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# Food labels: how consumers value moral, environmental, and health aspects of meat consumption

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# Food labels: how consumers value moral, environmental, and health aspects of meat consumption

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**Abstract**

Policy changes could improve health and environmental outcomes by addressing the many externalities and internalities related to food consumption. Using a stated preference approach, we investigate to what extent consumers are willing to make costlier food consumption choices if doing so contributes to decrease environmental externalities, health damages, and animal suffering. We find a considerable willingness to pay for some aspects of the food bought. People are willing to pay an additional 50% for a product if it carries a label declaring that the product meets the highest available standards in terms of healthiness, animal welfare, and antibiotics use, respectively. The willingness to pay for a climate impact label is also sizeable but smaller. We compare a traffic-light label with a plain-text label and a grey-scale label in order to disentangle the effects of introducing labels Our results are mixed, suggesting that a traffic-light label has both normative and cognitive effects on behavior.

**Key-words**: Food labels, choice experiment, norms, food choice

**JEL-codes**: Q11, Q18,

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## 1. Introduction

Food is of fundamental importance, not only physiologically but also as a centerpiece of our wellbeing, culture, and identity. It provides not only pleasure but also gives social and even religious meaning to our everyday life. Food production, however, leads to many serious global environmental problems such as climate change, the development of antibiotic resistance, eutrophication, and biodiversity loss (Foster et al., 2007; FAO 2019). Animal husbandry represents almost 15 percent of the anthropogenic climate impact worldwide[1], and among different meat products, beef, lamb, and other ruminants are the worst greenhouse-gas emitters (Swedish Board of Agriculture, 2018). Livestock raising also involves moral concerns over animal welfare, i.e., how animals are treated during their lifetime and at slaughter. Moreover, while meat provides important protein, minerals, vitamins, and fat for human health, some components, such as saturated fats in processed meat, increase the risk for cancer and cardiovascular diseases, at least in the long run (Swedish Food Agency, 2014, 2015). Hence, there are many externalities and internalities related to food.

In this paper, we focus on the consumption of meat and some problems that come with meat production. We conducted the study in Sweden, where meat consumption has continually increased. Even though the consumption has declined somewhat in the last few years (Swedish Board of Agriculture, 2019a), in 2013 Swedes consumed about 40 percent more meat than they did 30 years earlier (Swedish Board of Agriculture, 2013). In an international comparison, Swedish consumers and especially Swedish males eat more red meat than the average EU citizen (Swedish Board of Agriculture, 2019b).

To address the many food-related externalities and internalities, a first natural step is for people to undertake voluntary action supported by more information and education. As a consumer, however, it is often difficult, if not impossible, to know the environmental impact of one's consumption choices. For foods that feature credence characteristics, food labeling is often proposed as a means to overcome obstacles of asymmetric information or costly search behavior (e.g., Teisl and Roe, 1998). In many countries, health campaigns are used, accompanied by food labelling to give consumers a clearer understanding of the content of fat, sugar, and salt in various products. Most labels include several aspects, ranging from animal welfare and environmental impact to healthiness of the food and quality of the work

[1] Animal production includes meat, fish, milk, milk products, and eggs.

environment. However, it is hard to know how consumers value these product labels, and when it comes to the use of antibiotics in meat production, there are no existing labeling schemes in Sweden. Moreover, the impact differs depending on what country the meat comes from. Sweden has strict antibiotics and animal welfare regulations, while some of the countries from which meat is imported do not (WWF, 2016). Nevertheless, for example, the share of imported beef has increased by about 16 percentage points over the past ten years, to 44 percent of the total Swedish beef consumption in 2018 (Swedish Board of Agriculture, 2019c). All in all, there are a number of factors that indicate there may be a role for additional policy in this area.

The main objective of the present paper is to investigate to what extent Swedish consumers are willing to make more costly consumption choices if it contributes to decrease the environmental externalities, health damages, and animal suffering. More specifically, using a survey-based choice experiment (CE), we investigate people's willingness to pay (WTP) for buying food products with a set of labels relating to the use of antibiotics in the production, the climate impact, how animals are treated, and the healthiness of the food. The first three aspects reflect classic public-good problems. While consumers may attach great value to them, they also understand that their personal contribution is too small to have a meaningful impact on the total provision of the goods in question. This creates incentives to free-ride on others' contributions. The last aspect, *healthiness*, is a private characteristic that is laden with internalities since the connections between food and health are complex and involve major delays.

The literature on consumer preferences for food product attributes is extensive. Studies have looked at for example health aspects, food safety certifications, country-of-origin, traceability, carbon footprint, animal welfare, and use of genetically modified fodder (see, e.g., Carlsson et al., 2007; Lusk et al., 2007; Loureiro and Umberger, 2007; Onozaka and McFadden, 2011; Teratavanat and Hooker, 2006; Van Loo et al., 2014). The choice experiment method has become common in research as a way to examine preferences for a wide range of products from bread and vegetables to meat (Hu et al., 2004; Tonsor et al., 2005). The closest paper to ours is the one by Lusk et al. (2007), which looked at the demand for a food item (pork chops) to understand the consumer tradeoffs between public good aspects of the food production (e.g. waste from animal farming that affects water and air quality), antibiotic use antibiotic resistance, and animal welfare. They investigated whether altruism and free riding affect people's private choices of which pork chops to buy, and found that individuals who are more altruistic and less willing to free ride are willing to pay more for products with public good

dimensions than those who are less altruistic. In contrast to their paper, we – as already mentioned – include and compare the valuation of both private and public good aspects of food.

In the second part of the study, we investigate how the graphic illustrations of the labels affect choice behavior. In a meta-analysis, Cecchini and Warin (2016) found that food labeling increases healthier food intake by about 18 percent and that so-called traffic light ratings using the colors red, yellow, and green are more effective than other labeling schemes in increasing selection of healthier food. While the aim of the traffic light rating has been to give consumers a clearer understanding of the amount of fat, sugar, and salt in products, the knowledge of why it works is limited. It could work by improving cognition and reducing costly search behavior, or by setting an injunctive norm that describes appropriate behavior (i.e., what is seen as a good, a mediocre, a bad choice) (Cialdini, 2003). Currently we simply do not know why it works and in order to find out, we design three versions of the choice experiment. In all three versions, the attribute levels are described with words. In two of the versions, we add a graphic illustration to the written description of the attribute levels: in the first, we use a traffic light rating together with a value-laden description, and in the second, we use grey-scale circles without a value-laden description. In the third version of the choice experiment, the levels are only described with text. By comparing the three versions, we can investigate the impact of graphic illustrations and of the normative elements of the labels.

## 2. Survey design, sample, and econometric model

### *2.1. Survey design*

The survey started with a screening question since the targeted sample consisted of respondents who regularly buy ready-made meals with meat, such as lasagna, meatballs, and pizza. Those who did not regularly consume any meat products were dropped from the sample immediately after the screening question. We also asked who in their household did most of the grocery shopping. In the subsequent and second section, the survey provided information about the attributes and their levels.

The food product used in the experiment was frozen meat lasagna. The first three attributes are of a public nature, namely *antibiotics use*, *animal welfare*, and *climate impact*. We explained that since antibiotics can spread from animal production to the environment, the use of antibiotics in meat production increases the risk of antibiotic resistance, and thus, decreasing

the use of antibiotics will decrease this risk. The antibiotics use attribute had three levels, where the highest level was full restriction, meaning that antibiotics are only allowed for the treatment of sick animals as prescribed by a veterinarian and not for growth promotion. The animal welfare attribute had three levels, too, ranging from poor to very good depending on the stable environment and grazing opportunities. The third attribute, climate impact, described the impact of meat production on the climate. This attribute also had three levels, ranging from large to small impact. Finally, the last attribute, healthiness, is of private nature. Healthiness, too, had three levels, ranging from unhealthy to healthy. The exact information regarding all the attributes and their levels can be found in Table A1 of the Appendix. The levels of the attributes were illustrated with a traffic-light system using the colors red, yellow, and green. It was explicitly stated in the instructions that red represented a bad choice, yellow an intermediate, and green a good choice. In addition to this survey version, as already mentioned, we also used two additional survey versions.

In the second survey version the information was conveyed with grey-scale circles instead of the traffic-light system, and in the third survey version the attributes were described using text only and without graphic illustration. These two versions did not provide any further instructions or signals about how good or bad each attribute level was. Hence, only the first survey version include direct signals regarding the injunctive normative aspect of the labels. The second survey version, which used grey-scale circles, is identical to the first survey version in all aspects besides the injunctive norm. The third survey version with only text is likely to be cognitively more demanding. All together, these three survey versions make it possible to investigate the impact of graphic illustrations and the normative elements of the labels on behavior.

After the attribute table, we presented an example of a choice set. The respondents were also informed that they should answer as they would actually do in a real-life shopping situation (in store or online) and that they could only choose one of three 400 gram ready-cooked lasagnas: two with labels and one without. For the unlabeled lasagna, there was no information about the use of antibiotics, animal welfare conditions, climate impact, or healthiness of the product. We explained that the geographic origin of the meat was not known for any of the lasagnas[2] and

[2] This was important since antibiotics use and level of animal welfare are strictly regulated in Swedish beef production, and thus, most people know that Swedish meat products meet the highest available requirements in terms of these two attributes.

that all of them were equally tasty and contained an equal amount of meat. We asked the respondents to carefully compare the different alternatives and make their choice. In total, each respondent answered four choice sets. In addition, we added the following text to emphasize that it was important to respond in line with what they would actually do in a real shopping situation:

> "It is important that you answer what you would actually choose. There is no right or wrong answer, and we researchers have no opinion about what is good or bad. It is important that you answer as you would make a choice in a real situation, for example in a store, and therefore take into account the cost even if you do not really buy anything in this survey. This is why we ask all to answer with one's hand on one's heart."

In order to reduce experimental demand effects, we emphasized that we as researchers had no opinion on what a good choice was (Carlsson et al., 2018). To "answer with hand on heart" is a common idiom in Swedish and all respondents should understand the meaning of it: to answer truthfully ("to cross one's heart" is a close equivalent in English). Since a person might buy different varieties of products on different occasions, we also informed them that they should choose the product they would buy most often. We then showed them an example of a choice set; see Figure 1.

| | Alternative A (not labeled) | Alternative B (labeled) | Alternative C (labeled) |
|---|---|---|---|
| Use of antibiotics | Unknown | No restriction 🔴⚪⚪ | Some restrictions ⚪🟡⚪ |
| Animal welfare | Unknown | Poor 🔴⚪⚪ | Very good ⚪⚪🟢 |
| Climate impact | Unknown | Large: > 4 kg 🔴⚪⚪ | Medium: 3–4 kg ⚪🟡⚪ |
| Healthiness | Unknown | Healthy ⚪⚪🟢 | Unhealthy 🔴⚪⚪ |
| Price | 25 kr | 30 kr | 55 kr |
| Hand on heart , in a real shopping situation I would choose | | | |

**Figure 1**. An example of a choice set

Right before they started to make their choices, we reminded the respondents that a normal price of a frozen meat lasagna is 25 SEK,[3] and reminded them about their budget restriction. We also asked the respondents whether they could promise that they were going to answer truthfully what they would choose in a real shopping situation (Jaquemet et al., 2013). We included the following question:

> "Before you make your choice, we would like to know whether you can, hand one heart, promise that you will answer truthfully the questions about what you would choose. Thus, your choices in the survey will be equivalent to what you would actually choose in a store or when you shop online.
> □ Yes, I can promise that
> □ No, I cannot promise that"

After the four choice sets, to be able to control for possible attribute nonattendance (ANA), there was a set of questions about whether and why a respondent had ignored any or several of the attributes when making their choices. The last section of the survey contained questions about the respondents' socio-economic background and whether they regularly bought products that were organic, locally produced, or labeled as a healthy choice and whether they regularly chose Swedish products when buying meat. Finally, the section ended with knowledge questions to capture whether a respondent actually knew the implications of the Swedish organic label, the EU organic label, and Swedish non-organic meat in terms of, e.g., animal welfare, antibiotics use, and healthiness of meat.

*2.2. Survey sampling*

The study was conducted as a web survey in June–July 2019. Before the main study, four pilot studies were conducted. The respondents were recruited randomly from a representative panel of the Swedish population. However, in order to be eligible to participate, the respondent had to purchase ready-made meals more than just a few times per month. The survey therefore started with a screening question, and if the respondent reported to only buy ready-made meals 0–2 times per month, they were not invited to participate in the survey. The final survey yielded 3,020 responses: 1,029 for the traffic-lights version, 951 for the survey with grey-scale circles,

[3] 1 SEK ≈ 0.10 USD at the time of the survey.

and 1,040 for the text-only survey. The median response time was around 10 minutes for all three survey versions, and the mean was between 12 and 13 minutes.

**Table 1**. Descriptive statistics of respondents

| Variable | Description | Mean |
|---|---|---|
| Young | =1 if <30 years old | 0.178 |
| Old | = 1 if ≥65 years old | 0.223 |
| Female | =1 if female | 0.479 |
| University | =1 if a university education ≥3 years | 0.361 |
| Buy eco | =1 if a respondent regularly buys ecological food | 0.536 |
| Buy Swedish | =1 if a respondent regularly buys Swedish meat | 0.832 |
| Buy Healthy | =1 if a respondent regularly buys food labeled as a healthy choice. | 0.450 |
| Number of respondents | | 1,029 |

*2.3 Econometric model*

We estimate models in WTP space (Train and Weeks, 2005) using Nlogit 6. We specify WTP to be normally distributed for all attributes. The main results are based on a model without any individual characteristics, for the survey version with traffic lights. We then estimate two additional models for the survey version with traffic lights. In model one, we include a few socio-economic characteristics, i.e., gender, age, and university education, and interact them with the alternative specific constant (ASC) and all attributes. In model two, we add a few behavioral variables, namely whether a respondent regularly buys eco-labeled products, Swedish meat, and healthy food products. In all models, we use the information from the follow-up questions regarding attribute attendance. We assume that the MWTP for a particular attribute is zero for those who stated that they did not consider this attribute when making choices. The exception is the price attribute, where we instead assume that preference for price is the same as for those who gave attention to the price attribute. This means that the probabilities in the likelihood function are only a function of the attribute parameters of the attributes that have been taken into account when making the choices (Hensher et al., 2005; Carlsson et al., 2010).[4] From the model, we then estimate marginal willingness to pay MWTP for those respondents who considered the attribute when making the choices.

[4] We have also estimated a model where we instead allow for an interaction term between the attribute coefficients and a dummy variable that is equal to one if the attribute was ignored. A large majority of the interaction terms were not statistically significant, which confirms our assumption.

## 3. Results

### *3.1 Willingness to pay in the traffic light version*

In Table 2, we report the estimated mean and standard deviations for the attributes and the ASC. Note that we use the middle level of the attributes as the reference case; thus, the estimated MWTPs are compared with the medium level of the attribute for all cases. The lower/inferior levels of all attributes are therefore predicted to have negative and the upper/preferred levels are predicted to have positive signs. We also report the share of individuals in the traffic light version who stated that they did not take the attribute into consideration when making their decisions.[5] Based on this information we also estimate the mean WTP for all respondents, i.e., when we take the non-attendance information into consideration.

**Table 2.** Estimated mean and standard deviation of MWTP in SEK from a WTP-space model, traffic light version of the survey.

| | Mean | Standard deviation | Price premium[a] | Share non-attendance | Mean WTP all respondents | Price premium[a] |
|---|---|---|---|---|---|---|
| ASC (option with no label) | -46.9*** | 34.0*** | | n.a. | | |
| Antibiotics use: no restric. | -14.3*** | 8.3*** | -57% | 21% | -11.3*** | -45% |
| Antibiotics use: full restric. | 6.1*** | 6.9*** | 24% | | 4.8*** | 19% |
| Animal welfare: lacking | -16.0*** | 6.0*** | -64% | 22% | -12.5*** | -50% |
| Animal welfare: very good | 4.4*** | 9.5*** | 18% | | 3.4*** | 14% |
| Climate impact: large | -5.9*** | 11.5*** | -24% | 52% | -2.8*** | -11% |
| Climate impact: small | 4.5*** | 5.9** | 18% | | 2.2*** | 9% |
| Healthiness: unhealthy | -13.4*** | 10.3*** | -54% | 42% | -7.7*** | -31% |
| Healthiness: healthy | 10.0*** | 1.6 | 40% | | 5.8*** | 23% |
| Cost | | | | 43% | | |

***, **, and * = significance at 1, 5, and 10 %, respectively

Note: model estimated with simulated maximum likelihood using 1,000 Halton draws. 1 SEK ≈ 0.10 USD at the time of the survey.

[a] Price premium is calculated as the percentage price change using a base price of 25 SEK.

Let us begin with the ASC. The implicit WTP for the alternative with no label is negative, which means that there is a strong tendency, all else equal, to prefer an alternative with a label

[5] We have also estimated the shares of respondents who did not consider attributes for the grey-colored circles and plain-text versions, respectively. There are only small differences in the share of ANA across the three different surveys versions and there is no clear pattern for example of each attribute having a smaller/larger share of non-attendance in one specific survey version.

compared with one with no label. This means that people generally prefer to know how their food choices affect the environment and their health. One way to illustrate the role of the WTP for the alternative without a label is to calculate the WTP for moving from an unlabeled alternative to an alternative with labels but where the labels are all at their lowest level. While a respondent would be willing to pay about 47 SEK by having any labelled alternative, having the middle levels of all the attributes instead of the lowest level of the labels is associated with a WTP of about 50. Thus, the net gain would be -3 SEK.

If we then look at the individual attributes, we notice a number of interesting things. To begin with, for all attributes, consumers are more concerned with moving from the lowest to the medium level of the attribute (MWTP 5.9–16.0 SEK) than moving from the medium to the highest (MWTP 4.4–10.0 SEK), i.e., they are willing to pay more for moving from red to yellow than for moving from yellow to green. This is particularly true for antibiotics use and animal welfare. Second, estimated MWTPs are substantial. For example, the average MWTP for shifting from a label with no antibiotics restrictions to the medium level (some restrictions) is 14.3 SEK. The corresponding estimate for the animal welfare attribute is 16 SEK. However, note that these are estimates conditional on respondents taking the attribute into consideration when making their choices. In the final column in Table 2, we report estimated MWTP for the whole sample, given the assumption that those who stated that they did not take the attribute into consideration have a zero MWTP. Given the large fraction of non-attendance, the estimated MWTPs are naturally considerably lower. Now, the average MWTP for shifting from a label with no restrictions on the use of antibiotics to the medium level (some restrictions) is 11.3 SEK. For the climate impact attribute, the corresponding MWTP is 2.8 SEK.

Throughout the paper, we will compare the WTP for the levels of the labels between different attributes. This is clearly not without problems since the WTP will depend on the content of the label for an individual attribute. However, we believe that a comparison is still informative. In Table 3, we report WTP estimates for going from the lowest to the highest level of the attribute in order to be able to compare the attributes in a general way.

**Table 3.** Estimated mean MWTP in SEK from a WTP space model, traffic light version of the survey, going from the lowest to the highest level for each attribute

| | **Conditional mean WTP** | **Price premium[a]** | **Mean WTP, all** | **Price premium[a]** |
|---|---|---|---|---|
| Antibiotics use | 20 | 80% | 16 | 64% |

| | | | | |
|---|---|---|---|---|
| Animal welfare | 20 | 80% | 16 | 64% |
| Climate impact | 10 | 40% | 5 | 20% |
| Healthiness | 23 | 92% | 13 | 52% |

[a] Price premium is calculated as the percentage price change using a base price of 25 SEK

The general pattern is that there is a lower WTP for the climate impact attribute compared with the other three attributes. This is also the attribute with the highest share of respondents stating that they did not take this attribute into consideration when making their choices. If we look at the mean WTP for all, we have that the two first attributes, antibiotics use and animal welfare, have the highest WTP, closely followed by the healthiness attribute.

*3.2 Consumer heterogeneity*

As a next step, we include interaction terms between the attributes and a set of socio-economic characteristics (Table 4), and then we also include a set of behavioral variables (Table 5). In both cases, we report mean WTP for the reference group (middle-aged men without university education, and ditto who do not buy organic, Swedish, or healthy food) and difference in WTP for each characteristics. We will focus our attention on the MWTPs of the interaction terms. In the first model with only socio-economic characteristics, a number of interaction terms for the ASC are statistically significant. In particular, older respondents (over 65 years of age) and female respondents are less likely than 30–64 year olds and men, respectively, to choose the alternative without labels. Females generally have a higher WTP for all attributes except climate impact. University-educated respondents are more concerned about not having any restrictions for antibiotics use in meat production and have a higher WTP for avoiding unhealthy food than younger respondents. But at the same time, those with university education have a lower WTP for the highest level of animal welfare compared with individuals with a lower education level. In the second model when we add the behavioral interactions, most of the results for the interactions with the socio-economic characteristics persist. In addition, among the behavioral interactions, those who regularly buy Swedish organic food have a higher WTP for animal welfare, while those who regularly buy Swedish meat have a higher WTP for full antibiotics restrictions compared with other consumers. The behavioral characteristics seem also to drive a general interest in buying labeled products, since the two largest interaction terms are with the ASC. Subjects accustomed to buying eco-labelled or Swedish meat are considerably more likely to avoid the option without any labels.

**Table 4.** Estimated means and standard deviations from WTP space model with socio-economic factors

| | **Mean (ref. group)** | **Std. dev.** | **Young** | **Old** | **Female** | **University** |
|---|---|---|---|---|---|---|
| ASC (option with no label) | -41.9*** | 34.7*** | 12.9*** | -12.2*** | -7.9** | -4.9 |
| Antibiotics use: no restriction | -10.1*** | 6.9*** | 1.4 | -0.18 | -4.2** | -7.0*** |
| Antibiotics use: full restriction | 7.1*** | 7.1*** | 0.07 | 0.41 | -1.1 | -1.4 |
| Animal welfare: lacking | -12.9*** | 5.5** | -2.9 | -0.01 | -5.2*** | -1.8 |
| Animal welfare: very good | 3.7** | 8.8*** | 0.1 | -3.7* | 6.0*** | -2.9* |
| Climate impact: large | -3.9* | 11.4*** | 0.04 | -1.8 | -2.5 | -2.0 |
| Climate impact: small | 4.6*** | 4.6 | -1.2 | -0.7 | -1.0 | 1.7 |
| Healthiness: unhealthy | -9.0*** | 10.1*** | -8.3*** | 1.1 | -4.8** | -4.2* |
| Healthiness: healthy | 9.3*** | 3.3 | -2.1 | 3.3 | 1.2 | -0.3 |
| No. of obs. | 4,116 | | | | | |
| Adjusted R2 | 0.325 | | | | | |

***, **, and *= significance at 1, 5, and 10 %, respectively.

Note: Model estimated with simulated maximum likelihood using 1,000 Halton draws. 1 SEK ≈ 0.10 USD at the time of the survey.

**Table 5.** Estimated means and standard deviations from WTP space model with socio-economic and behavioral factors

| | **Mean (ref group)** | **Std. dev.** | **Young** | **Old** | **Female** | **University** | **Buy eco** | **Buy Swedish** | **Buy healthy** |
|---|---|---|---|---|---|---|---|---|---|
| ASC (option with no label) | -16.9*** | 32.5*** | 13.6*** | -15.4*** | -3.7 | -1.9 | -10.9*** | -21.8*** | -8.6** |
| Antibiotics use: no restriction | -6.8** | 6.7*** | 1.7 | -0.63 | -4.3** | -6.5*** | 0.42 | -4.4 | |
| Antibiotics use: full restriction | 2.4 | 6.5*** | 0.08 | 1.4 | -.1.7 | -1.9 | 1.5 | 4.8* | |
| Animal welfare: lacking | -11.6*** | 6.7*** | -2.2 | -0.9 | -4.0** | -1.3 | -5.4*** | 0.6 | |
| Animal welfare: very good | 1.2 | 9.0*** | 0.7 | -3.7* | 6.9*** | -2.9 | -2.8 | 3.9 | |
| Climate impact: large | 1.4 | 11.5*** | -0.04 | -3.4 | -1.8 | -1.6 | -1.3 | -5.8 | |
| Climate impact: small | 1.0 | 5.1 | -0.6 | -0.1 | -0.01 | 2.3 | 3.0 | 1.4 | |
| Healthiness: unhealthy | -9.0*** | 11.2*** | -7.5** | 0.8 | -5.0** | -4.2* | | | -0.7 |
| Healthiness: healthy | 8.6*** | 5.7*** | -1.7 | 3.9* | 1.2 | -0.1 | | | 0.9 |
| No. of obs. | 4,116 | | | | | | | | |
| Adjusted R2 | 0.336 | | | | | | | | |

***, **, and *= significance at 1, 5, and 10 %, respectively.

Note: Model estimated with simulated maximum likelihood using 1,000 Halton draws. 1 SEK ≈ 0.10 USD at the time of the survey.

*3.3 Cognitive and value judgement roles of food labels*

We have presented results about how consumers would act in a market with new labeling schemes. In addition, we want to understand what drives the behavior and the WTP for products displaying studied type of labels. In order to investigate how the implicit value judgements and the the simplification of the decision process affect WTP, we compare the WTP from the version with traffic-lights with those from the two other versions. In Table 6, we report MWTP estimates for the three survey versions, the differences in MWTP and results from z-tests of whether the differences are statistically significantly different from zero.

**Table 6**. Comparisons between the traffic-light, grey-color, and plain-text versions.

| | **MWTP** | | | **Differences** | | |
|---|---|---|---|---|---|---|
| | **Traffic light (1)** | **Grey color (2)** | **Plain text (3)** | **(1) vs (2)** | **(2) vs (3)** | **(1) vs (3)** |
| ASC (option with no label) | -46.9*** | -49.9*** | -55.1*** | 3.0 | 5.2 | 8.2** |
| Antibiotics use: no restriction | -14.3*** | -12.9*** | -11.2*** | -1.4 | -1.7 | -3.1** |
| Antibiotics use: full restriction | 6.1*** | 4.0*** | 4.9*** | 2.1* | -.85 | 1.2 |
| Animal welfare: lacking | -16.0*** | -15.9*** | -14.5*** | -0.16 | -1.50 | -1.7 |
| Animal welfare: very good | 4.4*** | 5.2*** | 5.9*** | -0.84 | -0.70 | -1.6 |
| Climate impact: large | -5.9*** | -6.6*** | -3.2*** | 0.66 | -3.44** | -2.8* |
| Climate impact: small | 4.5*** | 3.0*** | 3.3*** | 1.50 | -0.31 | 1.2 |
| Healthiness: unhealthy | -13.4*** | -15.0*** | -15.7*** | 1.62 | 0.66 | 2.3 |
| Healthiness: healthy | 10.0*** | 6.7*** | 6.9*** | 3.2*** | -0.24 | 3.0** |

***, **, and *= significance at 1, 5, and 10 %, respectively.

Note: Model estimated with simulated maximum likelihood using 1,000 Halton draws. 1 SEK ≈ 0.10 USD at the time of the survey.

Comparing the traffic-light version with the plain-text version, we see that there is an overall sizeable impact of designing the labels in a more visible and understandable way and inducing injunctive norms about the choices on MWTP. The differences in MWTP are statistically significant for one of the levels for three of the attributes: antibiotics use, climate impact, and healthiness. In all these cases, MWTP is higher in the traffic-light version. On the other hand, the MWTP for avoiding the alternative with no label is significantly higher in the plain-text version. If we compare the traffic-light version with the grey-scale version, we see that the differences are rather small, and there are only two statistically significant differences, namely for the antibiotics and the healthiness attributes. If we then compare the grey-scale version with the plain-text version, we see only one statistically significant difference in MWTP, namely for the climate impact attribute. This gives us a mixed picture of why using traffic light ratings affect behavior and increase MWTP. While it for antibiotics seems to be the injunctive norm that changes the behavior, for climate impact it seems to have more to do with that the grey-

scale version improving cognition.[6] For the healthiness attribute, it seems to be a combination of both effects. Also note that the differences in how much more the respondents would pay for a labeled lasagna compared with an unlabeled one, which we estimate by taking the ratio of the ASC to the price coefficient, is largest in the plain-text version and significantly larger in the traffic-light version.

## 4. Conclusions

Overall, there seems to be a considerable willingness to pay for some aspects or properties of the food bought. On average, Swedish people are willing to pay more than an additional 50% for food that is labeled as healthy. The MWTP for the highest level of the healthiness attribute is on average 10 SEK for the highest level compared with the medium level of the attribute. They have similar levels of WTP for some public good attributes, e.g., animal welfare and avoiding overuse of antibiotics. Their interest in a label for climate-related emissions is also sizeable but considerably smaller, corresponding to around 20% of the base price. The increase in WTP from inferior to adequate levels in all attributes are systematically larger compared with those from adequate to good conditions, implying decreasing marginal returns to restriction in antibiotics use, climate impact reduction, healthiness of food, and animal welfare. Moreover, the highest MWTP estimates are for those labels moving from the lowest animal welfare level and no restrictions in antibiotics use. A possible explanation for the high MWTP for the antibiotics attribute is that our respondents may have felt uneasey about the use of antibiotics in meat production: 77 percent of the them answered that organic meat from other countries in the EU can have some antibiotics left in it and as many as 25 percent believed that also Swedish meat could contain antibiotics (both statements are incorrect).

Regarding socio-economic and behavioral characteristics as drivers of the choices made, we find a sizeable difference between men and women. Female respondents were less likely to choose the alternative without labels and they have a higher average willingness to pay for all attributes except the climate impact one. University-educated and young respondents have a higher WTP for avoiding unhealthy food. Among the behavioral characteristics, those who regularly buy Swedish organic food have a higher WTP for avoiding poor animal welfare, while those regularly buying Swedish meat have a higher WTP for a label with the strictest use of

[6] We do not find, however, any differences across the three versions considering the stated difficulty respondents experienced in making choices in the CE. The mean values are, in all versions, just above 2 (on 1 (not at all difficult)–4 (very difficult) scale).

antibiotics compared with other consumers. The behavioral characteristics seem also to drive a general interest in buying labeled products, since the two largest interaction terms are with the ASC. People who currently buy eco-labelled or Swedish meat are considerably more likely to avoid the no-label option. Finally, mixed results emerge regarding the traffic light's normative messages. While the MWTPs are higher compared with the plain-text labels for three attributes, the comparison with the version with grey-scale labels indicates that only antibiotics shows signs of being driven primarily by injunctive norms. Climate impact, on the other hand, appears to be driven by improved cognition, while healthiness shows signs of both effects. Hence, for policy making, it is valuable to understand that traffic-light labeling does not only ease the cognitive burden of making choices, but also that it affects people's actions by signaling what is appropriate behavior.

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## APPENDIX A

### Table A1. Attributes, the description of the attributes, and the attribute levels, survey version with traffic lights.

| Attribute | Description | Attribute levels | |
|---|---|---|---|
| ***Antibiotics use*** | Antibiotics use in meat production entails a risk for antibiotics resistant bacteria to spread. This could complicate the treatment of bacterial infections such as tonsillitis and surgery-related infections in humans. Since antibiotics-treated animals have to wait a while before being slaughtered, there is no risk acquiring resistant bacteria from ingestion of the meat. Reduced usage of antibiotics reduces the risk for antibiotics-resistant bacteria. | No restriction: Antibiotics may be used to prevent diseases as prescribed by veterinarians, and for growth-promotion in healthy animals. | 🔴○○ |
| | | Some restrictions: Antibiotics may *not* be used for growth-promotion purposes, but to prevent diseases as prescribed by veterinarians. | ○🟡○ |
| | | Full restriction: Antibiotics may *not* be used for growth-promotion, but for ill animals as prescribed by veterinarians. | ○○🟢 |
| ***Animal welfare*** | Well-being among animals depends on, e.g., the stable environment and if they have opportunities for grazing. Stable environment denotes aspects such as spaciousness, access to a dry sleeping area, hygiene, noise level, and access to food and water. | Lacking: Lacking stable environment and no opportunities for grazing | 🔴○○ |
| | | Medium: Good stable environment and opportunities for grazing | ○🟡○ |
| | | Very good: Very good stable environment and opportunities for grazing | ○○🟢 |
| ***Climate impact*** | Animal keeping generates one fifth of total global emissions of greenhouse gases. Emission levels depend on animal species, where beef have the largest impact. The emissions from cows depend on, e.g., the animals' lifespan and the amount and type of fodder. The label describes the amount of the meat's emissions in kg greenhouse gases emitted per portion (1 kg is equivalent to driving a car approximately 5 kilometers). | Large: More than 4 kg | 🔴○○ |
| | | Medium: 3–4 kg | ○🟡○ |
| | | Small: Less than 3 kg | ○○🟢 |
| ***Healthiness*** | Reports how healthy the product is. The label is based on the Swedish Food Agency's recommendations and depends on the amount of sugar, salt and fat (low amounts are good) as well as whole grains and fibers (high amounts are good). | Unhealthy: The product meets none of the recommended levels. | 🔴○○ |
| | | Quite healthy: The product meets two of the five recommended levels. | ○🟡○ |
| | | Healthy: The product meets all the recommended levels. | ○○🟢 |
| *Price* | The price of the lasagna. The average price today is 25 SEK | 30, 35, 40, 45, 50, 55 SEK | |