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Consumers' purchase behavior of Cradle to Cradle Certified® products—The role of trust and supply chain transparency

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Abstract

Consumers' trust in eco-labels is declining due to the growing number of different kinds of eco-labels that can be uncertified and related to greenwashing. This paper argues that providing more transparency regarding green supply chains (GSCs) through eco-labels (such as Cradle to Cradle Certified®) is critical for creating trust and convincing consumers to buy eco-products over conventional ones. Building on previous literature related to sustainable consumption behavior, green purchasing behavior, Cradle to Cradle certification and GSC management, we develop and test a conceptual model to empirically investigate the links between consumers' trust in eco-product labels and GSC perceptions in influencing green purchase behavior (GPB) in the case of eco-friendly fast-moving consumer goods (FMCGs). By studying a sample of 276 German consumers and applying structural equation modeling, we find that the trust in eco-product labels and positive perceptions of GSCs are important drivers of GPB. Our research contributes by expanding the knowledge on the factors influencing the acceptance of eco-products, highlighting the importance of supply chain transparency and trust in GSCs among consumers. We discuss theoretical implications for green product innovation and marketing including eco-product labeling based on transparent GSCs.

KEYWORDS

Cradle to Cradle, eco-label, green product innovation, green purchase behavior, green supply chains, sustainable consumption

Abbreviations: C2C, Cradle to Cradle; CB-SEM, covariance-based structural equation modeling; CE, circular economy; CI, confidence interval; FMCG, fast-moving consumer good; GPB, green purchase behavior; GSC, green supply chain; GSCM, green supply chain management; HTMT, Heterotrait-Monotrait ratio of correlations; NPD, new product development; PLS-SEM, partial least squares structural equation modeling; RMSE, root mean square error; SCM, supply chain management; TPB, theory of planned behavior; TRA, theory of reasoned action; VIF, variance inflation factor.

Studying a sample of German consumers of Cradle-to-Cradle certified products and applying the PLS-SEM methodology, we find that the trust in eco-product labels and positive perceptions of green supply chains (GSCs) are important drivers of green purchasing behavior. Our research expands the knowledge on the importance of the awareness of GSCs among consumers and on the factors influencing the acceptance of eco-products. We discuss theoretical implications for green product innovation and supply chain management including labeling based on transparent GSCs.

1 | INTRODUCTION

Consumers' environmental concern and doubts regarding the trustworthiness of companies' green product development are impacted by greenwashing and fake green products on the markets (Nygaard & Silkoset, 2023). Consumers often lack the relevant technical knowledge to be able to assess a product, which is why eco-labels have become important in marking and certifying the sustainability of products, and third-party verification plays a key role in providing information that helps to create consumer trust (Gorton et al., 2021). Due to complex supply chain networks that sometimes also include suppliers with a bad reputation because of greenwashing, it may be hard for consumers to trust the sustainability of the final product. The repercussions of even one brand or producer resorting to greenwashing can have wide impacts on consumers' trust to the product category (Wang et al., 2020). As consumers may be perplexed when trying to select eco-friendly products and seek ways to identify truly trustworthy eco-labels, the organization providing the product label needs to be trusted by the consumers for it to have an impact on their purchase behavior (Khachatryan et al., 2021).

In the current era of Industry 4.0, focusing on sustainable production with the goal to tackling the sustainable development goals (SDGs) has become even more important (Awan et al., 2021), also from a product quality perspective. From this perspective, technological development has received attention in helping companies to become more sustainable by considering circular economy (CE) principles (Awan et al., 2021). NGOs have further been pressuring companies to be more transparent about their supply chains (Schäfer et al., 2024). In a recent literature review combining Industry 4.0 and CE in relation to global supply chains, the authors argue for a promising opportunity for CE implementation in global supply chains (Awan et al., 2022). Behind any product or service a supply chain is in place, which consists of a network of firms that are organized in a way to deliver to the customer in the best quality, price and time (Christopher, 2016), and nowadays also in the most sustainable (Seuring & Müller, 2008), or circular, manner (Farooque et al., 2019). In their recent research, Singh et al. (2024) prove that collaboration along the supply chain helps to achieve sustainable supply chain performance and thus CE implementation in firms.

Ul-Durar et al. (2023) suggest sustainability-oriented innovation, including sustainable product innovation, as one of four key literature streams toward CE. The authors found that sustainability-oriented innovation may "facilitate customer expectations around new solutions to the problems and can co-create solutions for sustainable development" (Ul-Durar et al., 2023, p. 2233). In the case of our research, this type of innovation is the intentional product-related change that may realize environmental value next to economic returns (Adams et al., 2019).

Therefore, with normative and legislative pressure from environmental legislation and consumer demands at hand, a growing number of companies are becoming increasingly interested in the Cradle to Cradle®[1] (C2C) concept (MBDC, n.d.), which is a way to move from linear to circular supply chains (Genovese et al., 2017). The C2C product design concept has been gaining more interest as companies are transitioning to the CE and creating circular business models and supply chains (del Mar Alonso-Almeida & Rodriguez-Anton, 2019; Farooque et al., 2019). The C2C concept is considered one of the most comprehensive tools for CE implementation in firms (Schmitt & Hansen, 2018) and has turned into a holistic product development standard and certification (C2CPII, 2021), i.e., Cradle to Cradle Certified®[2] (C2CPII, n.d.), which is referred to in this paper as C2C, and associated labeling, which is referred to as C2C-label. The C2C-label certification scheme ensures a standardized, trustworthy, and objective evaluation of products across human and environmental health categories (Braungart et al., 2007). The C2C concept enables firms to design and produce alternative products that significantly reduce the negative consequences of production and consumption processes, and address the major shortcomings of a product that is not eco-effective: the inability to fundamentally address the redesigning of material flows and lack of focus on prolonged product lifespan (Braungart et al., 2007; De Pauw et al., 2013). The most documented cases of C2C-labeled product development in the scientific literature include furniture manufacturer Herman Miller (Rossi et al., 2006) in addition to FMCG producers analyzed in the works of Hansen and Schmitt (2018, 2021). Ünal and Shao (2019) provide the analysis of 391 C2C product by 187 companies from 10 different industries, indicating the ever-growing adoption of the certification when implementing CE in firms.

The C2C product design is one of the first product design approaches that has also generated a product certification standard for the CE (Braungart et al., 2007). Creating products for the CE and circular industrial systems, that is, targeting eco-effectiveness and the development of products and production systems that can maintain the quality of materials through multiple use cycles, is at the center of this approach (McDonough & Braungart, 2002). In the C2C approach, the biological and technical cycles are separated, and the certification requires that the materials can be cycled and the health effects of the materials are verified to eliminate hazardous substances, in addition to water stewardship, use of renewable energies, and social fairness (Braungart et al., 2007; C2CPII, 2021). The C2C design approach offers a framework for creating products and production systems in various industrial sectors (as shown by Ünal and Shao [2019] in their analysis of 391 C2C products), which has been scientifically analyzed in the areas of innovation management and new product development (Rossi et al., 2006), process (Saari, Herstatt, & Dlugoborskyte, 2021; Schmitt & Hansen, 2018), strategic (Ünal & Shao, 2019), value chain (Hansen & Schmitt, 2021), and supply chain (Santos & Proença, 2022) management.

In this study, we focus on eco-friendly fast-moving consumer goods (FMCGs) that are available in markets as alternatives to traditional products. We chose FMCGs as our research focus, as the latter are currently an important source of environmental pollution due to the fact that they often come in plastic packaging and contain non-degradable elements (Dilkes-Hoffman et al., 2018;

[1]Cradle to Cradle® is a registered trademark that is owned and licensed by McDonough Braungart Design Chemistry, LLC (MBDC) (MBDC, n.d.).

[2]Cradle to Cradle Certified® is a registered trademark of the Cradle to Cradle Products Innovation Institute (C2CPII, n.d.).

Greenpeace, 2018). Green innovations, consisting of green product and process innovation (Chang, 2011) in the supply chain, are nowadays considered a competitive advantage (Zhu & He, 2017), in particular when it comes to pursuing sustainable development from a company perspective (Castellano et al., 2022; Kiefer et al., 2019). With this study, we therefore aim to better understand environmental product innovation aspects, taking FMCGs as an example. The C2C approach targets to create and reinvent products to meet the requirements of customers in addition to social and ecological systems (Braungart et al., 2007). To align C2C product design with producers' responsibility, particularly in the case of FMCGs, coherence, tight collaboration, and organizational interoperability are needed among the product, supply, and operations management functions to develop more transparency in green supply chain management (GSCM; Irani et al., 2017; Hansen & Schmitt, 2021; Santos & Proença, 2022). This is an attempt to also create trust among consumers and convince them to buy more sustainable eco-products (Duan & Aloysius, 2019).

GSCM considers the incorporation of environmental issues in the management of the supply chain, involving the supply chain partners, among other stakeholders, aiming at reducing environmental impacts (Fontoura & Coelho, 2022; Fritz, 2019). Previous research on trust and eco-labels in the context of supply chains has mainly focused on food supply chains (Goossens et al., 2017; Stampa & Zander, 2022; Van der Heijden & Cramer, 2017) and wood products (Appelhanz et al., 2016). The effect of consumer trust and environmental awareness on the eco-label strategy in the supply chain has been studied and showed significant results (Lou et al., 2024). However, to the best of our knowledge, the way eco-certification and eco-labeling of FMCG impacts green purchase behavior (GPB) in this product category has not been researched extensively; the focus has previously rather been more on the sustainability certification process of food products (Harris, 2007). Next to this, while prior research has identified barriers to GSCM (Govindan et al., 2014), customers have also increasingly started to demand the implementation of environmental practices like GSCM in various industries (Mathiyazhagan et al., 2015).

Building on the literature regarding sustainable consumption behavior (Geiger et al., 2018), GPB (Xu et al., 2022), C2C certification (Hansen & Schmitt, 2021), GSCM (Ahi & Searcy, 2013; Ha et al., 2021), and the theories of reasoned action (TRA; Ajzen & Fishbein, 1975; Fishbein & Ajzen, 1975) combined with the theory of planned behavior (TPB; Ajzen, 1991), we argue that trust in eco-labels (Taufique et al., 2019) and positive and transparent GSC perceptions (Bastian & Zentes, 2013) positively influence the likelihood of green purchase intention and further GPB (Harris, 2007; Gupta & Ogden, 2009; Osburg et al., 2019). This is demonstrated by C2C certified products for which the product design, production processes, and related supply chains meet the highest level of circularity, environmental sustainability, and transparency standards (C2CPII, 2021; McDonough et al., 2003; Braungart et al., 2007; Hansen & Schmitt, 2021; Saari, Herstatt, & Dlugoborskyte, 2021).

In our study, C2C certified products represent eco-friendlier alternatives because the new products for certification are developed according to strict requirements (see description earlier in the texts) following the green engineering principles applied in C2C product development (Braungart et al., 2007). We use the actual purchase of C2C products as the target construct and the green purchase intention as a mediator in the tested model to bridge the attitude–behavior gap phenomenon that has been highlighted in previous sustainable consumption behavior research (e.g., Terlau & Hirsch, 2015). We examine FMCGs, as a variety of those products have already been certified and are known by consumers, like the brand Frosch.[3] These products include, for example, cleaning products, washing detergents for clothes and dishes, and cosmetics that are made from plant-based ingredients and that do not include microplastics. By building a path model based on the above literature, we address the following research question: *What role do trust in eco-labels and green supply chain perceptions play in influencing consumers toward purchasing C2C certified products?*

With our study, we contribute to further develop the current research agenda on green supply chains (GSCs, Ahi & Searcy, 2013; de Mattos Nascimento et al., 2024; Ha et al., 2021), sustainable consumption behavior (Geiger et al., 2018), GPB (Xu et al., 2022), and C2C product design and certification (Braungart et al., 2007; Hansen & Schmitt, 2021). We highlight the relevance of trustworthy and transparent information on the development of a more environmentally sustainable production and GSCs in influencing GPB of the customers. Our empirical results show that such information, when provided to environmentally conscious consumers through eco-labels such as C2C-label, creates trust and convinces consumers to buy eco-products over conventional ones. Accordingly, we contribute to the field by (1) linking the sustainable consumption and C2C certification literature streams with the GSC literature, (2) building a replicable path model on consumers' GPB of C2C certified eco-products, (3) empirically identifying the main drivers of eco-friendly consumer purchase behavior, and (4) deriving both managerial and theoretical implications on the need for transparency and communication on GSC operations with the aim of providing recommendations for new companies considering C2C certification.

This research article is structured in the following manner. In the next section, we explore the underlying theory, develop, and explain our conceptual model. In the method section, we explain the operationalization of the constructs utilized as well as our data and methodology. Thereafter, we analyze the data, assess our results, and discuss our main findings with respect to theoretical and practical implications before we suggest avenues for future research in the final section.

2 | THEORETICAL BACKGROUND AND DEVELOPMENT OF THE CONCEPTUAL MODEL

2.1 | Environmentally sustainable Cradle to Cradle Certified® products

Environmental attributes (e.g., non-toxicity, efficiency, recyclability, eco-packaging) are found increasingly important from a consumer perspective in addition to traditional attributes, such as price and quality

[3] https://frosch.at/en/the-circular-economy/.

(Ketelsen et al., 2020; Watson et al., 2018). Purchasing more eco-friendly alternatives of products is an important aspect of sustainable consumer behavior (White et al., 2019). In this study, we understand environmentally sustainable products (also referred to as green and eco-products in some research papers) as a good or service that has been "designed to minimize its environmental impacts during its whole life-cycle" (Albino et al., 2009, p. 86), and these terms are used interchangeably throughout this paper. The C2C concept, which was originally introduced by McDonough and Braungart (2002), builds on the idea of circular and environmentally friendly production systems that are designed for waste-free production and to eliminate in the initial product design phase potentially harmful materials from the product (Rossi et al., 2006). Similar to the Ellen MacArthur Foundation that has taken C2C as one if its main strategies, we consider C2C product design as one of the most rigorous manifestations of CE implementation at the organization and product level as well as a framework that stimulates eco-innovativeness and further development of GSCM practices (Schmitt & Hansen, 2018; Ünal & Shao, 2019).

Other sustainability-oriented product development approaches include the green and environmental new product development (NPD) approaches, or green NPD (Yu et al., 2021) and environmental NPD (Shrivastava, 1995). These address environmental issues through product design and innovation, and aim to prevent pollution from the early stages of the product design by focusing on improvements of green product attributes (Chen, 2001; Yu et al., 2021). Green NPD has a focus on an extended green market orientation and green product characteristics that must be established, for example, by green targeting or green positioning (Driessen et al., 2013). Definitions for sustainable, eco-, environmental and green innovations tend to use slightly differing terms in their definitions, but they all focus on the same key aspects: the eco-friendliness of the innovation object (product or service, or process), green markets, environmental aspects of reducing negative impact, full life cycle perspective, economical or ecological intention for reduction of the environmental impact and the building of a new innovation, and green standards within organizations (Schiederig et al., 2012). With the aim to reduce environmental impacts, environmental NPD and green NPD focus on eco-efficiency (Bjørn & Hauschild, 2013), which is defined as adding maximum value with minimum resource use and minimum pollution.

CE pushes these goals further by envisioning a production and consumption system that circulates products, components, materials, and energy to maintain, add, and recreate value (Sihvonen & Partanen, 2016). The C2C design philosophy, as a firm-level implementation of CE (Schmitt & Hansen, 2018; Ünal & Shao, 2019), presents an alternative design and production concept to the strategies called eco-effectiveness (Braungart et al., 2007). The C2C concept introduces the environmentally sustainable product design that is based on a systemic and holistic quality innovation process of non-toxic products and solutions that also advance environmental sustainability, with the goal of maximizing the benefit to ecological systems and increasing the positive environmental impacts rather than reducing the negative impacts and keeping the focus on eco-efficiency (Bjørn & Hauschild, 2013; Braungart et al., 2007).

The C2C design approach is based on the principles of green engineering that are incorporated in a specific C2C focused certification system, the Cradle to Cradle Certified® (C2C Certified®) system maintained by the C2CPII organization (C2CPII, n.d.). The certification focuses on product circularity, material health, and evaluations of related processes (i.e., clean air and climate protection, water and soil stewardship, and social fairness; Braungart et al., 2007; C2CPII, 2021). The C2C certification approach offers a tool of reference when developing environmentally friendly products and production systems that are eco-effective and for managing material flows in the supply chain among all stakeholders (McDonough et al., 2003). Therefore, C2C is considered one of the first comprehensive green or eco-product certification standards (Hansen & Schmitt, 2021; C2CPII, 2021). This is demonstrated in an increasing number of companies that are designing C2C products and developing more sustainable production of C2C-labeled products (Kumar & Putnam, 2008). They are also implementing GSCs that are aligned according to the C2C criteria and aimed to support the United Nations' 17 Sustainable Development Goals (Santos & Proença, 2022).

The scientific literature that explores the C2C product design approach focuses on specific company case studies (Rossi et al., 2006), thereby establishing a taxonomy of C2C product developers (Ünal & Shao, 2019) and understanding the role of the external environment, such partners in the value chain (Hansen & Schmitt, 2021) and internal processes (Saari, Herstatt, & Dlugoborskyte, 2021). The C2C-labels include several levels of product certification (i.e., bronze, silver, gold, and platinum) based on the green product's performance according to C2C product design principles, thereby not only ensuring the transitioning toward CE (del Mar Alonso-Almeida & Rodriguez-Anton, 2019) but also improving innovation that stimulates design and continuous improvement (Hansen & Schmitt, 2021; C2CPII, 2021) as well as signaling the consumers of an environmentally friendly product by its design and production via C2C-label.

2.2 | The green intention–purchase behavior gap

The green intention-purchase behavior gap refers to "the significant discrepancy between consumers' intentions to buy products with sustainable attributes and their actual purchasing decisions" (Gruber & Schlegelmilch, 2014, p. 30). The intention of a consumer to buy environmentally friendly products can be defined as a consumer's motivation to exercise effort in executing GPB (Fishbein & Ajzen, 2005; Sharma et al., 2023). The issue of inconsistency between consumers' claims and their actual purchase behavior (also called "intention-behavior" or "attitude-behavior" gap) has been confirmed in prior studies, which have found rather low alignment between intentions and behavior (e.g., Park & Lin, 2020). Thus, the correlation between intention and purchase behavior has been found to be in the

range of 0.45–0.62 on average (Fishbein & Ajzen, 2005) and even below 0.2 in certain cases (Gleim et al., 2014; Mahoney, 2011; Moser, 2015).

The green intention-purchase behavior gap has been largely researched in existing literature and is, most frequently, related to the TPB (Ajzen, 1991), which assumes that positive buying intentions predict actual purchase behavior. However, consumers that show positive attitudes and intentions to act in a pro-environmental manner may also fail to transform these intentions into actual behavior (Echegaray & Hansstein, 2017; Grimmer & Miles, 2017). To holistically model the gap (cf. ElHaffar et al., 2020), in this paper, we consider both psychological (intention) and contextual variables (trust in C2C-labels and GSCM) by relying on the behavioral reasoning theory (Westaby, 2005). Like TPB, the behavioral reasoning theory postulates that adoption intentions are strong predictors of actual purchase behavior but considers context-specific factors that might have an impact on attitude formation and decision-making, "because they help individuals justify and defend their actions, which promotes and protects their self-worth" (Westaby, 2005, p. 98). Thus, consumers often search for justification of their purchasing decision to resolve potential cognitive dissonance and purchase with confidence (Claudy et al., 2013; Gleim et al., 2014; Westaby et al., 2010). One way companies are attempting to increase consumers' trust is to develop more sustainable GSCM practices for FMCGs (Irani et al., 2017; Lou et al., 2024), such as personal care products, and communicate this to the consumers (Ha et al., 2021). However, so far, limited research has been undertaken to empirically study the impact of this on actual consumer behavior (e.g., Hansen & Schmitt, 2021).

2.3 | Consumers' trust in eco-labels

Research highlights that the relationship between consumers and companies must be based on trust (Kang & Hustvedt, 2014). Trust between the company and the consumer contributes significantly to positive outcomes, such as loyalty to the company, purchase intention, willingness to act, and overall market performance (Chaudhuri & Holbrook, 2001; Matzler et al., 2008; Munuera-Aleman et al., 2003; Willmott, 2003). The linkage between consumers' trust in eco-product labels and their GSC perceptions in further influencing consumers' sustainable consumption and green purchasing behavior has not been covered in prior research (Andronie et al., 2021; Dabija et al., 2018; Lazaroiu et al., 2019). However, previous literature has covered to some extent trust in eco-labels (Taufique et al., 2019), positive and transparent GSC perceptions (Bastian & Zentes, 2013; Duan & Aloysius, 2019), and green purchase intentions as well as actual GPB (Harris, 2007; Gupta & Ogden, 2009; Osburg et al., 2019).

A consumer might obtain information on green products and their specific green characteristics via multiple sources—for example, communication directly from the producer, claims on the product from the producer, information obtained from consumer organizations, and signaling via third party verified eco-labels (Commission of the European Communities, 2001). Eco-labels make green products clearly recognizable (Albino et al., 2009). Contextual factors, such as trustworthiness of the brand or trust in labels, have been found to directly affect GPB (Gupta & Ogden, 2009) and its intention (Osburg et al., 2019); however, these factors have not been sufficiently researched in the context of the green intention–purchase behavior gap (ElHaffar et al., 2020). There have been various calls for more research that would include their consideration (e.g., Lobb et al., 2007; Osburg et al., 2019). Prior research suggests that the intention–behavior gap might be significantly better explained when considering the lack of trust in labels and low confidence in sustainability practices (Chen, 2007; Tung et al., 2012). Whether a consumer decides to purchase eco-products or green products largely depends upon consumer confidence in the production and supply chain processes, regarding whether eco-labeled products are truly designed, produced, and recycled in a holistic and sustainable manner, thereby protecting and enriching natural ecosystems (cf. Lindgreen, 2003; Tung et al., 2012). Hence, trust in eco-labels serves as a reason for adopting green purchase intention and positively impacts GPB intention (Lee & Holden, 1999), although various controversies surrounding certification procedures, diverse scandals, and greenwashing instances have also decreased faith in the trustworthiness of certain labels in the past (Harris et al., 2016; Tung et al., 2012; Yee et al., 2005). Therefore, a better understanding of the roles of transparency in gaining trust and encouraging the buying intention of C2C products is needed.

Furthermore, consumers often lack a profound knowledge of sustainable production processes and awareness into the implication of their purchase decisions on the entire supply chain (Grunert & Wills, 2007). According to signaling theory (Connelly et al., 2011), an information asymmetry between producers and consumers can be reduced by communicating relevant credence attributes (detailed, credible, and transparent signals) that inform consumers and lead to a certain behavioral response (Osburg et al., 2019). Product labels can serve as a means to provide convincing, credible, meaningful, and transparent signals (Atkinson & Rosenthal, 2014), although consumer's subjective perception of labels moderate their effectiveness (Vermeir & Verbeke, 2006). According to Litvine and Wüstenhagen (2011), clear standardized information addressing social and personal benefits can influence the move from intention to action. Providing overarching information regarding the complex criteria (origin, material, and supply chain characteristics) related to eco-labels can reduce the information asymmetry with respect to the product's green features and inform consumers regarding product sustainability in an aggregate manner, thereby enhancing consumer trust and serving as proof or justification for the features of an eco-product (Osburg et al., 2019; Gleim et al., 2014; Bradu et al., 2014). Thus, the green gap can be narrowed by increased consumer trust in C2C-labels and certification as well as the GSC practices (such as green procurement, GSCM, and green marketing, cf. Fahmi et al., 2023; Lee et al., 2021) that are embedded in the C2C product certification approach

(McDonough et al., 2003). Therefore, we propose the following hypotheses:

H1. Higher levels of trust in C2C-labels positively influence the green purchase intention of consumers.

H2. Higher levels of trust in C2C-labels positively influence the green purchase behavior of consumers.

2.4 | Consumers' perception of GSCs

Supply chain management (SCM) is traditionally defined as "a set of three or more entities (organizations or individuals) directly involved in the upstream and downstream flows of products, services, finances, and/or information from a source to a customer" (Mentzer et al., 2001, p. 4). Since the end of the 2000s, there has been an increasing interest in providing goods to consumers in a more sustainable manner, particularly focusing on reducing negative externalities of supply chain activities on the environment (Ahi & Searcy, 2013). The development of sustainability in SCM was initiated by integrating more green and environmental aspects in the SCM processes and practices (Ahi & Searcy, 2013). To do this, firms and their suppliers have a variety of possibilities that are, in combination, referred to as GSCM and involve the reduction of environmental impacts through all supply chain activities, such as product design, supplier selection, transport, procurement, manufacturing, packaging, or warehouse management (Fritz, 2019). Hence, GSCM should only provide green or eco-products in the market and also transparently delivers the information of GSCM practices to the customers and ideally also to end consumers (Lee et al., 2021; Fahmi et al., 2023; Sugandini et al., 2020).

Firms adopt various sustainability practices to attain legitimacy of external stakeholders on existing GSC practices (Awaysheh & Klassen, 2010). The GSC is most often perceived as sustainable when environmental practices of recycling, recovery, and reuse are present (Awaysheh & Klassen, 2010; Sharma & Henriques, 2005), especially with implemented environmental management systems, which drive credibility and environmental benefits (Marshall, McCarthy, McGrath, & Claudy, 2015; Pagell & Wu, 2009; Wiengarten & Pagell, 2012). However, social sustainability supply chain practices focus on health and safety compliance monitoring to ensure human rights and worker condition (Klassen & Vereecke, 2012; Marshall, McCarthy, Heavey, & McGrath, ; Pagell & Wu, 2009). Advanced social sustainability supply chain practices consider community benefits through the development of new products and processes, which go beyond monitoring and compliance, to improve performance, transparency, and reputation (Klassen & Vereecke, 2012; Pagell & Wu, 2009).

GSCM may be defined as "The creation of coordinated supply chains through the voluntary integration of environmental […] considerations with key inter-organizational business systems designed to efficiently and effectively manage the material, information, and capital flows associated with the procurement, production, and distribution of products or services in order to meet stakeholder requirements and improve the profitability, competitiveness, and resilience of the organization over the short- and long-term" (Ahi & Searcy, 2013, p. 339). Therefore, the "greening" of a supply chain also supports in the transition to a CE, as it requires the transformation of existing conventional ways of production and delivery of products to become more circular with such practices as, for example, recycling of materials, repair of products, and remanufacturing of parts of discarded products (de Mattos Nascimento et al., 2024; del Mar Alonso-Almeida & Rodriguez-Anton, 2019; Fontoura & Coelho, 2022). Circular SCM integrates circularity in SCM and the network of suppliers and encompasses its application in the entire supply chain (Farooque et al., 2019). The C2C product development involves circular thinking and transparency to be applied across the supply chain, which is also required for the C2C certification (C2CPII, 2021).

The responsibility for "greening" the supply chain often focuses on suppliers and the relationship between suppliers and buyers (e.g., Marshall, McCarthy, Heavey, & McGrath, 2015). However, it is known that stakeholders, including consumers, play a vital role on the demand side, and thus, they can have an important impact even on the redesign of supply chains to enhance the development of green products (Coskun et al., 2016; Hong et al., 2019; Li et al., 2021). As consumer environmental awareness is growing, there is a corresponding increase in the demand for sustainable products, in addition to higher expectations regarding transparency and accountability by suppliers in the supply chain (Sánchez-García et al., 2023). Through the adoption of circular SCM practices, companies demonstrate their dedication to achieving CE targets and foster a more favorable reputation among consumers (Farooque et al., 2019; Sánchez-García et al., 2023). Similarly, through C2C supply chain practices promoted by marketing departments, it is understood that firms could also strongly influence consumers' green purchase intentions and behaviors (Fahmi et al., 2023; Henninger et al., 2015; Lee et al., 2021). Thus, certain firms have voluntarily begun to green their products and supply chain processes to capture market shares from environmentally aware and responsible consumers that request, for example, eco-products with a lower carbon footprint (Ghosh & Shah, 2015). These efforts mobilize a variety of supply chain stakeholders, as stated by Hong and Guo (2019): "Consumers' actual green purchase behavior is directly associated with their knowledge of green products, which partly depends on the green marketing efforts implemented by product providers. Manufacturers design and produce green products to satisfy the demands of environmentally concerned consumers, whereas retailers use green marketing to promote green products in their marketplaces" (p. 155).

Especially marketing departments have the responsibility to communicate to consumers about product certifications and eco-labels, and thus play a key role in promoting supply chain innovations (Gao et al., 2017), such as C2C products. However, research on the perception of the environmental performance of supply chains from the consumer or end-user perspective in general (Santos & Proença, 2022) remains scarce; and research on C2C supply chain practices is even scarcer (Hansen & Schmitt, 2021).

Since the main aim in SCM is to satisfy customers in B2B or consumers in B2C contexts through speed, quality, and delivery

(e.g., Christopher, 2016), it is relevant to investigate whether the perceived environmental performance of a supply chain influences consumers' green purchase intentions and GPB in the context of GSCMs. To do so, we use the scales and constructs developed in the SCM literature related to product sustainability and product environmental friendliness (i.e., Marshall, McCarthy, McGrath, & Claudy, 2015; Croom et al., 2018; Das, 2017) and adapt them to consumers (for more details, see the methodology section and tables in the Appendix). Previous research reveals that consumers are willing to purchase green products in rather different national and sociocultural contexts when they are provided transparency regarding SCM activities (Bhaduri & Ha-Brookshire, 2011; Duan & Aloysius, 2019), with relevant information on the product and supply chain processes and when they are educated on the importance of purchasing green products (Ritter et al., 2015). Therefore, we posit the following hypotheses:

H3. More positive green supply chain perceptions positively influence the green purchase intention of consumers.

H4. More positive green supply chain perceptions positively influence consumers' green purchase behavior.

H5. Consumers' green purchase intentions serve as a mediator in the relationships between trust in C2C-labels (5a) as well as green supply chain perceptions (5b) and consumers' green purchase behavior.

The theoretical model with the relationships described above, including the hypotheses that are empirically tested in this study, are depicted in Figure 1.

3 | METHODOLOGY

3.1 | Operationalization of the constructs

In this study, the measurement operationalization is based on the theoretical background and previous studies with applicable constructs that have been adapted to fit our research context (see Table 1). Using measurement scales that have previously been tested is a good basis for validity and reliability. Therefore, the trust in C2C-labels (Taufique et al., 2019), green purchase intention (Wee et al., 2014), and behavior (Lee, 2009) measurements are based on validated scales. Moreover, we have extended our conceptual model with a construct that is based on the SCM literature with a focus on the development of GSCs, since the development of green products or services requires GSCM (Seuring & Müller, 2008), and consumers are increasingly sensitive to product origin and production processes, which are related to green SC practices such as green procurement (Fahmi et al., 2023). To do so, we adopted an exploratory approach in adapting the measure "GSC perceptions" to the consumer context from relevant literature and use the scales and constructs identified in the SCM literature related to product sustainability and product environmental friendliness (see Table 1).

To examine the GSC perceptions, we adapted a holistic scale, which is grounded in the sustainable SCM literature and emphasizes the customers' perceptions of GSC practices in delivering eco-friendly products. Hence, the items were adapted from established validated scales (Croom et al., 2018; Das, 2017; Marshall, McCarthy, McGrath, & Claudy, 2015). The scale emphasizes the importance of regulatory adherence in GSCs (Croom et al., 2018; Marshall, McCarthy, Heavey, & McGrath, 2015); the development of new, resource-efficient processes (Das, 2017; Marshall, McCarthy, Heavey, & McGrath, 2015); the perception that eco-product supply chains implement strategies for recycling, recovery, and reuse of products; the perception of health and safety monitoring as a significant practice in sustainable supply chains (Croom et al., 2018; Marshall, McCarthy, Heavey, & McGrath, 2015); beliefs that eco-product supply chains consider the health risk reduction in product and process development (Das, 2017; Marshall, McCarthy, Heavey, & McGrath, 2015); and perceptions that supply chains implement strategies to minimizes negative impacts on surrounding communities (Marshall, McCarthy, McGrath, & Claudy, 2015). The measurement items were reviewed by SCM experts to ensure content and face validity before survey administration (please also see Section 4, where we discuss the fit of the selected measurements and scales).

All items were measured on a 7-point Likert scale ranging from 1 "*Do not agree at all*" to 7 "*Completely agree*." The items were translated from English into German (and back to English for this paper),

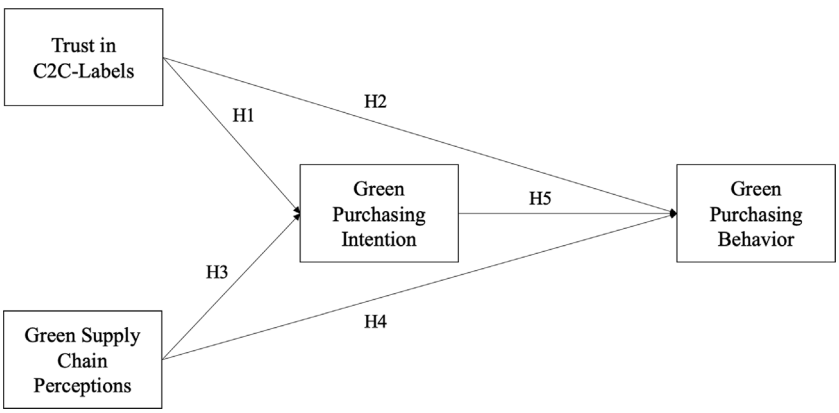

FIGURE 1 Conceptual model (Source: own illustration.).

TABLE 1 Construct measurement and operationalization.

Construct	Item	Item description	Exemplary sources
Trust in C2C-labels	TRUSTEC_1	C2C-labels are truly committed to environmental protection.	Taufique et al., 2019
	TRUSTEC_2	Most of what C2C-labels say about products is true.	
	TRUSTEC_3	If a C2C-label makes a claim about a product, that claim is probably true.	
Green supply chain perceptions	SC_1	I believe that in the supply chain of eco-products, attention is paid to compliance with environmental requirements.	Croom et al., 2018; Das, 2017; Marshall, McCarthy, McGrath, and Claudy, 2015
	SC_2	I believe that in the supply chain of eco-products, new products or processes are developed that consume fewer resources.	
	SC_3	I understand that in the eco-products supply chain, a strategy for recycling, recovery, and reuse of used products is implemented.	
	SC_4	I believe that in the supply chain of eco-products, compliance with health and safety requirements is monitored.	
	SC_5	I believe that in eco-product supply chains, new products or processes are developed that reduce health risks for workers, suppliers, and consumers.	
	SC_6	In the eco-product supply chain, there appear to be strategies in place to minimize the negative impacts on communities around their supply chain operations.	
Green purchase intention	GPI_1	I will buy environmentally friendly/green products in the near future.	Wee et al., 2014
	GPI_2	I plan to buy environmentally friendly/green products regularly.	
	GPI_3	I intend to buy environmentally friendly/green products because I care about the environment.	
Green purchase behavior	GPB_1	Before I buy a product, I first look at the label for ingredients that harm the environment.	Lee, 2009
	GPB_2	I prefer environmentally friendly products if their product characteristics are similar to conventional products.	
	GPB_3	I mostly buy products that are environmentally friendly.	
	GPB_4	I mostly buy environmentally friendly products, even if they are more expensive than non-organic products.	

Note: Items were translated from German into English. Scale: 1—*do not agree at all* to 7—*completely agree*.

thereby ensuring that the translation did not lead to misunderstandings of the formulations and, thus, avoiding response bias. All items were measured reflectively with multi-item scales (Sarstedt et al., 2016). Measuring items reflectively implies that the items are caused by the construct; thus, the items are expected to be interchangeable and, therefore, also highly correlated (Hair et al., 2022). The final path model was tested with 10 PhD students and specifically identified C2C experts before sending it out for an initial pre-test and then the final data collection via a university network.

3.2 | Sample description

To test the model, we collected data from consumers in Germany using convenience sampling through an online survey distributed via e-mail via a German university network. Counterintuitive or straight-line answers were excluded from the sample. All questions in our survey were mandatory, thereby preventing potential issues related to missing values. The final sample after data cleaning (i.e., exclusion of outliers, speeders, and other controversy response patterns) comprised 276 respondents. Sample sizes of at least 200 responses are typically used in partial least squares structural equation modeling (PLS-SEM) studies (Dash & Paul, 2021). Our descriptive statistics (see Table A1) of the sample indicate that males hold a larger share (55.1%) in comparison with females (40.9%). Most respondents are below the age of 35 years (70.3%) and have at least one university degree (67.7%). Almost half of the respondents are currently studying at a university (48.2%) and living alone (45.3%), whereas a similar number are employed (45.7%). The monthly household income is scattered across all income groups, probably since the survey was distributed among respondents in a university campus, consisting of university students, faculty, and staff. This shows that we used a sample of comparatively younger and well-informed people regarding their perceptions. Our research approach allowed us to reach a relatively large sample of consumers that are comparatively well-informed and educated. Conducting the study in Western Europe allowed us to gain a better understanding of consumers in this setting. Previous research on sustainable consumption matters is fragmented with studies often being conducted in Europe (Fischer et al., 2021), and also in emerging markets (Kautish et al., 2021). However, especially the C2C concept is fairly new and best known in Europe, where the CE is also promoted via the European Green Deal.

3.3 | PLS-SEM methodology

We develop our path model based on the relationships among the theoretical constructs in the conceptual model (see Figure 1). We assess the path model by means of PLS-SEM, which is a variance-based statistical analysis method that enables an analysis of relationships in a path model and the explanation of a target construct from a prediction perspective (Hair et al., 2022). With hypotheses developed from the relevant literature, theory, and existing constructs, we develop a green purchase intention–behavior model for eco-products, such as C2C certified FMCGs. We chose this methodological approach, as it allows for explanatory as well as causal-predictive inferences (Chin et al., 2020; Wold, 1982), and the derivation of practical implications (Hair et al., 2024). We apply PLS-SEM as opposed to covariance-based SEM (CB-SEM), as PLS-SEM is applicable for testing rather small data sets, for the assessment of reflective as well as formative measurement models (Hair et al., 2022), and in exploratory research (Hair et al., 2022) that is based on theory. While CB-SEM only focuses on the relationships between theory testing and confirmatory and explanatory modeling, PLS-SEM focuses on a prediction-oriented goal and a theoretically established structural model of the latent variables and their relationships (Richter et al., 2015). The PLS path modeling is generally more suitable when the objective is prediction of a target construct, that is, GPB in our study (Hair et al., 2022, 2018). The PLS-SEM methodology has been applied in a variety of previous recent and highly cited papers on sustainable consumer research and SCM (e.g., Mardani et al., 2020; Munerah et al., 2021; Saari, Damberg, et al., 2021; Seman et al., 2019; Vanalle et al., 2017).

To avoid potential uncertainty in the survey design, we included introductory background information and descriptions for respondents and explained that their answers are perceptional. All respondents' answers were handled anonymously in the online survey. With the goal to control for potential common method bias, we included a theoretically unrelated marker variable in the survey from a three-item loneliness scale ("*I often feel that I lack companionship*"; "*I often feel left out*"; "*I often feel isolated from others*") given by Hughes and co-authors (2004), and found no significant correlations between our reflective variables and this marker variable. Therefore, we consider our model likely to be free of common method bias. Researchers across the social sciences disciplines, including marketing (Liu et al., 2022; Damberg, 2021) and consumer research (Saari, Damberg, et al., 2021), use the PLS-SEM method in their empirical analyses to support the described research goals. We utilize the SmartPLS 4 software for conducting the analyses (Ringle et al., 2024).

4 | RESULTS

Our assessment of the measurement models and structural model follows the most recent PLS-SEM guidelines (Hair et al., 2019, 2022). Hence, we assess all our reflective measurement models by examining the indicator reliability, internal consistency, as well as convergence and discriminant validity. Table 2 displays the indicator loadings of the reflective measurement models, indicating if all measured items belong to a particular construct. The results reveal that all indicator loading values are above the threshold of 0.7, except for GPB items GPB_1 and GPB_2, which are slightly below the threshold, but still acceptable, as their average variance extracted (AVE) values are above 0.5. The internal consistency reliability of the reflective constructs is assessed using composite reliability (ρ_A; Table 2). The values of all constructs are satisfactory—that is, above the threshold of 0.7—thereby indicating that the indicators indeed measure what they were intended to measure. Consequently, the indicators are deemed reliable, and the constructs present high internal consistency. Next, the convergence validity of the constructs is checked (AVE), which exceeds the threshold of 0.5 for all constructs in our model. The Heterotrait–Monotrait (HTMT) criterion (Henseler et al., 2015) is used to assess discriminant validity of the reflective constructs in a path model. All the HTMT results are below the critical value of 0.85 (Table 3). While AVE shows how much of the variance of indicators is explained by the construct, the discriminant validity then represents the extent to which the construct is empirically distinct from other constructs and measures it is intended to measure (Hair et al., 2022). Therefore, we conclude that these results are acceptable to establish discriminant validity.

Next, we assess the structural model. This assessment includes assessing potential collinearity issues. The inner variance inflation factors (VIFs) are all below the conservative threshold of 3.3, with the highest VIF being 1.382. Therefore, collinearity is not at a critical level. We then compare and interpret the size of the path coefficients, which represent the hypothesized relationships (Hair et al., 2022). To evaluate the statistical significance of these path coefficients, bootstrapping is applied to generate a 95% confidence interval (CI) by using 10,000 subsamples (the bias-corrected 95% confidence intervals; Hair et al., 2022). The results of the bootstrapping procedure reveal that all path coefficients are significant (Table 4), except for the relationship between GSC perceptions and GPB, which is not significant. However, both trust in C2C-labels ($\beta = 0.186$, $p < .01$) and positive GSC perceptions ($\beta = 0.274$, $p < .01$) have a significant positive effect on green purchase intentions, while trust in C2C-labels is found to be an important driver for GPB ($\beta = 0.143$, $p < .01$). Further, we confirm that green purchase intention has a strong positive effect on GPB ($\beta = 0.601$, $p < .01$).

We conduct an additional mediation analysis (Cepeda Carrion et al., 2017; Nitzl et al., 2016), which reveals that trust in C2C-labels has an indirect effect on GPB via green purchase intention and that this effect is significant ($\beta = 0.112$, $p < .05$; see Table 4). Since the direct effect of trust in C2C-labels on GPB is significant, this relationship is partially mediated by green purchase intentions (Hair et al., 2022). The total indirect effect of GSC perceptions via green purchase intention on GPB is also significant ($\beta = 0.164$, $p < 0.01$). Since the direct effect of GSC perception on the target construct is not significant, we reveal a full mediation in this relationship.

The model entails relatively high levels of the amount of explained variance of the endogenous constructs, as indicated by the R^2 values that reveal the model's explanatory accuracy. For our target

TABLE 2 Results of the reflective measurement model.

Construct	Item	Outer loadings	ρ_A	rho_A	Cronbach's alpha	AVE
Trust in C2C-labels	TRUSTEC_1	0.895***	0.932	0.893	0.890	0.820
	TRUSTEC_2	0.923***				
	TRUSTEC_3	0.899***				
Green supply chain perceptions	GSC_1	0.816***	0.916	0.896	0.890	0.646
	GSC_2	0.805***				
	GSC_3	0.726***				
	GSC_4	0.786***				
	GSC_5	0.829***				
	GSC_6	0.857***				
Green purchasing intention	GPI_1	0.934***	0.945	0.913	0.913	0.852
	GPI_2	0.931***				
	GPI_3	0.904***				
Green purchase behavior	GPB_1	0.689***	0.865	0.825	0.788	0.621
	GPB_2	0.633***				
	GPB_3	0.905***				
	GPB_4	0.890***				

Note: CI = 95% bootstrap confidence interval; AVE = average variance extracted.
***= $p < .01$.

TABLE 3 Discriminant validity (HTMT results).

Constructs	Trust in C2C-labels	Supply chain perceptions	Green purchase intention	Green purchase behavior
Trust in C2C-labels	1			
Green supply chain perceptions	0.536 [0.437; 0.622]	1		
Green purchase intention	0.351 [0.229; 0.472]	0.398 [0.287; 0.497]	1	
Green purchase behavior	0.434 [0.312; 0.546]	0.400 [0.280; 0.511]	0.776 [0.680; 0.852]	1

Note: One-tailed test ($p < 0.05$); HTMT = Heterotrait–Monotrait ratio of correlations.

TABLE 4 Structural model results.

Paths	Hypotheses	Path coefficients	R^2 (GPB)
Trust → GPI	H1 (+)	0.186***	0.470
Trust → GPB	H2 (+)	0.143***	
GSC → GPI	H3 (+)	0.274***	
GSC → GPB	H4 (−)	0.055	
GPI → GPB	H5 (+)	0.601***	
Trust → GPI → GPB	H5a (+)	0.112**	
GSC → GPI → GPB	H5b (+)	0.164***	

Note: CI = 95% bootstrap confidence interval. Trust = trust in C2C-labels, GSC = green supply chain perceptions, GPI = green purchase intention, GPB = green purchase behavior.
***= $p < .01$.**= $p < .05$.

construct, GPB, our model explains over 47% of the construct's variance ($R^2 = 0.470$). In order to draw even better conclusions and making managerial recommendations, researchers are advised to look at the model's out-of-sample predictive power rather than solely examining the explanatory power using the R^2 value. For this purpose, we run the $PLS_{predict}$ procedure on GPB (Shmueli et al., 2016; Shmueli et al., 2019). The positive values in the $Q^2_{predict}$ column (Table 5) indicate that the PLS-SEM predictions are better than the mean prediction values. Additionally, the root mean square error (RMSE) value of the PLS-SEM predictions is, in all cases, smaller than the RMSE value of the linear model (LM) prediction benchmark. We therefore conclude that these results confirm the high predictive power of our proposed theoretical model.

5 | DISCUSSION

The main research objective of our study was to develop and test a theoretically derived conceptual model that describes how trust in eco-labels and GSCs impacts consumers' green purchase intentions and actual green purchase behavior, and to empirically test the hypotheses in the context of C2C certified FMCGs. Applying the PLS-SEM methodology enabled us to explore the direct and indirect relationships between trust in C2C-labels and GPB via green purchase

TABLE 5 $PLS_{predict}$ results for the target construct (green purchase behavior).

Indicator	$Q^2_{predict}$	$RMSE_{PLS}$	$RMSE_{LM}$	$RMSE_{PLS} - RMSE_{LM}$
GPB_1	0.056	1.686	1.738	−0.052
GPB_2	0.091	1.376	1.407	−0.031
GPB_3	0.119	1.342	1.369	−0.027
GPB_4	0.094	1.464	1.485	−0.021

Note: RMSE = root mean square error; LM = linear model.

intention as well as the relationship between GSC perceptions on GPB via the green purchase intention.

First, we confirm that trust in C2C-labels positively influences the green purchase intention (H1) and the GPB of consumers (H2). The results from our research are in line with the literature and reveal that the respondents trust in C2C-labels (Goossens et al., 2017; Gorton et al., 2021). Gorton et al. (2021) found that knowledge of third-party certification influences the trust in the eco-label, which in turn translates into consumers considering purchasing the products. Therefore, the trust in the label was found to be a critical mediator. The studies also show how important the trust in the organizations behind eco-labels is in consumers' sustainable behavior and even in increasing their willingness to pay (Khachatryan et al., 2021; Stampa & Zander, 2022). C2C-labels serve as signals and convey to consumers that C2C-labeled products have been designed and produced following a circular approach, the companies have GSCM practices, and that their consumption helps to protect natural ecosystems (cf. Lindgreen, 2003; Stampa & Zander, 2022; Tung et al., 2012). In addition, C2C-labels have a positive impact on the respondents' GPB (Xu et al., 2022), which has been shown with regard to other types of labels in prior research (Goossens et al., 2017; Lee & Holden, 1999). Our findings show that a C2C-label helps to reduce the information asymmetry between C2C-producers and their potential buyers, as it provides credible and transparent signals (cf. signaling theory; Connelly et al., 2011) and also leads to green purchase intention (Wee et al., 2014; Osburg et al., 2019) and GPB (Gupta & Ogden, 2009; Harris, 2007; Lee, 2009). Consequently, this directly addresses the green intention-purchase behavior gap (Gruber & Schlegelmilch, 2014; Tawde et al., 2023) and supports the TPB (Ajzen, 1991). In the context of C2C products, the transparent and credible signals via labels have an impact not only buying intentions but also translate into actual purchase behavior. This finding provides a novel perspective to previous studies that found that merely the intentions to act pro-environmentally often do not transform into actual behavior—that is, identified green intention–purchase behavior gap (Echegaray & Hansstein, 2017; Grimmer & Miles, 2017).

Second, we confirm that better GSC perceptions positively influence consumers' green purchase intention (H3). Earlier research has revealed that consumers are willing to purchase green products when they are provided transparency with regard to SCM activities (Ritter et al., 2015). However, the direct link between GSC perceptions and GPB could not be confirmed (H4). One reason for this could be that facts related to the GSC are complicated and that consumers need to take time to consider them more when deciding whether or not to buy a certain product. This thinking related to green intention-purchase behavior is a rather complex cognitive process that impacts their intention to buy and, thus, their behavioral outcome (Tawde et al., 2023). In this case, the intention needs to be built based on information available on the GSCM practices before the actual purchase behavior takes place. Another reason might be that the C2C-labels and GSCM practices implemented by a firm have different weightage in influencing a consumer's attitude toward a particular product and thus different conversion speed when it comes to purchasing that particular product after the attitude and intention are formed. The C2C-label that is visible on a product creates an immediate perception of that product as an eco-product, which—in addition to the intention for sustainable consumption behavior—immediately translates into a purchase. However, GSCM practices lead to the formation of a positive attitude toward a firm or a product but do not create an immediate intention to purchase. In this case, the consumer is willing to buy the product, but perhaps some time in the future, and has an overall positive attitude toward the firm. From the perspective of cognitive processes, Tawde et al. (2023) investigated the green intention-purchase behavior gap and introduced "implementation intentions" as an additional step in between consumer's intention and purchase action. The study did not look specifically into eco-labels nor did it consider GSCM as an influencing factor; however, it proved green intention-purchase gap being a multi-step process. It was also shown that consumers' cognitive processes might be interrupted by the greenwashing behavior of a single brand, which might impact the purchase intention of green products from other brands, including an entire industry (Wang et al., 2020). This might affect the period it takes for a consumer to form a positive attitude toward products, brands, and industries again, and thus prolong consumers' cognitive processes as well as intention and purchase action.

Third, our findings confirm the crucial role that marketing and transparent communication plays in enhancing consumers' trust, as shown by clear communication of the GSC practices' integration in C2C-labeled products (Gao et al., 2017; Henninger et al., 2020). This finding is in line with previous research, which found that providing consumers with "product information based on traceability systems increases product trust and purchase intentions" (Appelhanz et al., 2016 p. 132). When it comes to transparent communication, it was shown that the purchase intention is influenced by a combination of factors, such as perceived usefulness of product information, trust in detailed product information, and resistance to negative

information (Osburg et al., 2019). When analyzing the interplay of GSC integration and green new product development, Fontoura and Coelho (2022) found that the first aspect is related with innovation, whereas the second one directly affects the firms' performance, again confirming our findings, that GSC transparency needs to be tightly integrated with the green product information in order to translate into GPB. Goossens et al. (2017) in their analysis of eco-labels used for fresh products found that consumers request more environmental information provision and suggest that environmental performance-based labels are the prerequisite for closing the green intention–purchase gap. The latter aspect is proved by our findings in the context of C2C-labeling.

Fourth, we further found that consumers' green purchase intention serves as a mediator in the relationships between trust in C2C-labels (5a) as well as consumers' GSC perceptions (5b) and consumers' GPB (H5). Green purchase intention partially mediates the effect on the decision to purchase created by trust in C2C-labels; however, its mediation is full in the case of GSC perceptions. In their study, Fontoura and Coelho (2022) did not show the combined effect of green product development and GSCM on company's results, but they empirically link the integration of GSC with the innovation and green new product development with firm performance. We consider green product development according to C2C principles as a form of supply chain innovation. The implementation of C2C practices includes management of the inter-organizational relationships to develop eco-effectiveness among supply chain partners (McDonough et al., 2003), which can be a source of competitive advantage (Wong & Ngai, 2022). Our findings indicate the path beginning with the consumer learning about the GSC that forms the green purchase intention and subsequently results in actual purchase. Applying behavioral reasoning theory (Westaby, 2005), we find that in the context of C2C, the contextual variables (trust in C2C-labels and GSCM) strongly influence the psychological variable (intention) formation that, in turn, impacts actual purchase behavior. In fact, as a contextual parameter, the GSC perception has a greater influence on green purchase intention than trust in C2C-labels and a stronger indirect effect on the final GPB.

Fifth, in our study, the strong positive effect of green purchase intention on GPB is in alignment with earlier findings in the scientific literature (Fishbein & Ajzen, 2005). In addition, it brings a novel perspective from the context of a certified eco-label that consumers trust to other studies that have indicated the growing green intention–purchase behavior gap (Gleim et al., 2014; Mahoney, 2011; Moser, 2015). This could be demonstrated by PLS-SEM path modeling, which enables us to estimate the contextual parameters in narrowing the green gap (ElHaffar et al., 2020; Moser, 2015; Nguyen et al., 2019; Peattie, 2010). Therefore, our study indicates that GSC perception and C2C-labels as transparent and credible signals to consumers could help to narrow the green gap. The predictive power of the model also shows the fit of parameters to predict the GPB.

We incorporate our findings in a *green value creation–green value capture* framework that explains how the value that firms create when developing green products can be successfully captured in the market

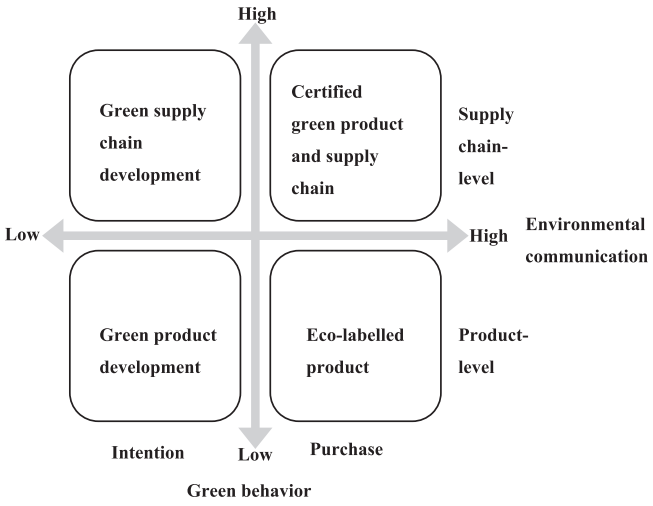

FIGURE 2 Green value creation-capture framework (Source: own illustration).

by bridging the green intention–purchase gap (see Figure 2). Building on the findings of our study, we show that green product development and GSC development lead to the formation of positive perceptions and, thus, the green behavior intention. The translation of intentions into actual GPB is influenced by eco-labeling and, more so, by labeling that signals green product certification and GSC transparency, such as C2C-labels.

5.1 | Theoretical implications

Our study effectively links several research areas—which are sustainable consumption behavior (Geiger et al., 2018), GPB (Xu et al., 2022) in relation with the TPB (Ajzen, 1991) and the TRA (Ajzen & Fishbein, 1975), C2C product design and certification (Braungart et al., 2007; Hansen & Schmitt, 2021), and GSCM (Ahi & Searcy, 2013; Ha et al., 2021). C2C product design is an innovative approach to environmental NPD (Cooper & Kleinschmidt, 1987; Shrivastava, 1995) and green NPD (Yu et al., 2021) that helps to address environmental problems (Chen, 2001) and results in value creation (Shrivastava, 1995) via green products that have been produced with GSCM practices. Our results show that in the context of C2C products, the C2C-labels serve as transparent signals to consumers that result in perceived eco-friendliness and transparent and positive GSC perceptions, both positively influencing the green purchase intention and consequently turning into actual GPB.

Through the lens of behavioral reasoning theory (Westaby, 2005), our research reveals that in the case of C2C, contextual variables such as trust in C2C-labels and GSCM significantly influence the psychological variable (intention) formation, consequently impacting actual purchase behavior. A C2C-label helps to reduce the information asymmetry between C2C-producers and their potential consumers and buyers, as it provides credible and transparent signals (cf. signaling theory; Connelly et al., 2011) and further leads to sustainable

consumption behavior, including the intention and purchase of green products, that is, GPB. Consequently, this directly addresses the discussed green intention–purchase behavior gap and supports the TPB (Ajzen, 1991). Thus, combining research on consumer trust, marketing and GSCM practices in the context of C2C product certifications, can help to reduce the prominent green gap in consumer research. Indeed, GSCM not only provides green (or eco-) products in the market but also delivers the information of such GSCM practices to the customers and ideally also to end consumers. In the context of C2C products, the transparent and credible signals via labels can impact buying intentions and also translate into actual purchase behavior.

Theoretically, we build on research on sustainable consumption behavior (Geiger et al., 2018), GPB (Xu et al., 2022), C2C certification (Hansen & Schmitt, 2021), GSCM (Ahi & Searcy, 2013; Ha et al., 2021) as well as TRA (Ajzen & Fishbein, 1975) and TPB (Ajzen, 1991). We focus on a relatively new product type—that is, C2C certified FMCG products—and include the impact of eco-labels on consumers' purchase intentions and purchase behavior and their GSC perceptions. This is a particularly novel approach in the sustainable consumption behavior literature, thereby also linking to GSCM literature that has previously not taken the consumer perspective into consideration in quantitative empirical studies; and a general lack of suitable scales in the context of supply chain innovation is evident (Wong & Ngai, 2022). Our proposed model explains and predicts GPB of consumers in the case of C2C products, proving the importance of consumers' perceptions of products based on the trustworthiness of eco-labels and on the perceptions of GSCs.

Our findings support the TPB (Ajzen, 1991) in the context of C2C products. Confirming the behavioral reasoning theory (Westaby, 2005), we ground our findings on the signaling theory (Connelly et al., 2011), revealing that C2C-labels and GSC perceptions serve as contextual signals in defining the actual green behavior of the consumers. Finally, this reveals that eco-labels associated with certified eco-products and GSCs, as it is in the case of C2C-labels, actually help to minimize the green intention–purchase behavior gap in the case of eco-products, especially when introduced in the market.

5.2 | Managerial implications

From a practical perspective, our findings can guide managers in product design, SCM, marketing, sales, and communication departments that are responsible for product innovation, development of supply chain transparency, and product launches to identify the most important factors that signal the trustworthiness of green environmentally sustainable, eco-products—that is the relevance of eco-labels and trustworthy supply chain perceptions among consumers and their impact on their green purchase intention and GPB. Our study emphasizes the crucial role that the marketing of eco-label certification and transparent communication about supply chains play in enhancing consumers' trust in the eco-labels of green products, as shown in the case of C2C-labeled products (Gao et al., 2017; Henninger et al., 2020). Moreover, it is evident from our sample that C2C products are indeed accepted, particularly among younger consumers with a relatively high socioeconomic status.

More widely, this research encourages supply chain managers in developing more C2C practices to support the transition toward a CE (del Mar Alonso-Almeida & Rodriguez-Anton, 2019; Ha et al., 2021) and achievement of the sustainable development goals (Santos & Proença, 2022), given the importance it has on stimulating consumers' purchase intentions and behavior. In this way, it will be possible for firms, through their marketing departments, to communicate more transparently about green characteristics of their products and SCM activities, to build trust among their consumers, and thus stimulate their green purchase intentions and behaviors (Appelhanz et al., 2016; Osburg et al., 2019; Goossens et al., 2017; Henninger et al., 2020; Hong & Guo, 2019; Ritter et al., 2015). Furthermore, the development of supply chain practices to manufacture more C2C products could contribute to the overall protection of the environment by changing consumers' purchasing intentions and behaviors (Lindgreen, 2003; Tung et al., 2012). Since consumers often lack information on green product manufacturing processes to make informed purchasing decisions (Grunert & Wills, 2007), in companies that are C2C certified the marketers and supply chain managers could additionally contribute to the national, European, and worldwide sustainable development goal no. 4: "Quality education" by contributing to educating consumers on the importance of purchasing green products (Ritter et al., 2015) using C2C labels.

6 | LIMITATIONS AND FUTURE RESEARCH PERSPECTIVES

From a methodological perspective, we base our findings on cross-sectional data, which draws a momentary picture. Therefore, we argue that the proposed model needs to be tested further in future studies, particularly once C2C products are more widely available in consumer markets and have become more known among consumers, also outside Europe. Moreover, we recommend conducting further testing the measure for the extended consumer-focused GSC perceptions in future studies to enable cross-country comparisons. Moreover, we acknowledge the findings of previous research that has found that consumers choose a product with better performance over better sustainability characteristics, and that consumers' choices depend on the extent to which they value sustainability (Luchs et al., 2012).

In this paper, we based the measurement model on a novel scale that we adapted to the consumer context from validated items identified in the SCM literature related to product sustainability and product environmental friendliness (i.e., Marshall, McCarthy, Heavey, & McGrath, 2015; Croom et al., 2018; Das, 2017). Based on our findings, more research needs to be conducted to analyze what kind of SCM information consumers trust and how it would directly impact their GPB. Furthermore, this study is meaningful from an ENPD perspective (Cooper & Kleinschmidt, 1987; Shrivastava, 1995), as it highlights that C2C products and C2C supply chain practices can have a

powerful impact on consumers' purchase intentions and behavior as well as on the development of GSCs. We also encourage further research to replicate this study by analyzing a wider scope of sustainability and taking into account social and economic factors or the sustainable development goals, as this study is limited to environmental factors.

Although previous studies have evaluated the drivers of GPB, in this study, we further investigated the specific and detailed factors that influence GPB—that is, the role of C2C-labeling in product innovation adoption and GSC perceptions—and we offer researchers as well as practitioners a comprehensive model in this regard. In particular, for marketing and communications departments, we argue that marketing campaigns could be used by C2C certified companies to promote C2C supply chain initiatives, and thereby change consumers' mindsets toward higher levels of sustainability. Certification and labeling can be one important element in informing consumers about the materials, ingredients and composition of products (Hansen & Schmitt, 2021), and GSCM practices (Ha et al., 2021), which—particularly in the case of FMCGs—often cannot be easily distinguished from non-environmentally friendly alternatives (Kanda et al., 2018).

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CONFLICT OF INTEREST STATEMENT

All authors declare that they have no conflict of interest.

ETHICS STATEMENT

The authors have read and agreed to the Committee on Publication Ethics (COPE) international standards for authors.

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APPENDIX

TABLE A1 Sample demographics.

Sample criteria	*n*	%
Gender		
Male	152	55.1
Female	113	40.9
Diverse	1	0.4
Prefer not to answer	10	3.6
Age		
18–24	70	25.4
25–34	124	44.9
35–44	26	9.4
45–54	15	5.4
55–65	37	13.4
>65	3	1.1
Prefer not to answer	1	0.4
Marital status		
Living alone	125	45.3
Living with a partner	76	27.5
Married	57	20.6
Divorced	1	0.4
Widowed	3	1.1
Prefer not to answer	14	5.1
Education (highest level)		
"Hauptschule" (completed 9th grade)	0	0.0
"Mittlere Reife" (completed 10th grade)	3	1.1
"Fachhochschulreife" (completed 12th grade)	4	1.5
Abitur (high school diploma)	50	18.1
Vocational training	13	4.7
University degree (bachelor, master, or similar)	187	67.7
Ph.D.	18	6.5
Prefer not to answer	1	0.4
Occupational status		
Unemployed	1	0.4
Retired	8	2.8
Houseman/housewife	1	0.4
In education	1	0.4
Studying at a university	133	48.2
Self-employed	5	1.8
Employed	126	45.7
Prefer not to answer	1	0.4
Monthly household income (after taxes)		
< EUR 750	46	16.7
EUR 751–1250	47	17.0
EUR 1251–2000	28	10.1
EUR 2001–3500	57	20.7
EUR 3501–5000	43	15.6
> EUR 5000	26	9.4
Prefer not to answer	29	10.5

Note: Own tabulation based on descriptive data on the sample; own calculations; n = sample size.