Boundaries Shaping Sustainability: The Impact of Organic Food Information Boundaries on Purchase Intentions

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Article

Boundaries Shaping Sustainability: The Impact of Organic Food Information Boundaries on Purchase Intentions

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Abstract: This study investigates the role of information boundaries in organic food packaging and their impact on consumers' purchase intentions, aiming to uncover how packaging information design can drive sustainable consumption. Although previous research has extensively explored factors such as background color, shape, and positioning, the influence of information boundaries has received less attention. Through three experiments involving 766 participants, this study delves into the psychological mechanisms influencing sustainable consumption. Experiment 1 explores how information boundaries (presence vs. absence) affect purchase intention and confirms that health perception mediates this relationship. Experiment 2, using virtual brands to eliminate brand familiarity bias, further validates the positive effect of information boundaries on purchase intention through heightened health perceptions. Experiment 3 investigates the moderating role of certification label structures, showing that information boundaries enhance purchase intentions when ingredient-level cues are presented, whereas boundary-free designs are more effective for product-level cues. Our research demonstrates that driving consumer purchases of organic products through strategic packaging design contributes significantly to achieving sustainability goals. These findings provide actionable insights for businesses and policymakers aiming to develop packaging strategies that promote long-term sustainability and environmentally responsible consumer behavior, ultimately contributing to the achievement of global sustainable development goals.

Keywords: sustainable organic food consumption; information boundaries; perceived healthiness; cues of credence-label structure; purchase intentions

1. Introduction

Information boundaries assume a crucial role in effectively conveying product information and exert a significant influence on consumer judgment. Additionally, they serve as essential conduits through which companies can disseminate health and nutrition-related information pertaining to food products to their consumers. Within our daily lives, encounters with information boundaries associated with food are a common occurrence ("boundaries"). Notably, certain brands initially adopted an unbounded approach to their information design but later introduced boundaries as a strategic decision. For example, Nestle's organic milk presents information encompassed by boundaries. Intriguingly, there are instances where brands initially presented their information without boundaries but subsequently incorporated them, such as Abbott's organic pure milk in Denmark and Jason's rye bread in Germany. This study endeavors to address the question of whether boundaries in organic food information also exert an influence on consumers' purchase intention, aiming to provide comprehensive insights into this inquiry.

The existing body of research related to organic food information can be classified into two main categories: verbal indicators (such as product descriptions and ingredient details) and non-verbal

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indicators (which include colors, shapes, placements, visuals, and textual elements)[1]. Regarding verbal cues, governmental regulations are in place to govern food labeling, with a specific focus on enhancing human health and safety while simultaneously addressing environmental risks, particularly within the context of organic food[2]. Organic food exhibits distinct characteristics, including the purity of origin, utilization of unique processing and production methods, as well as an abundance of specific ingredients or raw materials[3]. Functioning as an external cue, organic food information partially unveils the intrinsic quality attributes of the food and its associated production processes[4]. This aspect assumes a critical role in fostering consumer trust-building and serves as an essential foundation for the evaluation of organic food. Non-verbal cues encompass various visual perceptual attributes such as color, shape, position, text, and pictures. Diverse visual presentations of these cues elicit a range of visual experiences and psychological perceptions among consumers.

Relative to verbal cues, the existing body of research has primarily focused on non-verbal cues, specifically the background color, shape, and display position of food information. Regarding information color, Baklova and Van Tripp (2010) conducted a study that revealed the significant impact of a red background in food information on increasing consumers' purchase intentions, particularly concerning specific nutritional attributes. This effect can be attributed to the heightened attention-capturing ability of the red background[5]. Shen et al. (2017) proposed that red boundaries are more effective than blue boundaries in enhancing the utility of food information. As a result, consumers exhibit longer reaction times during the decision-making process, leading to greater consideration of attributes and sustained attention when confronted with tasks involving multiple choices[6]. With respect to information shape, even subtle and minimal variations in the shape characteristics of food information as an external feature can exert a surprisingly profound influence on consumers. For example, Zhong ke et al. (2019) conducted a study demonstrating that long food information shapes, as opposed to squares, influence consumers' perception of products being usable for an extended period. This finding suggests that the aspect ratio of food information shapes can elongate consumers' perception of product time attributes, such as battery life[7]. In terms of information location design, Wen and Lurie (2019) found that boundaries play a role in how individuals process information when presented with multiple products and their associated information. Specifically, horizontal boundaries used to segregate product options result in an "option-option" processing order, while vertical boundaries used to segregate product attributes lead to an "attribute-attribute" processing order. The latter case enhances attribute comparisons, highlighting distinctions between options and intensifying individuals' perceptions of diversity. This effect is particularly pronounced under high cognitive load conditions[8]. Jing et al. (2019) identified information boundaries that influence consumers' purchase decisions[4]. Furthermore, several studies have indicated that food information boundaries can impact consumers' food purchase decisions[9]. Previous studies have thoroughly investigated multiple facets of food information, such as background color, shape, and display location, while relatively little focus has been placed on the limits of food information, particularly regarding organic food. This study aims to examine the impact of the limits of information regarding organic food on consumers' buying intentions, addressing a gap in the existing literature related to the constraints of organic food information.

Organic food is a type of purely natural ecological food that is produced using environmentally sound methods throughout its entire lifecycle, including production, processing, storage, and transportation. It is free from modern synthetic inputs like pesticides, genetically modified organisms, and chemical food additives. Certified by relevant authorities, organic food is widely acknowledged as a high-quality and safe health food option[10]. Organic food is characterized by its purity of origin, unique processing and production methods, and the abundance of specific special ingredients or raw materials[11]. These distinct attributes are communicated to consumers through the presentation of food information, which acts as an external cue influencing consumers' purchasing behavior[12]. By applying the concepts of symbolic cognition theory, we propose that the presence of informational boundaries in organic food significantly influences consumers' intentions to purchase. In particular, incorporating boundaries in organic food (as opposed to those without

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boundaries) bolsters consumers' purchasing intentions (Experiment 1), a phenomenon that is mediated by perceived health benefits (Experiment 2). Additionally, our analysis reveals that cues associated with the architecture of credence labels influence how organic food information boundaries affect purchasing intentions. Specifically, when considering ingredient-level cues tied to the credence-label framework, consumers exposed to boundaries in organic food (compared to those without boundaries) tend to perceive higher levels of healthiness, which in turn, results in more robust purchase intentions. Conversely, for product-level cues within the credence-label structure, the absence of boundaries in organic food (vs. without boundaries) enhances consumer perceptions of healthiness and, thus, boosts purchase intentions (Experiment 3).

This study contributes in three ways. Firstly, it expands the existing research on the boundaries of organic food information. Although earlier research has mainly concentrated on aspects like background color, shape, and position concerning organic food information, there has been less emphasis on the limits of organic food information itself. This paper explores the deficiency in existing research by analyzing how organic food information boundaries influence consumers' intentions to buy. Additionally, this investigation deepens our comprehension of the intermediary role played by perceptions of health benefits. The results indicate that the way healthiness is perceived greatly influences how organic food information boundaries affect buying intentions. Ultimately, this research broadens the exploration of signals related to the credence-label framework specifically in relation to organic food. The findings indicate that the relationship between organic food and the components of the credence-label framework influences the ways in which consumers interpret food information and assess its health benefits. Furthermore, this study emphasizes how the informational limits surrounding organic food affect consumers' intentions to buy, thus enhancing the empirical understanding of food information in the field of consumer research. The outcomes presented in this paper provide valuable insights for effective management strategies in marketing.

2. Theoretical Analysis and Research Hypothesis

2.1. Information Boundaries

The term "boundary" pertains to the visual delineation encircling the focal object[13]. Its primary function involves defining the spatial allocation of objects and encapsulating the establishment of structure and order within the given environment[14]. The study of boundaries originated within the domains of sociology and psychology. Newman (1972) introduced the defensible space theory, which posits that boundaries can be utilized to create defensible spaces, thereby enhancing individuals' assessment of neighborhood rules and order[15]. Drawing on Gestalt psychology, regions can be effectively partitioned into homogenous areas by employing enclosed lines that form outlines. These outlines enable the region enclosed within them to be perceived as the primary figure, while the region beyond the outlines is recognized as the background[16]. The "figure" represents the salient aspect of cognition, attracting attention and possessing a greater sense of solidity in comparison to the background. In essence, the figure exhibits a higher degree of organizational structure than the background. Extensive research on boundaries has consistently demonstrated and elucidated their organizational potential, providing individuals with a sense of structure[14]and belongingness[17].

Within the marketing domain, Courtright (2012) provided empirical evidence demonstrating that brand logo boundaries, graphic boundaries, and boundaries in product design function as mechanisms to reinstate consumers' sense of control. Specifically, when individuals perceive a threat to their control, they develop a structural need that amplifies their inclination towards boundaries[14]. Expanding on this discovery, Tong LC (2015) identified that individuals in high-power states manifest an intensified need for control, thereby exhibiting a greater preference for boundaries[18]. Moreover, Du WV et al. (2017) ascertained that an environment characterized by clutter can result in a loss of control[19]. To reclaim a sense of control, consumers elevate their preference for brand logos featuring boundaries. Additionally, beyond their restorative influence on consumers' sense of control, information boundaries engender an augmentation in perceived

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distance, a reduction in attitudes towards product safety risks[20], a dilution of brand freedom, and a contraction in brand breadth[20,21]. Consequently, boundaries exert a profound impact on consumers' purchasing behavior.

As an external visual feature that conveys information to consumers, information boundaries represent the most intuitive means of product evaluation. The perception of information boundaries substantially influences consumers' purchasing behavior, as evident from the process through which consumers receive, collate, process, and store external information, ultimately shaping their perception of goods or services. This perceptual process encompasses a series of interconnected stages, ranging from the phenomenal to the essential and progressing from simplicity to complexity[21]. Generally, when consumers encounter product information, they initially respond intuitively to surface-level attributes such as color, shape, light, and boundaries, thereby forming an initial external impression before directing attention towards the intrinsic quality and performance of the product. Subsequently, a comprehensive analysis is undertaken based on personal experiences. Nonetheless, limited research has been conducted on information boundaries, primarily concentrating on domains such as advertising, marketing, green practices, and public health. Notably, a study examining the utilization of information boundaries to encourage increased consumption of organic fruits and vegetables among individuals revealed a significant increase in their intake after one week, highlighting the noteworthy impact of information boundaries on intervention effectiveness[22]. Wen and Lurie (2019) discovered that the sequential processing of bounded information enhances consumers' perception of diversity when exposed to multiple products and their accompanying information[23]. Keller (1995) contends that the use of color framing in information significantly influences consumer purchase decisions[24]. Taking the UK traffic light nutrition information border as an example, the utilization of green to symbolize "good for the body" corresponds to a gain frame, whereas red, representing "bad for the body," corresponds to a loss frame. In a study conducted by Edgren (2021), participants were notably discouraged from choosing unhealthy varieties of biscuits when the packaging of both healthy and unhealthy biscuits featured images labeled with two distinct information frames[25]. Further research on food information boundaries has demonstrated that the combined impact of text and images is more effective in influencing consumers[26]. While the influence of different types of information boundaries on purchase intentions may vary[27], both positive and negative frames strive to convey the idea of pursuing healthy consumption, thereby fostering a strong consumer identification with the conveyed information and ultimately shaping purchase intentions.

An extensive examination of the current literature indicates that most studies regarding food information boundaries have mainly focused on traditional general foods instead of organic options. A recent study investigated how information boundaries influence consumers' buying behavior, particularly regarding food products[27]. The results indicated that adding boundaries to food information creates unique visual experiences and psychological interpretations for consumers. However, individuals who actively seek more information pertaining to the health aspects of organic food demonstrate a preference for easily accessible[28], and manageable information during the organic food purchasing process[29]. The organic food information border acts as a highly accessible means for individuals to directly receive health-related data. When information boundaries exist, highlighting the health claims associated with the product is likely to increase the motivation to buy organic food. On the other hand, when there are no constraints on information, focusing on the advantages of the product is more likely to increase the likelihood of purchasing organic food. As a result, this paper aims to examine how food information boundaries affect purchase intentions, particularly within the realm of organic food, in order to tackle current research gaps.

2.2. Organic Food

Foods that are classified as organic are cultivated through practices that are sustainable for the environment and do not involve the use of synthetic substances like pesticides, fertilizers, genetically altered organisms, irradiation, industrial solvents, or chemical additives in food, which ensures their

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safety for the environment[30]. Scholars have increasingly focused on studying organic food from various dimensions. Gabriel (2021) contends that organic food should possess qualities such as healthiness, safety, energy efficiency, and positive effects on the body[31]. Perceived healthiness and naturalness are fundamental attributes used to assess the quality of organic food[32]. Organic foods are widely valued for their inherent naturalness and health benefits[12,33,34]. In a global study on health and happiness, Nielsen surveyed 30,000 consumers from 60 countries, revealing that the most appealing food characteristics were healthiness, naturalness, and minimal processing[35]. The Kampf Meyer Food Innovation study, which involved 4,000 consumers across 8 European countries, further emphasized the significance of naturalness as a "decisive purchase incentive" with nearly three-quarters of participants associating "perceived naturalness" closely with "perceived healthiness"[36].The information boundary functions as an external visual feature that symbolizes the healthiness of organic food. It serves as a medium through which consumers are exposed to organic food and significantly influences their perceptions. Interestingly, organic foods like fruits and milk available in shopping malls and supermarkets often evoke consumers' perceptions of healthiness during everyday consumption scenarios. Consequently, this study aims to investigate whether food information boundaries can impact the perceived healthiness of organic food, offering a unique perspective on the topic[29].

2.3. Information Boundaries and Organic Food

Information boundaries have the function of informative descriptions that guide consumers' purchasing behavior at the point of consumption and are the entry point for studying purchase intentions to buy. Accessing food information serves as a crucial resource for individuals seeking insights into food health[37]. This information directly influences how people perceive the healthiness of food and significantly impacts their assessment of its nutritional value[38–42]. At present, researchers have explored how characteristics of food information impact the perceived healthiness of various foods, commonly focusing on features like the color of food labels[43], nutrient labelling[44], information presentation[8], information presentation (simple vs. complex) and font[45,46], among others. Information boundaries, as a visual subjective perception, are easily influenced by cues related to food information.

Metaphor cognition is the idea that people can use concrete concepts to learn and understand relatively abstract concepts[47]. According to cognitive metaphor theory, humans can learn and reinforce B concepts with the help of A concepts, and A concepts tend to have more concrete and intuitive characteristics[48]. Boundaries, for example, fenced yards and houses with doors and windows, always isolate one's space from the unknown outside in everyday life, forming a relatively separate and enclosed space within the boundary[49]. Physical boundaries in established spaces, such as ceilings and walls on either side of a walkway, can inspire a sense of inclusion and protection in consumers, leading to psychological safety[50]. Suppose the boundaries of packaged information are seen as physical boundaries. In such situations, people may be subconsciously swayed by the metaphorical concept that "a setting with defined borders is more secure," leading them to perceive certain things as being safer. This tendency is particularly evident when individuals feel a lack of control; they often look for boundaries in their physical environments to establish a sense of order and organization[4]. External characteristics of food information have been shown to influence the perception of specific product attributes and purchase intentions[51]. The causes of these shape effects can be broadly classified into two categories: cognitive bias caused by perceptual illusions and extended cognition of shape symbolism[52], in which the metaphorical meaning of shape attributes affects consumers' perceptions[53]. It was found that when organic food information is designed with a border, the external border becomes a prominent feature in the product's appearance instead of a borderless logo with identical other features. When consumers notice this appearance feature, they unconsciously associate having a border with a sense of health when making judgments about specific attributes of the product. One is healthiness, a conceptual metaphor influencing consumers to make more positive judgments about product purchases[54]. This research explores how the

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boundaries of information regarding organic food influence consumers' intentions to make purchases, emphasizing the product's external characteristic signals. Based on the earlier analysis, the subsequent hypothesis is suggested:

Hypothesis 1 (H1): *The presence of information boundaries on organic food packaging will increase consumers' purchase intentions compared to scenarios where no boundaries are present.*

2.4. The Mediating Role of Perceived Healthiness

Perceived healthiness encompasses individuals' perspectives on food safety and health-related attributes [55,56]. As a subjective perception, it is often vulnerable to biases, as most consumers lack the ability to accurately assess whether food is genuinely safe and healthy [57]. In the absence of a clear and universally accepted definition of healthiness among consumers, individuals typically differentiate between healthy and unhealthy foods based on food categories. For instance, vegetables are generally categorized as healthy foods [58], while carbonated beverages are often viewed as classic examples of unhealthy foods. However, due to the hierarchical structure within these categories, not all foods within a given category (whether labeled as healthy or unhealthy) are perceived equally. Significant differences exist in evaluative judgments between foods that are more representative of a category and those that are less so, with foods that exhibit higher representativeness within the healthy category being perceived as healthier [59]. Consequently, consumers must rely on explicit environmental cues to evaluate the perceived healthiness of a particular food product.

In packaging design, informational boundaries-particularly elements such as color, placement, and layout-significantly influence consumers' perceptions of a product's health attributes. Research has demonstrated that these packaging elements not only act as visual cues but also play a crucial role in enhancing consumers' awareness of the product's health attributes.

The color of packaging significantly influences consumers' judgments regarding the healthiness of food products. Color serves as one of the most pertinent packaging cues related to health perception. Research indicates that light blue packaging tends to perform poorly in terms of health perception, correlating with the widespread consumer belief that blue is not associated with health. Conversely, green packaging is generally linked to nature and health, leading to more favorable health perceptions among consumers [60]. This finding reinforces the notion that color boundaries function as visual cues, enabling consumers to subconsciously associate specific packaging colors with health perceptions. Additionally, the study by Robert Mai et al. (2016) found that light and pastel colors on food packaging typically convey a more favorable health perception, while darker colors may evoke unhealthy impressions [61]. This research underscores how color boundaries act as visual cues, guiding consumers in their associations between certain packaging colors and health perceptions. When packaging colors are congruent with health attributes, the presence of color boundaries further enhances the perceived healthiness of the product.

Nutritional claims and warnings on packaging are closely linked to consumers' health perceptions. The study by Nobrega et al. (2020) investigated the effectiveness of nutritional warnings and claims in shaping these perceptions. Research has found that warnings, such as 'high sugar' or 'fat-free,' are more effective in influencing health perceptions than positive health claims, such as 'rich in vitamins' or 'natural.' Studies indicate that warning messages, serving as informational boundaries, are more likely to capture consumers' attention, reinforce perceptions of health risks associated with the product, and thereby influence health-related decision-making. Additionally, the study by Li et al. (2024) explored how packaging cues affect consumer decisions, particularly in the health food sector. This research emphasizes that packaging elements, especially health claims and warnings, enhance health perception through clear boundary cues. Health-related boundary cues not only provide explicit guidance but also significantly convey the product's health value, thereby enhancing consumers' health perception and purchase intention. These findings align with studies by Tijssen et al. (2017) and Nobrega et al. (2020), suggesting that such boundary cues can effectively guide consumers toward making healthier food choices.

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The impact of informational boundaries on health perception is further reinforced by their mediating role in consumer decision-making. The study by Spartano et al. (2021) found that packaging cues, such as the presence of boundaries, not only directly influence health perception but also mediate the relationship between packaging design and consumer purchase intention [65]. Specifically, consumers are more likely to perceive products with health cues (such as green borders or health claims) as healthier, thereby increasing their likelihood of selecting these products for purchase. Research indicates that as individuals perceive a food product to be healthier, their intention to purchase it often rises [66]. The study by Li et al. (2024) further corroborates this perspective, highlighting that health perception plays a critical role in the manner through which packaging cues affect purchase intention [67]. By effectively communicating health information, packaging improves consumers' perceptions of health, thereby increasing their intentions to purchase. Health perception acts as a mediating factor, and informational boundaries play a significant role in shaping consumer decision-making. As a result, informational boundaries are identified as a crucial predictor of consumers' emotional and cognitive reactions to health. In light of this analysis, the study puts forward the following hypotheses:

Hypothesis 2 (H2)*: Perceived healthiness mediates the relationship between the presence of information boundaries on organic food packaging and consumers' purchase intentions.*

2.5. The Moderating Role of Cues of Credence-Label Structure

In consumer trust research, credence labels play a crucial role, particularly in shaping trust perceptions at both the product and ingredient levels. Credence labels are generally defined as mechanisms through which consumers establish trust in product quality when complete information is lacking, utilizing cues such as product labeling or brand reputation [68]. Within the framework of credence labels, these elements are essential for aiding consumers in recognizing health-related claims about food in a logical and effective manner. These elements can be categorized into two groups: product-level cues, which describe the overall features of the food, and ingredient-level cues, which provide detailed information regarding the composition of the food [69,70]. These cues significantly influence the intention to purchase organic products [71].The distinction between product-level and ingredient-level cues can be further understood by examining consumers' focus on food attributes and the manner in which they process this information during their purchasing decisions.

Firstly, product-level cues typically focus on the overall safety characteristics of food, such as whether the food is organic certified, meets certain environmental standards, or possesses other external assurance measures[72]. Product-level cues represent consumers' attention to food safety and certification during their purchasing decisions. According to Grunert (2005), consumers are more likely to trust products with safety labels, especially in the case of organic foods, as these safety labels provide information about whether the food meets basic health and safety standards[73]. Therefore, when credence labels emphasize product-level cues, consumers' decision-making processes tend to focus on external signals (e.g., certification marks) rather than specific details about internal ingredients. These labels are more focused on conveying external assurances and trust, with safety often being the primary concern for consumers seeking "verified" products. In contrast, ingredient-level cues emphasize the specific composition and nutritional value of food. These cues include detailed ingredient descriptions such as "low sugar," "high fiber," or "rich in antioxidants[74]." This information helps consumers understand the health attributes of a product, beyond simply whether it meets certain external standards. Papies and Hamstra (2010) noted that when labels provide information about the specific ingredients of food, consumers are more likely to form perceptions of the food's healthfulness[75]. Ingredient-level cues not only relate to the nutritional quality of food but may also involve consumer concerns about the food's origin, production methods, and the naturalness of its ingredients[76]. Particularly for consumers who are focused on the health properties of food, these cues can significantly influence their evaluation of the food's healthfulness and may increase their purchase intentions.

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According to Dube, Hitsch and Chintagunta (2010), different types of information have varying levels of appeal to consumers when making food purchasing decisions[77]. For consumers with a strong focus on health, ingredient-level information is more compelling because it is directly related to their expectations regarding the health benefits of the food. In contrast, product-level safety information is more suitable for consumers who are concerned with the overall safety of the food rather than its specific nutritional components. Therefore, ingredient-level cues in credence labels are typically more closely related to consumers' health needs, while product-level cues are more tightly associated with their concerns about food safety and compliance. As a result, consumers generally prioritize either food safety or healthiness in their purchasing decisions, particularly when choosing organic foods.

Considering organic food components, both product-level and ingredient-level cues associated with credence-label structures can assist consumers in assessing the safety and health benefits of food by providing informational boundaries. This evaluation, in turn, may affect their intentions to buy organic products. In particular, the ingredient-level cues of credence-label structures highlight the natural and healthful characteristics of organic food, setting it apart from conventional food options. Therefore, consumers concerned about organic food's health attributes will have a higher perceived sense of health and will be more likely to purchase such products. In relation to the cues at the product level within the credence-label framework, the emphasis on safety characteristics is a hallmark of organic food. Consequently, consumers purchasing organic products who prioritize food safety attributes may experience a diminished perception of health in this context, resulting in a reduced likelihood of opting for these products.

This study argues that the structure of credence labels can influence how information limits affect consumers' buying intentions when discussing different aspects of organic food. Regarding the ingredient-specific signals within the credence-label framework, consumers show a greater focus on the health benefits of the product. So adding a boundary to the information expressed in organic food makes it easier for consumers to identify and perceive the healthiness of the product, enhancing their perception of healthiness and thus their intentions to purchase. For product-level cues of credence-label structure, consumers focus more on its safety as a feature and less on health as an attribute, reducing consumers' perception of healthiness and thus their intentions to buy. As an external signal that indicates the inherent quality features of a food item, the elements of credence-label structure partially disclose the product's qualities and its production methods[12]. These cues contribute to fostering consumer trust and serve as a crucial foundation for consumers' assessments of the food product's attributes. Consequently, this research selects credence-label structure cues as a moderating variable to investigate how organic food information boundaries affect consumer purchasing intentions.

In light of this, the current study puts forth the following hypothesis:

Hypothesis 3 (H3): *The effect of organic food information boundaries on consumers' purchase intentions is moderated by the structure of credence-label cues.*

Hypothesis 3a (H3a): *When the credence-label structure focuses on ingredient-level cues, the presence of boundaries on organic food packaging enhances consumers' purchase intentions more than when no boundaries are present.*

Hypothesis 3b (H3b): *When the credence-label structure focuses on product-level cues, the absence of boundaries on organic food packaging leads to a higher purchase intention compared to when boundaries are present.*

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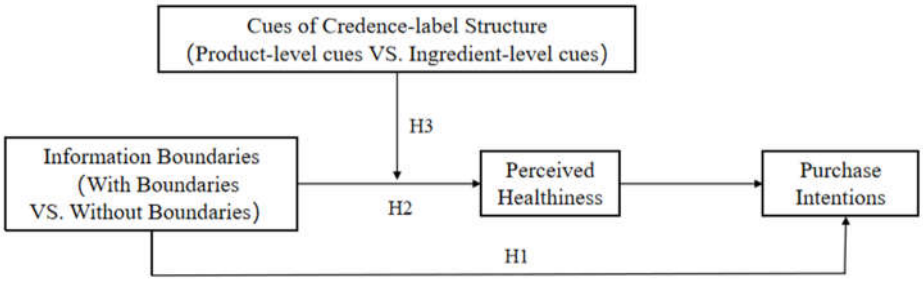

Figure 1. Conceptual framework diagram .

3. Experiment 1: Influence of Organic Food Information Boundaries on Purchase Intention

3.1. Purpose of the Experiment

The main aim of Experiment 1 was to assess the research hypotheses H1 and H2, particularly focusing on the impact of the presence or absence of organic food information boundaries on purchase intention (H1) and the mediating role of perceived healthiness (H2). To enhance the external validity of the findings, we chose the authentic brand "SATINE" organic milk as the stimulus and analyzed the food information related to this same product, including its production location, storage requirements, shelf life, and other relevant details.

3.2. Experimental Design and Subjects

The first experiment utilized a one-way between-group design to investigate how the presence of organic food information (yes vs. no) influenced purchase intentions. The organic food information condition was identified as the independent variable in this study, whereas the dependent variable concentrated on the intention to purchase. Additionally, perceived healthiness functioned as the mediating variable.

To minimize the potential biases caused by individual characteristics, we implemented a controlled experimental design. Participants were recruited to ensure a balanced distribution across age, gender, and consumer habits. A total of 166 participants were recruited through a reputable online survey platform in China. The average age of the participants was 26.49 years (SD = 5.316), with 86 females representing 51.80% of the total sample. Prior to the main experiment, a screening questionnaire was used to identify and exclude individuals with extreme or unrepresentative consumer habits. Additionally, participants were randomly assigned to different experimental groups, thereby enhancing the internal validity and reliability of the results. The entire study was conducted online, and each participant received between 5 to 10 RMB in cash upon completing all questions.

3.3. Experimental Procedure

This experiment used the real brand " SATINE " (Famous brand in China) organic milk as the stimulus. The experiment was randomly assigned into 2 experimental groups: the bounded group and the unbounded group.

The initial segment involved a reading exercise. This exercise aimed to alter consumers' perceptions regarding "SATINE" organic milk as a type of organic food. The researcher started by giving the participants a concise overview of "SATINE" organic milk. This product is enriched with 19 varieties of natural nutrients and boasts over 3.5% of premium milk protein for every 100g, surpassing the national standard by 20%. The entirety of the production zone is regulated, featuring an exclusive seventh organic farm dedicated solely to supplying high-quality milk for the creation of Golden Classic products. The entire production process is meticulously overseen to maintain the quality of Golden Classic products from the very beginning, supported by an exemplary quality inspection system. This inspection system ensures the safety and integrity of organic milk from the

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farm all the way to the final product. Following the reading, participants were requested to respond to questions pertaining to the manipulation test.

The second section involved a task for evaluating food. Initially, participants were informed that the YIlI manufacturer intended to introduce an organic milk line and sought to gauge consumer opinions prior to its official release. Subsequently, they were shown an image representing the product details of the organic milk, which was described as a screenshot taken from the packaging. Participants in the no-border condition viewed the product information image without any frames (Figure A1(a) without boundaries), whereas those in the border condition viewed the image enclosed within boundaries (Figure A1(b) boundaries). Both groups were exposed to identical content regarding the product information. This information comprised the product's name (organic milk), its shelf life (6 months), the recommended storage conditions (between 2°C and 6°C, in an airtight container), and the production date. Questions were then answered after the subjects had read the stimulus material.

3.4. Measurement Scale

The variables that were manipulated primarily involved the perception of "SATINE" organic milk as an organic product[78]. The inquiry made was, "Do you view 'SATINE' organic milk as organic food?" Participants provided their answers using a 7-point scale, with 1 indicating strong disagreement and 7 signifying strong agreement. The mediating variables were assessed using a perceived healthiness scale (Cronbach's α = 0.933)[79], which included 5 items across 7 subscales, rated from 1 (disagree) to 7 (strongly agree). The statements included: "I believe this organic milk is healthy"; "I find this organic milk to be environmentally friendly"; "I view this organic milk as nutritious"; "I consider this organic milk to be low-fat"; "I think this organic milk benefits my body." The assessment of the dependent variable was conducted concerning the organic food purchase intention scale (Cronbach α = 0.908), which was created by Grunter et al.[80] and Schifferstein et al.[81]. The measurement included three statements (encompassing seven subscales, where 1 represents disagreement and 7 indicates strong agreement): "I might think about purchasing this organic plain milk; it is very probable that I would buy this organic plain milk; I would choose to purchase this organic plain milk."

The scales selected for this study were chosen based on their demonstrated reliability and validity in prior research. The perceived healthiness scale (Cronbach's α = 0.933) was selected because it has been widely validated and comprehensively assesses various dimensions of health perception, including nutritional value, environmental friendliness, and overall health benefits. The purchase intention scale (Cronbach's α = 0.908) was chosen for its reliability and effectiveness in measuring consumers' willingness to purchase organic products.

Control variables encompassed brand familiarity, product preference, level of hunger, and weight loss goals. The selection of these variables was informed by prior research, which identified them as potential confounders that could influence consumers' purchase intentions and perceptions of healthiness. By controlling for these variables, we were able to more accurately assess the impact of information boundaries on purchase intentions, thereby mitigating the interference of these potential confounders and enhancing the robustness and credibility of our findings. Additionally, demographic information, including participants' age and gender, was documented.

3.5. Experimental Results

3.5.1. Manipulation Test

The findings from the one-way ANOVA indicated that both groups rated "SATINE" organic pure milk as organic food similarly (M with boundaries = 6.21, SD = 1.195; M without boundaries = 6.13, SD = 1.189; $F(1,198) = 1.321$, $p > 0.05$), showing no significant difference. However, a notable difference was observed concerning the information boundary size perceived by the two groups of participants (M with boundaries = 4.86, SD = 1.401; M without boundaries = 4.31, SD = 1.623; $F(1,198) = 2.286$, $p > 0.05$), product familiarity (M without boundaries = 3.79, SD = 2.107; M with boundaries =

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4.07, SD = 1.845; F(1, 198) = 1.522, p > 0.05), and product preference (M without boundaries = 4.73, SD = 1.487; M with boundaries = 4.91, SD = 1.277; F(1, 198) = 1.298, p > 0.05). No significant difference was found regarding whether participants from the two groups had a clear weight loss objective (M without boundaries = 4.11, SD = 1.956; M with boundaries = 4.33, SD = 1.943; F(1, 198) = 0.988, p > 0.05). These results suggest that the experimental manipulation of information boundaries in organic food is effective.

3.5.2. Purchase Intention

A variance analysis (ANOVA) was performed using information boundary as the independent variable and the intention to purchase as the dependent variable. As shown in Figure 2, the results indicate that the information boundary related to organic food had a significant impact on purchase intentions. Based on the results from the one-way ANOVA, participants in the boundary group (M with boundaries = 5.021, SD = 1.231) exhibited a greater intention to purchase organic plain milk compared to those in the group without boundaries (M without boundaries = 4.282, SD = 0.951) [F (1, 207) = 5.187, p = 0.024]. This supports H1.

To control for potential confounding effects of gender and age, a further analysis of covariance (ANCOVA) was conducted, including gender and age as covariates. The independent variable remained the information boundary, and the dependent variable was the intention to purchase organic plain milk. The results showed that after adjusting for gender and age, the information boundary still had a significant impact on purchase intention ($p < 0.05$). This result suggests that the effect of the information boundary on purchase intention remained robust despite the potential influence of these demographic variables. The covariate analysis also revealed that neither gender [F (1, 205) = 0.421, p = 0.517] nor age [F (1, 205) = 1.142, p = 0.286] had a significant direct effect on purchase intention. These findings further support H1, indicating that the presence of information boundaries significantly influences consumers' purchase intentions, independent of gender and age differences.

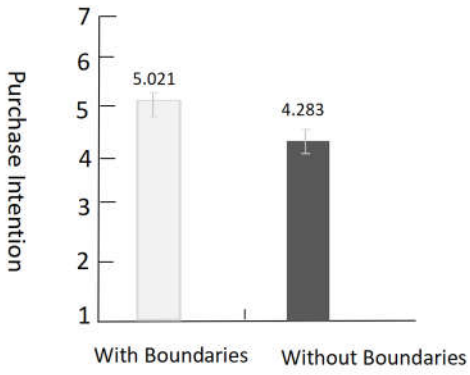

Figure 2. The influence of organic food information boundary on purchase intention (Real Brand- SATINE).

3.5.3. Perceived Healthiness

The results of the ANOVA indicated that participants in the bounded group (M = 4.839, SD = 1.022) considered organic pure milk to be healthier compared to those in the unbounded group (M = 4.193, SD = 1.879) [F(1, 148) = 4.717, p = 0.024]. This suggests that the perceived health benefits of organic food positively influence intentions to purchase such products.

3.5.4. Mediating Role of Perceived Healthiness of Food

The method of Bootstrapping described in the Process (Model 4; Hayes, 2013) [82] was utilized to investigate the mediating role of the perceived healthiness of organic food in the connection between the boundary of food information and the intention to purchase. In the current analysis, the boundary of food information was considered the independent variable, whereas the intention to

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purchase was identified as the dependent variable, with the perceived healthiness of food acting as a mediating factor. The research involved a repeated measures sample consisting of 5,000 participants and determined a confidence interval of 95%. Results demonstrated that the food information boundary positively impacted the perception of food healthiness ($\beta = 0.382$, $t = 2.32$, $p = 0.0348$). In addition, the perception of food healthiness had a significant influence on the intention to purchase. ($\beta = 1.021$, $t = 11.257$, $p < 0.001$). At the same time, the direct impact of food information boundary on purchase intention was found to be non-significant ($\beta = -0.217$, $t = -1.107$, $p = 0.425$). Additionally, the perceived healthiness of food demonstrated a mediating effect of 0.3209, with a confidence interval that did not include 0 (LLCI = -0.7221, ULCI = -0.0623), suggesting that this mediating effect is indeed significant. The verification of H2 was also conducted.

3.6. Discussion

The first experiment confirmed that the presence of boundaries in organic food information mediates the relationship between purchase intention and perceived healthiness. The chosen scales ensure the reliability and validity of the measurements, thereby enhancing the credibility of the study results. Our study accounted for potential influences of gender and age by including them as control variables in the analysis. The results indicate that the effects of information boundaries on purchase intentions and perceived healthiness are robust and not significantly influenced by gender or age differences. This strengthens the validity of our findings and suggests that the observed effects are primarily driven by the presence or absence of information boundaries. Controlling for the selected variables helps to minimize potential biases and strengthens the robustness of the findings, allowing for more accurate conclusions regarding the impact of information boundaries on consumers' purchase intentions. Specifically, Consumers tend to exhibit enhanced perceptions of healthiness and, in turn, increased intentions to purchase when they encounter information about organic food that incorporates certain boundaries, compared to when such information lacks those boundaries. No significant differences emerged between the two groups regarding brand familiarity, product familiarity, product preference, set weight loss goals, and hunger levels, leaving aside potential alternative interpretations of these aspects. It is crucial to note that, although the study employed the genuine brand "SATINE" organic milk for validation purposes, the effect of participants' prior perceptions of the actual brand on the results was not entirely managed. Consequently, Experiment 2 opted for the virtual brand "Natural Life" organic whole wheat bread to further evaluate H1 and H2.

4. Experiment 2: Influence of Organic Food Information Boundaries on Purchase Intention（Virtual Brand）

4.1. Experimental Purpose

The aim of the study was to confirm H1 and H2. In contrast to Experiment 1, we substituted the stimuli with a virtual brand to remove the impact of the subjects' views on the actual brand and enhance the experiment's robustness. In this study, we utilized the organic whole wheat bread from the fictitious brand "Natural Life" as our stimulus. To closely simulate a real-world scenario, we adopted the presentation style of products and product information from e-commerce platforms like Jindong and Taobao—Chinese shopping websites. Specifically, The food image appeared on the left side of the screen, with the related information placed on the right side, enabling consumers to see the details more clearly. Simultaneously, we provided increasingly detailed food information to the participants, such as the source, expiration date, production standard number, components, and conditions for food storage.

4.2. Experimental Design and Subjects

The methodology employed in Experiment 2 closely resembled that of Experiment 1. This study utilized a one-way between-group design based on food information boundary, with conditions of yes and no. A total of 250 participants were sourced via a professional online survey platform,

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averaging 29.32 years in age (SD = 7.274), which included 159 females, comprising 59.6% of the overall sample. Upon finishing the questionnaire, every participant was awarded a cash incentive between 5 and 10 RMB.

4.3. Experimental Procedure

In Experiment 2, to eliminate the impact of the participants' perceptions of the actual brand, the virtual brand "Natural Life" organic whole wheat bread served as one stimulus, while the real brand "SATINE" organic milk was utilized as another stimulus. The experiment involved random assignment into two groups: the bounded group and the unbounded group.

The initial section involved a reading assignment. This reading assignment aimed to influence consumers' views of "Natural Life" whole wheat bread as a product of organic food production and to shape the perceived limits of the information presented. The subjects were initially presented with a brief overview of Natural Life whole wheat bread by the researcher. "Founded in 2020 in Guilin, Guangxi, the Natural Life Food Company focuses on organic food items, including breads and cereals, and its products are now available throughout China." The company is preparing to introduce a new product, "Natural Life," which is organic whole wheat bread. During production, we employ a cutting-edge management process that leads internationally. The wheat undergoes comprehensive milling, adhering to the principle of utilizing every part without discarding or wasting any. Thus, the fiber present in the wheat husk is maintained, and the essential value of wheat-malt-is safeguarded as well. Whole wheat bread, produced from whole wheat flour, is rich in carbohydrates, proteins, unsaturated fats, dietary fiber, vitamins, minerals, and various other nutrients, particularly B vitamins. This food item excludes artificial components, preservatives, and radiation treatment. Following the review of the material, participants were requested to respond to questions regarding the manipulation test.

The second part was a food evaluation task. First, subjects were told that a manufacturer was about to launch an organic whole wheat bread and that the manufacturer wanted to find out consumers' attitudes towards this product before officially launching it. The subjects were then presented with a picture of the whole wheat bread and the product information, with the border group presented with the product information with a border (Figure B 1(b) boundaries) and the borderless group presented with the product information without a border (Figure B1(a) without boundaries). The subjects in both groups saw the same product information. The product information included the product name (organic whole wheat bread), shelf life (6 months), storage conditions, and production date. Questions were then answered after the subjects had read the stimulus material.

4.4. Variable Measurement

The variables that were manipulated[78] primarily included assessments of perceptions regarding "Natural Living" organic whole wheat bread as organic food. The question posed was, "Do you believe that 'Natural Living' organic whole wheat bread qualifies as organic food?" Every scale used in this study was a 7-point scale (1=strongly disagree, 7=strongly agree). The mediating variables were assessed based on the perceived healthiness scale (Cronbach's α = 0.933)[79], which comprised 5 measures (7 subscales, where 1 represents disagreement and 7 indicates strong agreement): "I think this whole wheat bread is healthy" "I think this whole wheat bread is environmentally friendly" "I think this whole wheat bread is nutritious" "I think this whole wheat bread is low fat", and "I think this whole wheat bread is good for my body " (Cronbach's α = 0. 822) (Hagen, 2021). The assessment of the dependent variable, purchase intention (Cronbach's α = 0.908), was carried out using the organic food scale designed by Grunter et al. [80] alongside Schifferstein and Lophius [81]. This scale comprised three primary items, categorized into seven subscales, with responses ranging from 1 (disagree) to 7 (strongly agree): 'I would consider buying this whole wheat bread; I am very likely to purchase this whole wheat bread; I plan to acquire this whole wheat bread.' Furthermore, participants were assessed for control variables, which included brand familiarity, preferences for products, their level of hunger at the time of the survey, and whether they had a specific weight loss goal.

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Additionally, various demographic information, such as the participants' age and gender, was also collected.

4.5. Experimental Results

4.5.1. Manipulation Test

The results showed that the two groups of participants did not perceive a significant difference in the organic food "Natural Life" whole wheat bread(M with boundaries = 6.01, SD = 1.195; M without boundary = 6.13, SD = 1.182; $F(1, 264) = 0.981$, $p>0.05$). Additionally, there was no notable disparity in the perception related to the size of the information boundary (M with boundaries = 4.68, SD = 1.501; M without boundary = 4.23, SD = 1.723; $F(1, 264) = 0.981$, $p>0.05$). The perceived magnitude of information boundaries (M with boundaries = 4.68, SD = 1.501; M without boundaries = 4.23, SD = 1.723; $F(1, 264) = 2.386$, $p<0.05$) showed a significant difference. To further eliminate potential alternative explanations related to other variables, this study also assessed participants' familiarity with the brand, familiarity with the product, and emotional response to the brand. The findings indicated that there were notable differences between the two subject groups regarding brand familiarity (M unbounded = 3.92, SD = 1.321; M bounded = 4.11, SD = 1.190; $F(1, 264) = 1.515$, $p>0.05$), product familiarity (M unbounded = 3.79, SD = 2.107; M bounded = 4.07, SD = 1.845; $F(1, 264) = 1.562$, $p>0.05$), and product preference (M unbounded = 3.73, SD = 1.457; M bounded = 3.91, SD = 1.317; $F(1, 264) = 1.368$, $p>0.05$), which were not significantly different. This effectively confirmed the success of the experimental stimulus.

4.5.2. Purchase Intention

The results of the ANOVA indicated that participants in the boundaries group (M = 5.173, SD = 1.515) showed a higher likelihood of purchasing whole wheat bread compared to those in the no boundaries group (M = 4.711, SD = 1.166) [$F(1, 148) = 5.936$, $p = 0.016$]. This suggests that organic food communications featuring information boundaries can enhance consumers' intention to purchase. The hypothesis H1 was supported.

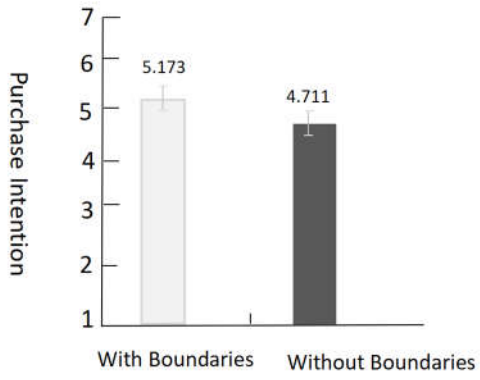

Figure 3. The influence of organic food information boundary on purchase intention (Virtual Brand- Natural Life).

4.5.3. Perceived Healthiness

The ANOVA findings revealed that participants in the bounded group (M = 5.139, SD = 1.022) rated the health benefits of whole wheat bread higher than those in the unbounded group (M = 5.093, SD = 1.879) [$F(1, 148) = 4.717$, $p = 0.024$]. This suggests that the perception of the healthiness of organic foods positively influences the decision to buy organic products. Thus, it can be concluded that how healthy organic food is perceived significantly impacts consumers' intentions to purchase such items.

4.5.4. Mediating Role of Perceived Healthiness of Food

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The Bootstrapping technique described in the Process (Model 4; Hayes, 2013) [82] was utilized to examine how the perceived healthiness of organic food mediates the connection between the food information boundary and purchase intention. In this study, the food information boundary was treated as the independent variable, with purchase intention identified as the dependent variable, and the perceived healthiness of food functioning as the mediating variable. The research employed a repeated measures sample consisting of 5,000 participants, with a confidence interval established at 95%. Results demonstrated that the boundary of food information positively influenced perceptions of food healthiness ($\beta = 0.355$, $t = 2.28$, $p = 0.0242$). Additionally, this perception of healthiness regarding food positively affected the intention to purchase ($\beta = 1.046$, $t = 13.255$, $p < 0.001$). However, the direct influence of the food information boundary on purchase intention was found to be insignificant ($\beta = -0.167$, $t = -1.167$, $t = -1.097$, $p = 0.275$). The mediating effect of the perceived healthiness of food was calculated to be 0.3709, with a confidence interval that did not include 0 (LLCI = -0.6242, ULCI = -0.0593), suggesting the significance of this mediating effect. The hypothesis H2 was confirmed.

4.6. Discussion

To remove the inherent impact of subjects' views on the actual brand, Experiment 2 employed the virtual brand "Natural Life" organic whole wheat bread as a stimulus. This approach aimed to further confirm the main effect (H1) by circumventing the potential biases stemming from participants' familiarity with and preference for the existing brand. In particular, organic food that provided specific information (as opposed to no specific information) would enhance consumers' perception of healthiness and markedly boost their intention to purchase. Furthermore, Experiment 2 confirmed this mediating effect (H2), which indicates that the perception of healthiness mediated the relationship between information boundaries and purchase intention. After excluding the influence of various potential alternative explanations, we found no significant differences regarding brand familiarity, familiarity with the product, liking of the product, explicit weight loss objectives, and levels of hunger. In Experiment 1, we utilized basic product information as our experimental material; however, it is essential to integrate product images with basic product details to assess the significance and complexity of intentions to purchase organic food. Consequently, Experiment 2 incorporated product images as experimental stimuli, building upon Experiment 1. These images and corresponding details were provided to the participants in order to examine how the complexity of information boundaries influences their food purchasing intentions.

5. Experiment 3: The Moderating Role of Cues of Credence-Label Structure

5.1. Experiment Purpose

The purpose of Experiment 3 was twofold: first, to employ the product information available on the packaging of the virtual brand "Green Classic" organic milk as a stimulus, enhancing the realism of the experimental context and increasing the study's validity; second, to investigate the moderating influence of cues associated with the design of credence labels, particularly to assess H3..

5.2. Experimental Design and Subjects

Experiment 3 used the virtual brand "Green Classic" organic milk as the stimulant, which differed from Experiments 1 and 2 in that the way the pictures were presented to the subjects was changed, and this experiment presented the pictures in three dimensions, with the front and back of the product as a whole, which was more three-dimensional and comprehensive than Experiments 1 and 2. The study implemented a 2 (food information boundary: yes vs. no) X 2 credibility labeling structure cue (product vs. ingredient) intergroup design. Involving 350 participants who were recruited from a university located in southern China. The average age of the participants was 20.32 years (SD = 7.274), with 189 females, representing 59.6% of the overall participant pool. Upon completion of all survey questions, each participant was compensated with a cash reward between 5 to 10 RMB.

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5.3. Experimental Procedure

Participants were randomly allocated into four different experimental groups. We notified the participants that the experiment consisted of two distinct components.

The initial component involved a reading task. The purpose of the reading task was to manipulate the consumer's perception of "Green Code" organic milk as an organic food product and the perceived information boundaries. Initially, the researcher offered the participants a concise overview of "Green Code" organic milk. This type of milk is generated through a top-tier global production management process that ensures it is free from pollution and additives. It comprises 20 varieties of natural nutrients and boasts over 5% high-quality milk protein per 100g, exceeding the national standard by 30%. The product is backed by an impeccable quality inspection framework, guaranteeing the integrity of the organic milk from the farm to the final product, making it both safe and trustworthy. Following their review of the material, the participants were requested to respond to questions pertaining to the manipulation test.

The second part was a food evaluation task. First, the subject was told that a manufacturer was about to launch an organic milk product and that the manufacturer wanted to find out consumers' attitudes towards the product before officially launching it. Subsequently, participants were presented with an image showcasing the product details of Green Dairy Organic Pure Milk, informed that it represented a screenshot of the packaging information for this organic pure milk. Regarding product-level cues within the credence-label framework, individuals in the no-boundary category viewed the product information image without any boundaries (Figure C1(a) without boundaries in Product-level Cues of Credence-label Structure), while those in the bounded category observed the food information image with defined boundaries (Figure C1(b) boundaries in Product-level Cues of Credence-label Structure); In terms of ingredient-level indicators within the credence-label framework, participants in the no-boundary condition viewed the nutrition information image without any boundaries (Figure C2(a) without boundaries in Ingredient-level Cues of Credence-label Structure), while those in the bounded condition observed the nutrition information image with boundaries (Figure C2(b) boundaries in Ingredient-level Cues of Credence-label Structure). All four participant groups received identical product information, which encompassed the product name (organic milk), shelf life (6 months), storage requirements (airtight at 2°C to 6°C), and production date. Following their review of the stimulus material, participants were then asked to respond to questions.

5.4. Variable Measurement

The organic food scale (Cronbach α = 0.908), developed by Grunter et al.[80] and Schifferstein and Ophism[81], was employed to assess the dependent variable of purchase intention. This measurement comprised three items across seven subscales, where a score of 1 indicates disagreement and a score of 7 denotes strong agreement: 'I would contemplate purchasing this machine for pure milk; it is likely that I would buy this machine for pure milk; I would acquire this machine for pure milk.' The measured variables were assessed according to the perceived healthiness scale (Cronbach's α = 0.933)[79], utilizing 5 measures across 7 subscales, where 1 indicates disagreement and 7 signifies strong agreement: "I think this organic pure milk is healthy"; I think this organic pure milk is environmentally friendly; I think this organic pure milk is nutritious; I think this organic pure milk is low-fat; and I think this organic pure milk is good for my body." Ultimately, factors like the participants' familiarity with brands, their preference for the product, their hunger levels at the time of the survey, and the presence of a specific weight loss objective were assessed. Additionally, demographic information including the age and gender of the participants was documented.

5.5. Experimental Results

5.5.1. Manipulation Test

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Initially, tests involving manipulation were conducted to explore the cognitive capabilities and the indicators of the credence-label framework associated with organic foods. The results revealed that there was no significant distinction between the two groups of participants concerning their views on Green Classic organic milk as organic food (M with boundaries = 6.24, SD = 1.205; M without boundaries = 6.08, SD = 1.198; $F(1, 278) = 0.931$, $p>0.05$); A notable difference was observed in how the four subject groups perceived the size of information boundaries. Specifically, within the component cues of the credence-label structure, participants in the boundary group (M = 5.721, SD = 1.188) perceived the healthiness of organic pure milk to be significantly higher compared to those in the no-boundary group (M = 3.293, SD = 1.570) [$F(1, 278) = 211.321$, $p < 0.001$]. In the analysis of product-level cues related to the credence-label structure, participants from the no-boundary group (M = 4.829, SD = 1.188) perceived organic pure milk as healthier compared to those in the boundary group (M = 3.792, SD = 1.570) [$F(1, 278) = 211.321$, $p < 0.001$]. This outcome confirms H3, suggesting that the experimental manipulation of the credence-label structure cues was effective.

5.5.2. Moderating Effect of Cues of Credence-Label Structure

The results from the ANOVA indicated that neither the main effects of the organic food information boundary ($p = 0.934$) nor the cues related to credence-label structure ($p = 0.919$) significantly influenced perceptions of healthiness regarding organic food. However, the interaction effects were significant [$F(1, 276) = 13.693$, $p < 0.001$]. Subsequently, we employed the Bootstrapping technique in Process (Model 7; Hayes, 2013)[82], designating food information boundary as the independent variable, perceptions of food healthiness as the dependent variable, and cues from the credence-label structure as the moderating variable. This analysis utilized a repeated-measures sample size of 5,000 and established a 95% confidence interval. The results showed that the interaction between food information boundary and cues of credence-label structure was significant ($F = 13.693$, $p = 0.0003$). Specifically, for product-level cues of credence-label structure group, the addition of boundaries reduced subjects' perceptions of the healthiness of organic pure milk (M boundaries group = 4.851, SD boundaries group = 1.213 vs. M without boundaries group = 5.571, SD no boundary group = 0.992; $\beta = -0.420$, $t = -2.035$, $p = 0.0197$); whereas for ingredient -level cues of credence-label structure group, the addition of boundaries increased subjects' perceptions of the healthiness of organic pure milk (M boundaries group = 5.560, SD boundaries group = 0.939 vs. M without boundaries group = 5.043, SD without boundaries group = 1.074; $\beta = 0.517$, $t = 2.888$, $p = 0.0042$). Thus H3 was supported.

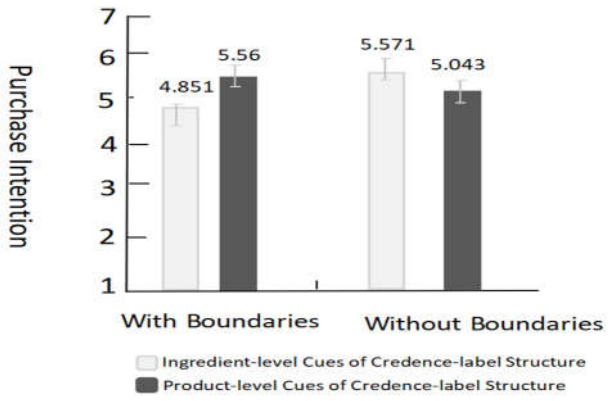

Figure 4. Moderating effect of cues of credence-label structure.

5.5.3. Moderated Mediating Role

Subsequently, we continue to employ the bootstrapping technique to examine the mediated model that is influenced by moderation, utilizing Process Model 7 from Hayes[82]. In this study, the independent variable refers to the information boundary, the dependent variable pertains to the intention to purchase, the mediating variable is related to the perceived healthfulness of food, and

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the moderating variable includes cues from the credence-label structure. We established a sample size of 5,000 for repeated measures, maintaining a confidence level of 95%. The results indicated that the mediated model being moderated was significant with an effect value of 0. 9751 (LLCI = 0. 4476, ULCI = 1. 5099). Specifically, for product-level cues of credence-label structure group, the mediated effect value for perceived food healthiness was -0. 437 (SE = 0. 1917, 95% CI [-0. 8128, -0. 0637]); for ingredient -level cues of credence-label structure group, the mediated effect value for perceived food healthiness was 0. 5. for ingredient -level cues of credence-label structure group, the mediated effect value of perceived healthiness of food was 0. 5381 (SE = 0. 1806, 95% CI [0. 1953, 0. 9038]). H3 (a) and H3 (b) are supported.

5.5.4. Exclusion Explanation

The findings indicated that participants across the four categories exhibited an interest in brand familiarity (M unbounded = 3.92, SD = 1.321; M bounded = 4.11, SD = 1.190; $F(1, 264) = 1.515$, $p>0.05$), product familiarity (M with boundaries = 3.79, SD = 2.107; M boundary = 4.07, SD = 1.845; $F(1, 264) = 1.562$, $p>0.05$), and product preference (M unbounded = 3.73, SD = 1.457; M bounded = 3.91, SD = 1.317; $F(1, 264) = 1.368$, $p>0.05$), with no significant differences observed. Furthermore, the presence of a distinct weight loss objective among the participants in the four groups did not show a significant difference (M without boundary = 4.11, SD = 2.056; M boundary = 4.33, SD = 1.963; $F(1, 264) = 1.088$, $p>0.05$). Consequently, the potential confounding influence of alternative explanatory factors, such as consumers' brand preferences, was ruled out.

5.6. Discussion

The third experiment reinforced the initial effect by using the virtual brand Green Classic organic milk as a stimulus, which helped reduce the possible impact of participants' prior familiarity and preference for the existing brand. In particular, the presence of organic food information boundaries (as opposed to those without) significantly boosted consumers' intent to purchase (H1). Additionally, the mediating role of healthiness perception (H2) was substantiated; that is, healthiness perception acted as a mediator between information boundary and purchase intention. Simultaneously, Experiment 3 checked the boundary condition of this proposed effect (H3), focusing on how cues related to credence-label structure moderated the influence of food information boundaries on perceptions of food healthiness. Specifically, when considering product-level cues of the credence-label structure, the inclusion of food information boundaries leads to a decrease in individuals' perceived healthiness of food products, which subsequently lowers their purchase intentions (H3b). In contrast, for ingredient-level cues related to the credence-label structure, consumers tend to view food products as healthier, and the addition of food information boundaries enhances their perceived healthiness, thereby increasing their purchase intentions (H3a). In contrast, the distinction between Experiment 1 and Experiment 2 lies in the fact that Experiment 3 offers participants a three-dimensional representation, whereas Experiments 1 and 2 provide them with a two-dimensional image format. This advancement in the method of picture presentation greatly enhances the external validity and strength of the experiment.

6. General Discussion

6.1. Conclusion

Research on labels for organic food information has increased; however, the primary emphasis has been placed on aspects such as text, images, design, and color of these labels, with insufficient focus on their boundaries. This study aimed to investigate the influence of these informational boundaries on consumers' intentions regarding the purchase of organic food, thereby addressing a gap identified in the existing literature. Through experimental data collected from three distinct experiments, the findings illustrate that the boundaries of information labels for organic food significantly affect consumer purchase intentions. Experiment 1 used the real brand "SATINE" organic milk as a stimulant to present the product information to the subjects in a flat format and

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found that organic food products with boundaries information labels could increase consumers' purchase intention compared to those without boundary information, which verified H1 and H2. Experiment 2 used the virtual brand "Natural Life" organic whole wheat bread as the stimulant and presented the product picture and information to the subjects in a flat way, which improved the validity of the experiment and further verified H1 and H2. The subjects were presented with the overall three-dimensional effect, and the boundary effect (H3) was confirmed, meaning that various types of cues related to the credence-label structure influenced how the organic food information boundary affected consumers' intention to purchase.

6.2. Theoretical Contributions

This study expands the investigation into information boundaries specifically within the realm of organic food. Previous research on this topic has predominantly centered around conventional food products, indicating that information boundaries relating to food tend to correspond with a diminished perception of health and a reduced likelihood of purchase compared to food information that lacks such boundaries[83,84]. In contrast to the findings, this research revealed that for organic food, information that is limited in scope was more effective in boosting consumers' purchase intentions compared to information that is unlimited. Moreover, several researchers have examined how the organization of food-related data[85] and the hue of this information[86] impact traditional purchasing behavior for products. While both aspects pertain to the external features of food information, they do not specifically address the product information regarding organic food. Li RQ et al.(2021) directly explored the impact of information boundaries on purchase intentions, yet also focused on food[9]. This research expands the concept of information boundaries by applying it to organic food, revealing that incorporating a boundary for organic food information relates to the significance of health attributes—a discovery that contrasts with previous studies on food. As a result, this study presents a new viewpoint for exploring the boundaries of information regarding organic food.

Our study aligns with international research that has explored the impact of packaging and labeling on consumer perceptions and purchase intentions, particularly in the context of organic food consumption. For example, studies in Europe and North America have shown that clear and structured information boundaries can significantly influence consumer trust and purchasing behavior[87]. Our findings further support these conclusions, demonstrating that information boundaries play a crucial role in enhancing perceived healthiness and purchase intentions for organic products[88]. Additionally, research has highlighted the importance of health-related determinants in influencing consumer attitudes towards organic food[89]. Studies have also shown that credible labeling can significantly impact consumer willingness to pay for certified organic products[90]. These findings are consistent with global consumer attitudes towards nutrition information on food labels[91].

Compared to studies that have focused on traditional food products, our research highlights the unique impact of information boundaries on organic food, which is often perceived as healthier and more environmentally friendly. For instance, a study by [Meng Shen, et al., 2018] found that information boundaries had a significant effect on health perceptions, similar to our findings [92]. However, our study extends this by examining the moderating role of credence-label structure cues, which has not been extensively explored in previous research [93].

Second, this study broadens the scope of consideration of factors influencing the intentions to purchase organic food. Research has primarily focused on the impact of prior factors like brand identity[94], environmental consciousness[48], advertising attractiveness, and product availability [95] on the intention to buy organic food. Additionally, there has been a greater emphasis on examining the connection between consumers and their heightened purchasing intention from the viewpoint of the consumers themselves[96]. This research contributes valuable insights to the exploration of intentions behind purchasing organic food. Additionally, it expands upon the investigation of healthiness perception as a mediating factor, enhances the theoretical framework

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regarding healthiness perception within the context of organic food information boundaries, confirms the impact of these information boundaries on purchase intentions, and uncovers the mediating role that healthiness perception plays in this relationship. Research examining perceptions of healthiness has been undertaken to investigate how these perceptions affect the intentions to repurchase organic food, largely focusing on advertising claims[95]. Simultaneously, additional research has validated the mediating role of health perceptions in the connection between environmental consciousness and purchasing intentions[97]. Nevertheless, none have explored the constraints related to the scope of information on organic foods. The findings of this research significantly contribute to understanding the boundaries of organic food information and introduce a fresh perspective for future studies.

Third, this research enhances the insights regarding the credence-label structure within the context of organic food information. Previous studies have explored the cues related to the credence-label structure, primarily emphasizing traditional products[98]. This research utilizes elements of credence-label structure within the organic food industry, demonstrating that the product cues associated with credence-label structure differ from the ingredient cues within the organic food information framework. Additionally, it confirms the varying impacts of these cues on the organic food information boundary via an empirical investigation. This offers empirical evidence for the significance of implementing credence-label structure cues within marketing science and contributes to enhancing the academic community's comprehension of these cues in organic food.

6.3. Marketing Insights

Initially, this study's findings indicate that introducing limitations to organic food information can enhance consumers' intent to purchase. This suggests that companies may influence consumers' perceptions of the health benefits of organic food by strategically framing the information surrounding it. On the one hand, businesses can attract consumers' attention to their products by adding boundaries when displaying information about organic food; On the other hand, when designing promotional images for organic food, advertisers should design the boundaries of the information in the images to be as eye-catching and prominent as possible, making the most of every information position, which may trigger customers' attention to organic food.

Secondly, This study indicates that how healthy individuals perceive food acts as a mediator in the impact of organic food information constraints on consumers' intent to purchase. Retailers have the opportunity to utilize health perceptions to differentiate their offerings and strategically place them to capture new customer prospects within the organic market segment. Consequently, in the promotion of organic items, such as healthy organic milk and raw organic fruits and vegetables, adding boundaries to the key information segments of these offerings may enhance consumers' awareness of the conservation benefits associated with organic foods, while also emphasizing health and safety to boost sales.

Third, marketers should create strategies for the layout of organic foods tailored to various population segments. The influence of information boundaries on the intention to purchase organic products relies on the characteristics of the cues related to credence-label structures. When it comes to organic items that emphasize health and safety features, businesses ought to showcase the product's distinct qualities and incorporate information boundaries, particularly when presenting organic options. This approach aims to address the desires of health-conscious consumers. Conversely, for organic foods lacking health-related information, omitting boundaries may enhance consumer perceptions of these products as environmentally sustainable and cost-effective, thereby encouraging purchases. Consequently, retailers must carefully design their information boundaries in accordance with the specific attributes of the credence-label structures.

Our findings contribute to the existing literature by providing empirical evidence that information boundaries can influence consumer behavior in the context of organic food. This is consistent with broader research on consumer psychology and marketing, which emphasizes the importance of visual cues and information presentation [99]. For example, studies have shown that

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clear and structured information boundaries can significantly enhance consumer trust and purchasing behavior [100]. Additionally, research has highlighted the role of visual cues in shaping consumer perceptions of health and environmental sustainability [101]. By incorporating these insights, our study offers practical guidance for marketers aiming to develop effective packaging strategies for organic products.

6.4. Limitations and Future Research

First, in presenting consumers' perceptions of healthiness, emphasis is placed on the perception of organic food as an attribute of healthiness, which includes not only healthy nutritional properties but also attributes such as naturalness and lack of contamination, and consumers may have different cognitive responses depending on the attribute they perceive.

Secondly, this research examines how perceived healthiness might act as a mediating factor in the impact of organic food information boundaries on consumers' purchase intentions. Additionally, in future studies, it may be beneficial to incorporate variables like perceived utility and green trust when analyzing the effect of organic food information boundaries on purchase intentions.

Third, this study focused only on moderating variables related to the product itself; other boundary conditions, such as the level of organic knowledge and the restrictive nature of variables such as product type (search-based versus experiential, functional versus hedonic), could be explored in the future.

Fourth, this study primarily focused on younger consumers in the sample, while future research might investigate how perceived healthiness influences purchase intentions among middle-aged and older individuals.

Author Contributions: L.L. and S.L. contributed to the conceptualization, methodology, resource management, and review and editing of the writing; Y.Z. was responsible for visualization, supervision, and data curation; B.L. and R.L. handled software development, validation, original draft writing, and investigation; and S.L. managed project administration and funding acquisition. All authors have reviewed and approved the final version of the manuscript.

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Institutional Review Board Statement: This study was conducted in accordance with the principles of the Declaration of Helsinki and complied with the relevant provisions of the "Measures for the Ethical Review of Biomedical Research Involving Humans (Trial)" and the "Personal Information Protection Law of the People's Republic of China." The study protocol was reviewed and approved for exemption by the Ethics Committee of Nanning University Business School (Approval Number: UNN-BSEC-2025M-007, Date: January 17, 2025).

Informed Consent Statement: All participants in the study provided their informed consent.

Data Availability Statement: The data presented in this study are available upon request from the corresponding author. The restriction is due to the data containing unpublished research findings, which cannot be shared publicly to protect the rights of relevant stakeholders or to comply with legal and ethical requirements. Researchers interested in accessing the data should contact the corresponding author to discuss the possibility of data sharing and ensure that any use complies with ethical and legal guidelines.

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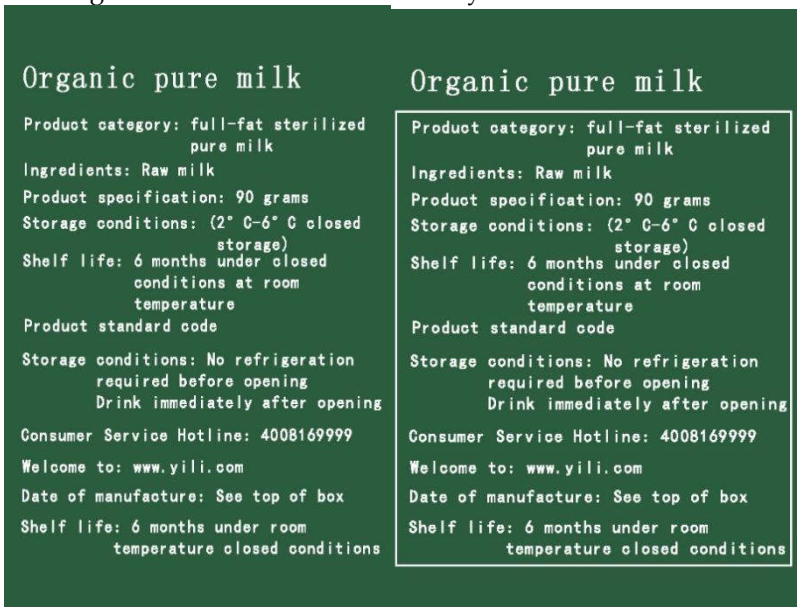
Declaration of Generative AI and AI-assisted technologies in the writing process：The authors affirm that no AI tools were employed in the creation of this work, and the author fully intends to assume responsibility for the publication's content.

Appendix A

"SATINE" YILI Organic Milk Stimuli Used in Study 1

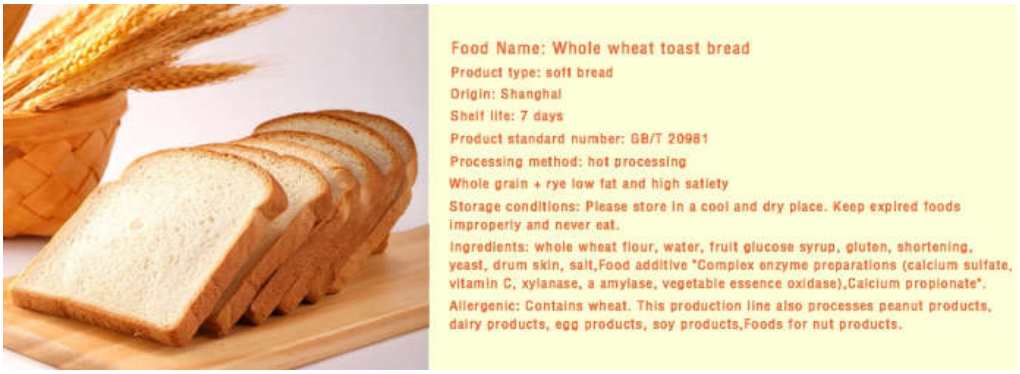


(a) **(b)**

Figure A1. (a) without boundaries. The Chinese meaning of the above figure is "without boundaries of 'SATINE' organic milk's product Information." **Figure A1(b)** boundaries. The Chinese meaning of the above figure is "with boundaries of 'SATINE' organic milk's product Information.".

Appendix B

"Natural Life" Organic Bread's Stimuli Used in Study 2



(a)

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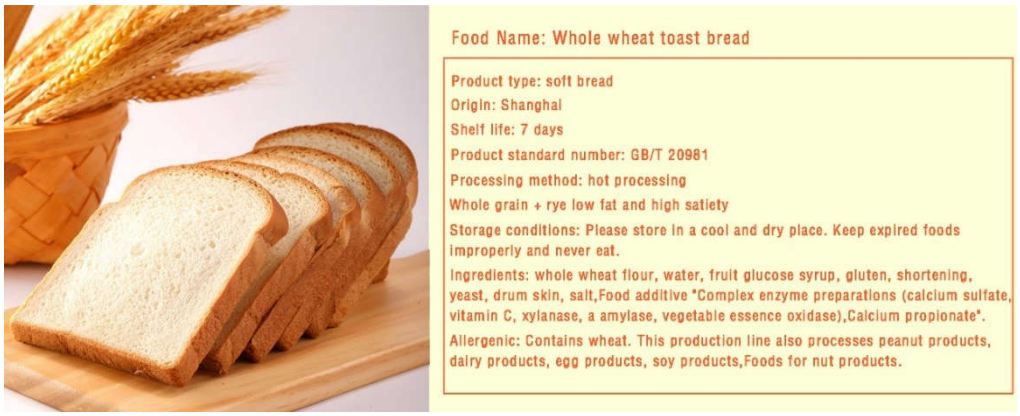

(b)

Figure B1. (a) without boundaries. The Chinese meaning of the above figure is "without boundaries of 'Natural Life' organic bread's product Information." **Figure B1 (b)** boundaries. The Chinese meaning of the above figure is "with boundaries of 'Natural Life' organic bread's product Information.".

Appendix C

"Green Classic" Organic Milk Stimuli Used in Study 3

C1 (a) **C2 (b)**

Figure C1. (a) without boundaries in Product-level Cues of Credence-label Structure. The Chinese meaning of the above figure is "without boundaries of 'Green Classic' organic milk's product Information in Product-level Cues of Credence-label Structure." **Figure C1 (b)** boundaries in Product-level Cues of Credence-label Structure. The Chinese meaning of the above figure is "with boundaries of 'Green Classic' organic milk's product Information in Product-level Cues of Credence-label Structure.".

Appendix D

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C2 (a) C2 (b)

Figure C2. (a) without boundaries in Ingredient-level Cues of Credence-label Structure. The Chinese meaning of the above figure is "without boundaries of 'Green Classic' organic milk's product Information in Ingredient-level Cues of Credence-label Structure." **Figure C2 (b)** boundaries in Ingredient-level Cues of Credence-label Structure. The Chinese meaning of the above figure is "with boundaries of 'Green Classic' organic milk's product Information in Ingredient-level Cues of Credence-label Structure.".

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