THE UNIVERSITY OF MELBOURNE

# Welcome to the (label) jungle? Analyzing how consumers deal with intra-sustainability label trade-offs on food

Winnie Isabel Sonntag, Dominic Lemken, Achim Spiller, Maureen Schulze

*Food Quality and Preference (2023)*

**Changfa FU**

We acknowledge and pay respect to the Traditional Owners of the lands upon which our campuses are situated

# What makes your food decisions?

Drivers in food purchase decisions (Yadav, 2016):

- Altruistic buying motives
  - Concerns for others' well-being (e.g., animal welfare)
  - Society in general (e.g., climate protection)
- Egoistic buying motives
  - Maximization of personal interests (e.g., price, taste)
  - Health concerns

Decision-making

- Product attributes
- Sustainability attributes
  - Awareness
  - Understanding
  - Credibility


# Study Aim

## Existing Literature

- Individual labels and intra-sustainability label trade-offs
- Trade-offs between price and sustainability labels or other product-specific attributes

## Research Gap

- Complex interaction effects of different scores / combination of labels on a product

## Research Aim

- Consumers' **WTP for individual sustainability labels** when buying **animal products**
- Interaction effects of **multi-level sustainability** labels in a (potentially conflicting) **combination**

Research Question

(1) Which sustainability label is more important to consumers and shows greater effects?

(2) In case there are several positive or several negative labels on one product: What is the additional benefit of another label?

(3) How do consumers deal with the conflicting situation when one label is positive and the other negative, which is increasingly the case with multi-level and (quasi-)mandatory labels? Do they weight these results against each other?

# Multi-Labels

More than 1 label may decrease marginal utility of the individual labels (Gerini et al., 2016)

- Alter consumer to intra-sustainability trade-offs (Luchs and Kumar, 2017)
- Cognitive biases to reduce mental effort in a decision situation (Tversky and Kahneman, 1974)
- Halo effect can lead to a product being bought for the wrong motive
  - Sustainable food (Green) => healthier
- Adverse selection can lead to distrust due to information overload

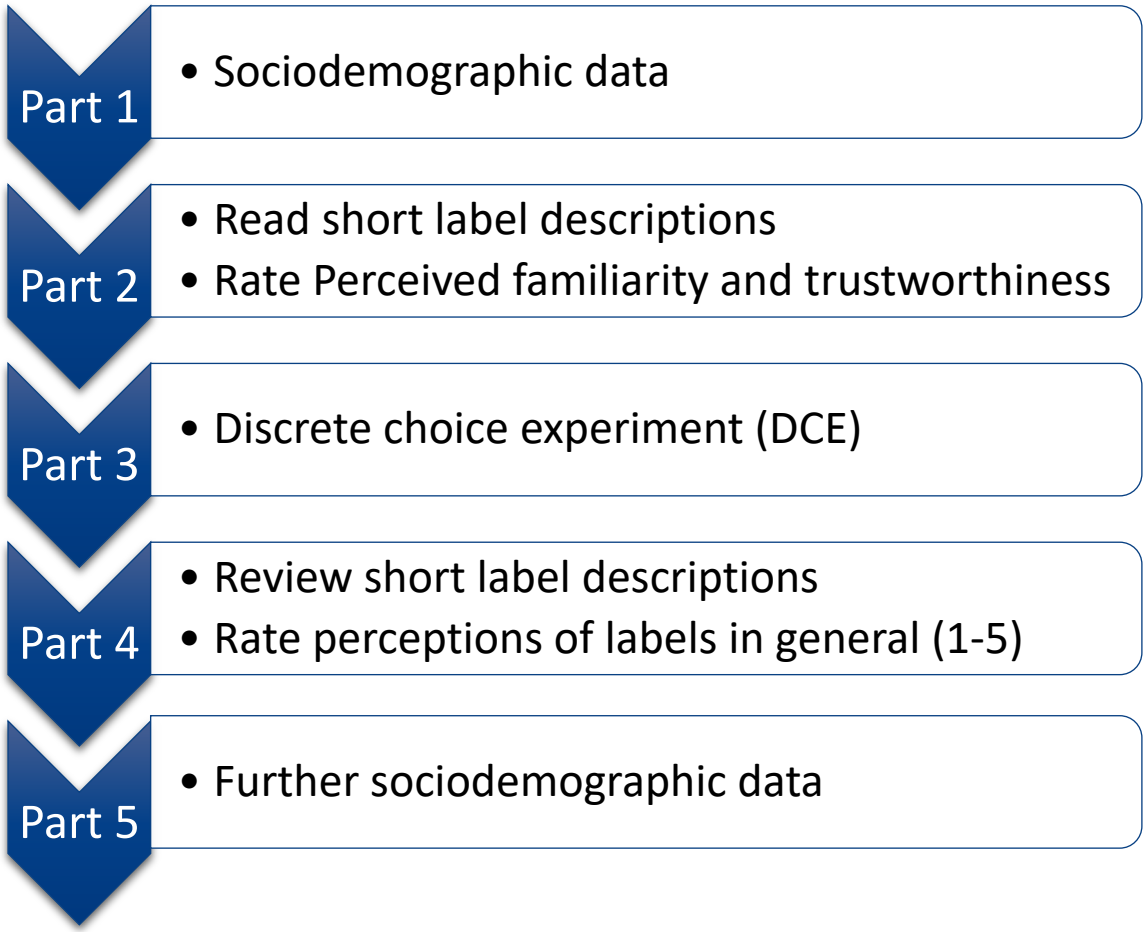

# Experiment: Discrete Choice Experiment

Sustainability dimensions and label selection (EU)

- Health: Nutri-Score
- Ethics: Animal welfare label (“Haltungsform”)
- Environmental: organic label and the climate label (carbon footprint)

Online survey / Experiment (Norstat):

- Gender, age, income, and place of residence were used as quota parameters to mimic the German population.
- Participants:
  - 1084 (18 and 86 years old)
  - 985 valid respondents
  - 50.8 % female; 48.9 % male



# Attributes and levels used in the choice experiment

Design mechanism

- DCE: adequate to measure consumers' trade-offs
  - An established approach in marketing research based on a household survey (Gracia, Loureiro, & Nayga, 2009).
  - In line with random utility theory (McFadden, 1974)
  - Follows Lancasterian consumer theory (Lancaster, 1966)
- Cheap talk script: avoid bias due to hypothetical nature
  - Explain hypothetical bias to participants before answering WTP questions (Cummings & Taylor, 1999)
- Participants randomly assigned
- Choice set in randomised order
- Half of the respondents for chicken breast (n = 482) and the others for whole milk (n = 503).

| Attribute | Level |
|---|---|
| Price | Whole milk (€/l): 0.76, 0.96, 1.16, 1.36, 1.56 |
| | Chicken breast (€/400g): 2.58, 5.58, 8.58, 11.58, 14.58 |
| Organic label | None |
| | Organic label |
| Nutri-Score | None |
| | Level B |
| | Level D |
| Climate label | None |
| | Low climate impact |
| | High climate impact |
| Animal welfare label | None |
| | Stable-based plus |
| | Outdoor access |


# Label Combinations

d-efficient design: two-way interactions to reduce choice sets number to 28

- The blocking technique reduces the number of choice sets for each participant to 7 sets

1. Organic vs. poor Nutri-Score
2. Organic vs. poor climate rating
3. Organic vs. poor animal welfare
4. Positive animal welfare vs. poor Nutri-Score
5. Positive animal welfare vs. poor climate rating
6. Positive Nutri-Score vs. poor climate rating
7. Positive Nutri-Score vs. poor animal welfare

Impossible

Each choice set consisted of three varying alternatives and a non-purchase option


# Statistical analysis

The choice-based conjoint is consistent with the random utility theory (McFadden, 1986).

- Individual n derives utility Unat from the choice alternative a in a given choice set t.
- Random parameter logit (RPL) model: Assume product-specific parameters follow a random distribution.
  - Account for consumer heterogeneity concerning product-specific attributes.
  - Fixed parameters (β1): Attribute levels of labels (Xnat), and interaction effects (XX)
  - Random parameter (β2): Price (Pnat) assuming a normal distribution.

  Utility functions estimated:

  - $U_{nat} = \mu_a + X_{nat}\beta_1 + p_{nat}\beta_2 + \varrho_{nat}$
  - $U_{nat} = \mu_a + X_{nat}\beta_1 + p_{nat}\beta_2 + XX_{nat}\beta_3 + \varrho_{nat}$
    - μa, alternative relative to the no-purchase option
  - $WTP = \frac{\beta_{attribute}}{\beta_{price}}$

# Results: Familiarity & Trustworthiness of Labels

Table 3. Perception of used sustainability labels.

| | Nutri-Score (%) | Animal Welfare Label (%) | Climate Label (%) | Organic Label (%) |
|---|---|---|---|---|
| *Do you know these labels from your daily grocery shopping?* | | | | |
| Unknown[1] | 38.4 | 27.8 | 59.4 | 4.7 |
| Partly/partly | 18.2 | 15.4 | 16.9 | 7.2 |
| Known[2] | 43.1 | 56.4 | 23.4 | 87.8 |
| *How trustworthy do you find these labels?* | | | | |
| I do not trust[5] | 19.5 | 16.1 | 23.5 | 23.0 |
| Partly/partly | 41.2 | 36.6 | 48.0 | 38.2 |
| I trust[6] | 39.1 | 47.0 | 28.3 | 38.7 |
| *Do you consider these labels when grocery shopping?* | | | | |
| No[3] | 51.7 | 29.7 | 61.2 | 30.7 |
| Partly/partly | 26.5 | 24.1 | 25.2 | 26.8 |
| Often[4] | 21.5 | 46.0 | 13.2 | 42.2 |

Source: Own calculation; [1]Combination of "Unknown" and "Rather unknown"; [2]Combination of "Known" and "Rather known"; [3]Combination of "Never" and "Rare"; [4]Combination of "Often" and "Very often"; [5]Combination of "I do not trust" and "I rather do not trust"; [6]Combination of "I trust" and "I rather trust".

# Results: WTP for sustainability labels: chicken breast

| | Mean (€/400g) | 95% CI | Mean[1] (%) |
|---|---|---|---|
| **Main effect** | | | |
| *Organic label* [1] | | | |
| Organic label | 0.98 | [0.52, 1.44] | 24.62 |
| *Nutri-Score label* [1] | | | |
| Level B | 2.10 | [1.49, 2.69] | 52.76 |
| Level D | −1.78 | [−2.40, −1.18] | −44.72 |
| *Climate label* [1] | | | |
| Low climate impact | 1.70 | [1.28, 2.20] | 42.71 |
| High climate impact | −1.62 | [−2.18, −1.06] | −40.70 |
| *Animal welfare label* [1] | | | |
| Stable-based plus | −0.81 | [−1.32, −0.30] | −20.35 |
| Outdoor access | 1.26 | [0.80, 1.73] | 31.66 |

Most: No Significant Interaction Effects

| Interaction effect | | | |
|---|---|---|---|
| Positive×Negative | | | |
| Organic×NS D | 0.18 | [−0.22, 0.58] | 4.52 |
| Organic×High climate impact | −0.38 | [−0.73, −0.02] | −9.55 |
| Organic×Stable-based plus | 0.08 | [−2.5, 0.41] | 2.01 |
| Low climate impact×NS D | 0.05 | [−0.28, 0.38] | 1.26 |
| Low climate impact×Stable-based plus | 0.16 | [−0.18, 0.50] | 4.02 |
| High climate impact×NS B | −0.52 | [−0.90, −0.14] | −13.07 |
| High climate impact×Outdoor access | −0.07 | [−0.44, 0.37] | −1.76 |
| NS B×Stable-based plus | 0.02 | [−0.34, 0.35] | 0.50 |
| NS D×Outdoor access | 0.34 | [−0.00, 0.68] | 8.54 |
| Positive×Positive | | | |
| Organic×NS B | −0.53 | [−0.86, −0.19] | −13.32 |
| Organic×Low climate impact | −0.15 | [−0.40, 0.14] | −3.77 |
| Organic×Outdoor access | −0.31 | [−0.63, 0.01] | −7.79 |
| Low climate impact×NS B | −0.28 | [−0.62, 0.06] | −7.04 |
| Low climate impact×Outdoor access | −0.20 | [−0.50, 0.11] | −5.03 |
| NS B×Outdoor access | −0.08 | [−0.43, 0.24] | −2.01 |
| Negative×Negative | | | |
| High climate impact×NS D | 0.00 | [−0.38, 0.42] | 0.00 |
| High climate impact×Stable-based plus | 0.49 | [0.10, 0.91] | 12.31 |
| NS D×Stable-based plus | −0.10 | [−0.48, 0.27] | −2.51 |

# Results: WTP for sustainability labels: whole milk

| | Mean (€/l) | 95% CI | Mean[1] (%) |
|---|---|---|---|
| Main effect | | | |
| *Organic label* [1] | | | |
| Organic label | 0.02 | [−0.13, 0.13] | 2.17 |
| *Nutri-Score label* [1] | | | |
| Level B | 0.30 | [0.14, 0.45] | 32.61 |
| Level D | −0.25 | [−0.42, −0.08] | −27.17 |
| *Climate label* [1] | | | 0.00 |
| Low climate impact | 0.40 | [0.28, 0.59] | 43.48 |
| High climate impact | −0.55 | [−0.82, −0.38] | −59.78 |
| *Animal welfare label* [1] | | | |
| Stable-based plus | −0.24 | [−0.40, −0.11] | −26.09 |
| Outdoor access | 0.23 | [0.11, 0.35] | 25.00 |

Most: No Significant Interaction Effects

| Interaction effect | | | |
|---|---|---|---|
| Positive×Negative | | | |
| Organic×NS D | 0.02 | [−0.9, 0.12] | 2.17 |
| Organic×High climate impact | 0.07 | [−0.009, 0.17] | 7.61 |
| Organic×Stable-based plus | 0.10 | [0.02, 0.21] | 10.87 |
| Low climate impact×NS D | −0.07 | [−0.17, 0.01] | −7.61 |
| Low climate impact×Stable-based plus | 0.02 | [−0.07, 0.12] | 2.17 |
| High climate impact×NS B | 0.06 | [−0.26, 0.17] | 6.52 |
| High climate impact×Outdoor access | 0.04 | [−0.05, 0.16] | 4.35 |
| NS B×Stable-based plus | 0.04 | [−0.05, 0.13] | 4.35 |
| NS D×Outdoor access | 0.07 | [−0.02, 0.17] | 7.61 |
| Positive×Positive | | | |
| Organic×NS B | −0.08 | [−0.18, 0.001] | −8.70 |
| Organic×Low climate impact | 0.01 | [−0.05, 0.08] | 1.09 |
| Organic×Outdoor access | 0.03 | [−0.05, 0.12] | 3.26 |
| Low climate impact×NS B | 0.002 | [−0.08, 0.09] | 0.22 |
| Low climate impact×Outdoor access | −0.01 | [−0.09, 0.06] | −1.09 |
| NS B×Outdoor access | −0.06 | [−0.16, 0.01] | −6.52 |
| Negative×Negative | | | |
| High climate impact×NS D | 0.02 | [−0.08, 0.12] | 2.17 |
| High climate impact×Stable-based plus | 0.17 | [0.72, 0.32] | 18.48 |
| NS D×Stable-based plus | −0.02 | [−0.13, 0.08] | −2.17 |

# Discussion: which sustainability label individually had the highest utility for decisions

Highest WTP

- Chicken breast: Nutri-Score (B), followed by the climate label (low)
- Whole milk: climate label (low)

Low impact factor: organic label on both

- High awareness, but low trustworthiness

Important factor: climate label (carbon footprint for production)

- Awareness of climate change
- Not yet well-developed

# Discussion: what happens if there are two positive labels on one product

Both positive labels bring more customer benefits and thus a higher WTP

- Additional information
- Increase in customer benefit

But the marginal utility of the second label has a decreasing tendency

# Discussion: how consumers deal with the conflicting situation

| Label | WTP Chicken Breast | WTP Whole Milk |
|---|---|---|
| Organic | +0.98 | +0.02 |
| Nutri-Score (High) | +2.10/-1.78 | +0.30/-0.25 |
| Climate Impact (Low) | +1.70/-1.62 | +0.40/-0.55 |
| Animal Welfare (Good) | +1.26/-0.81 | +0.23/-0.24 |

Negative labels compensate the higher WTP of positive labels et vice versa

Spill-over effects from one label to another => rarely detected

- Consumer can handle two labels separately and value them individually
- Good understanding in multi-level labels, thus, less confusion and information overload

Multi-level labels has high impact

- Other positive labels cannot compensate negative forms of the following labels
  - Nutri-Score
  - Climate label

Increasing regulatory pressure and retailer requirements could lead  to negative labelling in the future

- Making above conflicting situation possible in real-life setting
- Negative + Negative situation

# Limitations & Implications

Confusion to participants due to **impractical label combination**

DCEs do not hold the **full complexity** of the decision-making process in a real-life setting

Solely examined **two-way interactions**

No **extreme scoring** verified the experiment

Limited food items, which may not be **generalisable** to other livestock products or other food categories

Limited demographics and labelling system (**Germany**)

**Label coloring** may affect consumer perception

# Michelle's comments/thoughts

- In 2021, the vegetarian/vegan population in Germany was 10% and 2%, respectively (Wiki)
  - Didn't control for this -> biased results
  - People can be vegan/vegetarian for non-sustainability reasons (such as religion)

- Didn't compare WTP of single attribute vs. 3 options in the DCE
  - This would show how the individual attribute values are combined/traded off

- Complexity
  - Modelled utility function was linear and interaction effects were mostly insignificant -> product attribute is simple, so perhaps sustainability factors were easy to value, what happens when the product itself has multiple attributes


- Didn't use control for individual preferences/attitudes towards sustainability factors in modelling
- No demo breakdown/lack individual differences analysis (ignored second part of the survey)

# References


Cummings, R. G., & Taylor, L. O. (1999). Unbiased Value Estimates for Environmental Goods: A Cheap Talk Design for the Contingent Valuation Method. *American Economic Review*, *89*(3), 649–665. https://doi.org/10.1257/aer.89.3.649

Gerini, F., Alfnes, F., & Schjøll, A. (2016). Organic- and Animal Welfare-labelled Eggs: Competing for the Same Consumers? *Journal of Agricultural Economics*, *67*(2), 471–490. https://doi.org/10.1111/1477-9552.12154

Gracia, A., Loureiro, M. L., & Nayga, R. M. (2009). Consumers' valuation of nutritional information: A choice experiment study. *Food Quality and Preference*, *20*(7), 463–471. https://doi.org/10.1016/j.foodqual.2009.03.010

Isabel Sonntag, W., Lemken, D., Spiller, A., & Schulze, M. (2023). Welcome to the (label) jungle? Analyzing how consumers deal with intra-sustainability label trade-offs on food. *Food Quality and Preference*, *104*, 104746. https://doi.org/10.1016/j.foodqual.2022.104746

Lancaster, K. J. (1966). A New Approach to Consumer Theory. *Journal of Political Economy*, *74*(2), 132–157. https://www.jstor.org/stable/1828835

Luchs, M. G., & Kumar, M. (2017). "Yes, but this Other One Looks Better/Works Better": How do Consumers Respond to Trade-offs Between Sustainability and Other Valued Attributes? *Journal of Business Ethics*, *140*(3), 567–584. https://doi.org/10.1007/s10551-015-2695-0

McFadden, D. (1974). Conditional Logit Analysis of Qualitative Choice Behavior. In *Frontiers in econometrics* (pp. 105–142). Academic Press.

McFadden, D. (1986). The Choice Theory Approach to Market Research. *Marketing Science*, *5*(4), 275–297. https://doi.org/10.1287/mksc.5.4.275

Tversky, A., & Kahneman, D. (1974). Judgment under Uncertainty: Heuristics and Biases: Biases in judgments reveal some heuristics of thinking under uncertainty. *Science*, *185*(4157), 1124–1131. https://doi.org/10.1126/science.185.4157.1124

Yadav, R. (2016). Altruistic or egoistic: Which value promotes organic food consumption among young consumers? A study in the context of a developing nation. *Journal of Retailing and Consumer Services*, *33*, 92–97. https://doi.org/10.1016/j.jretconser.2016.08.008

THE UNIVERSITY OF MELBOURNE

# Thank you