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Enhancing Sustainability Label Effectiveness Through Logo Design Modification: An Analysis of the EU Green Leaf Logo

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ABSTRACT

Sustainability labels can help support consumers select more socially and environmentally friendly options, thereby enhancing returns for conscientious producers and promoting the transition to a more sustainable food system. However, consumer confusion regarding labels' meaning undermines their effectiveness. This holds especially for labels that are abstract in nature and lack concreteness. Could simple modifications to the design of such logos enhance consumer perceptions and purchase intentions? Two studies, drawing on signaling theory and using the EU organic green leaf logo as an example, reveal that design changes that improve signal clarity induce more favorable label perceptions (Study 1, seven countries, $N = 9378$) with Study 2 (Germany, $N = 498$) uncovering the mechanism by which this occurs. Specifically, Study 2 demonstrates that logo modifications that improve signal clarity, reduce consumer uncertainty, which in turn improves trust and ultimately consumers' intentions to use the label. These findings deepen understanding of how policymakers can improve the effectiveness of sustainability labels through targeted logo modifications.

1 | Introduction

Today's food system contributes roughly 30% of global greenhouse gas emissions, drives 80% of tropical deforestation, and is a major factor in biodiversity loss, land degradation, and water scarcity (Von Braun et al. 2023), underscoring the urgent need for sustainable transformation. Consumer choices are central to this transition; the consumption decisions people make drive the adoption of sustainable practices that help build a more resilient food system. Sustainable food labels are designed to assure consumers that products adhere to specific social and ecological standards. A wide variety of these labels exist, reflecting credence qualities, such as organic, fair trade, and animal welfare, and serving as essential tools for communicating a product's production methods (Gorton et al. 2023; Carlsson et al. 2022; Annunziata et al. 2019). Well-designed labels cannot only increase the likelihood of consumers choosing more sustainable options (Carlsson et al. 2022; Maier 2024; Vlaeminck et al. 2014) but also improve producers' returns (Connor et al. 2022), thereby fostering a shift toward more environmentally and socially responsible food systems (Sponagel et al. 2024; Majer et al. 2022).

However, many labels fall short because they either fail to capture attention, lack sufficient clarity, or mislead consumers (Moon et al. 2017; Brécard 2014; Gorton et al. 2023; Global Health Advocacy Incubator 2021; Annunziata et al. 2019; McLeod et al. 2024). This has increased the political salience of food labels (Kneafsey et al. 2021), with widespread fears that

consumers lack relevant information on which to make informed choices (FAO 2016; Global Health Advocacy Incubator 2021). Particular controversies surround the appropriate form of front-of-pack nutrition labelling and the classification of particular foods (Julia et al. 2025; Global Health Advocacy Incubator 2021), as well as concerns that existing labels are ineffective in promoting more sustainable consumption choices (Lin and Nayga 2022; Maier 2024; McLeod et al. 2024). This motivates research into more effective labeling strategies (Sigurdsson et al. 2022; Vázquez et al. 2023; Majer et al. 2022; Torma and Thøgersen 2024).

A substantial body of literature examines various aspects of logo design, including the effects of color (Cabrera et al. 2017; Gislason et al. 2020; Hellier et al. 2012; de Sousa et al. 2020; Thøgersen and Nielsen 2016), font (Henley et al. 2011; Costello et al. 2003), label shape (Khandpur et al. 2019; de Sousa et al. 2020), text and/or pictorial elements (Morgan et al. 2021, Macht et al. 2025) and design complexity (Donato and Adıgüzel 2022) on consumer perceptions. This study establishes that logo design matters (Corallo et al. 2021), with even subtle changes in colors, images, and text having the potential to affect significantly consumer responses (Morgan et al. 2021). While much of this study derives from a brand management perspective, recent studies address sustainability labels (e.g., Macht et al. 2025, Stephansen and Lane 2024; Donato and Adıgüzel 2022; Corallo et al. 2021; Meyerding et al. 2019). However, both streams of literature have largely neglected the causal mechanisms that drive logo effectiveness.

To bridge this gap and deepen our understanding of label effectiveness, we introduce a conceptual framework, drawing on signaling theory–which at its core addresses how to reduce information asymmetry between two parties (Spence 1973). According to signaling theory, a key function of a label is to reduce consumer uncertainty. A label that provides clear and credible information reduces uncertainty thereby increasing trust and behavioral intentions to use the label in decision making. The framework is empirically tested and validated in two studies focusing on the EU organic "green leaf" logo.

The EU "green leaf" organic logo was introduced in 2010 under Council Regulation (EC) No 834/2007 and Commission Regulation (EC) No 889/2008. Through the launch of the "green leaf" logo, the European Commission (EC) aimed to enhance consumer recognition of organic products, reduce confusion, and create a Single Market for certified organic products within the EU (European Commission 2010). This initiative acknowledged that while some Member States had well-known and highly regarded national organic labels, such recognition was not universal. Even when a national label is popular domestically, it may be poorly recognized or understood in other Member States (Janssen and Hamm 2012). By standardizing the organic logo, the EC sought to increase consumer confidence that any product bearing the label complies with EU organic production regulations, thus supporting a unified market for green products (Zander et al. 2015). However, despite being mandatory on all pre-packaged products containing at least 95% organic ingredients since 2010, a recent Eurobarometer survey (European Commission 2024) reveals that only 56% of the EU population is aware of the label—and this awareness has been declining. Moreover, Hartmann et al. (2019) found that among consumers who recognize the EU organic label, only 45% understand that it signifies compliance with EU organic guidelines—a finding echoed in other studies (Zander et al. 2015). While the existing literature documents the limited consumer recognition, knowledge, and usage of the green leaf logo label (European Commission 2024; Hartmann et al. 2019; Zander et al. 2015), it pays little attention to exploring potential improvements. Notably, to our knowledge, prior studies have not examined whether modifying the green leaf design could enhance its effectiveness—though this has been recommended by policymakers (European Committee of the Regions 2021).

To examine how logo modifications influence sustainability label effectiveness, we therefore use the EU organic label as a case study. Leveraging signaling theory, we assess the impact of two specific design modifications of the green leaf logo on consumers' perceptions. This occurs through two studies. Specifically, Study 1 empirically assesses consumer perceptions associated with the EU organic label, comparing the standard logo to two versions modified by the addition of the terms "ECO" or "ECO EU certified." Data were collected from participants in seven European countries, and the findings provide robust support for the positive effects of these modifications on consumer evaluations. Study 2 investigates the causal mechanisms underlying these improvements, identifying how the modifications reduce consumer uncertainty, which in turn enhances trust and influences consumers' intentions to use a food quality label in decision-making. The research responds to recent calls for "experimental designs that would analyze the efficiency of sustainability labels" (Vázquez et al. 2023, 127) and offers important insights for both practitioners and policymakers seeking to improve sustainable label effectiveness.

The paper is structured as follows. The next section provides a succinct review of the literature on logo design, followed by a discussion of theoretical perspectives on sustainability label design, introducing hypotheses relating to uncertainty reduction, label trust, and behavioral intentions. Next, Studies 1 and 2 are presented, detailing data sources, methods, and empirical results. A discussion of policy implications and conclusions follows.

2 | Conceptual Framework and Hypotheses Development

Process characteristics such as organic production or animal welfare are credence attributes that consumers cannot verify easily, either before or after purchase, and consumption (Daugbjerg et al. 2014; Yang et al. 2020). These quality attributes can support selling a product at a significantly higher price, thus generating a substantial price premium (e.g., Li and Kallas 2021). Because sellers typically know more about a product's true quality than buyers, a situation known as asymmetric information, there is a risk that sellers may behave opportunistically, taking advantage of this knowledge gap through dishonest practices that can lead to market failure (Akerlof 1970).

According to signaling theory (Spence 1973), actors marketing goods and services with superior qualities have an incentive to communicate (signal) such information to reduce information

asymmetry with buyers, allowing the latter to make better-informed decisions (Connelly et al. 2011; Bergh et al. 2014). Sustainability labels are signals regarding a product's environmental or social characteristics, which can reduce information asymmetry and transform credence attributes into quasi-search ones (Perrini et al. 2010; Gorton et al. 2021). However, while some signals can be easily and correctly interpreted by consumers, others lack clarity (Erdem and Swait 1998). Signaling theory suggests that consumers, *ceteris paribus*, prefer a high level of signal clarity as that best reduces asymmetric information, and thus helps them make choices consistent with their preferences (Connelly et al. 2011; Dang and Nguyen Viet 2021). In contrast, ambiguous stimuli which allow for multiple interpretations are of limited utility to consumers, as they impede their ability to judge a product's true quality (Hoch and Ha 1986). Empirical evidence supports the notion that greater signal clarity improves consumer reactions to a brand (Erdem and Swait 1998). More specifically, research indicates that German consumers prefer products featuring the national organic label over those with the EU organic label (Yeh et al. 2021; Jürkenbeck 2023). This is particularly noteworthy given that both labels adhere to the same organic standards, yet only the EU label is mandatory on product packaging. This discrepancy might be explained by the fact that the EU label is perceived as abstract and ambiguous (Anastasiou et al. 2017), whereas the German national label is more straightforward, explicitly emphasizing the product's organic nature by using the term "Bio." Consequently, we expect that a modification of a sustainable label that improves signal clarity will induce a more favorable perception of the label, leading us to H1:

H1. *Label design* (*original label vs. Modification* 1/*Modification* 2) *influences label perception. A label design with greater label clarity leads to more favorable label perceptions.*

To test H1, we modified the label design of the green leaf logo by adding the information "ECO" (Modification 1) or "ECO EU certified" (Modification 2)[1] to improve signal clarity and test whether these modifications are successful.

While previous research reveals that signal clarity matters, there is a lack of understanding of the specific mechanisms by which label clarity affects consumers' intention to use a label in the decision-making process. In the following, we derive a model, consistent with signaling theory that allows for a better understanding of this mechanism. The concept of uncertainty underpins the model.

Uncertainty reflects a critical lack of knowledge (Aspers 2018), in our case regarding the sustainability-related attributes of a product. Accordingly, uncertainty reduction refers to an increase in knowledge that allows an actor to better perform a task (Liu and Hart 2011; Aspers 2018). Signaling theory argues that for signals to be effective they must increase the relevant knowledge of an intended recipient so that the latter can make better informed decisions (Connelly et al. 2011). Sustainable labels seek to reduce uncertainty, converting credence attributes into quasi-search ones, thereby easing consumers' decision-making (Perrini et al. 2010; Verbeke and Ward 2006). However, the extent to which such labels increase knowledge and reduce uncertainty varies depending on the information transmitted. Some logos are purely image based like the EU green leaf organic label. Other labels combine supporting text with an image, such as the German organic label. Different images and text vary in terms of a recipient's ability to correctly decode the intended signal (Morgan et al. 2021). For instance, a label with the text "vegan" on a food product may be understood by most consumers as a food suitable for vegans, while a label with the text "V" could be interpreted by some to imply a vegetarian product, by others as a vegan product, and by a third group it might not be understood at all. Consequently, some labels provide greater signal clarity than others. Sustainable labels with ambiguities limit uncertainty reduction amongst recipients. Modifications of ambiguous labels that improve signal clarity are expected to lead to uncertainty reduction. Accordingly, we hypothesize:

H2. *Label design* (*original label vs. Modification* 1/*Modification* 2) *influences uncertainty. A label design with greater label clarity reduces uncertainty.*

Signaling theory proposes that recipients prefer unambiguous rather than ambiguous signals, so that they can make better informed decisions (Lee et al. 2005). Unambiguous signals are regarded as more honest and trustworthy (Johansen et al. 2013; Weber et al. 2004). In contrast, signals without a clear meaning frustrate recipients (Shiu et al. 2011) and are more likely to raise questions regarding the ability, benevolence, and integrity of the sender (Lee et al. 2005; Shiu et al. 2011). In other words, recipients trust ambiguous signals less (Weber et al. 2004). Consequently, we expect that a redesign of a sustainability label that improves signal clarity and reduces uncertainty, positively affects label trust so that:

H3. *Uncertainty reduction positively affects label trust.*

In his pioneering work, Spence (1973) demonstrates how signals may prevent or solve market failure, by creating a separating equilibrium, whereby there is at least one signal which is cheap enough, relative to the benefit, for truthful signalers to send but which is too costly, relative to the benefit, for dishonest signalers to send. Spence (1973) applies this theory to the case of the labor market and the use of higher educational qualifications as signals, arguing that more productive and able workers have greater ability to acquire the qualification at a lower cost than less able, low productivity workers. Consequently, higher educational qualifications are a useful and trusted signal for employers to use in their decisions regarding whom to hire. However, if a signal is not trusted, for instance, employers do not regard a degree qualification as a reliable signal of a job applicants' ability, it will be discounted in the decision-making process (Spence 1973). Consequently, the use of signals depends on their perceived trustworthiness, so that trust is a significant determinant of consumer behavior (Gefen et al. 2003; Morgan and Hunt 1994; Sirdeshmukh et al. 2002). Consistent with this, research on sustainable labels identifies trust as an antecedent of the behavioral intention of label use (Nuttavuthisit and Thøgersen 2017; Gorton et al. 2021; Wang et al. 2020; Taufique et al. 2017). Accordingly, we hypothesize:

H4. *Trust in a label positively affects the behavioral intention to use the label.*

Consequently, uncertainty reduction and label trust sequentially mediate the relationship between label clarity and behavioral intention to use the label (Figure 1).

3 | Study 1

Study 1 focuses on H1 and investigates the impact of label design on consumers' label perceptions across seven European countries. More specifically, Study 1 explores consumers' evaluation of the EU organic label and two label modifications.

3.1 | Data and Methods

The analysis is based on two pan-European consumer surveys conducted in the period 2017 and 2018 across seven European countries. We include France (FR), Germany (DE), Italy (IT) and the United Kingdom (UK), and thus four long term EU members, with the UK at the time of the survey on the way out of the EU, Hungary as a more recent member country, and Serbia and Norway as two countries associated with the EU. Norway is a member of the European Economic Area and thus part of the EU's single market, and Serbia was granted EU candidate status in March 2012. Survey participants were recruited in all countries via the marketing research company LiGHTSPEED. For each country, approximately 800 respondents took part in each survey. Overall, about 25% of respondents could be matched across the two surveys. The first consumer survey, conducted in Autumn 2017, focused on consumer evaluations of food logos, including the EU green leaf organic (referred to as the "original" logo in Figure 2). The second survey, conducted in summer 2018, integrated country-specific Discrete Choice Experiments (DCE) aimed at investigating the role of different logos in consumers' food choices. This part is not considered in the present study. In the second survey, however, we also tested modifications of the EU organic label by adding–depending on the language–the text "ECO" or "BIO" inside the green leaf for one group, and the text "ECO EU certified" or "BIO EU certified" for the second group of respondents (see logos in the second and third column of Figure 2). In both surveys of Study 1, respondents' perception of the labels (Survey 1 original logo, Survey 2 modified logo 1 in Group 1 and modified logo 2 in Group 2) was measured on a five-point Likert scale (where: 1 = do not agree at all; 5 = totally agree) according to their level of agreement on the following statements: "the label is easy to understand," "the label has a clear logo," "the label is trustworthy," "the label helps me to make an informed choice," "the label is more than just a means of advertising," and "the label is attractive." The "not applicable" option was also included for each statement. The questionnaires were originally designed in English and translated by academic experts into their respective languages. To ensure that all surveys were identical, irrespective of the national language, a professional translation institute undertook back translation. Consistency to the original English survey was checked and all problems corrected before the questionnaires were pre-tested across the seven countries.

The final sample excludes those participants who were not mainly, or partly, responsible for food purchasing decisions in their household. In total, 9578 valid responses were recorded across the seven countries, which could be used for further analysis ($N_{FR} = 1355$; $N_{DE} = 1429$; $N_{HU} = 1334$; $N_{IT} = 1396$; $N_{NO} = 1247$; $N_{RS} = 1426$; $N_{UK} = 1391$). Of these, 2228 participants completed both surveys (about 23.2% of the sample).[2] Those respondents evaluated in the 2017 survey the original EU organic logo and in the follow-up survey, in 2018, one of the modified labels. Taking the six perception statements into account, an exploratory factor analysis (EFA) investigated whether the statements loaded on to one or a few underlying factors. To determine the suitability of our data for factor analysis, we assessed the Kaiser–Meyer–Olkin (KMO) statistics (Kaiser 1974) and the Bartlett's test of sphericity (Bartlett 1954).

To test H1 and thus the impact of label modification on consumers' perception of the EU organic logo, two empirical analyses were conducted. First, after matching the data from the two surveys ($N = 2228$), we conducted a paired sample t-test comparing the means of the six perception questions to investigate the effect of the label modification for those respondents who evaluated both the original organic label and one of the modified labels.

The second part of the analysis considered all 9578 valid responses of the two surveys. An ordinary least squared (OLS) model was estimated using the robust standard error approach. The individual-specific factor scores for label perception served as the dependent variable. Two label modification dummy variables (e.g., $D_{LM1} = 1$ if respondents saw the EU organic logo with modification 1, $D_{LM1} = 0$ otherwise; $D_{LM2} = 1$ if respondents saw the EU organic logo with modification 2, $D_{LM2} = 0$ otherwise) were included as independent variables to test for the potential impact of the label modification (H1). As control variables, we considered different socio-demographic factors: income (six levels, see Table A2 in the Appendix), gender (dummy variable where male = 1), education (five levels), living area (three levels), and EU country (five dummy variables with UK as reference category). Lastly, we accounted for two types of exposure effects. The first one

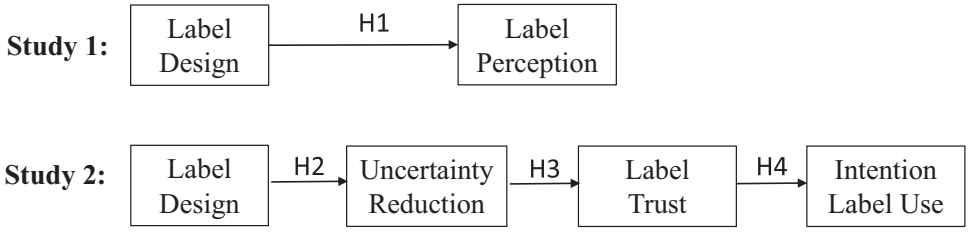

FIGURE 1 | Conceptual models: Influence of label design on label perception and behavioral intention to use the label.

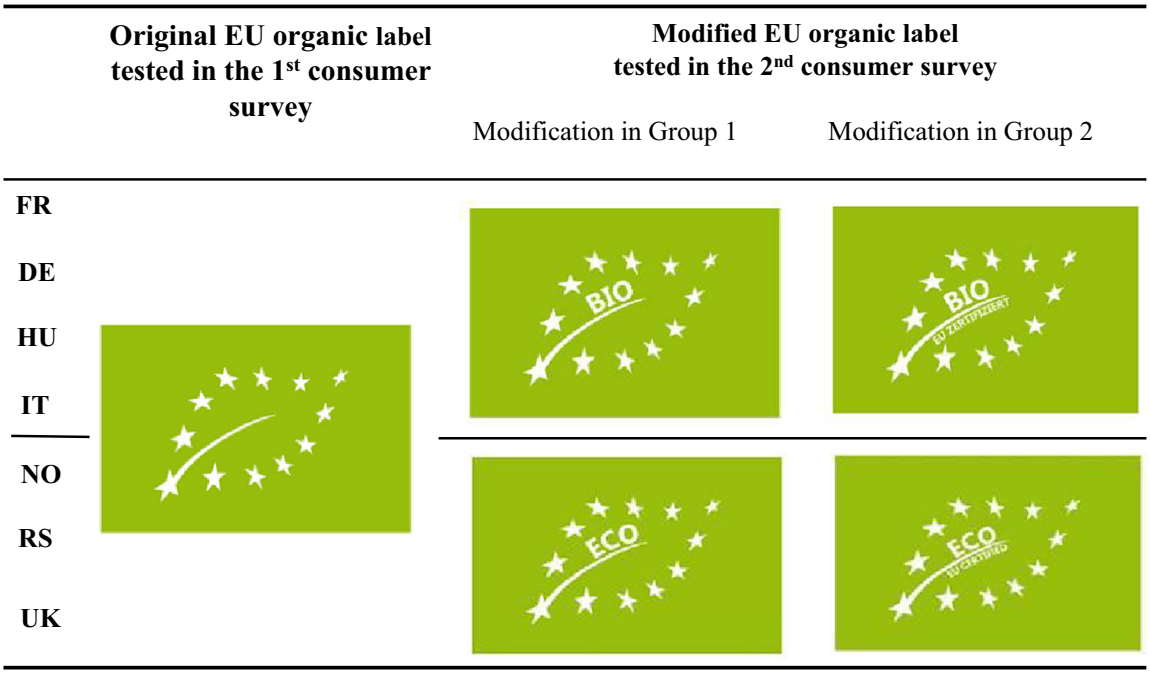

FIGURE 2 | Original and modified EU organic labels used in the two consumer surveys.

considers that some respondents participating in the second survey, in 2018, had already taken part in the first survey in 2017, and were thus asked twice to evaluate the EU-organic label. The second results from the fact that the second consumer survey integrated a DCE, which in some countries included products with an EU organic label. To control for these effects, we introduced three dummy variables: one for the sole survey exposure effect ($D_{EXP,S} = 1$), one for the sole DCE exposure effect ($D_{EXP,DCE} = 1$) and one for the combined exposure effects ($D_{EXP,S+DCE} = 1$). In addition, OLS models with robust standard errors were estimated for each country separately.

3.2 | Results

Table A1 (see Appendix) provides an overview of the summary statistics across the seven countries investigated–the respective samples echo the overall population structure within each country, in terms of gender and age. However, some deviations across countries are noted with respect to living area (biased toward those living in rural areas in France and Germany) and education (biased toward higher educated respondents in most countries) (Office for National Statistics 2013; Hungarian Central Statistical Office 2011; Statistical Office of the Republic of Serbia 2012; Statistics Norway 2016; Statistisches Bundesamt Destatis 2016b; Statistisches Bundesamt Destatis 2016a). Despite these deviations, the samples are adequate for the analysis and broadly representative. In addition, we include several socio-demographic factors, such as education and living area, as control variables.

EFA was conducted to investigate whether the six label evaluation statements load onto a single factor or multiple underlying factors. Three separate analyses were performed: one for the first survey (EFA 1), one for the second survey (EFA 2) using only those respondents who participated in both surveys, and one for the entire sample of valid responses collected across both surveys (EFA 3). The data proved suitable for factor analysis. The KMO statistics of sampling adequacy exceeded, with values above 0.87 in all three cases, the recommended threshold of 0.6 (Tabachnick and Fidell 2001) and Bartlett's Test of Sphericity was statistically significant at the 0.001 level (EFA $1: \chi^2 = 2648.17$; EFA $2: \chi^2 = 2874.22$; EFA $3: \chi^2 = 36198.07$). The eigenvalue criterion (see Table A3 in the Appendix) suggested a single-factor solution, which explained between 68% and 72% of the total variance depending on the sample (EFA 1: 68%, EFA 2: 72% and EFA 3: 70%). The finding is in line with the percentage of variance criterion commonly applied in social science research (Hair et al. 2010). Moreover, all six statements revealed high factor loadings, with values exceeding 0.8.

Table 1 presents the mean over all six label evaluation statements for the original label (from the first survey) and the modified EU organic labels (from the second survey) for those respondents taking part in both surveys. Mean differences are calculated by subtracting the value obtained with respect to the modification label from the value obtained regarding the original label (see Table 1). The results suggest significant differences between the respective mean scores ($p < 0.001$). This pattern holds for all countries and irrespective of the modification considered (ECO or ECO EU certified). Overall, the findings provide a strong first indication in support of H1, and more specifically that label design, and thus a modification of the EU green leaf logo aimed at improving label clarity, improves the perception of the label, as evaluated by consumers.

A potential limitation of this analysis could be that the results obtained may stem from an exposure effect. In particular, the fact that respondents had been confronted with the label in the first survey conducted in 2017 might have primed them to pay more attention to this label in the second survey in 2018 (Zajonc 1968). Consequently, this may have influenced their

TABLE 1 | Means and mean differences in consumer perception of the two modified EU organic labels compared to the original EU organic label.[a]

	Original EU label				Modified EU label				Change			
	Group 1		Group 2		Group 1		Group 2		Group 1		Group 2	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean diff.	*p* value	Mean diff.	*p* value
France	3.24	1.13	3.47	1.21	4.03	0.79	4.06	0.84	0.79	< 0.001	0.59	< 0.001
Germany	3.25	1.14	3.19	1.09	3.84	1.01	3.72	0.95	0.59	< 0.001	0.53	< 0.001
Hungary	3.49	1.08	3.25	1.19	4.21	0.82	4.15	0.83	0.72	< 0.001	0.9	< 0.001
Italy	3.45	1.06	3.54	1.04	4.24	0.71	4.26	0.69	0.79	< 0.001	0.72	< 0.001
Norway	2.95	1.28	2.97	1.25	3.51	1.09	3.64	1.03	0.56	< 0.001	0.67	< 0.001
Serbia	2.91	1.18	2.99	1.09	3.84	1.00	4.00	0.91	0.93	< 0.001	1.01	< 0.001
UK	3.34	1.08	3.19	1.15	3.62	0.79	3.49	0.91	0.28	< 0.001	0.29	< 0.001

[a]Average over the following six items: "the label is easy to understand," "the label has a clear logo," "the label is trustworthy," "the label helps me to make an informed choice," "the label is more than just a means of advertising," and "the label is attractive." Group 1 saw the modified organic label with the word "ECO" added, Group 2 saw the modified organic label with the words "ECO EU certified" added. Mean differences are calculated by subtracting the value of the original label from the one obtained from the respective modified label. Group 1: $N = 714$, Group 2: $N = 683$. Numbers deviate from all participants taking part in both survey as those who indicated "not applicable" for any of the perception statements were excluded from the analysis. For information on the robustness of the factor analysis, see Table A3 in the Appendix.

evaluation in the second survey irrespective of the label modification. Furthermore, some respondents completed a DCE that included the EU organic label before the evaluation of the label in the second survey. Similarly, this might have had an impact on the evaluation of the label. For this reason, a more in-depth analysis was conducted considering all 9578 valid responses of the two surveys, while controlling for potential exposure effects and socio-demographic factors.

The individual-specific factor scores obtained from the EFA serve in the subsequent OLS model as the dependent variable, with the independent variables including the label modification dummies, and the control variables as explained above. Table 2 summarizes the results. It reveals that both types of label modification have strong and significant positive effects on consumers' perception of the label, thus providing further support for H1. With respect to the control variables, younger, female, and higher educated respondents evaluate the EU organic label more positively, while income and living area has no statistically significant impact on respondents' assessment of the logo. In addition, all three dummies which capture potential exposure effects are not significant. Furthermore, compared to the UK (reference country), respondents from France, Germany, Hungary, and Italy evaluate the EU organic label more positively while the opposite holds for respondents from Norway. Regarding the logo modification, country-specific analysis (see Table A4 in Appendix[3]) confirms a significant label modification effect for all countries. The exposure effect is insignificant in all countries. However, the impact of socio-demographics on label perception differs depending on the country analyzed.

4 | Study 2

Study 2 investigates the causal mechanisms underlying successful sustainability label modifications, more specifically, the role of uncertainty reduction in augmenting consumer trust and intentions to use the EU organic label in purchase decisions. Thus, Study 2 focuses on H2–H4.

4.1 | Data and Methods

A single factor between-subjects experiment was conducted. Respondents were randomly assigned to one of three label conditions: original EU organic label and one of the two label modifications as in Study 1—that is, organic EU label with the text "ECO" inside the green leaf, organic EU label with the text "ECO EU certified" (see Figure 2). Participants were recruited in April 2021 using the online Prolific platform (https://prolific.co/). In total, 526 participants took part in the short survey and received €0.85 in compensation. Participants were restricted to those being at least co-responsible for food shopping in their household and living in Germany, the EU's largest market for organic food, leading to an exclusion of 28 participants. Thus, a total of 498 valid responses could be used for further analysis.

After completing questions relating to socio-demographics, participants saw either the original EU organic label or one of the two modifications and were requested to answer questions relating to their perception of the (modified) EU organic label and their intention to use this label when grocery shopping. For this reason, empirical measures for the multidimensional constructs—Uncertainty Reduction, Trust, and Behavioral Intention were defined. We capture the Uncertainty Reduction construct using a modified version of the scale of Johnson et al. (2006). Label Trust was operationalized according to the five-item scale of Koschate–Fischer and Gartner (2015). Furthermore, the three-item construct Behavioral Intention was adapted from Fishbein and Ajzen (2011). Table 4 details the wording of all items for the three constructs.

In Study 1, it was assumed that the two label modifications increased label clarity. To test whether there is indeed an increase in the clarity of the green leaf labels, and thus as a

TABLE 2 | Determinants of consumer perception of the EU organic label: OLS regression with robust standard errors.

N[a]	8879			
F(15, 8863)	117.85			
Prob > F	0.000			
R squared	0.175			
Adj. R squared	0.174			
Root MSE	0.909			
Factor score	**Coef.**	**Std. err.**	**Sig.**	**Beta**
Constant	−0.360	0.062	< 0.001	
Modification 1	0.740	0.030	< 0.001	0.330
Modification 2	0.752	0.028	< 0.001	0.339
Exposure survey	0.014	0.033	0.652	0.006
Exposure DCE	−0.010	0.033	0.761	−0.004
Exposure survey + DCE	0.027	0.045	0.498	0.007
Gender (male = 1)	−0.106	0.019	< 0.001	−0.053
Age	−0.004	0.001	< 0.001	−0.048
Education[b]	0.040	0.008	< 0.001	0.047
Household net income[b]	−0.002	0.006	0.730	−0.004
Living_area[b]	0.014	0.013	0.249	0.012
France	0.272	0.038	< 0.001	0.095
Germany	0.092	0.036	0.012	0.033
Hungary	0.254	0.037	< 0.001	0.088
Italy	0.371	0.036	< 0.001	0.132
Norway	−0.185	0.039	< 0.001	−0.062
Serbia	−0.005	0.037	0.979	0.001

[a]Numbers deviate from the overall sample of all participants as those who indicated "not applicable" for any of the perception statements were excluded from the analysis.
[b]Categories for education, net income, and living area provided in Tables A1 and A2 in the Appendix.

manipulation check for our modification, we showed consumers the following six statements in Study 2: (1) This is an EU label, (2) This is a label certified by a body independent of the producer and retailer, (3) Products with this label indicate that the product is recyclable, (4) This label certifies that a product is vegan, (5) This label certifies that a product is organic, (6) This label certifies that a product is vegetarian. Respondents were asked to indicate whether each statement was right, wrong, or whether they do not know. The final section of the questionnaire requested information regarding additional socio-demographic variables and consumers' food purchase behavior. The questionnaire was designed in English and subsequently translated into German before pre-testing the comprehensibility of the survey questions ($N = 8$).

In the analysis, we first evaluated whether the modification of the label was successful in leading to a better understanding of what the EU green leaf label stands for, by conducting an ANOVA with Bonferroni post hoc pairwise test. Subsequently, we investigated whether the label modification had a significant impact on Uncertainty Reduction, Trust, and Behavioral Intention using again an ANOVA with Bonferroni post hoc pairwise test. For the main analysis, we followed the approach of Hayes and Preacher (2014) which allows for a serial mediation analysis with a multi-categorical independent variable (i.e., label modification 1 vs label modification 2 vs. control). We used the indicator coding approach (Hayes and Preacher 2014) so that, to compare the effects of label modifications to the original EU organic label, we treated the latter as the reference in the dummy-coded variables. We included the two dummy variables as independent variables, Uncertainty Reduction and Trust as serial mediators and Behavioral Intention as the dependent variable. We tested the conceptual model (see Figure 1) with maximum likelihood estimation employing Mplus (Muthén and Muthén 2017). We used bootstrapping (5000 bootstrap samples) to obtain bias-corrected 95% confidence intervals for the indirect effects of the model.

4.2 | Results

Table A5 in the Appendix presents summary statistics for the socio-demographic characteristics of respondents. Compared to the German population, the sample is biased toward younger and higher educated people as well as females.

First, we assessed whether the random assignment in the three experimental conditions was successful, by testing for significant demographic differences between the groups. ANOVAs showed that the experimental conditions did not differ significantly on age ($p > 0.05$) and income ($p > 0.05$). Similarly, Kruskall–Wallis tests showed no significant differences in the distribution by gender ($p > 0.05$), education ($p > 0.05$), shopping responsibility ($p > 0.05$), and frequency of buying organic food across the three groups ($p > 0.05$).

As a manipulation check, we tested whether the modification of the label increased its clarity. Sixty-eight percent of the participants who saw the original label ticked "true" (options true, false, do not know) to the most relevant question: "The label certifies that a product is organic." For Modifications 1 and 2, the share ticking "true" was much higher–87% and 81%, respectively. Considering all six knowledge questions, the overall number of correct answers is on average 3.23 in the control group and rises to 4.02 for the first modified label and to 4.28 for the second modified label, respectively. Interestingly, the number of "Don't know" responses is considerably higher in the case of the original label (2.37 vs. 1.64 and 1.52). ANOVA tests with Bonferroni post hoc comparison indicate that, compared to the original label, both label modifications increased consumers' understanding of what the label stands for ($p < 0.001$). These results held regardless of whether we measured understanding only based on the number of correct answers or whether we penalized for wrong answers. No significant difference in understanding could be detected between the two modified labels ($p = 0.435$ true answers; $p = 0.178$ true minus false answers). The number of "Don't know" responses significantly declined for both modified labels compared to the original one ($p < 0.001$). Thus, we conclude that our manipulations were successful, and the two

modifications of the label increased the clarity of the label compared to the original EU organic green leaf label.

Table 3 presents the Cronbach's alpha coefficients for the three constructs Uncertainty Reduction, Trust and Behavioral Intention. All values are between 0.809 and 0.949, suggesting good to very good internal consistency.

Table 4 summarizes the descriptive analysis for the three constructs. The findings reveal a mean value of the construct Uncertainty Reduction of 3.37 in the control group indicating that respondents on average do not agree that the original EU label reduces their uncertainty with respect to what the label stands for. Though the values are higher in the label modification groups (Group 1: 4.19; Group 2: 4.28) uncertainty reduction remains modest. The values for the trust construct range between 4.21 in the original label group, and 4.64 and 4.43 in the intervention groups. The survey thus indicates that respondents in all three groups slightly trust the (modified) organic labels, however, more so in the two intervention groups. Finally, the findings regarding Behavioral Intention reveal for all three groups values below 4, and thus weak intentions to regularly use the organic logo when grocery shopping. Next, we analyzed whether uncertainty reduction, trust, and behavioral intention significantly differed between the three labels (original and two modifications). Bonferroni-corrected post hoc tests showed that both label modifications induced a significant reduction in uncertainty compared to the original EU label (p <0.001). Similarly, label Modification 1 significantly increased label trust compared to the original label ($p < 0.001$). No other post hoc comparisons yielded a significant result (see Table 4).

Figure 3 shows the results of the hypothesis tests for Study 2. In support of H2, the analysis indicates that the modified EU organic labels compared to the original label results in Uncertainty Reduction. This holds for both label modifications (Modification 1: $b = 0.265$, $p < 0.001$; modification 2: $b = 0.268$, $p < 0.001$). Second, in line with H3, results reveal that Uncertainty Reduction is positively related to Trust ($b = 0.834$, $p < 0.001$). Furthermore, the results indicate that Trust is positively associated with Behavioral Intention ($b = 0.612$, $p < 0.001$), and that there exists a significant indirect effect of the label modification on Behavioral Intention (Modification 1: indirect effect = 0.135, SE = 0.027, 95% CI = 0.066–0.207; Modification 2: indirect effect = 0.137, SE = 0.028, 95% CI = 0.064–0.211), thereby providing support for H4. The lack of a significant direct effect of the label modification on Behavioral Intention (Modification 1 dummy: $b = 0.067$, $p > 0.05$; Modification 2 dummy: $b = 0.011$, $p > 0.05$) indicates that the mediators Uncertainty Reduction and Trust fully account for the differences in Behavioral Intention between respondents being confronted with the respective modified label compared to those who saw the original EU organic label. Thus, in summary, the results show that the modified labels are associated with a reduction in uncertainty, which in turn augments trust and behavioral intentions among respondents seeing one of the modified EU organic labels compared to those viewing the original logo.

5 | Discussion

Consumers' evaluations of sustainability labels can significantly influence their decision-making. When labels are not well understood, they tend to be discounted (Leire and Thidell 2005). Empirical studies consistently find that many sustainability-related labels confuse consumers with the attributes of specific labels poorly understood (Thorsøe et al. 2016; Janssen and Hamm 2012; Brécard 2014; Annunziata et al. 2019). When label information lacks clarity or does not meet consumers' needs, the resulting uncertainty can lead to dissatisfaction and distrust (Moon et al. 2017). Consequently, sustainability-related labels may not be as effective in guiding product choices as they could be (Torma and Thøgersen 2024; Mancuso et al. 2021; McLeod et al. 2024; Vlaeminck et al. 2014). This underscores the need to explore strategies for improving the effectiveness of such labels and to better understand how a lack of clarity affects label evaluation, trust, and usage. This paper addresses these issues by empirically examining the EU's Green Leaf organic logo, making three key contributions to the literature.

The first contribution relates to the validation of our novel conceptual framework based on signaling theory. According to signaling theory (Connelly et al. 2011), easily comprehensible messages are processed more efficiently, leading to more favorable evaluations. Our findings demonstrate that label clarity significantly influences consumer perceptions of the EU organic label. As Erdem and Swait (1998) suggest, clarity triggers a positive response—a finding further supported by Werle et al. (2021) in the context of Front-of-Package nutrition labels. Our analysis indicates that enhanced label clarity not only improves consumer perceptions but also builds trust, thereby increasing the likelihood that the label will influence purchase decisions. Although our study focuses on the EU organic logo, similar clarity issues bedevil many other sustainable labels.

The second major contribution concerns the demonstration that label modifications can positively influence consumer perceptions. Recognizing that the claims of sustainability labels often confuse consumers (Torma and Thøgersen 2024), we tested two modifications of the EU Green Leaf logo. The first modification involved adding "ECO" to create an explicit connection to

TABLE 3 | Reliability of the constructs uncertainty reduction, trust, and behavioral intention: Cronbach's alpha.

	Uncertainty reduction	Trust	Behavioral intention
All $N = 498$	0.878	0.939	0.863
Control group ($N = 169$): Original Organic Label	0.897	0.949	0.876
Treatment 1 ($N = 162$): Modified Organic Label 1	0.809	0.939	0.842
Treatment 2 ($N = 167$): Modified Organic Label 2	0.876	0.925	0.905

TABLE 4 | Descriptive analysis of the constructs: Uncertainty reduction, trust, and behavioral intention.

	Uncertainty reduction[a]		Trust[b]		Behavioral intention[c]	
	Mean	**SD**	**Mean**	**SD**	**Mean**	**SD**
All $N = 498$	3.94	1.38	4.42	1.36	3.68	1.32
Groups						
Control (CG): $N = 169$	3.37	1.44	4.21	1.44	3.60	1.33
Original organic label						
Treatment 1 (TG1): $N = 162$	4.19	1.16	4.64	1.29	3.68	1.24
Modified Organic Label 1						
Treatment 2 (TG2): $N = 167$	4.28	1.34	4.43	1.32	3.74	1.37
Modified Organic Label 2						
	Sig.		**Sig.**		**Sig.**	
ANOVA	< 0.01		0.02		0.62	
Bonferroni						
CG vs. TG1	< 0.01		0.01		1.00	
TG1 vs. TG2	1.00		0.51		1.00	
CG vs. TG2	< 0.01		0.41		0.98	

[a]Items Uncertainty Reduction: This logo provides me with a large amount of information; this logo minimizes the danger of false product selection; this logo satisfies my information need with respect to what the label stands for; this logo reduces uncertainties about the product, Scale: 1 = strongly disagree, 7 strongly agree.
[b]Items Trust: I trust this logo; I am confident in this logo's ability to perform well; I can rely on this logo; this logo is safe; I expect this logo to deliver on its promise; Scale: 1 = strongly disagree, 7 strongly agree.
[c]Items and respective scale Behavioral Intention: I will make an effort to use this logo when shopping for food on a regular basis, 1 = strongly disagree, 7 strongly agree; I intend to use this logo when buying groceries on a regular basis, 1= extremely unlikely, 7 = extremely likely; In future, when you go grocery shopping how often will you buy food carrying this logo?, 1 = never, 7 = every time.

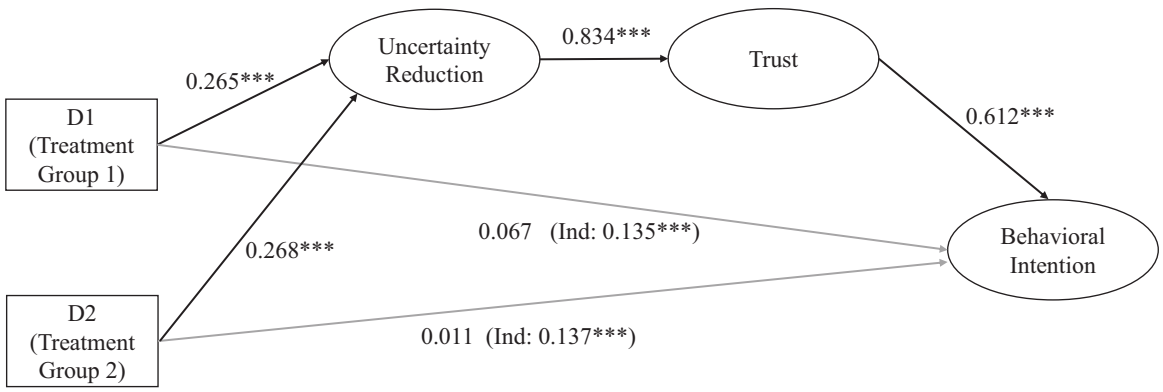

FIGURE 3 | Mediation analysis.

ecological production methods. The second, in addition, made a direct reference to certification. The modifications recognize that most consumers are unaware that the label signifies compliance with EU organic guidelines and certification (e.g., Hartmann et al. 2019). Moreover, the tested label modification aligns with the European Committee of the Regions 2021 recommendation to "add the words 'EU organic' and indicate the production region beneath the green leaf to enhance consumer recognition" (European Committee of the Regions 2021). The results thus provide empirical support for a policy recommendation made by the European Committee of the Regions (2021). Both modifications resulted in significant improvements in consumer evaluations, reinforcing the notion that clearer signals enhance understanding (Erdem and Swait 1998; Werle et al. 2021). Although these improvements were statistically significant, their magnitude was modest—comparable to the effects typically observed in nudging interventions (Cadario and Chandon 2020). While other interventions, such as financial incentives (List 2022), might yield stronger effects, they might be infeasible for universal adoption due to high costs. In contrast, slight modifications to a logo are a low-cost, scalable alternative. Given governments' financial constraints and consumers' limited attention, time, and cognitive resources, modifying labels emerges as a promising, cost-effective approach to facilitating sustainable choices that warrants further consideration.

The third contribution of this paper is the demonstration that the effects of label modifications are not limited to a single country but are observable across various, contrasting European nations. Our findings indicate that the improved consumer evaluations resulting from label modifications hold true regardless of cultural or economic differences among the countries studied. This cross-national consistency reinforces the conclusion that enhancing

label clarity is a universally relevant strategy for increasing consumer engagement with sustainable labels.

5.1 | Limitations and Directions for Future Research

Despite its contributions, the study has several limitations. First, Study 1 relied on data collected in 2017/2018. Although recognition of the EU organic label is higher today than at the time of our study, a recent European Commission (2024) Eurobarometer poll indicates a decline in consumer awareness, suggesting that challenges relating to label comprehension persist. Moreover, the EC identifies that there still exists "insufficient consumer knowledge of the logo and of the benefits of organic production" (European Commission 2021, 5) and emphasizes the need to boost consumer confidence in organic products (European Commission 2023; European Commission 2021), underscoring the relevance of our research. Second, although the Study 1 sample was not fully representative of the overall population in the countries investigated, we controlled for potential biases in our analysis and remain confident in the robustness of our findings. Finally, the experimental design presented the EU organic label in isolation from a product context. Although the context can influence perception, any such bias is likely to be consistent across conditions and does not compromise the overall findings. Nonetheless, future research could assess the effectiveness of these modifications on actual products, investigate the impact of repeated exposure, and explore improvements for other sustainability labels that similarly contribute to consumer confusion.

5.2 | Conclusions

One of the EU's policy objectives is to provide consumers with "access to understandable, relevant, credible information... through labelling" (European Commission 2001, 12). However, given current levels of consumer understanding, it is questionable whether existing EU labels meet this goal. In particular, the EU Green Leaf logo has been criticized for its abstract design and lack of explicit cues regarding organic certification (Septianto et al. 2019). Our findings suggest that a slight modification of the EU organic label can significantly improve consumer evaluation of the label, with these improvements being evident across seven European countries, encompassing diverse economic and cultural contexts. Furthermore, our study provides insights into the consequences of a lack of clarity on consumer trust and intention to use a label in a purchase decision.

Replacing an established label with a completely new design could lead to the loss of recognition and reputation, even if modest, and would require additional investments in rebranding and promotion. In contrast, slight modifications to an existing label incur relatively low costs, although adjustments at the political (e.g., legislation) and business (e.g., packaging) levels remain necessary. Therefore, it is crucial to pre-test the effectiveness and behavioral impacts of such modifications through systematic, cross-national experiments. In doing so, our research offers new scientific evidence that can guide the EU and other public authorities in revising sustainability labels, to better serve consumers, and to promote more sustainable consumption patterns.

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Ethics Statement

The research undertaken in this paper received ethical approval from Newcastle University (Ref. P16798).

Data Availability Statement

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

Endnotes

[1] Depending on the language–we used instead of the word "ECO" the word "BIO" inside the green leaf.

[2] Respondents were tracked based on their anonymized identification code obtained from the marketing agency.

[3] To keep the analysis identical for all countries, the country-specific analysis only considers the first survey-related exposure effect as not in all countries were respondents confronted with a DCE including the EU organic label.

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Appendix A

TABLE A1 | Study 1—Sample structure.

Country	FR		DE		HU		IT		NO		RS		UK		All	
Total valid N	**1355**		**1429**		**1334**		**1396**		**1247**		**1426**		**1391**		**9578**	
Average age	**Mean 40.77**	**SD 13.50**	**Mean 43.06**	**SD 13.52**	**Mean 41.89**	**SD 13.18**	**Mean 42.5**	**SD 12.56**	**Mean 42.99**	**SD 13.10**	**Mean 42.37**	**SD 12.74**	**Mean 42.97**	**SD 13.39**	**Mean 42.37**	**SD 13.16**
	Freq.	**%**	**Freq.**	**%**	**Freq.**	**%**	**Freq.**	**%**	**Freq.**	**%**	**Freq.**	**%**	**Freq.**	**%**	**Freq.**	**%**
Gender																
Female	651	48.04	708	49.55	670	50.22	732	52.44	636	51.00	711	49.86	702	50.47	4810	50.22
Male	704	51.96	721	50.45	664	49.78	664	47.56	611	49.00	715	50.14	689	49.53	4768	49.78
Living area																
Rural area	721	53.21	560	39.19	238	17.84	196	14.04	286	22.94	149	10.45	383	27.53	2533	26.45
Urban medium town	328	24.21	379	26.52	498	37.33	623	44.63	454	36.41	635	44.53	615	44.21	3532	36.88
City	306	22.58	490	34.29	598	44.83	577	41.33	507	40.66	642	45.02	393	28.25	3513	36.68
Education																
Lower secondary/primary education or below	60	4.43	275	19.24	28	2.10	99	7.09	56	4.49	6	0.42	297	21.35	821	8.57
Upper secondary education	471	34.76	247	17.28	281	21.06	565	40.47	319	25.58	562	39.41	371	26.67	2616	29.4
University or college entrance qualification	324	23.91	538	37.65	443	33.21	225	16.12	196	15.72	258	18.09	238	17.11	2222	23.2
Bachelor's degree or equivalent level	270	19.93	174	12.18	392	29.39	229	16.40	414	33.20	434	30.43	357	25.66	2270	23.7
Master, postgraduate or doctoral degree	230	16.97	195	13.65	190	14.24	278	19.91	262	21.01	166	11.64	128	9.20	1449	15.13
Income[a]																
Category 1	136	10.04	74	5.18	146	10.94	86	6.16	145	11.63	68	4.77	161	11.57	816	8.52
Category 2	137	10.11	126	8.82	184	13.79	276	19.77	147	11.79	307	21.53	284	20.42	1461	15.25
Category 3	229	16.90	230	16.10	146	10.94	418	29.94	161	12.91	368	25.81	232	16.68	1784	18.63
Category 4	238	17.56	542	37.93	437	32.76	284	20.34	153	12.27	321	22.51	261	18.76	2236	23.35
Category 5	367	27.08	258	18.05	287	21.51	105	7.52	167	13.39	108	7.57	251	18.04	1543	16.11
Category 6	175	12.92	98	6.86	24	1.80	36	2.58	231	18.52	40	2.81	90	6.47	694	7.25
Prefer not to state	73	5.39	101	7.07	110	8.25	191	13.68	243	19.49	214	15.01	112	8.05	1044	10.9

Matched sample N	**401**		**316**		**351**		**395**		**216**		**323**		**226**		**2228**	
Average age	**45.10**		**46.02**		**43.74**		**44.22**		**45.98**		**44.18**		**45.72**		**44.87**	
	Freq.	**%**	**Freq.**	**%**	**Freq.**	**%**	**Freq.**	**%**	**Freq.**	**%**	**Freq.**	**%**	**Freq.**	**%**	**Freq.**	**%**
Gender																
Female	195	48.63	148	46.84	168	47.86	217	54.94	105	48.61	132	40.87	95	42.04	1060	47.58

(Continues)

TABLE A1 | (Continued)

Matched sample N Average age	401 45.10		316 46.02		351 43.74		395 44.22		216 45.98		323 44.18		226 45.72		2228 44.87	
	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%
Male	206	51.37	168	53.16	183	52.14	178	45.06	111	51.39	191	59.13	131	57.96	1168	52.42
Living area																
Rural area	231	57.61	127	40.19	57	16.24	57	12.91	53	24.54	28	8.67	62	27.43	609	27.33
Urban medium town	88	21.95	72	22.78	129	36.75	175	44.30	71	32.87	165	51.08	94	41.59	794	35.64
City	82	20.45	117	37.03	165	47.01	169	42.78	92	42.59	130	40.25	70	30.97	825	37.03
Education																
Lower secondary/ primary education or below	22	5.49	54	17.09	5	1.42	23	5.82	5	2.31	0	0	56	24.78	165	7.41
Upper secondary education	140	34.91	43	13.61	107	30.48	162	41.01	52	24.07	128	39.63	59	26.11	691	31.01
University or college entrance qualification	98	24.44	134	42.41	92	26.21	61	15.44	35	16.20	59	18.27	36	15.93	515	23.11
Bachelor's degree or equivalent level	77	19.20	32	10.13	85	24.22	56	14.18	73	33.80	93	28.79	52	23.01	468	21.01
Master, postgraduate or doctoral degree	64	15.96	53	16.77	62	17.66	93	23.54	51	23.61	43	13.31	23	10.18	389	17.46
Income[a]																
Category 1	32	7.98	10	3.16	25	7.12	26	6.58	30	13.89	7	2.17	24	10.62	154	6.91
Category 2	29	7.23	26	8.23	48	13.68	74	18.73	24	11.11	58	17.96	54	23.89	313	14.05
Category 3	77	19.20	59	18.67	40	11.40	116	29.37	23	10.65	85	26.32	32	14.16	432	19.39
Category 4	80	19.95	118	37.34	125	35.61	89	22.53	21	9.72	83	25.70	39	17.26	555	24.91
Category 5	113	28.18	68	21.20	84	23.93	27	6.84	26	12.04	28	8.67	52	23.01	397	17.82
Category 6	53	13.22	23	7.28	8	2.28	12	3.04	50	23.15	11	3.41	12	5.31	169	7.59
Prefer not to state	17	4.24	13	4.11	21	5.98	51	12.91	42	19.44	51	15.79	13	5.75	208	9.34

[a]Country-specific categories for household net income are provided in Table A2.

TABLE A2 | Study 1—Country-specific household net income categories used in the consumer surveys.

Country ***N***	**FR** **1355**	**DE** **1429**	**HU** **1334**	**IT** **1396**	**NO** **1247**	**RS** **1426**	**UK** **1391**
Household net income (HHI)							
Category 1	HHI < €1130	HHI < €900	HHI < €486	HHI < €900	HHI < NOK 19,900	HHI < Din 25,000	HHI< £ 1000
Category 2	€1130 ≤ HHI < €1450	€900 ≤ HHI < €1300	€486 ≤ HHI < €664	€900 ≤ HHI < €664	NOK 19,900 ≤ HHI < NOK 29,900	Din 25,000 ≤ HHI < Din 55,000	£ 1000 ≤ HHI < £ 1600
Category 3	€1450 ≤ HHI< €2090	€1300 ≤ HHI < €2000	€664 ≤ HHI < €761	€664 ≤ HHI < €761	NOK 29,900 ≤ HHI < NOK 39,900	Din 55,000 ≤ HHI < Din 85,000	£ 1600 ≤ HHI < £ 2200
Category 4	€2090 ≤ HHI < €2890	€2000 ≤ HHI < €3600	€761 ≤ HHI < €1231	€761 ≤ HHI < €1231	NOK 39,900 ≤ HHI < NOK 54,900	Din 85,000 ≤ HHI < Din 125,000	£ 2200 ≤ HHI < £ 3000
Category 5	€2890 ≤ HHI < €4100	€3600 ≤ HHI < €5000	€1231 ≤ HHI < €2705	€1231 ≤ HHI < €2705	NOK 549,900 ≤ HHI < NOK 69,900	Din 125,000 ≤ HHI < Din 185,000	£ 3000 ≤ HHI < £ 5000
Category 6	€4100 ≤ HHI	€5000 ≤ HHI	€2705 ≤ HHI	€2705 ≤ HHI	NOK 69,900 ≤ HHI	Din 185,000 ≤ HHI	£ 5000 ≤ HHI

Note: € 1 is approx. NOK 9.35; € 1 is approx. DIN 122.5; € 1 is approx. £ 0.86.

TABLE A3 | Study 1—Exploratory factor analysis for the six label evaluation statements.

Total variance explained									
	Respondents taking both surveys ($N = 1397$)[a]						All respondents over both surveys ($N = 8879$)[a]		
	Original EU Label			Modified EU Label					
	Initial eigenvalues								
	Total	% of variance	Cumulative variance %	Total	% of variance	Cumulative variance %	Total	% of variance	Cumulative variance %
1	4.08	68.02	68.02	4.29	71.56	71.56	4.21	70.08	70.08
2	0.66	11.09	79.12	0.59	9.90	81.46	0.57	9.45	79.53
3	0.39	6.51	85.63	0.34	5.69	87.14	0.39	6.50	86.03
4	0.35	5.84	91.47	0.30	4.91	92.06	0.35	5.75	91.79
5	0.27	4.77	96.24	0.25	4.21	96.26	0.28	4.69	96.48
6	0.23	3.76	100.00	0.22	3.74	100.00	0.21	3.52	100.00
	KMO= 0.88; $\chi^2 = 2648.17$; $p < 0.001$			KMO= 0.90; $\chi^2 = 2874.22$; $p < 0.001$			KMO= 0.87; $\chi^2 = 36198.07$; $p < 0.001$		

[a]Numbers deviate from the overall sample of all participants as those who indicated "not applicable" for any of the perception statements were excluded from the analysis.

TABLE A4 | Determinants of consumer perception of the EU organic label: Country-specific results of OLS regression with robust standard errors.

	France				Germany				Hungary			
N[a]	1277				1281				1228			
F	27.24				23.50				44.34			
Prob > F	0.000				0.000				0.000			
R squared	0.147				0.128				0.225			
Adj. R squared	0.141				0.123				0.220			
Root MSE	0.904				0.922				0.875			
Factor score	**Coef.**	**Std. err.**	**Sig.**	**Beta**	**Coef.**	**Std. err.**	**Sig.**	**Beta**	**Coef.**	**Std. err.**	**Sig.**	**Beta**
Constant	−0.282	0.152	0.065	—	0.096	0.155	0.538	—	−0.759	0.160	0.000	—
Modification 1	0.731	0.072	0.000	0.334	0.627	0.069	0.000	0.285	0.955	0.069	0.000	0.432
Modification 2	0.737	0.073	0.000	0.335	0.681	0.068	0.000	0.310	0.893	0.066	0.000	0.412
Exp. (1st survey)	−0.008	0.072	0.909	−0.005	−0.030	0.071	0.669	−0.013	0.018	0.002	0.784	0.008
Gender (male = 1)	−0.011	0.051	0.831	−0.005	−0.152	0.052	0.003	−0.078	−0.011	0.050	0.831	−0.005
Age	−0.002	0.002	0.259	−0.035	−0.009	0.002	0.000	−0.124	0.006	0.002	0.003	0.076
Education[b]	0.016	0.023	0.499	0.023	0.026	0.021	0.249	0.031	0.035	0.025	0.165	0.036
Income[b]	0.034	0.016	0.035	0.057	0.008	0.018	0.661	0.012	−0.007	0.016	0.651	−0.012
Living_Area[b]	−0.029	0.032	0.365	−0.025	0.013	0.030	0.650	0.012	0.031	0.034	0.357	0.023
	Italy				**Norway**				**Serbia**			
N[a]	1335				1153				1368			
F	34.43				23.63				56.21			
Prob > F	0.000				0.000				0.000			
R squared	0.172				0.141				0.248			
Adj. R squared	0.167				0.135				0.244			
Root MSE	0.841				0.942				0.917			
Factor score	**Coef.**	**Std. err.**	**Sig.**	**Beta**	**Coef.**	**Std. err.**	**Sig.**	**Beta**	**Coef.**	**Std. err.**	**Sig.**	**Beta**
Constant	−0.105	0.144	0.465	—	0.054	0.165	0.740	—	−0.810	0.162	0.000	—
Modification 1	0.727	0.064	0.000	0.347	0.540	0.071	0.000	0.242	0.952	0.068	0.000	0.398
Modification 2	0.673	0.064	0.000	0.322	0.691	0.070	0.000	0.318	1.029	0.065	0.000	0.437
Exp. (1st survey)	0.092	0.064	0.148	0.043	−0.014	0.081	0.859	−0.005	0.021	0.070	0.770	0.008

(Continues)

TABLE A4 | (Continued)

Factor score	Coef.	Std. err.	Sig.	Beta	Coef.	Std. err.	Sig.	Beta	Coef.	Std. err.	Sig.	Beta
Gender (male =1)	−0.113	0.046	0.015	−0.061	−0.258	0.057	0.000	−0.127	−0.115	0.050	0.022	−0.054
Age	−0.001	0.002	0.657	−0.011	−0.011	0.002	0.000	−0.141	0.008	0.002	0.000	0.092
Education[b]	0.043	0.018	0.020	0.059	0.016	0.024	0.504	0.019	0.095	0.024	0.000	0.098
Income[b]	−0.003	0.014	0.806	−0.006	−0.009	0.014	0.496	−0.019	−0.044	0.015	0.003	−0.073
Living_Area[b]	0.013	0.033	0.697	0.009	0.073	0.036	0.046	0.056	−0.065	0.038	0.088	−0.041

United Kingdom	
N[a]	1237
F(15, 8863)	23.86
Prob > *F*	0.000
R squared	0.134
Adj. *R* squared	0.129
Root MSE	0.893

Factor score	Coef.	Std. err.	Sig.	Beta
Constant	−0.019	0.158	0.904	—
Modification 1	0.624	0.065	0.000	0.299
Modification 2	0.516	0.065	0.000	0.246
Exp. (1st survey)	−0.018	0.076	0.810	−0.007
Gender (male = 1)	−0.052	0.051	0.316	−0.027
Age	−0.014	0.002	0.000	−0.191
Education[b]	0.049	0.020	0.016	0.067
Income[b]	0.010	0.015	0.488	0.019
Living_Area[b]	0.034	0.034	0.320	0.027

[a]Numbers deviate from the overall sample of all participants in each country as those who indicated "not applicable" for any of the perception statements were excluded from the analysis.
[b]Categories for education. net income, and living area provided in Table A1 and Table A2.

TABLE A5 | Study 2—Sample structure.

	All ($N = 498$)	Control group ($N = 169$)	Treated group A ($N = 162$)	Treated group B ($N = 167$)
(Mean) age	29.30	29.46	29.17	29.27
Gender				
Male	40.1%	39.6%	38.3%	42.5%
Female	58.8%	58.6%	61.1%	56.9%
Other	1.0%	1.8%	0.6%	0.6%
Frequency of buying organic food in last 3 months	4.31	4.31	4.21	4.40
Education				
Lower secondary education or below	4.2%	4.1%	3.7%	4.8%
Upper secondary education	25.3%	26.0%	25.9%	24.0%
Vocational training or college qualification below a degree	12.1%	12.4%	7.4%	16.2%
Bachelor's degree	30.7%	32.0%	32.1%	28.1%
Postgraduate with masters or doctorate degree	27.7%	25.4%	30.9%	27.0%
Income				
Net household income < €900	20.5%	24.9%	14.8%	21.6%
€901–€1300	12.1%	11.2%	13.6%	11.4%
€1301–€2000	15.5%	16.0%	14.2%	16.2%
€2001–€3600	25.7%	23.1%	27.8%	26.4%
€3601–€5000	11.7%	9.5%	13.0%	12.6%
€5001 < net household income	5.4%	6.5%	4.3%	5.4%
Prefer not to answer/do not know	9.2%	8.9%	12.4%	6.6%