Exploring the Intention-Outcome Inconsistency Effect in Consumer Pro-Environmental Behavior

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Abstract

Promoting consumers' pro-environmental behavior has been a prominent research topic in recent years. Existing research has primarily focused on the antecedents of pro-environmental behavioral intention formation and intervention strategies, neglecting the phenomenon that actual behavioral outcomes may deviate from intentions. This study proposes the existence of an "intention-outcome inconsistency effect" in consumer pro-environmental behavior and plans to conduct a series of studies to construct a theoretical framework revealing when and why pro-environmental behavior exhibits inconsistency between subjective intentions and objective outcomes. Specifically, this study attempts to approach from individual motivational conflicts in social dilemmas, examining the antecedents and manifestations of intention-outcome inconsistency from three motivational dimensions: environmental efficacy considerations, self-interest considerations, and justice considerations. It respectively demonstrates research propositions on the green efficacy illusion effect, novelty aversion effect, and bystander misattribution effect, verifies their psychological mechanisms, and proposes targeted intervention measures. The research conclusions will extend a new focus on "differences between objective outcomes and subjective intentions" for future green consumption research, providing not only precision intervention programs based on behavioral science for policy makers, but also possessing important theoretical value and practical implications for promoting green consumption and advancing sustainable development practices.

Full Text

Preamble

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Abstract

Promoting consumers' pro-environmental behavior has become a prominent research topic in recent years. Existing studies have primarily focused on the antecedents of pro-environmental intentions and the corresponding intervention strategies, while largely overlooking the phenomenon in which actual outcomes may deviate from behavioral intention. This study introduces the concept of the "behavioral intention–outcome inconsistency effect" in consumers' pro-environmental behavior and proposes a series of studies to construct a theoretical framework that explains when and why discrepancies occur between subjective intentions and objective outcomes. Specifically, the study approaches this issue from the perspective of motivational conflicts in social dilemmas, examining three motivational dimensions—environmental efficacy considerations, self-interest considerations, and fairness considerations—as factors driving behavioral intention–outcome inconsistency. The research conceptualizes and empirically tests three mechanisms: the green efficacy illusion effect, the novelty-evoked rejection effect, and the bystander misattribution effect, and proposes targeted interventions based on these mechanisms. The findings extend the focus of future green consumption research to the "gap between subjective intention and objective outcome," offering behaviorally grounded guidance for policymakers and providing both theoretical insights and practical implications for promoting green consumption and advancing sustainable development.

Keywords: pro-environmental behavior, psychological resistance, behavioral intention–outcome inconsistency, cognitive bias, social dilemma

1. Introduction

The 2025 Communiqué of the Fourth Plenary Session of the 20th Central Committee of the Communist Party of China explicitly states: "We must firmly establish and practice the concept that lucid waters and lush mountains are invaluable assets, and accelerate the formation of green production and lifestyle patterns." Continuously improving the pro-environmental level of consumer behavior constitutes a crucial component of this transformation toward green production and lifestyle. In the "Ten Guidelines for Citizens' Ecological and Environmental Behavior" issued by China's Ministry of Ecology and Environment and four other departments, provisions such as conserving energy and resources, practicing green consumption, choosing low-carbon travel, sorting waste for disposal, and reducing pollution generation all aim to guide citizens in practicing pro-environmental behavior in daily consumption, thereby advancing China's ecological civilization construction and the achievement of "dual carbon" goals. Evidently, the research topic of individual consumers' pro-environmental behavior addresses an important and urgent need for economic and social develop-

ment.

Over the past decade, scholars both domestically and internationally have conducted substantial and fruitful research in this hot area of individual pro-environmental behavior (Andrade & Vieites, 2025; 陈斯允等, 2024; Sokolova et al., 2023; 孙瑾, 陈晨, 2024; Xu et al., 2023). Most of these studies assume that "enhanced consumer pro-environmental subjective intentions necessarily lead to increased pro-environmental outcomes," meaning that consumers with stronger pro-environmental intentions can consistently realize their pro-environmental aspirations without deviation. Unlike previous research focusing primarily on "drivers and interventions before the formation of pro-environmental subjective intentions," this study examines whether and why the objective outcomes of behavior implementation deviate from individuals' pro-environmental intentions —that is, the "behavioral intention-outcome inconsistency" effect (systematic inconsistency between pro-environmental intentions and subsequent behavioral outcomes).

Consider a real-life scenario: A consumer purchases a pair of sneakers packaged in non-biodegradable material. Upon opening the box, they find a suggestion from the merchant to repurpose the shoebox into a storage shelf. Which of the following two disposal methods would they choose? Option A: Discard it in the trash bin. Option B: Reuse and repurpose it into a storage shelf. If we change one condition—suppose the consumer notices at purchase that the shoebox material is fully biodegradable—how would they choose when receiving the reuse suggestion?

Our preliminary experimental results using this scenario show that when the shoebox is non-biodegradable, 56% of people choose reuse; when the shoebox is biodegradable, only 30% of consumers choose reuse, while 70% opt to discard it directly (Zhong et al., 2025). In this example, people' s subjective intention in using biodegradable packaging is to "reduce the environmental burden of waste disposal," yet this intention is not fully realized in the objective outcome, ultimately resulting in biodegradable packaging being reused less frequently and becoming waste requiring disposal sooner.

Such effects of "objective outcomes failing to achieve subjective pro-environmental intentions" are not isolated incidents but recurring systematic biases. Research has found that adding a paper layer to original plastic packaging leads consumers to mistakenly perceive increased environmental friendliness and become more willing to purchase these "green products" (Sokolova et al., 2023). Other studies reveal that attaching "recycling waste" labels to trash bins at gatherings aims to promote waste sorting, yet compared to ordinary "landfill waste" labels, "recycling waste" labels actually cause a significant increase in disposable cup usage (Sun & Trudel, 2017). These intention-outcome inconsistency effects demonstrate that pro-environmental consumption behavior does not necessarily produce expected outcomes as traditional theoretical models assume; consumers' pro-environmental behavior exhibits "reaping beans after sowing melons" —situations where good subjective

intentions yield poor objective results that violate theoretical expectations.

In this regard, the intention–outcome inconsistency effect proposed in this study can be viewed psychologically as a new manifestation of cognitive misjudgment—central to behavioral decision theory—in the context of pro-environmental behavior. Although bounded rationality and dual-system processing theories provide theoretical resources for explaining such misjudgments, specific psychological mechanisms for each inconsistency effect require concrete revelation. Uncovering these mechanisms not only helps identify new intention–outcome inconsistency effects but also facilitates the design of targeted interventions to align behavioral outcomes with pro-environmental intentions. To investigate the intention–outcome inconsistency effect in consumer pro-environmental behavior, this study builds on existing literature to explore the discovery, psychological mechanisms, and interventions for a series of intention–outcome inconsistency effects in individual pro-environmental behavior. The findings will not only contribute to refining the theoretical system of consumer pro-environmental behavior but also provide a scientific theoretical basis for government green policy formulation and corporate green production and marketing practices.

2. Literature Review

2.1 Definition and Classification of Consumer Pro-Environmental Behavior

Consumer pro-environmental behavior refers to individuals' efforts throughout the entire consumption process—including purchase, use, and disposal—to alter existing behavioral patterns or adopt new behaviors to minimize negative ecological impacts (Kollmuss & Agyeman, 2002; White et al., 2019). Such behaviors can be categorized into four types: First, reducing behavior, such as energy conservation and plastic reduction (傅鑫媛等, 2019); second, reusing behavior, such as recycling and item repurposing; third, replacing behavior, such as substituting energy-intensive methods with energy-efficient equipment or green transportation (Allcott & Mullainathan, 2010); and fourth, other environmental behaviors such as green travel, green tourism, and environmental donations (代昀昊等, 2024; Ro, 2023; Xuan & Zheng, 2024). Factors influencing consumer pro-environmental behavior mainly include individual and social factors (Barth et al., 2021). Individual factors encompass values, self-construal, sense of responsibility, and perceived control (Hua & Mi, 2023; Wyss et al., 2022), while social factors involve social norms, cultural differences, and class characteristics (Dermody et al., 2021; Yan et al., 2021). Existing research indicates that individuals' environmental awareness, sense of responsibility, and social environment all influence their environmental decision-making and behavioral performance across different contexts (Sorcaru et al., 2024).

2.2 Theoretical Perspectives on Behavioral Motivation: Relevant Theories Activating Pro-Environmental Behavior

Theoretical perspectives activating consumer pro-environmental behavior primarily draw on classic models from social psychology explaining prosocial behavior motivation, emphasizing the roles of individual rationality and social norms in behavior formation (Fishbein & Ajzen, 1981). The Theory of Planned Behavior posits that behavioral attitudes, subjective norms, and perceived behavioral control jointly influence behavioral intentions, which subsequently determine behavior implementation (Ajzen, 1991), and has been validated in contexts such as green consumption and waste sorting (董雪旺等, 2023) and green travel (Nogueira et al., 2023). The Norm Activation Model emphasizes the central role of personal norms in environmental action—when individuals become aware of behavioral consequences and feel responsible, moral obligations are activated, and social norms can further strengthen this effect through image maintenance and emotional arousal (Schwartz, 1992). The Value-Belief-Norm Theory views values as the foundation of beliefs and personal norms, with altruistic and biospheric values significantly promoting pro-environmental behavior (Stern et al., 1995). Protection Motivation Theory suggests that when individuals perceive environmental threats and possess high self-efficacy, response efficacy, and low action costs, they are more likely to adopt protective environmental behaviors (Rogers, 1975). Integrating these theories helps comprehensively understand the formation mechanisms of consumer pro-environmental behavior and provides multidimensional theoretical support for intervention design.

Research from the behavioral motivation perspective, represented by the Theory of Planned Behavior and Norm Activation Model, explores pro-environmental behavior drivers from positive angles such as social norms, consumers' sense of control over behavioral outcomes, and reputation gains from implementing pro-environmental behavior. These studies also provide theoretical support for a series of pro-environmental behavior interventions, such as providing descriptive norm information, effectiveness feedback, and incentive strategies. Additionally, this research recognizes that pro-environmental behavior does not merely entail increased costs—publicly visible pro-environmental behavior can also generate benefits for consumers, such as moral reputation and social approval. However, other findings in pro-environmental behavior are difficult to explain through these theories. For instance, literature reports the moral licensing effect in pro-environmental behavior, where consumers who have engaged in green purchasing show reduced subsequent pro-environmental behavioral intentions (Tiefenbeck et al., 2018), indicating that subsequent behaviors following pro-environmental actions do not consistently align with social norms. Existing research has begun exploring these issues from the theoretical perspective of behavioral resistance.

2.3.1 Knowledge Deficit Model

Individuals' insufficient pro-environmental knowledge constitutes a powerful barrier to implementing pro-environmental behavior (Andrade & Vieites, 2025;

Hoffmann et al., 2024; Huoponen, 2024). One reason people fail to take environmental action is their lack of understanding about the causes and impacts of environmental problems. This "deficiency or insufficiency" hinders subsequent action and is known as the "knowledge deficit model" (van Valkengoed et al., 2022). For example, some consumers rarely engage in waste recycling due to insufficient knowledge about recyclable waste, biodegradable materials, and environmentally friendly products (王建明, 2007). Even when individuals possess environmental awareness, differences in pro-environmental knowledge lead to variations in pro-environmental behavior. For instance, due to potential lack of expertise about green products and unclear understanding of why such products are environmentally friendly, consumers may choose not to purchase them (Chaihanchanchai & Anantachart, 2023). Similarly, the public may lack specialized knowledge about climate issues and hold misconceptions, resulting in reluctance to adopt pro-environmental actions (Tobler et al., 2012). The decline in pro-environmental behavioral intention caused by consumer knowledge deficits can be addressed through enhanced public information dissemination (Gifford & Nilsson, 2014) and green identity labeling (Schwartz et al., 2020). For example, scholars have found that eco-labels with external verification information enable consumers to better understand products, though further education about eco-labels is needed to help consumers comprehend the information they represent, increase trust in such labels, and thereby promote pro-environmental behavior (Taufique et al., 2017).

2.3.2 Attitude-Behavior Gap Model

Even when consumers hold positive attitudes toward pro-environmental behavior, they may not necessarily put them into practice. This inconsistency between attitudes and actual behavior is termed the "attitude-behavior gap" (Attitude-behavior gap; Peattie, 2001; Shaw et al., 2016). This gap represents a core challenge in pro-environmental behavior research, revealing multiple barriers between positive attitudes and actual actions. Nielsen et al. (2022) demonstrated through research in eco-friendly apparel consumption that a huge chasm exists between people' s psychological environmental motivations and their actual environmental impact—environmental "attitude" does not equal environmental "outcome." Additionally, research analyzing potential influencing factors of the attitude-behavior gap found that the difficulty and cost of implementing green consumption, availability of green products, trade-offs between green and non-green product attributes, and past consumption behaviors all contribute to consumers' inability to translate positive environmental attitudes into actual consumption behaviors despite holding them (Sharma et al., 2023). 戚海峰等 (2019) summarized the causes of the attitude-behavior gap, arguing that needs regarding quality and quality of life constitute intrinsic drivers stimulating consumers to purchase green products, while values such as health and environmental protection further strengthen this preference.

The attitude-behavior gap differs from the intention–outcome inconsistency ef-

fect examined in this study. First, consumers with positive pro-environmental attitudes but no corresponding actions clearly know they "have not actually implemented environmentally beneficial behaviors," whereas the intention–outcome inconsistency effect refers to consumers "mistakenly believing they are doing or will do something more environmentally beneficial." Second, attitude-behavior gap research focuses on the break "between attitude and intention," while this study examines the break "between subjective intention and objective behavioral outcome." Finally, the attitude-behavior gap concerns the psychological tendency of inconsistency between words and actions, whereas this study focuses on "good intentions leading to bad outcomes" or "Lord Ye' s professed love of dragons" -style outcome slippage.

2.3.3 Social Dilemma Model

Social dilemmas refer to conflict situations individuals face in decision-making where personal and collective interests clash (Guagnano et al., 1994). When confronting social dilemmas, individuals experience internal conflicts among multiple motivations. Social psychologist Wilke (1991) argued that "maximizing personal benefit" is not the sole psychological driver in social dilemmas, proposing the "Greed-Efficiency-Fairness (GEF)" model. He suggested that individual greed is constrained by two other desires: the desire for groups to use resources efficiently (Efficiency) and the desire for fair resource distribution (Fairness). Renowned environmental psychology scholars Steg et al. (2018) adopted the GEF model in their monograph *Environmental Psychology* to conduct in-depth analysis of individual motivational considerations in pro-environmental behavior. As shown in Figure 1 [Figure 1: see original paper], in pro-environmental consumption contexts (left box), consumers need to process options and related information, making specific considerations based on one of the GEF motivations.

First, self-interest considerations (G) refer to people' s motivation to maximize their own benefits, which is the primary driver leading individuals to defect in social dilemmas—for example, consumers pursuing product performance benefits are more likely to abandon products with green attributes (Techawachirakul et al., 2023). Second, environmental efficacy considerations (E) represent the efficacy considerations of people' s motivation to maximize collective benefits. In pro-environmental contexts, this refers to people' s motivation to minimize negative environmental impacts, which generally inhibits self-interest considerations and positively correlates with pro-environmental behavior (Barth et al., 2021). Finally, fairness considerations (F) reflect expectations about outcome distribution, with people hoping allocation follows one of three principles: first, the equity principle—allocating resources proportionally to input, meaning in pro-environmental contexts that polluters bear responsibility and protectors gain benefits to avoid free-riding; second, the equality principle—equal resource distribution to avoid imbalance; and third, the need principle—helping those in need or danger, such as donating to people harmed by environmental pollution.

The GEF model provides a structured analysis of the complexity of individual motivations in pro-environmental social dilemmas. Figure 1 shows that consumers integrate these considerations to form intentions and implement behaviors. However, misjudgments can occur in these considerations. For example, in environmental efficacy considerations, people mistakenly believe that "paper + plastic" packaging is more environmentally friendly than plastic-only packaging (Sokolova et al., 2023); when paper is crumpled, people stop putting it in recycling bins and treat it as non-recyclable waste (Trudel et al., 2016). In self-interest considerations, a large-scale survey of men in Finland showed that only respondents with higher IQ could effectively integrate complex information about the economic benefits and environmental efficacy of automobile carbon dioxide emission taxes (Aspara et al., 2017). In fairness considerations, due to consumers' ambivalent attitudes toward purchasing green products, they are more likely to make irrational negative moral attributions, such as suspecting the validity of all green product claims (Chang, 2011); people also exhibit attribution bias, underestimating their own environmental responsibility and rationalizing their non-environmentally friendly behaviors (Tiefenbeck et al., 2018).

When systematic misjudgments occur in any GEF dimension, consumers' positive intentions may carry erroneous expectations of pro-environmental effectiveness. The actual outcomes of behaviors guided by such intentions may have negative or insufficiently positive environmental impacts, creating a divergence between subjective intentions and objective outcomes—the "behavioral intention-outcome inconsistency effect." We argue that individuals in pro-environmental decision-making face complex situations with multiple coexisting motivations, and the intention–outcome inconsistency effect examined in this study is triggered by specific systematic misjudgments in one of the three GEF dimensions.

2.3.4 Cognitive Biases

Systematic deviations of individual decisions from actions predicted by rational assumptions are termed biases or cognitive biases in behavioral decision theory. Kahneman' s (2011) dual-system processing theory explains the emergence of cognitive biases: people rely excessively on System 1' s intuition and emotion to make quick decisions, while System 2' s rational analysis and computation often function poorly due to higher cognitive resource demands. Numerous empirical studies have verified the negative impact of cognitive biases on pro-environmental decision-making. Scholars have found that consumers evaluate the credibility of product environmental information based on their inherent cognitive schemas about green products. When products not typically considered environmentally friendly categories (e.g., fuel vehicles, fast-moving consumer goods) engage in green promotion, consumers may doubt this information conflicting with existing schemas and become unwilling to purchase (龚思羽, 盛光华, 2023). People' s beliefs and concerns about global warming depend on whether the local temperature on the day of questioning is hotter or colder than usual (Li et al., 2011). Research also shows that individuals, given the opportunity,

will reduce pro-environmental behavior and engage in cognitive rationalization —for example, low-energy households receiving feedback showing they consume less electricity than neighbors subsequently increase their consumption (Schultz et al., 2007). Additionally, as mentioned earlier, people misjudge environmental friendliness based on packaging material proportions rather than absolute material usage due to the intuition that "paper = more environmentally friendly." Since the proportion of environmentally friendly components in paper + plastic packaging is greater than zero, while that in pure plastic packaging is zero, people mistakenly judge paper + plastic as more environmentally friendly than pure plastic.

The intention–outcome inconsistency effect in pro-environmental behavior proposed in this study represents a downstream consequence of cognitive biases in consumers'earlier information processing and decision-making stages. Therefore, this study will integrate relevant theories of cognitive bias with the GEF model to identify potential antecedents of the intention–outcome inconsistency effect in consumers' environmental efficacy, self-interest, and fairness considerations.

2.4 Intervention Strategies for Promoting Pro-Environmental Behavior

Literature from "behavioral motivation" and "behavioral resistance" perspectives provides theoretical tools for constructing interventions to promote pro-environmental behavior. Some scholars argue that sustainable consumption behavior is driven by four factors: cognitive barriers, self-factors, social influence, and product characteristics, requiring corresponding interventions for different resistance types. For example, cognitive barriers causing people to neglect long-term environmental benefits can be addressed through economic incentives and future-orientation activation (Trudel, 2019). Others have summarized the SHIFT theoretical framework, proposing five psychological pathways: Social influence, Habit formation, Individual self, Feelings and cognition, and Tangibility, along with intervention strategies. For habit formation, interventions such as default options, prompts, and implementation intentions can be employed (White et al., 2019). Although different resistance types have their own effective interventions, these interventions may apply to multiple resistances and can be combined to strengthen effects. Some scholars argue that the effectiveness of pro-environmental interventions depends on precisely targeting key determinants of resistance, summarizing 13 categories of behavior determinants that can be changed through interventions, such as knowledge, risk perception, and responsibility attribution, and propose six intervention types: information provision, commitment, feedback, incentives, goal setting, and choice architecture (van Valkengoed et al., 2022). From the perspective of sustainable behavior resistance at market, individual, and social levels, scholars have applied Minimization and Circumvention strategies to intervene in pro-environmental behavior. For example, to address consumers' concerns about green product quality, risk minimization can be achieved through quality assurance statements, or

problem circumvention can be employed by downplaying eco-labels and emphasizing high-relevance quality attributes such as performance (Andrade & Vieites, 2025).

Different classification criteria for pro-environmental behavior resistance lead to varied intervention strategies, some independent and others overlapping. This paper reviews and synthesizes intervention strategies from relevant literature, defining six major intervention approaches: information provision, commitment, effectiveness feedback, stimulus incentives, goal setting, and option structure.

First, information provision involves delivering guidance information about environmental issues and behavioral consequences to the public (Suri et al., 2025). Information such as household electricity comparisons and eco-labels can promote green purchasing behavior (Allcott, 2011). Moreover, information framing design significantly impacts decision-making (Zhong et al., 2025); for instance, matching self-interest appeals with loss frames and altruistic appeals with gain frames enhances green product purchase intentions (盛光华等, 2019). Second, commitment refers to people promising to adopt pro-environmental behaviors or avoid harmful behaviors, which can be private or public. Commitments can activate self-concept, attitudes, and norms, thereby motivating individuals to maintain new behaviors (Lokhorst et al., 2013). Research shows that commitment is an effective intervention for promoting pro-environmental behavior, with public commitment particularly considered a key strategy for encouraging resource conservation (Cooper et al., 2024). For example, hotel guests who make sustainable behavior commitments are more likely to reuse towels, and symbolic commitment signs can enhance commitment effectiveness (Baca-Motes et al., 2013). Third, effectiveness feedback involves providing behavioral subjects with information about their past behavior or performance. For instance, regularly sending electricity bills with energy-saving information can raise household energy-saving awareness and prompt more conservation measures (Composto & Weber, 2022). Effectiveness feedback interventions have proven effective in promoting recycling, energy conservation, and resource protection (Mertens & Schultz, 2021; Xia, 2022). Fourth, stimulus incentives directly guide or prompt behavior change by providing positive or negative external incentives (Ling & Xu, 2021). Positive incentives such as rewards, subsidies, and praise can strengthen environmental behavior tendencies, while negative incentives such as fines, taxes, and criticism can weaken non-environmentally friendly behavior tendencies. Fifth, goal setting involves guiding people to establish desired behavioral targets (Ajzen, 1991; Kothe et al., 2019). Research shows that specific, feasible goals (e.g., reducing electricity consumption by 20%) can enhance self-efficacy and promote pro-environmental behavior (Bachman & Katzev, 1982). Sixth, option structure involves optimizing the decision environment by changing option combinations or sequences without altering actual costs (van Valkengoed et al., 2022). When lacking time or motivation, consumers tend to rely on automatic decision-making (Kahneman, 2011). Default options, as automatic choices, can guide more environmentally friendly behavior (Liebe et al., 2021). For example, setting printers to default to "double-sided printing" reduces pa-

per consumption (Bonini et al., 2018), and setting "no cutlery needed" as the default option when ordering takeout significantly increases the proportion of eco-friendly orders (He et al., 2023).

2.5 Summary and Outlook of Existing Research

Currently, scholars have conducted extensive outstanding research in pro-environmental behavior-related fields, particularly exploring different behavior types, motivational theoretical perspectives, and intervention strategies (Prinzing et al., 2024), laying a solid foundation for this study' s conceptualization. Existing research has thoroughly examined various influencing factors of pro-environmental behavior and proposed multiple theoretical models, such as the Theory of Planned Behavior and Norm Activation Model, to explain and predict human pro-environmental behavior (Lee et al., 2023). However, most existing research focuses on the occurrence of pro-environmental behavior while neglecting the issue of "pro-environmental intentions failing to achieve actual pro-environmental outcomes," creating an innovative space for this study. This study aims to fill this gap by exploring influencing factors behind the discrepancy between pro-environmental intentions and actual behavioral outcomes.

The core research question targeted by this study' s conceptualization is: How does the intention–outcome inconsistency effect occur in consumer pro-environmental behavior, and what are its scientific patterns? The research focus is exploring what systematic misjudgments consumers make in environmental efficacy, self-interest, and fairness considerations that cause behavioral outcomes to deviate from pro-environmental intentions, as well as identifying feasible intervention strategies.

3. Research Design

3.1 Study 1: The Green Efficacy Illusion Effect

As global climate crises intensify and sustainable development concepts deepen, green consumption has become an increasingly mainstream consumption concept. Green product purchasing constitutes an important component of pro-environmental consumption behavior. The *2024 China Sustainable Consumption Report* mentions that 82.36% of respondents indicate their daily consumption choices are influenced by green consumption information (energy efficiency labels, green product certifications, etc.). To promote the purchase of high-cost environmental products such as green appliances and new energy vehicles, governments launch subsidy policies and other economic incentives. Consumers receiving such incentives may purchase these products through addition rather than replacement, mistakenly believing that simultaneously using green and conventional products is environmentally friendly, when in fact their overall energy consumption increases compared to before the purchase. Consequently, this study proposes that consumers who add green products may experience the

green efficacy illusion effect: believing that purchasing additional low-energy green products reduces energy consumption during use.

Research shows that consumers typically struggle to accurately assess the environmental impact of different products, leading to limitations or even biases in their understanding of sustainable or environmentally friendly product choices (Sokolova et al., 2023). For example, Gershoff and Frels (2015) demonstrated that different judgments about products with identical environmental benefits depend on whether green benefits derive from more or fewer core product attributes. Sokolova et al. (2023) found that consumers judge plastic packaging with additional paper components as more environmentally friendly than identical plastic packaging without paper. Actively seeking green products, learning how to use energy efficiently, and constantly monitoring energy consumption all require additional cognitive resources (Appiah et al., 2023). Given the complexity of evaluating product environmental friendliness, we infer that consumers habitually use heuristic thinking to simplify decisions in green product addition scenarios.

Judging the environmental attributes of green products requires covering the entire lifecycle of production, transportation, use, and disposal, involving multidimensional assessments of natural environmental impact, energy consumption, and resource waste (Severis et al., 2019). However, consumers exhibit significant biases in environmental cognition of green products, often focusing on environmental value during the use phase while neglecting resource consumption during manufacturing and disposal phases (Sun et al., 2021), and failing to fully consider how heterogeneous usage behaviors and reference point selection affect environmental efficacy, ultimately leading to divergence between subjective environmental intentions and objective environmental outcomes. Taking new energy vehicles as an example, their environmental advantages mainly manifest as low emissions during the use phase, yet their environmental value realization heavily depends on individual usage behaviors. Factors such as mileage, electricity sources, and vehicle inventory status significantly affect actual environmental efficacy, while consumers often simplify this complex evaluation process by equating their "relative environmental advantage over fuel vehicles" with "absolute environmental friendliness."

The green efficacy illusion represents an important manifestation of the pro-environmental intention–outcome inconsistency effect. This illusion causes consumers to underestimate their actual energy consumption when judging both others' and their own consumption. Using new energy vehicles as an example, consumers choosing to add a new energy vehicle rather than replacing a fuel vehicle believe they have made efforts to reduce carbon emissions from travel. This effort brings positive identification with a green consumer identity, leading consumers to generally believe their household' s travel patterns have become greener overall. This positive identification applies to evaluations of both others and oneself. Although consumers judging their own travel energy consumption have more direct evidence such as frequent charging or refueling, consumers who

add new energy vehicles are more likely to adopt reference points that maintain their green consumer identity. Specifically, their current travel configuration is one old fuel vehicle plus one newly added new energy vehicle, which consumers compare against the alternative of one old fuel vehicle plus one hypothetical newly added fuel vehicle, rather than comparing against the option of replacing the old fuel vehicle with a new energy vehicle. This reference point selection leads consumers to perceive their energy consumption as relatively low when making judgments, thereby maintaining their green consumer identity while neglecting the potential overall energy consumption increase caused by the "addition" behavior.

This "green efficacy illusion" is not limited to new energy vehicles but may occur in any scenario where households can own multiple products, such as adding energy-efficient air conditioners or refrigerators: consumers add energy-efficient appliances with environmental intentions, yet due to identity generalization and reference point bias, they neglect the total energy consumption increase from using multiple appliances simultaneously, ultimately creating inconsistency between environmental intentions and energy-saving outcomes.

Proposition 1: In product addition scenarios for energy-consuming products, a green efficacy illusion exists. Consumers believe that adding new green products (owning 1 conventional product + 1 energy-efficient product) is more environmentally friendly than maintaining the status quo (owning 1 conventional product) and tend to choose the addition option.

Consumers are often limited by information access channels and personal cognitive capacity, making it difficult to objectively assess product environmental friendliness. When encountering pro-environmental behaviors whose environmental impact is difficult to judge, consumers rely to some extent on the effort they invest (Andrade & Vieites, 2025). In new green product addition scenarios, due to lack of knowledge about evaluating full-lifecycle environmental friendliness of green products, consumers place greater emphasis on the "effort" they make for environmental protection and adopt heuristic methods to simplify decision-making (Utgård & Gaustad, 2024). Individuals who add new green products are perceived as making greater efforts and investing more mental and financial resources in environmental protection, while those who do not add are seen as not taking pro-environmental actions or making efforts, and thus considered insufficiently environmentally friendly. Consumers often overlook the possibility that "not doing something may be more environmentally friendly," believing that their subjective behavioral intentions and efforts for environmental protection will inevitably bring corresponding positive results, ultimately leading to erroneous judgments. This study defines perceived carbon reduction effort as consumers' subjective assessment of the mental resources, physical exertion, and time and energy they invest or need to invest in carbon reduction and environmental protection.

This study proposes that consumers hold a biased intuitive belief that "energy-saving products = environmentally friendly" regarding green products' envi-

ronmental attributes. This belief formation depends on internal cues such as personal usage experience and knowledge information, as well as external cues such as policy promotion and product advertising. On one hand, consumers can observe that new energy vehicles have lower or even "zero emissions" during operation compared to conventional fuel vehicles, potentially creating an illusion of "zero energy consumption." On the other hand, government subsidy policies and corporate promotions often use slogans like "low-carbon green" or "only one kilowatt-hour per night," further reinforcing this belief.

Proposition 2: Perceived carbon reduction effort mediates the underestimation effect of addition options (vs. maintaining status quo) on individuals' environmental friendliness judgments in Proposition 1.

Proposition 3: The strength of individuals' intuitive belief in "green products = environmentally friendly" moderates the impact of product addition decision options on environmental friendliness judgments. Specifically, individuals holding this belief more strongly are more likely to exhibit the green efficacy illusion proposed in Proposition 1.

The environmental features of new green products such as energy-efficient appliances and new energy vehicles are defined relative to conventional products as reference points. Consumers unconsciously treat the "relative environmental attributes" of new green products compared to conventional products as their "absolute environmental attributes" when making actual addition decisions, making addition choices based on usage needs and pro-environmental intentions. Governments and enterprises should guide consumers to gradually phase out existing high-energy-consuming products and replace them with low-energy-consuming products to promote environmentally friendly consumption patterns. Since the green efficacy illusion in the above scenario arises from knowledge deficits and individual effort perception—that is, consumers tend to rely on intuitive information and individual effort levels—introducing other more direct and reasonable cues in the context can effectively correct consumers' misjudgments. For example, descriptive norms and full product lifecycle information prompts are effective intervention methods.

Taking new energy vehicles as an example, even when consumers have clear knowledge about their household vehicle energy consumption, they still exhibit cognitive limitations focusing on the use phase while neglecting the full product lifecycle, and may develop self-identification of having fulfilled environmental responsibility through new energy vehicle usage, leading them to mistakenly believe their household' s travel patterns have become greener overall. Therefore, this study proposes that for such products, information prompts can break consumers' original intuitive belief that green products must equal environmental friendliness, reminding consumers that replacement is a more environmentally friendly choice than addition. Second, existing research shows that descriptive norm information simplifies individuals' cognitive processing and strengthens the rationality of environmental behavior choices by presenting the actual environmental behavior choices or proportions of the majority (Schultz et al., 2008).

For instance, informing consumers that more people choose replacement over addition can prompt consumers to recognize that replacement is actually the more environmentally friendly choice, thereby further reducing non-essential new energy vehicle additions and promoting replacement.

Proposition 4: Information prompts are an effective intervention that can mitigate the underestimation of environmental friendliness caused by product addition decision options (vs. maintaining status quo).

Proposition 4-1: Compared to information prompts without product lifecycle information, prompts including product lifecycle information can mitigate the underestimation of environmental friendliness caused by product addition decision options (vs. maintaining status quo).

Proposition 4-2: Compared to prompts without norm information, descriptive norm information prompts can mitigate the underestimation of environmental friendliness caused by product addition decision options (vs. maintaining status quo).

Study 1 plans to conduct three laboratory experiments. Studies 1a and 1b will verify the main effect of the green efficacy illusion and the mediating effect of perceived carbon reduction effort, while Studies 1c and 1d will test the moderating effect of effective information prompts. Specifically, Study 1a will use a single-factor two-level between-subjects design (two options: "fuel vehicle" / "fuel vehicle + pure electric vehicle" ; four options: adding "pure electric vehicle replacement" / "add low-energy fuel vehicle" to the above) to ask participants to rank different travel options by environmental friendliness and finally measure participants' belief that "pure electric vehicles = environmentally friendly, fuel vehicles = not environmentally friendly." Study 1b will employ a single-factor three-level between-subjects design (a household' s vehicle usage: using only one fuel vehicle [monthly mileage disclosed] vs. using one fuel vehicle [monthly mileage disclosed] and one pure electric vehicle [monthly mileage not disclosed] vs. using one fuel vehicle [monthly mileage disclosed] and one pure electric vehicle [monthly mileage disclosed]), with different manipulation groups viewing different textual descriptions. Participants will then answer three items assessing how much effort the household has made to reduce carbon emissions in transportation, and finally report their individual belief that "new energy vehicles = environmentally friendly, fuel vehicles = not environmentally friendly."

Study 1c introduces descriptive norm information prompts as a moderating variable. Building on Study 1a' s single-factor two-level design, it adds two groups: one with full product lifecycle information prompts ("Considering the environmental friendliness of adding new energy vehicles requires considering both use and disposal phases") and one without ("Considering the environmental friendliness of adding new energy vehicles should focus on use phase performance"), then asks participants to rank travel options by environmental friendliness and measures their belief that "pure electric vehicles = environmentally friendly, fuel vehicles = not environmentally friendly." Study 1d follows the same procedure as

Study 1c, with the only difference being the experimental material information is changed to descriptive norm prompts ("77% of car owners choose to replace fuel vehicles with new energy vehicles") and no-norm prompts ("Green travel advocates practicing low-carbon and environmentally friendly travel").

3.2 Study 2: The Novelty-Evoked Rejection Effect

Product packaging serves as the "first medium"for communicating information to consumers and significantly influences consumption decisions. Existing research shows that packaging size, color, and labels (Dubois et al., 2021; Sokolova et al., 2023) all affect consumer decisions and purchasing behavior. Soft drink packaging bottles are a major source of solid plastic waste. Although many food companies have developed and launched green updates using biodegradable plastics for packaging, biodegradable plastics may still fail to decompose (Royer et al., 2023). Consequently, some brands adopt "label-free" plastic reduction packaging that directly reduces plastic components in packaging. This approach is simple for producers to implement and has clear waste reduction effects.

Label-free products directly reduce plastic usage in packaging and decrease production and waste disposal processes, prompting numerous enterprises and government departments to vigorously promote this packaging solution. For example, South Korea' s Ministry of Environment announced in 2024 a partial revision to the "Standards, Specifications, and Labeling Standards for Natural Mineral Water," which will ban plastic labels on natural mineral water products in the market starting in 2026. However, consumers irrationally reject label-free products. Highly habitual thinking leads consumers to lack awareness of multiple options, easily make routine decisions, and respond indifferently to new information (Aarts et al., 1997; Verplanken et al., 1997). Because label-free products appear markedly different from traditional packaging that consumers are accustomed to, this environmentally friendly packaging has encountered significant resistance in market promotion.

According to rational behavior assumptions, consumers with even minimal green consumption intentions should prefer label-free products, as these products have no additional functional or cost burdens, only incremental environmental benefits. Even consumers without green consumption motivations should be indifferent between two substantively identical products. However, in real markets, consumers' actual reactions to such products are rejection and refusal.

Market performance of label-free products shows that consumers hold negative attitudes and low purchase intentions toward them. In 2022, both PepsiCo and Master Kong launched label-free products sold in whole cases on Taobao and JD.com platforms. The outer packaging of the 12-bottle cases included brand identification, ingredient lists, production addresses, and shelf life information, but both products were eventually delisted due to consumer rejection. We analyzed consumer comments and conducted interview pre-research, finding that most consumers expressed willingness to choose lower-carbon packaging

products and recognized such packaging as green and environmentally friendly. However, when asked about reasons for not accepting these products, most consumers did not cite "product not environmentally friendly" but rather emotional reactions such as "I think it looks bad," "very ugly," or "feels like a counterfeit product." Based on consumers' high dependence on bottle labels in product packaging and their habitual thinking, we infer that when label-free products are introduced, although consumers have the "intention to choose low-carbon packaging," they emotionally reject this "plastic-reducing packaging" when it actually appears, preventing their intention to choose environmentally friendly packaging from being realized in consumption outcomes.

Study 2 addresses a "Lord Ye' s professed love of dragons" -style intention–outcome inconsistency phenomenon, aiming to explore the novelty-evoked rejection effect. When the specific form of environmentally friendly packaging products is not presented, consumers have stronger intentions to choose environmentally friendly packaging products that are substantively identical to conventional packaging products. However, when consumers actually see label-free environmentally friendly packaging products that look very different from traditional products, they react with shock and subsequent rejection, just like Lord Ye upon seeing a real dragon.

Proposition 5: Compared to traditional products with labels and plastic-reducing products with labels, consumers' purchase intentions and product attitudes toward label-free plastic-reducing products are significantly lower.

For label-free plastic-reducing products, consumers may perceive significant visual differences from traditional products with labels, meaning that unfamiliarity evokes negative emotions or attitudes (De Temmerman et al., 2023). Additionally, because label-free products deprive individuals of certain important aspects of the consumption experience (such as visual experience and information experience), consumers also experience shock and strangeness in their consumption experience, even mistakenly believing that label-free product quality may be reduced (Renner et al., 2016). This negative emotion triggered by novelty and unfamiliarity—such as shock and strangeness—further reduces consumers' perceived value and trust in label-free products, consequently decreasing purchase intentions. Based on this, this study proposes:

Proposition 6: Negative emotional reactions mediate the negative effect of label-free products on consumers. Compared to products with labels, label-free products trigger negative emotional reactions in people, thereby reducing their choice/attitude toward label-free products.

Although consumers generally dislike products that deviate from conventions and require longer time to accept such highly innovative products (Lee et al., 2024), and they evaluate excessively incongruent products lower, deviant products are not without advantages. Compared to conventional products, deviant products more easily attract consumer attention, are more memorable, and generate broader discussion (Gerrath & Biraglia, 2021). Eye movement-related

decision research shows that individuals have longer fixation durations on options of interest (汪祚军, 李纾, 2012). Therefore, this study argues that although label-free products highly deviate from consumers' habitual thinking and product design trends, they can gain more attention. Additionally, explicit pupil changes can serve as indicators of internal psychological activity. Emotional arousal activates the autonomic nervous system, further causing pupil changes (Mathôt, 2018). Compared to positive emotional stimuli, people are more sensitive to negative emotional stimuli, more likely to produce pupil dilation, and the dilation lasts longer (Derksen et al., 2018). This study will also use eye movement indicators of pupil and fixation to reflect emotional reactions. Due to the large deviation of label-free products from conventional products, this study infers that consumers will exhibit pupil dilation changes when viewing label-free products.

Proposition 7: Compared to plastic-reducing products with labels and traditional products with labels, consumers show greater pupil reactions when viewing label-free plastic-reducing products, manifested as longer pupil dilation duration, longer fixation duration, and more fixation points.

Label-free products may trigger high-arousal responses in consumers (such as alertness or cognitive conflict). To mitigate the potential barrier to acceptance caused by such initial reactions, this study plans to introduce a gradual exposure strategy. Specifically, we draw on the foot-in-the-door effect, where having individuals first accept a smaller request increases their subsequent compliance with larger requests (Gorassini & Olson, 1995). Simultaneously, from an emotional adaptation perspective, gradual exposure can also serve a desensitization function: repeated exposure to weak negative stimuli gradually reduces individuals' emotional responses to them (Wilson & Gilbert, 2008). In this study, reduced-label products will serve as transitional stimuli with dual functions: acting as a "small request" to guide behavioral adaptation and as a low-intensity stimulus to trigger emotional desensitization. We hypothesize that this intervention can reduce consumers' negative perceptions of label-free products, thereby enhancing their selection and purchase intentions. Compared to directly advocating label-free products, this gradual strategy is expected to more effectively facilitate consumers' behavioral transition from reduced-label to label-free products.

Proposition 8: Product launch strategy moderates the effect of label-free products on consumer choice behavior. When reduced-label products are launched before label-free products, consumers' choice intentions/product attitudes toward label-free products significantly increase; directly launching label-free products does not affect consumers' low choice intentions/product attitudes toward them.

Study 2 plans to conduct two laboratory experiments (including one eye-tracking experiment) and one incentive-compatible experiment. Study 2a aims to verify the main effect proposed in Proposition 5, using a single-factor three-level between-subjects design (packaging plastic reduction method: label-free - 40% plastic reduction vs. with label - 40% plastic reduction vs. with label - tradi-

tional product). The experiment plans to use a real product—Master Kong Iced Tea—as stimulus material. Participants will imagine shopping in a supermarket and needing to purchase some beverages, seeing a Master Kong Iced Tea product on the shelf (three groups: label-free - 40% plastic reduction / with label - 40% plastic reduction / with label - traditional product, with both eco-friendly options described as 40% plastic reduction to control for potential effects of different reduction levels). Dependent variables are consumer purchase intention and product attitude, with control variables including environmental attitude.

Study 2b plans to use a single-factor between-subjects eye-tracking experiment with product type as the independent variable at three levels: label-free plastic-reducing product, plastic-reducing product with label, and traditional product with label. To exclude interference from irrelevant variables, the three product groups will maintain consistent visual features except for "label presence" and "material type," including bottle shape, color, capacity, placement position, and background environment, ensuring that eye movement differences across groups are triggered only by the independent variable (product type) rather than other visual factors. Eye movement indicators include fixation measures and pupil diameter, with fixation indicators reflecting attention to product packaging and pupil diameter commonly serving as a physiological indicator of emotional arousal.

Study 2c is an incentive-compatible experiment using a 2 (packaging plastic reduction method: with label - 40% plastic reduction vs. label-free - 40% plastic reduction, within-subjects) $\times$ 2 (label-free product launch strategy: direct launch vs. reduced-label products first, between-subjects) mixed design. This experiment uses a real product—Pepsi—as stimulus material. In the direct launch condition, participants imagine shopping in a supermarket and needing to purchase some beverages, simultaneously seeing a label-free - 40% plastic reduction Pepsi and a with label - 40% plastic reduction Pepsi on the shelf, both being environmentally friendly products. In the reduced-label products first group, participants first see a reduced-label Pepsi, complete an unrelated filler task, and then imagine seeing a label-free - 40% plastic reduction Pepsi and a with label - 40% plastic reduction Pepsi on the shelf. Dependent variables are consumers' choices between the two products, reported purchase intentions and product attitudes toward both products, and measured negative emotional reactions. Control variables include environmental attitude. We expect the direct launch group to replicate previous experimental results, while the reduced-label products first group will show reduced negative emotional reactions toward label-free products, further increasing selection of label-free environmentally friendly products and raising purchase intentions and product attitudes toward them to exceed those for plastic-reducing products with labels.

3.3 Study 3: The Bystander Misattribution Effect

A manufacturing enterprise invests substantial effort in energy conservation and emission reduction during production and develops greener products. When

consumers accidentally see this product' s packaging waste on clean ground, although the enterprise is clearly not the legal perpetrator of this environmental damage, if brand exposure on the packaging activates an association between "corporate identity" and "environmental damage behavior" in consumers' minds, consumers may automatically attribute partial responsibility to the enterprise psychologically. If such misattribution effects are widespread, they will damage the incentive effects of the consumer market for green production (Delmas & Montes Sancho, 2010). Therefore, Study 3 will deeply explore the psychological mechanism of this bystander misattribution effect and corporate coping strategies.

Extensive related research shows that investors and consumers indeed often misjudge corporate green investments or the authenticity of green products (Lyon & Montgomery, 2015), with these studies generally focusing on corporate greenwashing behavior (Yao et al., 2024). Research finds that enterprises have both the motivation and ability to exploit information asymmetry to release false information, thereby whitewashing pollution or falsely claiming greenness (Treepongkaruna et al., 2024). Both types of behavior imply that information recipients may mistakenly identify "non-do-gooders" as "do-gooders." Logically and empirically, another type of misjudgment exists: "non-wrongdoers" being misattributed as "wrongdoers," yet few studies have explored this psychological attribution bias. Only a few studies have found that corporate disclosure of certain environmental information, such as symbolic environmental actions, reduces consumers' green trust and increases greenwashing perception (Fella & Bausa, 2024). These studies only examine negative attitudes arising from consumers' analytical processing of environmental information, while substantial evidence shows that consumers' perceptions and attitudes toward corporate and product attributes are influenced by numerous incidental situational factors (Di Muro & Noseworthy, 2013), but no research has investigated whether situational factors in waste disposal trigger consumers' misjudgment of corporate or product green attributes.

In reality, when consumers see brand packaging waste appearing where it should not be, they will likely identify the brand identity and automatically associate the negative situation with the brand, generating negative attitudes toward it. Furthermore, because waste disposal relates to corporate environmental protection responsibility, this negatively activated association also affects consumers' trust in the environmental performance of the brand' s manufacturer—that is, green trust (Chen, 2010). Consumers will associate the occurrence of negative events with the brand' s manufacturer, uncritically attributing environmental damage responsibility to the producer, thereby reducing green trust in the producer and brand attitudes.

Proposition 9: When seeing a brand's packaging discarded in an inappropriate location (vs. appropriate location), consumers exhibit poorer brand attitudes and lower green trust; that is, brand exposure in improper disposal scenarios triggers consumers' bystander misattribution effect toward the brand.

Dual-system processing theory posits that two information processing systems exist in human decision-making: the heuristic system and the analytical system (Kahneman, 2011). When individuals lack strong motivation to think or information cues, the heuristic system plays the primary role, which tends to cause irrational cognitive biases (Kahneman, 2011). When lacking direct cues, individuals are affected by the availability heuristic, unconsciously interpreting events or making decisions based on easily accessible and recallable information cues (Tversky & Kahneman, 1974). However, previous research has shown that availability heuristic bias can be eliminated through interventions—requiring people to carefully think about the reasons for their decisions or 暗示 ing the existence of interfering factors can eliminate this bias (Fang et al., 2007). Therefore, this study speculates that if consumers are required to carefully consider who should be responsible for properly disposing of packaging before seeing brand exposure in misplaced waste, the analytical system will be activated to process information about packaging misplacement. Consumers will realize that producers are not the perpetrators of disposal behavior, and thus the bystander misattribution effect will disappear.

Proposition 10: When consumers are asked to think about waste disposal responsibility attribution, brand exposure from packaging discarded in inappropriate locations (vs. appropriate locations) will not reduce consumers' brand attitudes and green trust, and the misattribution effect proposed in Proposition 9 will disappear; when consumers are not asked, the effect remains.

If the misattribution effect results from cognitive bias due to availability heuristic, then when more direct and reasonable cues exist in the situation, consumers will be automatically influenced by such accessible cues. The Accessibility-Diagnosticity Model posits that consumers determine the diagnosticity of information based on its relevance to decisions. When multiple cues exist in a decision context, consumers make decisions based on more diagnostic cues (Byun et al., 2021; 黄敏学等, 2018; Lynch et al., 1988). Since improper packaging disposal is directly caused by the disposer, if consumers feel they have seen the disposer in the scenario, the disposer cue will be more diagnostic for explaining the event' s cause than brand information, eliminating the heuristic processing bias caused by brand exposure.

Proposition 11: When disposer cues and brand information are simultaneously exposed, packaging discarded in inappropriate locations (vs. appropriate locations) will not reduce consumers' brand attitudes and green trust, and the misattribution effect proposed in Proposition 9 will disappear; when disposer cues are absent, the misattribution effect remains.

The aforementioned bystander misattribution effect indicates that situational factors beyond corporate control trigger consumers' negative attribution. This heuristic information processing automatically reduces consumers' green trust in enterprises. That is, even if enterprises make high-quality green efforts in the front-end production phase, they may suffer undeserved blame in the end-of-life disposal phase. Based on the psychological mechanism of heuristic cognitive

bias, enterprises can adopt proactive information provision strategies to resolve this unfavorable situation. Regarding the classification of intervention information, Walker and Wan (2012) divide corporate environmental actions into two types: first, symbolic environmental actions, referring to corporate environmental plans such as participating in environmental projects, joining environmental committees, and applying for green certifications; second, substantive environmental actions, referring to specific environmental actions that enterprises are conducting or have completed, requiring increased financial, human, and time investments, sometimes even launching reforms in production processes and management systems. Research shows that consumers trust substantive environmental actions more (Truong et al., 2021). This is because symbolic environmental actions may represent intermediate steps toward substantive environmental actions or merely corporate efforts to promote their social image, making consumers perceive the information covered by symbolic environmental actions as relatively vague and less certain for environmental protection than substantive environmental actions. Based on the Accessibility-Diagnosticity Model (Lynch et al., 1988), in scenarios where packaging waste is improperly disposed, when consumers can retrieve information about corporate substantive environmental actions from memory, the diagnosticity of the current brand for responsibility attribution will be weakened. However, when consumers retrieve information about symbolic environmental actions, this information is insufficient to weaken the brand' s diagnosticity for responsibility attribution.

Proposition 12: The type of environmental action information released by enterprises moderates the bystander misattribution effect. Specifically, when enterprises provide substantive environmental action information, the misattribution effect proposed in Proposition 9 disappears; when enterprises provide symbolic environmental action information, consumers seeing packaging discarded in inappropriate locations (vs. appropriate locations) will still exhibit reduced brand attitudes and green trust.

Product packaging information is a physical communication medium directly facing consumers. Compared to advertising and other marketing communication forms, consumers consider information conveyed on packaging more credible (Fajardo & Townsend, 2016). Therefore, this study proposes that enterprises can directly provide preventive prompts on packaging. Through repeated exposure to prompt information on product packaging during daily product use, this continuous cognitive processing blocks consumers' heuristic misattribution effects. Specifically, these preventive prompts on packaging can be divided into two types: directive disposal prompts and slogan-style disposal prompts. Directive disposal prompts provide specific, actionable behavioral norms, such as Coca-Cola' s "Recycle Me"on packaging. Such directive disposal prompts clearly define responsibility attribution and behavioral execution standards, with information attributes highly aligned with substantive environmental action information. Because such prompts repeatedly convey strong signals to bystanders that "the brand has fully fulfilled its environmental guidance obligations," they significantly weaken the association between the brand and improper packaging

disposal, reducing the likelihood of consumers attributing wrongful responsibility to the brand. In contrast, slogan-style disposal prompts (such as "Let' s keep the environment clean together!" on some dairy product packaging) are merely environmental propaganda conveying general environmental value beliefs, lacking specific responsibility attribution and behavioral norm guidance. When such packaging is improperly discarded, bystanders will still mistakenly attribute littering responsibility to the brand, leading to reduced consumer attitudes and green trust toward the brand.

Proposition 13: The type of disposal prompt on product packaging moderates the bystander misattribution effect. Specifically, when packaging bears clear directive disposal prompts, the bystander misattribution effect proposed in Proposition 9 disappears; when packaging bears clear slogan-style disposal prompts, consumers seeing packaging discarded in inappropriate locations (vs. appropriate locations) will still exhibit reduced brand attitudes and green trust.

Study 3 plans to conduct one field experiment and five laboratory experiments to test the above propositions layer by layer. Study 3a, a field experiment set in real-life scenarios, will verify the impact of product packaging appearing outside trash bins on consumers' actual donation behavior. The other five laboratory experiments will be set in different virtual online contexts, with specific brand names on packaging and key experimental stimulus materials completed through pre-testing. The field experiment uses a single-factor two-level (packaging disposal location: inappropriate location vs. appropriate location) between-subjects design. The specific procedure is: first, after checking out at a convenience store, the clerk will proactively prompt consumers to collect a 1-yuan coupon outside the store, unknowingly making them experimental participants; next, participants will walk past an area with transparent trash bins (where the manipulation is implemented, with Brand A packaging discarded outside or inside the transparent bin); finally, at the coupon collection area (experimental zone), participants will learn about the coupon usage method through a promoter and choose whether to use the 1-yuan coupon for consumption or donate it to ocean protection projects for Brand A or Brand B. The promoter is a student research assistant trained in the procedure but unaware of the experimental purpose. The experiment is expected to initially verify that brand exposure in misplaced packaging waste leads to observer misattribution effects.

To further verify the theoretical explanation of attribution bias through availability heuristic, Study 3b first explores the moderating role of cognitive decision processing style, using a 2 (packaging disposal location: inappropriate location vs. appropriate location) × 2 (responsibility attribution questioning: no questioning vs. questioning) between-subjects design. Study 3b selects the unfamiliar foreign drinking water brand "NORNINR" as stimulus material, with all participants randomly assigned to four experimental groups (inside bin-no questioning, outside bin-no questioning, inside bin-questioning, outside bin-questioning). Compared to the no-questioning groups, the questioning groups only add one

question before viewing the disposal scenario: participants first answer the responsibility attribution question, "Who is responsible for littering?" (100-point scale, 1 = consumer, 100 = enterprise). Study 3b' s results are expected to verify Proposition 10—that when consumers adopt analytical system processing, the attribution bias effect disappears.

Second, Study 3c explores the internal role of availability heuristic processing, using a 2 (packaging disposal location: inappropriate location vs. appropriate location) × 3 (responsibility cue: no disposer cue vs. implied disposer cue vs. explicit disposer cue) between-subjects design. First, all participants will be randomly assigned to six experimental groups, viewing scenes of a consumed "NORNINR" water bottle appearing inside or outside a trash bin with three corresponding types of responsibility cues (inside bin-none, inside bin-implied, inside bin-explicit, outside bin-none, outside bin-implied, outside bin-explicit). Participants will then complete evaluations of "NORNINR" brand attitude and green trust, as well as measures of environmental knowledge and brand familiarity. Finally, they will report demographic variables.

Finally, Study 3 will verify management responses to attribution bias effects through two laboratory experiments: Study 3d explores how substantive environmental action information resolves attribution bias, and Study 3e examines how directive disposal prompts resolve attribution bias. Specifically, Study 3d uses a 2 (packaging disposal location: inappropriate location vs. appropriate location) × 3 (corporate environmental action information type: none vs. symbolic vs. substantive) between-subjects design. Participants will view one of two scenes of discarded "BUNDEBERG" soda glass bottles appearing inside or outside a trash bin, then complete measures of brand attitude, green trust, environmental knowledge, brand familiarity, manipulation check for corporate environmental action information type, and demographic variables. Study 3e uses a 2 (packaging disposal location: inappropriate location vs. appropriate location) × 2 (disposal prompt type on packaging: slogan-style vs. directive) between-subjects design, with all participants randomly assigned to four experimental groups (inside bin-slogan style, outside bin-slogan style, inside bin-directive, outside bin-directive). The experimental procedure is identical to Study 3d.

4. Overall Framework and Significance

4.1 Theoretical Framework

This research conceptualization proceeds from the perspective of motivational conflicts in social dilemmas, using the GEF model to divide individual considerations in pro-environmental behavior decision-making into environmental efficacy, self-interest, and fairness considerations. It explores what systematic cognitive biases consumers exhibit in these considerations and what intention-outcome inconsistency effects these biases trigger in pro-environmental behavior, specifically designing three sub-studies. The model framework of this study is shown in Figure 2 [Figure 2: see original paper].

Study 1 focuses on environmental efficacy (E) considerations, proposing that while consumers may accurately judge the environmental efficacy of a single pro-environmental behavior or product, the market contains interchangeable pro-environmental options. Consumers are prone to judgment biases when processing complex choice sets composed of multiple options, mistakenly believing their choices have achieved good pro-environmental effects, thereby causing the green efficacy illusion effect of intention–outcome inconsistency.

Study 2 focuses on self-interest (G) considerations, where two directions of bias may exist: underestimating the benefits of pro-environmental products to oneself, or overestimating or misjudging their negative impacts. This study starts from the latter, proposing that green new products produced through new technologies and concepts may make consumers feel unfamiliar, with prior experiences and emotional intuition triggering consumer rejection. Despite these products having clear and credible quality signals and consumers recognizing their environmental efficacy, they may still make irrational rejections based on prior experience or emotional intuition, producing the novelty-evoked rejection effect of intention–outcome inconsistency.

Study 3 focuses on fairness (F) considerations. In pro-environmental contexts, fairness perception mainly comes from fair responsibility sharing and fair benefit distribution. This study primarily addresses responsibility issues. However, due to the existence of pro-environmental behavior costs, consumers are likely to mistakenly blame others due to self-serving bias—that is, consumers may misattribute blame to innocent others, ultimately forming the bystander misattribution effect of intention–outcome inconsistency.

4.2 Research Significance

Pro-environmental behavior in consumption is crucial for environmental governance effectiveness in reducing carbon emissions, pollution control, and climate improvement, and has become a key and hot topic in consumer behavior theoretical research in recent years. This research conceptualization approaches from the new angle of "objective outcomes deviating from subjective intentions in pro-environmental behavior," exploring situational and psychological factors that prevent individual behaviors from achieving actual pro-environmental effects and corresponding interventions. This conceptualization helps refine the theoretical system in the consumer pro-environmental behavior domain, representing new expansion in both focus issues and research perspectives.

Theoretical Significance:

First, this study proposes and validates the theoretical proposition that "consumer pro-environmental behavior exhibits an inconsistency effect between subjective intentions and objective outcomes," extending a new focus for consumer pro-environmental behavior research. Existing research has found the "attitude-behavior gap" in consumer pro-environmental behavior, where consumers say more than they do or do less than they say. These studies still focus on sub-

jective antecedents of action. In reality, consumers need to judge the factual environmental impact of various behavioral options or alternative products in environmental efficacy considerations, with consumers' objective knowledge deficits and vague understanding of green signals being the main triggers of intention–outcome inconsistency effects. However, self-interest and fairness considerations involve more subjective perceptual components, such as performance discounts of green products in self-interest considerations and perceived responsibility attribution and green trust in fairness considerations. Therefore, different manifestations and specific triggers of intention–outcome inconsistency effects need to be explored separately across the three dimensions. Thus, this study proposes that research should focus on "the objective outcomes of individual consumer actions" —even when consumers have pro-environmental intentions and take action, not all pro-environmental subjective intentions achieve sufficiently positive objective outcomes.

Second, this study is among the first to discover and test a series of new intention–outcome inconsistency effects in consumer pro-environmental behavior (which can be viewed psychologically as new manifestations of decision-making cognitive misjudgment—central to behavioral decision theory—in pro-environmental contexts) and preliminarily constructs a theoretical framework explaining these effects. This study will confirm multiple manifestations of intention–outcome inconsistency effects in specific contexts such as new energy vehicle addition and label-free packaging adoption. It will also use the GEF framework describing individual complex motivations in social conflicts, combined with behavioral decision theory research on cognitive biases, to identify which consideration misjudgment triggers each effect.

Third, this study proposes targeted interventions to weaken and eliminate intention–outcome inconsistency effects, enhancing theoretical application precision. The intention–outcome inconsistency effect means that many pro-environmental efforts do not achieve sufficiently good actual results. Previous intervention research focused more on influencing intentions and actions but paid insufficient attention to actual behavioral outcomes. For example, He et al. (2023) demonstrated in a field experiment on the Ele.me platform that default options positively nudge consumers to select the "no cutlery needed" option, which holds important value for the takeout platform to promote consumers' pro-environmental actions. If the research could further focus on the actual supply of disposable utensils during order delivery (the pro-environmental outcome), more effective integrated interventions could be proposed. Anyone with takeout ordering experience knows that even when selecting "no cutlery needed," a considerable number of merchants still deliver disposable utensils due to reducing complaint risks and process branching. If researchers and platform managers focused on actual behavioral outcomes, they could consider additional interventions such as green point incentives for merchants and encouraging diners to provide feedback on actual utensil delivery. Based on the causes of each intention–outcome inconsistency effect and after clarifying their psychological mechanisms, this study proposes and validates intervention strategies targeting pro-environmental ef-

fectiveness. Because the mechanisms of these targeted interventions are clear, their generalizable scope is also more precise.

Fourth, at the macro level, this study closely aligns with national strategic needs, conforming to China's trends in ecological civilization construction, "dual carbon" goal advancement, and sustainable development realization, providing micro-level social consumption support for national ecological strategy implementation. As a key carrier of pro-environmental behavior, sustainable consumption represents a core pathway for reducing terminal carbon emissions and promoting the transformation of consumption patterns from traditional high-consumption to green low-carbon, holding irreplaceable significance for achieving "dual carbon" goals. This study focuses on a type of negative interference that is not easily identified during transformation, breaking through existing research limitations that focus more on "how to stimulate pro-environmental intentions," aiming to identify those "subjectively positive consumer decisions and behaviors that do not bring positive objective effectiveness," so that subjective goodwill in pro-environmental intentions can more frequently be converted into objective good results for ecological environment optimization.

Fifth, at the micro level, this study not only helps managers and policymakers design more comprehensive, refined, and effective interventions but also helps consumers more clearly understand the actual impact of their personal pro-environmental behaviors, adjust cognitive patterns, and implement behaviors with more objectively pro-environmental effects. On one hand, this study provides policymakers and managers with a more comprehensive consideration dimension when designing interventions: focusing on the actual environmental impact results of pro-environmental behaviors. It also offers multiple targeted intervention strategies for different intention–outcome inconsistency effects, enabling them to use combined interventions to overcome individual cognitive barriers and promote consumer pro-environmental behavior. On the other hand, this study encourages consumers to re-examine their intuitive inferences in pro-environmental behavior. Understanding these inconsistency effects and their underlying mechanisms can help environmentally conscious consumers practice truly effective pro-environmental behaviors and reduce or eliminate irrational rejection of pro-environmental behaviors among less environmentally conscious consumers.

Previous research has focused more on drivers and interventions before the formation of individual pro-environmental subjective intentions. However, in reality, enhanced consumer pro-environmental intentions do not necessarily lead to increased pro-environmental outcomes. Therefore, this study expands consumer pro-environmental behavior research by exploring the new perspective of "objective behavioral outcomes deviating from subjective intentions," with the proposed intention–outcome inconsistency effect representing a perspective innovation in the pro-environmental behavior domain. Beyond the effects proposed in this study, this perspective can extend to more research possibilities. Additionally, regarding this newly discovered negative psychological effect in green

consumption contexts, this study does not limit itself to a single theoretical perspective but creatively integrates social dilemma theory' s interpretation of "individual-collective interest conflict"with cognitive bias theory's explanation of "decision-making judgment bias," proposing an integrated framework to explain intention–outcome inconsistency effects and clearly revealing the internal psychological mechanism of the "intention–outcome inconsistency" phenomenon in green consumption, providing more convincing theoretical support for the outcome slippage problem in pro-environmental behavior. In practical application, this study further transforms theoretical discoveries into actionable management strategies. The exploration of core causes of intention–outcome inconsistency effects enables managers to use combined interventions to overcome individual cognitive barriers and achieve green consumption transformation goals.

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Note: Figure translations are in progress. See original paper for figures.