases choice uncertainty (error variance) when exposed to climate information.

We further predict that individuals that feel responsible to change behavior but rather not undertake such changes will find choice task complexity higher when exposed to climate information: $H6$. R&N that oblige action increases choice uncertainty (error variance) when exposed to climate information.

**Method**

We conducted a stated preference choice experiment with a within subject design experiment. An online survey was distributed by a research panel firm in Sweden, resulting in 803 responses. The survey included initial screening questions on sociodemographic characteristics, which were used to ensure a representative sample of the population with respect to gender, age and region. Next, there were questions regarding food related habits and general food attitudes, followed by the choice tasks. A final section included questions regarding attitudes and beliefs for the measures of CD and R&N, detailed further below.

The choice experiment used meat products, since this is a category where significant differences in CO$_2$E-levels exist, and where the level of CO$_2$E is relatively high for some products. Following discussions in two focus group sessions, and analysis of retail sales data, grounded meat was selected as the most suitable product. A hybrid meat product, combining meat and vegetable protein, was included as a viable option for less involved consumers (de Boer and Aiking 2017) Relevant product attributes and levels were also selected in this process (Table A1 in appendix). Price levels were selected based on current market prices. The levels of CO$_2$-equivalent for each of the meat types were based on a recent LCA review (Clune, Crossin, and Verghes 2017; Blonk et al. 2008). Given the unfamiliarity with the CO$_2$-equivalents a short explanation was provided before the first task containing such information (Survey available Supplementary Material).

The experimental design was generated using a d-efficiency criterion for evaluation, and Bayesian priors were included from the pilot study ($n=400$). The final main effects design included 12 choice tasks, and these were blocked in three to reduce the burden on respondents. Each choice task included four alternatives and the option no to purchase any product. The order of the choice tasks and the position of the alternatives were randomized.
Design of information experiment
Each respondent was initially presented with four choice tasks, where the product type was presented (control), without information about the products’ climate impact. Following this, respondents were asked if they wished to see the CO2-E-levels on the product through an additional label (“info-takers”) or not (“info-decliners”). They were forced to answer either yes or no prior to proceeding. The effort was thereby equal for the two options. We note that respondents may opt for ‘no information’ as they want to limit their cognitive burden, and would, hence, avoid any additional labelling information. While this could be solved by providing some ‘nonsense information’ to those declining the climate information, we decided against it, as there would be a risk of confusing respondents.

Following the information question, all respondents were provided the final four choice tasks were the CO2 information was included on all products as an additional label. The information question did, hence, not affect the information provision. We note that this approach may annoy participants who were provided information against their will. For this reason, we included an explanation to these participants that the choice tasks were decided in an experimental design, and they were therefore provided information. We tested alternative measures in the survey testing (focus groups), where the likelihood of receiving climate information was affected by the answer to the climate demand question. These efforts were not understood by the participants, and we received no feedback from participants in the pilot of being annoyed with the information against their will. The final four choice tasks (Treatment) were based on the same experimental design as the first four (Control).

Measures of expected cognitive dissonance from climate information
Cognitive dissonance is a latent construct, which can be measured using beliefs and values as proxies. The CD measure was designed to capture the conflict between on one hand conceptualizations of eating meat and on the other hand meat-related climate anxiety. The conceptualizations of eating meat included five statements on liking of the taste, part of identity, meat is natural, meat has central role in meals, and nutritional importance, on a likert scale with anchors (1=disagree–5=agree) (α =0.85, M=3.8 and S.d.=0.95). The climate anxiety scale was generated from a short version of the positive and negative affect scale (PANAS) (Watson, Clark, and Tellegan 1988), only including the negative scale. Respondents indicated their feelings when exposed to information about climate impacts from food, including afraid, nervous, upset, distressed and guilty5, on a scale from 1-5 (never–always) (α=0.90 M=2.2 S.d.=1.0). The CD scale was constructed by reversing the absolute value of the difference between the two sub-scales, such that CD=0 implies low CD, and 4 implies high CD.

Measures of Responsibility and Personal Norms
A composite measure for R&N were constructed based on personal responsibility feelings and personal norms that oblige climate reducing action (α =0.84 M=3.8 S.d.=0.9). Personal responsibility feelings were measured by two items, modified from (Kaiser et al. 1999); Because my personal contribution is very small I do not feel responsible for climate change (reverse coded) and I feel co-responsible for climate change because I contribute with carbon emissions through my consumption. Personal norms were measured by two items, building on (Han 2014; Onwezen, Antonides, and Bartels 2013); I feel a moral obligation to reduce my contribution to climate change and I do not have a responsibility to reduce my contribution to climate change if other consumers do not (reverse coded).

Other control measures
A measure of attitudes towards the relation between humans and nature was developed using four selected questions from the New Ecological Paradigm (NEP) questionnaire, modified to describe the context of climate change (Dunlap et al. 2000) (α=0.73 M=3.6 S.d.=0.75). We included a measure of case-specific problem awareness, where individuals indicated to what extent they agree with the statement Red meat has a large negative climate impact. To obtain insights about the motivation for declining information, a

5 Short version is tested in (Mackinnon et al. 1999), although here scared was altered to guilt following focus group discussions.
question was included following the choice tasks where individuals could indicate which statements(s) they agreed with. Finally, we asked respondents to indicate their recent consumption behavior in five different domains of relevance for climate impact; flying, traveling by car, overall consumption, consumption of meat and energy usage. They indicated on a scale from had reduced, planned to reduce, not change, planned to increase or had increased.

Econometric methods
Data from the choice experiment are analyzed taking departure in random utility theory, (McFadden 1974). For individual $i$, the utility of choosing alternative $k = 1, ..., K$ on choice situation $t = 1, ..., T$ is:

$$U_{ikt} = \beta' x_{ikt} + \epsilon_{ikt}, \quad (1)$$

where $x_{ikt}$ is a vector of the observable variables related to alternative $k$ and the person, $\beta$ is a vector of parameters to be estimated and $\epsilon$ is a random term with mean zero that denotes the unobserved part of utility. $\epsilon$ is iid extreme value type 1 distributed with variance $\pi^2/6\lambda^2$, where $\lambda$ is a scale parameter. In our case $T = 8$, four choice situations without climate labeling (control) and four with climate labeling (treatment), and $K = 5$. To allow for heterogeneity in preferences between the respondents we estimate mixed logit (ML) models, where all product attributes are described by a density function $f(\beta)$ which takes the form:

$$\beta_i = b + \sigma v_i, \quad (2)$$

with the population mean $b$, parameter standard deviation $\sigma$, and random error term $v_i \sim \text{i.i.d. } N(0,1)$ capturing the individual specific heterogeneity (Train 2003). The unconditional probability can then be written as:

$$P_{ik} = \int \left( \prod_{t=1}^{T} \left[ \frac{\exp(\lambda(\beta' x_{ikt}))}{\sum_{k=1}^{K} \exp(\lambda(\beta' x_{ikt}))} \right] \right) f(\beta | b, \sigma) d\beta, \quad (3)$$

where $\beta_i$ is the individual specific parameter vector. The ML models are estimated in R (R Core Team 2018), using the package Apollo (Hess and Palma 2019). Estimates were stable at 1000 Halton draws, and at different starting values. All estimates were specified with a normal distribution except price for which a negative lognormal distribution was modelled, since it is expected to be negative for all respondents.

To test H2-H4 we test if the preferences for the meat types and for opting out are different after the provision of carbon information (Treatment), and if such changes depend on the degree of CD and/or the extent of R&N. We include interaction terms, and in the ML specifications these are included in the form of shifters in the mean. For H2 this takes the form

$$b = b_1 + b_2 \text{treatment}, \quad (4)$$

i.e. we test if the mean differs between the Control and Treatment. The variable treatment takes the value one for the treatment group (the four last choice tasks for the respondents) and zero otherwise. For, H3 and H4 we also include interactions with CD and R&N respectively. Finally, to test H5 we allow the error variance to depend on the degree of CD. More specifically we specify $\lambda$ as:

$$\lambda = \exp(\gamma_3 \text{treatment} + \gamma_2 CD + \gamma_3 CD * \text{treatment}) \quad (5)$$

where $\gamma_3$ is the main parameter of interest, enabling us test if the scale (and thereby error variance) is affected differently by the information treatment depending on the level of cognitive dissonance. A corresponding function is specified in the model with R&N to test H6. This specifications also allow for scale differences between the control group and treatment group.
Given that the hypothetical products likely share a different error structure compared to not purchasing any (opt-out), we specify an error component for the product alternatives with mean 0, and a normal distribution (Brownstone, Bunch, and Train 2000). Thereby the variance of the opt-out option and the hypothetical alternatives are allowed to differ. The off-diagonal elements in the covariance matrix is set to zero.

Results

Information takers vs. decliners

One third (33%) of the respondents indicate that they do not wish to access climate information on the products, supporting the first hypothesis of info-decliners. There is a significant difference in self-reported frequency of meat consumption between info-takers and info-decliners; 40% of the decliners consume red meat four times a week or more often, while only 27% of the info-takers do so. On the problem awareness question, info-takers were more in agreement with the proposition that meat is bad for climate in comparison with info-decliners ($\chi^2 = 125.7$ p-val.<0.001). Interestingly, even though info-decliners, on average, do not believe meat has large climate impact, 25.2% do believe so. Moreover, a non-negligible share of info-takers do not believe that meat has a large negative climate impact (16.2%) (Figure A1 in appendix).

To further explore differences between info-takers and info-decliners we estimate a logit model with the indicated wish to access climate information or not as the dependent variable (Table 1). We note that sociodemographic characteristics are poor predictors of desire to access information, as the parameters for most characteristics are insignificant (not reported). The most important predictor of choice of information access are the R&N, problem awareness (belief that red meat affects climate negatively) and CD. The measure based on selected questions from the NEP scale is insignificant, implying that after controlling for the other aspects, the attitude towards nature and humans’ role in it does not explain information demand. When excluding the case-specific problem awareness variable the NEP becomes statistically significant (Table A2 in appendix), suggesting that these measures to some extent measure the same construct (general and case specific problem awareness). Regressing the R&N-measure on sociodemographic characteristics does not provide significant parameters (with the exception of gender) (Table A3 in appendix). However, regressing CD and Problem Awareness respectively reveals that older individuals experience less CD with respect to meat consumption and agree less with the large negative impact from meat.

Table 1. Estimates from logit model of info-decliners/takers

|                          | Coef. | z      | dy/dx | z  |
|--------------------------|-------|--------|-------|----|
| Cognitive dissonance (CD)| 0.29  | 3.02   | 0.05  | 3.08|
| Responsibility feelings & personal Norms (R&N) | 0.78  | 5.87   | 0.13  | 6.34|
| NEP                      | 0.22  | 1.42   | 0.04  | 1.42|
| Problem Awareness        | 0.39  | 4.33   | 0.06  | 4.51|
| Meat consumption (reference level ≤ 1/week) |       |        |       |    |
| 2-3 /week                | 0.06  | 0.24   | 0.01  | 0.24|
| ≥ 4 /week                | -0.13 | -0.50  | -0.02 | -0.50|
| N                        | 803.00|        |       |     |
| LL                       | 399.01|        |       |     |
| Pseudo R^2               | 0.22  |        |       |     |

Note: Dependent variable: 1=info-taker, 0=info-decliner. Model included gender-, region- and age-variables and intercept. Bold estimates indicate significance level at 5% level.
Following the choice tasks, respondents indicated which statements they agreed with, concerning a set of motivations for wanting to access CO₂E-information or not. The most notable differences between info-decliners and info-takers is the distrust in climate information (48% vs. 27%, p-val.=0.000). Moreover, more info-decliners agree with that climate change is not caused by humans (8.6% vs. 2.1%, p-val.=0.000). A low agreement with “I want to use climate information when I purchase food” among the info-decliners (7,1%) is consistent with their previous decline to access information in the experiment.

The most notable differences between info-decliners and info-takers is the distrust in climate information (48% vs. 27%, p-val.=0.000). Moreover, more info-decliners agree with that climate change is not caused by humans (8.6% vs. 2.1%, p-val.=0.000). A low agreement with “I want to use climate information when I purchase food” among the info-decliners (7,1%) is consistent with their previous decline to access information in the experiment.

The corresponding rate among info-takers was 55%. This relatively low agreement among info-takers signals that some individuals indicated that they wish to see climate information out of indifference (the cost of saying yes and no was very similar) (Table A4 in appendix).

We also explore if info-decliners were uninterested in the climate information on meat, but planned or had made changes towards climate friendlier behavior in other domains. For all five domains (flying, traveling by car, overall consumption, consumption of meat, energy usage) did the info-takers have higher scores; i.e. planned or had already done changes towards more climate friendly behavior.

**Table 2. Mixed logit models for Control sample**

| Variable          | All respondents | All respondents info-demanders effects |
|-------------------|-----------------|---------------------------------------|
|                   | Coef. t-ratio   | S.d t-ratio                           | Coef. t-ratio   | S.d t-ratio |
| Status quo        | -3.36 -11.48    | -3.44 -9.05                           |                |             |
| Beef              | 2.62 16.51      | 1.68 8.42                             | 3.29 11.53      | 1.70 8.38   |
| Beef & pork       | 1.74 13.39      | 0.84 3.51                             | 2.10 10.06      | 0.82 3.40   |
| Pork              | 0.00            |                                      | 0.00            |             |
| Chicken           | -0.48 -2.26     | 2.43 11.06                            | -1.22 -3.82     | 2.44 10.18  |
| Beef & beans      | 0.48 3.67       | 2.03 12.73                            | -0.35 -1.66     | 1.94 12.38  |
| Meat substitute   | -12.11 -3.52    | 13.63 5.15                            | -23.54 -3.78    | 14.77 4.13  |
| Organic           | 0.36 4.80       | 0.74 5.51                             | 0.24 1.97       | 0.79 6.55   |
| log(Price)        | -3.30 -35.16    | 0.76 6.62                             | -3.20 -23.42    | 0.70 9.02   |
| Meanprice/         | -0.05           | 0.04                                  | -0.04           | 0.04        |
| S.d price         |                |                                       |                |             |
| S.d for err. comp.| 2.97 8.44      |                                       | 3.02 9.78       |             |
| Shifters for Info-takers |      |                                       |                |             |
| Beef              | -0.98           | -3.01                                 |                |             |
| Beef & pork       | -0.52           | -2.09                                 |                |             |
| Pork              | 0.00            |                                       |                |             |
| Chicken           | 1.05            | 3.10                                  |                |             |
| Beef & beans      | 1.27            | 5.24                                  |                |             |
| Meat substitute   | 13.50           | 4.01                                  |                |             |
| Status quo        | 0.02            | 0.06                                  |                |             |
| Organic           | 0.14            | 0.93                                  |                |             |
| Price             | 0.01            | 0.89                                  |                |             |
| # individuals     | 803             |                                       | 803             |             |
| # observations    | 3212            |                                       | 3212            |             |
| LL                | -4124.4         |                                       | -4055.9         |             |
| BIC               | 8378.0          |                                       | 8305.6          |             |

*Note:* Bold estimates indicate significance level at 5% level. *a* Price takes a negative lognormal distribution the estimated parameter is log(β_price). The mean_{price} = exp(β_price+(s^2_{price}/2)) and S_d_{price} = mean_{price}*(exp(s^2_{price})-1)/2
Next, we investigate if info-decliners and info-takers have different preferences for the products in the experiment. The results for the control tasks (without climate information) are presented in Table 2, where the relative size of the standard deviation to the mean reveals the degree of heterogeneity in preferences. As a point of reference, a main effects model with all respondents is presented. All else equal, on average, participants prefer organic products over conventional, and they are more likely to choose products that are priced lower. The negative opt-out parameter implies that respondents prefer a product over not choosing any. The statistically significant standard deviation for the error component implies that the error variance, and hence the discussion process, differs between experimentally generated products compared to the opt-out alternative, something that has been found in previous studies (Scarpa et al. 2013; Mørkbak and Nordström 2009).

There is relatively homogenous preferences for beef and beef&pork compared to pork. In contrast, preferences for chicken, beef&beans and meat substitute are heterogeneous. For example, while the mean estimate for chicken compared to pork is negative, the large standard deviation relative to the mean implies that 42% of the respondents prefer chicken over pork. In the second model all mean coefficients are interacted with the wish to access climate information (info-takers). This reveals that only the estimates associated with the meat types are statistically significantly different between the info-takers and info-decliners.

Info-decliners’ choice behavior following climate information
To test the second hypothesis, if info-decliners are avoiders (rather than indifferent), we analyze the impact of the climate information on the choice behavior in the experiment. ML models for info-decliners and info-takers are estimated separately, were the product type and opt-out parameters are interacted with the treatment period (Table 3).

Table 3. Mixed logit models with Treatment-shifters

| Variable            | Coef. | t-ratio | S.d | t-ratio | Coef. | t-ratio | S.d | t-ratio |
|---------------------|-------|---------|-----|---------|-------|---------|-----|---------|
| Status quo          | -3.13 | -6.72   | 3.07| 9.25    | -3.83 | -12.07  | 2.13| 11.23   |
| Beef                | 3.34  | 9.00    | 8.74| 7.47    | 2.62  | 14.15   | 9.90| 1.56    |
| Beef & pork         | 2.10  | 8.74    | 1.76| 7.47    | 1.71  | 9.90    | 1.56| 9.16    |
| Pork                | 0.00  | 0.00    | 0.00| 0.00    | 0.09  | 0.42    | 2.61| 12.83   |
| Chicken             | -1.46 | -4.17   | 2.76| 10.60   | 0.09  | 0.42    | 2.61| 12.83   |
| Beef & beans        | -0.34 | -1.54   | 2.36| 8.18    | 1.19  | 7.44    | 2.32| 13.20   |
| Meat substitute     | -9.72 | -3.21   | 6.76| 3.44    | -4.23 | -4.33   | 10.59| 8.96    |
| Organic             | 0.01  | 0.13    | 0.80| 5.51    | 0.48  | 6.04    | 0.88| 6.89    |
| log(Price)a         | -3.33 | -23.45  | 0.83| 9.27    | -3.33 | -33.87  | 0.85| -17.67  |
| Meanprice/          |       |         |     |         |       |         |     |         |
| S.d for err. Comp.  | -0.05 | 0.06    | 0.06| 0.06    | 3.38  | 7.69    | 3.45| 11.59   |
| Shifters for Treatment b |   |         |     |         |       |         |     |         |
| Status quo          | -0.03 | -0.14   | 0.67| 3.05    | -0.06 | -0.35   | 0.35| 0.35    |
| Beef                | -0.91 | -3.30   | 8.18| 2.97    | -2.36 | -12.46  | 1.51| 1.51    |
| Beef & pork         | -0.54 | -2.29   | 2.97| 0.26    | -1.65 | -9.30   | 1.28| 3.94    |
| Chicken             | 0.79  | 2.97    | 1.51| 3.89    | 0.26  | 1.51    | 3.89| 1.51    |
| Beef & beans        | -0.87 | -3.89   | 1.45| 3.89    | -2.25 | -12.04  | 1.28| 3.94    |
| Meat substitute     | 0.24  | 0.38    | 1.28| 3.94    | 1.28  | 3.94    | 1.28| 3.94    |
| # individuals       | 267   |         | 536 |         |       |         |     |         |
| # observations      | 2132  |         | 4285|         |       |         |     |         |
| LL                  | -2310.3|        | -5023.0|       |
BIC 4789.2 10229.9

Note: Bold estimates indicate significance level at 5% level. * mean_price = \exp(\beta_{\text{price}} + (s^2_{\text{price}}/2)) \) and S.d_{\text{price}} = mean_{\text{price}} \ast (\exp(s^2_{\text{price}})-1)^{1/2} b Specified in equation (4)

Interaction parameters between treatment and organic and price are not included, as they were insignificant in both models. Info-takers change preferences significantly following that carbon information is presented on the products; beef, beef&pork and beef&beans become less preferred while the meat substitute becomes more preferred. Interestingly, info-decliners also shift preferences following the provision of information. This provides support for the second hypothesis of active information avoidance; there are individuals who incorporate the climate information in their decision even though they declined to access such information.

Cognitive dissonance and choices behavior following climate information

There are differences in the average CD between the info-takers and info-decliners (p-val.=0.000), while there is not statistical differences in the distribution (p-val=0.891) (Figure 2a). We test H3a and H3b by interacting the level of CD with the product type parameters and treatment. These model specifications include a large number of interactions, and the number of observations does not allow for random preference heterogeneity, wherefore we estimate MNL models. We present the parameters in focus for the hypothesis in Table 4, while the full results are available in Table A4 in appendix.

Figure 2. Histogram by info-decliners and info-takers
Table 4. MNL model with Treatment (Tr.) and Cognitive dissonance (CD) interactions

| Product type          | All                  | Info-decliners only |
|-----------------------|----------------------|---------------------|
|                       | Main | Tr. | CD | Tr.*CD | Main | Tr. | CD | Tr.*CD |
| Beef                  | 2.07 | -0.21 | -0.18 | -0.42 | 2.30 | -0.32 | -0.02 | -0.11 |
| Beef & pork           | 1.59 | -0.54 | -0.26 | -0.08 | 1.79 | -0.45 | -0.23 | 0.09  |
| Chicken               | -0.32 | 0.06 | 0.22 | 0.05 | -0.51 | 0.23 | -0.38 | 0.14  |
| Beef & beans          | -0.13 | -0.59 | 0.33 | -0.20 | -0.13 | -0.57 | 0.02 | 0.07  |
| Meat substitute       | -1.39 | -0.12 | 0.67 | 0.10 | -3.18 | -0.67 | 0.07 | 0.32  |
| Other attributes      |       |     |     |       |       |     |     |       |
| Opt-out               | -1.12 |       |     |       |       | -1.16 |     |       |
| Organic               | 0.13  |       |     |       |       | -0.05 |     |       |
| Price                 | -0.02 |       |     |       |       | -0.02 |     |       |
| # Choices / Indiv.    | 32 085 | 803 |     |       | 10660 | 267 |     |       |
| LL                    | -9321.4 |     |     |       | -2817.8 |     |     |       |

Note: Utility function: \( V_j = \sum_{k=1}^{K} \beta_{Main,Producttype_k} + \sum_{k=1}^{K} \beta_{Tr,Producttype_k} \times Tr + \sum_{k=1}^{K} \beta_{CD,Producttype_k} \times CD + \sum_{k=1}^{K} \beta_{Tr*CD,Producttype_k} \times Tr \times CD + \beta_{org,Org} + \beta_{price,Price} + \beta_{opt-out,Opt-out} \) (individual subscripts are omitted). Bold estimates indicate significance level at 5% level.

In the first model, including all respondents, individuals with higher levels of CD are more likely to choose less carbon-emitting product types. Moreover, as predicted in H3a, climate information affects individuals with higher CD more than individuals with less or no CD (Tr*CD column). When including info-decliners only (second model in Table 4) this pattern does not hold. While the likelihood of purchasing the different product types varies with the level of CD, this is not affected by the information treatment. There is, hence, not support for H3b.

**Responsibility and personal norms and choice behavior following climate information**

Info-takers have higher degree of agreement with the responsibility and personal norms statements (p-val.=0.000 for each of the four statements) (Figure 2b). High values represent high degree of experienced personal obligations to act climate friendly. There is higher agreement among the info-takers (M\(_{\text{decliners}}\)=3.2 \( M_{\text{takers}}\)=4.0 p-val.=0.000), while there is larger heterogeneity among the info-decliners (S.d.\(_{\text{decliners}}\)=0.91 S.d.\(_{\text{takers}}\)=0.80 p-val.=0.009).

H4a and H4b are tested by interacting the level of R&N with the product type parameters and treatment (Table 5). Full results in Table A5 in appendix. The first model, including all respondents, shows that individuals with high levels of R&N that obliged them to act climate friendly are more likely to choose the less carbon emitting product types before the information treatment. Moreover, the treatment effect varies significantly with R&N (Tr*R&N column). Individuals with high R&N are less likely to choose beef, beef&pork and beef&beans after they receive the CO\(_2\)E-information, compared to individuals with low R&N levels. These product types are also the highest emitters of carbon. There is, hence, support for H4a.
Table 5. MNL model with Treatment (Tr.)- and Responsibility & Norms (R&N) interactions

| Product type      | All                | Info-decliners only |
|-------------------|--------------------|---------------------|
|                   | Tr.    | R&N    | Tr.*R&N | Tr.    | R&N    | Tr.*R&N |
| Beef              | 2.27   | 0.67   | -0.15   | -0.44  | 1.42   | 0.24    | 0.17    | -0.23  |
| Beef & pork       | 1.88   | 0.29   | -0.21   | -0.27  | 1.07   | 0.12    | 0.05    | -0.14  |
| Chicken           | -0.64  | 0.08   | 0.21    | 0.02   | -0.35  | -1.05   | -0.04   | 0.46   |
| Beef & beans      | -1.26  | 0.20   | 0.47    | 0.02   | -0.98  | -1.02   | 0.30    | 0.17   |
| Meat substitute   | -4.45  | 0.66   | 1.14    | -0.13  | -4.16  | 0.07    | 0.70    | 0.01   |

| Other attributes  |        |        |        |        |
|--------------------|--------|--------|--------|--------|
| Opt-out            | -1.13  |        | -1.16  |        |
| Organic            | 0.14   |        |        | -0.05  |
| Price              | -0.02  |        | -0.02  |        |
| # Choices / Indiv. | 32085  | 803    | 10660  | 267    |
| LL                 | -9341.7|        | -2837.3|        |

Note: Utility function: 
\[ V_j = \sum_{k=1}^{K} \beta_{k}^{\text{main}} \text{Producttype}_k + \sum_{k=1}^{K} \beta_{k}^{Tr} \text{Producttype}_k \times Tr + \sum_{k=1}^{K} \beta_{k}^{R&N} \text{Producttype}_k \times R&N + \sum_{k=1}^{K} \beta_{k}^{Tr*R&N} \text{Producttype}_k \times Tr \times R&N + \beta_{\text{org}} \text{Org} + \beta_{\text{price}} \text{price} + \beta_{\text{opt-out}} \text{Opt-out} \] (individual subscripts omitted). Bold estimates indicate significance level at 5% level.

The R&N impact on the treatment effects are less significant in the info-decliners only model, where only the treatment effect on the likelihood of choosing chicken increases more for individuals with high levels of R&N. There is therefore little support for H4b. The insignificant interactions effects in the info-decliners-only model does not lend support for info-decliners with motivations for avoiding information (CD and/or RN) react stronger to climate information when provided it. We acknowledge that the lower number of info-decliners (267 vs. 536) may contribute to the insignificant results.

Cognitive dissonance, responsibility and norms and choice task complexity

We test if the introduction of climate information makes the choice task more complex for respondents that experience CD (H5) and R&N (H6), by including these measures in the scale term and interactions with the treatment (eq. 3). Results are presented for CD in the first model in Table 6, and R&N in the second. The models become more computationally burdensome compared to the models presented in Tables 3 and 4, and for this reason only the product types are specified with distributions. The scale parameter is obtain from \( \exp(\lambda) \), where the normalization is one. Therefore, the \( \lambda \)-parameters should be tested against zero. In both models the treatment \( \lambda \)-parameter is positive in both models, implying an increased choice uncertainty after the introduction of climate information. The scale does not vary with the level of CD, as revealed from the statistically insignificant \( \lambda_{\text{CD}} \) parameter. However, individuals with higher levels of CD show larger choice inconsistencies in the choice tasks with climate information (\( CD*Tr \)). This is in line with prior expectations, providing support to H5.
Table 6. Mixed logit models with scale shifters

|                          | Cognitive dissonance (CD) | Responsibility and Norms (R&N) |
|--------------------------|---------------------------|--------------------------------|
|                          | Coef. t-ratio Std.dev     | Coef. t-ratio Std.dev          |
| Status quo               | -1.42 -9.61               | -1.04 -5.41                    |
| Beef                     | 2.16 11.11 2.28 11.14     | 1.63 6.27 1.72 6.51            |
| Beef & pork              | 1.19 8.17 1.78 11.69      | 0.89 5.38 1.32 6.45            |
| Pork                     | 0                           | 0                               |
| Chicken                  | -0.57 -3.62 2.20 10.97    | -0.41 -3.23 1.61 5.99          |
| Beef & beans             | 0.30 2.55 2.11 11.19      | 0.23 2.57 1.55 6.35            |
| Meat substitute          | -3.79 -5.99 5.33 7.19     | -2.66 -4.38 3.76 4.88          |
| Organic                  | 0.16 3.41                  | 0.13 3.21                      |
| Price                    | -0.03 -9.53                | -0.02 -5.52                    |

Shifters for Treatment

|                          |                           |                               |
|--------------------------|---------------------------|--------------------------------|
|                          | Coef. t-ratio Std.dev     | Coef. t-ratio Std.dev          |
| Beef                     | -1.62 -11.16              | -1.24 -6.51                    |
| Beef & pork              | -1.07 -8.60               | -0.80 -5.67                    |
| Pork                     | 0                           | 0                               |
| Chicken                  | 0.37 3.26                 | 0.27 3.09                      |
| Beef & beans             | -1.46 -10.64              | -1.10 -6.28                    |
| Meat substitute          | 0.98 4.25                 | 0.69 3.64                      |

Scale shifters (λ)^

|                          |                           |                               |
|--------------------------|---------------------------|--------------------------------|
|                          | Coef. t-ratio Std.dev     | Coef. t-ratio Std.dev          |
| Treatment                | 0.55 4.81                 | 0.96 4.08                      |
| CD                       | -0.01 -0.31               |                               |
| CD*Treatment             | -0.14 2.82               |                               |
| RN                       |                           | 0.07 1.86                      |
| RN*Treatment             |                           | -0.18 -3.14                    |
| # individuals            | 803                       | 803                            |
| # observations           | 6417                      | 6417                           |
| LL                       | -8023.2                   | -8026.9                        |
| BIC                      | 16230.5                   | 16237.9                        |

Note: Bold estimates indicate significance level at 5% level. ^ Specified in equation (5)

The second model in Table 6 reveals that, similarly to the CD-model, the level of R&N does not affect the scale significantly, but, after the information treatment the level of R&N is associated with a lower scale (0.83) and thereby a higher error variance. These findings support H6; individuals with high degree of R&N concerning meat consumption become less certain in their choices after the provision of climate information.

Changes in CO₂ emissions following climate information

Finally, we explore the effect on carbon emissions from the CO₂E-information, and we compare the effect between those being imposed climate information (info-decliners) and those being provided it voluntarily (info-takers). We summarize the total amount of CO₂-equivalents from the chosen products in the control tasks, and compare against the total amount in the treatment tasks. The percentage change in total CO₂-equivalents provide the effect on emissions from the imposed information. Since the experimental design is the same for the control tasks and the treatment tasks, the total CO₂-equivalents can be compared.\(^6\) For

\(^6\) While the distribution between the blocks is close to evenly distributed, some minor differences occur, wherefore we weigh the blocks equally when calculating the CO₂-equivalents before and after the information treatment.
the whole sample, the provision of climate information reduced the total number of CO\textsubscript{2} equivalents emitted from the chosen products with 25% (Table 7). Although the reduction is larger among the info-takers (32%), there is a reduction among the individuals who indicated that they prefer not to access climate information. As expected, the total CO\textsubscript{2} equivalent emissions from the low emitting product types (e.g. pork, chicken, meat substitute) increases as a result of the substitution away from the high emitting product types.

|            | All respondents | Info-decliners | Info-takers |
|------------|-----------------|----------------|-------------|
| Beef       | -33             | -16            | -45         |
| Beef & pork| -19             | -9             | -27         |
| Pork       | 50              | 20             | 69          |
| Chicken    | 73              | 75             | 73          |
| Beef & beans| -48            | -26            | -54         |
| Meat substitute| 56   | 19             | 58          |
| Total      | -25             | -12            | -32         |

Discussion
One possible measure for reducing climate impact from consumption is carbon emission (CO\textsubscript{2}E)-labels on food products. However, a requirement for labeling programs to be efficient is that consumers consider the information, and change consumption patterns based on it. There is evidence from other domains that some consumers actively avoid certain types of information, in order to eschew uncomfortable feelings (Onwezen and van der Weele 2016; Thunström et al. 2016). This article explores if consumers want to learn about the climate impact when making food purchases, and how their behavior is affected if imposed such information. Data was collected in an online questionnaire, including a stated preference experiment. One-third of the respondents did not wish to access CO\textsubscript{2}E-information when choosing grounded meat products (info-decliners). Interestingly, when the info-decliners were imposed CO\textsubscript{2}E-information on the products, the likelihood of purchasing products with high CO\textsubscript{2}E declined. This suggest some degree of active information avoidance.

We investigate two motivations for avoidance of climate information. (1) Avoiding discomfort from conflicting beliefs or emotions, cognitive dissonance (CD). We propose that individuals with higher levels of CD are more likely to change behavior if imposed information. (2) Strategic avoidance implies that responsibility feelings and personal norms (R&N) that oblige action that one does rather not undertake motivate information avoidance. We find that both motivations affect the reaction to information. Higher degree of CD related to meat consumption is associated with higher uncertainty when making purchases when imposed climate information. Similarly, stronger R&N that oblige the individual to act climate friendly is associated with higher levels of uncertainty in the decision after CO\textsubscript{2}E-information is included on the products. Moreover, individuals with higher levels of CD and R&N are more likely to change purchase behavior towards less carbon emitting products when provided climate information. However, among info-decliners, we only find weak support for this effect from R&N and no effect from CD. A possible reason for this is that the info-decliners that are avoiders (as opposed to indifferent) are relatively few, and that such effects are therefore not possible to measure in our experimental setup.

Policy implications
Our findings have practical implications for policy makers and other actors that seek to reduce CO\textsubscript{2}E from food consumption. It highlights that individuals that are information-decliners will not actively seek out information, but may be affected if exposed to it. We identify three types of individuals; (1) individuals that are interested in climate information (they wish to access such information, and they change behavior if it is provided and the information deviates from their expectations). (2) Individuals
that are indifferent (they may or may not wish to access information, but are not affected by it) (3) Avoiders who decline information if it is voluntary, but were at least some are affected sufficiently to change behavior when imposed information. The implication from these findings is that while interested individuals can be expected to more actively seek out climate information (e.g. turn the package, read a complex label), avoiders will only be affected by the label if it is imposed on them. Hence, while CO₂-E can be reduced by providing consumers with labels on products, such initiatives will likely need to be mandatory, or provided by grocery stores, as high emitting producers are unlikely to voluntarily provide such information on a product level. Importantly, the impact of a mandatory CO₂-E label will be affected by its’ presentation (label complexity and position). The results from this study indicate that if a label is difficult to avoid, the effects are likely considerably larger.

We use a heterogeneous definition of a product category, where the grounded protein includes both red meat types and chicken and meat substitute. The inclusion of low carbon-emitting product types in the same choice context as red meat products makes such alternatives more feasible and increases awareness. The market share for minced meat substitutes, minced chicken and minced beef combined with minced beans are currently very low on the market while the market share in this experiment is significant, and for chicken and meat substitutes it increases following the inclusion of climate information. The introduction of specific CO₂-E-labels on all products is a complicated task that requires policy and/or grocery stores demanding such information from producers. A more feasible measure, which can easily be implemented by grocery stores, is the use of simple nudges; placing the meat substitutes and chicken products in the same shelf as the red meat products with some kind of simple CO₂ label on the food products, say red, yellow and green to help the consumer to identify low emitting product groups.

Limitations and future research directions

This study used online responses to hypothetical purchases. Incentivized choices and experiments with real products has the advantage of higher external validity, but these methods are typically conducted in smaller samples (due to costs of such data collections). The experimental set-up in this study also has the advantage of providing responses from a representative sample of the population, and it gives the freedom to design products that are not yet on the market.

There is not an established CD-scale, but different methods are used in the literature. One can imagine many different variants of questions, and the appropriateness is also likely to vary with the context. While the approach in this study has been instructive, we suggest that more work is needed on the measurement of CD, and developments of short scales that can be included in questionnaires. Moreover, while challenging to measure, the degree of disutility experienced when imposed information would be informative to include in future studies on active information avoidance.

Conclusion

The results from this study point to the potential of climate information as a measure for changing food consumption in the direction of less carbon emissions. It also reveals that a share of individuals avoid carbon information if possible – and change behavior if information is imposed on them. While info-takers reduced their CO₂-E with 32% following information, the info-decliners also reduced their CO₂-E (12%). This study contributes with insights regarding motivations for avoidance of climate information, and how these motivations affect the reaction if information is provided. The study demonstrates that when positive beliefs and preferences towards carbon heavy consumption is combined with climate concerns, carbon information results in larger uncertainty in choice behavior. Similarly, responsibility feelings and norms to consume climate friendly result in increased choice uncertainty when exposed to climate information. These findings point to the potential of affecting these consumers in the direction of less carbon emitting products.
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Appendix Material

Table A1. Attributes and levels for grounded meat product in choice experiment

| Attribute                  | Levels                  | Treatment information (CO2e) |
|----------------------------|-------------------------|------------------------------|
| Product type (Grounded meat) | Beef                    | 27                           |
|                            | Beef & pork 50/50       | 16                           |
|                            | Beef & beans 70/30      | 19                           |
|                            | Pork                    | 6                            |
|                            | Chicken                 | 4                            |
|                            | Meat substitute         | 3                            |
| Production method          | Conventional, Organic  |                              |
| Price                      | 25,33,41,49,57,65       |                              |

Figure A1. “Red meat has large negative impact on climate change” 1=do not agree 5=agree
Table A2. Logit-model where Problem awareness is excluded

|                     | Coef. | z    |
|---------------------|-------|------|
| Male                | 0.39  | 2.04 |
| Age category (reference level: 35-49) |       |      |
| <24                 | 0.09  | 0.19 |
| 25-34               | -0.26 | -0.95|
| 50-74               | -0.37 | -1.72|
| 75-                 | -0.40 | -0.97|
| Region (reference level: Middle region) |       |      |
| Northern region     | -0.36 | -1.51|
| Southern region     | 0.26  | 1.33 |
| CD                  | 0.38  | 4.19 |
| Responsibility & Norms | 0.86  | 6.57 |
| NEP                 | 0.34  | 2.27 |

Meat eating frequency

|                     | Coef. | z    |
|---------------------|-------|------|
| <1 time/week        |       |      |
| 2-3/week            | -0.04 | -0.18|
| 4 or more/week      | -0.28 | -1.08|
| Problem Awareness   |       |      |
| Constant            | -4.28 | -6.93|
| N                   | 803   |      |
| LL                  | -408.48 |      |
| Pseudo R2           | 0.20  |      |

Bold estimates indicate significance level at 5% level.
Table A#.  

| CD | Responsibility & Norms | Problem Awareness |
|----|------------------------|-------------------|
|    | Coef.      | t-value | Coef.     | t-value | Coef.     | t-value |
| Male | -0.40 | -5.02 | -0.47 | -7.14 | -0.39 | -4.60 |
| Age category | | | | | | |
| <24 | 0.12 | 0.59 | -0.13 | -0.74 | 0.96 | 4.43 |
| 25-34 | 0.17 | 1.49 | -0.09 | -0.95 | 0.23 | 1.89 |
| 35-49 reference level | 0 | 0 | 0 | | | |
| 50-74 | -0.24 | -2.56 | -0.13 | -1.71 | -0.29 | -2.92 |
| 75- | -0.45 | -2.47 | 0.04 | 0.24 | -0.41 | -2.15 |
| Region | | | | | | |
| Middle region (ref.) | 0 | 0 | 0 | | | |
| Northern region | -0.03 | -0.27 | 0.11 | 1.26 | 0.06 | 0.48 |
| Southern region | 0.05 | 0.60 | -0.01 | -0.12 | 0.05 | 0.57 |
| Constant | 2.29 | 23.19 | 4.05 | 49.58 | 3.54 | 33.95 |
| R² adjusted | 0.07 | 0.06 | 0.10 | | | |
| F-statistic | 9.52 | 8.83 | 13.68 | | | |
| N | 803 | 803 | 803 | | | |

Estimated all of these with educ too, where educ was insign for all.

Table A4

| Don’t trust that the climate information is correct | Info-demanders | Info-decliners | Difference |
|---------------------------------------------------|----------------|----------------|------------|
| Not caused by humans                              | 27.2           | 48.3           | **         |
| Reducing climate impact not my personal responsibility | 7.5           | 16.9           | **         |
| Climate info makes me feel bad                    | 13.3           | 10.9           |            |
| I already know much about climate impact from food | 24.6           | 21.4           |            |
| I do not know how to interpret the climate info   | 26.1           | 26.2           |            |
| I want to use climate info                         | 55.6           | 7.1            | **         |

** p-value < 0.001
Table A4a. MNL model with Treatment- and CD interactions

| Product type      | Treatment effect | CD-effect | Treatment* CD-effect |
|-------------------|------------------|-----------|----------------------|
|                   | Coef.            | t-ratio   | Coef.                | t-ratio | Coef. | t-ratio |
| Beef              | 2.07             | 15.41     | -0.21                | -1.16   | -0.18 | -3.31   | -0.42 | -5.11 |
| Beef & pork       | 1.59             | 12.17     | -0.54                | -3.06   | -0.26 | -4.49   | -0.08 | -1.02 |
| Pork              | 0                | 0         | 0                    | 0       | 0     | 0       |
| Chicken           | -0.32            | -2.04     | 0.06                 | 0.30    | 0.22  | 3.44    | 0.05 | 0.64 |
| Beef & beans      | -0.13            | -1.11     | -0.59                | -3.30   | 0.33  | 6.62    | -0.20 | -2.61 |
| Meat substitute   | -1.39            | -6.12     | -0.12                | -0.42   | 0.67  | 8.20    | 0.10 | 0.94 |
| Opt-out           | -1.12            | -19.91    |                      |         |       |         |
| Product attributes|                 |           |                      |         |       |         |
| Organic           | 0.13             | 3.24      |                      |         |       |         |
| Price             | -0.02            | -15.16    |                      |         |       |         |
| # Observations    | 32 085           |           |                      |         |       |         |
| # Individuals     | 803              |           |                      |         |       |         |
| LL                | -9321.4          |           |                      |         |       |         |
Table A4b. MNL model with Treatment- and CD interactions, Info-decliners

| Product type          | Treatment effect | CD-effect | Treatment* CD-effect |
|-----------------------|------------------|-----------|----------------------|
|                       | Coef. t-ratio    | Coef. t-ratio | Coef. t-ratio | Coef. t-ratio |
| **Product type**      |                  |            |                     |              |
| Beef                  | 2.30             | 11.19     | -0.32               | -1.23        | -0.02       | -8.57 | -0.11 | -0.79 |
| Beef & pork           | 1.79             | 9.52      | -0.45               | -1.82        | -0.23       | -2.34 | 0.09  | 0.64  |
| Pork                  | 0                | 0         | 0                   | 0            | 0           | 0     | 0     | 0     |
| Chicken               | -0.51            | -2.05     | 0.23                | 0.73         | -0.38       | -3.91 | 0.14  | 0.88  |
| Beef & beans          | -0.13            | -0.72     | -0.57               | -2.12        | 0.02        | 0.14  | 0.07  | 0.52  |
| Meat substitute       | -3.18            | -4.70     | -0.67               | -0.69        | 0.07        | 0.72  | 0.32  | 0.89  |
| **Opt-out**           |                  |           |                     |              |
| Opt-out               | -1.16            | -12.01    |                     |              |             |       |       |       |
| **Product attributes**|                  |           |                     |              |
| Organic               | -0.05            | -0.78     |                     |              |
| Price                 | -0.02            | -8.57     |                     |              |
| # Observations        | 10660            |           |                     |              |
| # Individuals         | 267              |           |                     |              |
| LL                    | -2817.8          |           |                     |              |
Table A5a. MNL model with Treatment- and Responsibility & Norms (RN) interactions

| Product type          | Treatment effect |  | RN-effect |  | Treatment* RN-effect |  |
|-----------------------|------------------|-----------------|-----------------|-----------------|-----------------|-----------------|
|                       | Coef. | t-ratio | Coef. | t-ratio | Coef. | t-ratio | Coef. | t-ratio | Coef. | t-ratio |
| **Product type**      |        |         |        |         |        |         |        |         |        |         |
| Beef                  | 2,27   | 8,69    | 0,67  | 1,83    | -0,15 | -2,21   | -0,44 | -4,56    |
| Beef & pork           | 1,88   | 7,56    | 0,29  | 0,84    | -0,21 | -3,26   | -0,27 | -2,91    |
| Pork                  |        |         |        |         |        |         |        |         |
| Chicken               | -0,64  | -2,12   | 0,08  | 0,20    | 0,21  | 2,69    | 0,02  | 0,25     |
| Beef & beans          | -1,26  | -5,01   | 0,20  | 0,52    | 0,47  | 7,50    | -0,32 | -3,30    |
| Meat substitute       | -4,45  | -8,46   | 0,66  | 0,98    | 1,14  | 9,36    | -0,13 | -0,82    |
| **Opt-out**           |        |         |        |         |        |         |        |         |
| Opt-out               | -1,13  | -20,05  |        |         |        |         |        |         |
| **Product attributes**|        |         |        |         |        |         |        |         |
| Organic               | 0,14   | 3,32    |        |         |        |         |        |         |
| Price                 | -0,02  | -15,35  |        |         |        |         |        |         |
| # Observations        | 32085  |        |        |         |        |         |        |         |
| # Individuals         | 803    |        |        |         |        |         |        |         |
| LL                    | -9341,7|        |        |         |        |         |        |         |
Table A5b. MNL model with Treatment- and Responsibility & Norms (RN) interactions, Info-decliners

| Product type          | Coef. | t-ratio | Coef. | t-ratio | Coef. | t-ratio | Coef. | t-ratio |
|-----------------------|-------|---------|-------|---------|-------|---------|-------|---------|
|                       | Treatment effect | RN-effect | Treatment* RN-effect |
| Beef                  | 1.42  | 3.58    | 0.24  | 0.45    | 0.17  | 1.43    | -0.23 | -1.38   |
| Beef & pork           | 1.07  | 3.03    | 0.12  | 0.23    | 0.05  | 0.48    | -0.14 | -0.94   |
| Pork                  |       |         |       |         |       |         |       |         |
| Chicken               | -0.35 | -0.74   | -1.05 | -1.64   | -0.04 | -0.29   | 0.46  | 2.39    |
| Beef & beans          | -0.98 | -2.54   | -1.02 | -1.72   | 0.30  | 2.60    | 0.17  | 0.97    |
| Meat substitute       | -4.16 | -3.14   | 0.07  | 0.04    | 0.70  | 1.96    | 0.01  | 0.03    |
| Opt-out               | -1.16 | -12.05  |       |         |       |         |       |         |
| Opt-out               |       |         |       |         |       |         |       |         |
| Organic               | -0.05 | -0.71   |       |         |       |         |       |         |
| Price                 | -0.02 | -8.64   |       |         |       |         |       |         |
| # Observations        | 10660 |         |       |         |       |         |       |         |
| # Individuals         | 267   |         |       |         |       |         |       |         |
| LL                    | -2837.3 |        |       |         |       |         |       |         |
About AgriFood Economics Centre

AgriFood Economics Centre provides economic expertise in the fields of food, agriculture, fishing and rural development. The Centre is a cooperation for applied research between the Swedish University of Agricultural Sciences (SLU) and Lund University. The aim is to supply government bodies with a solid scientific foundation supporting strategic and long-term policy choices.

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