




Addressing Plastic Concern: Behavioral Insights into Recycled Plastic Products and Packaging in a Circular Economy

Filippo Corsini^{1,2}  · Natalia Marzia Gusmerotti³ · Edoardo Bartoletti⁴ · Francesco Testa⁴ · Andrea Appolloni³ · Fabio Iraldo⁴

Received: 18 October 2023 / Accepted: 27 March 2024 / Published online: 11 April 2024
© The Author(s) 2024

Abstract

The excessive production and use of new plastic materials pose a critical environmental challenge, and reducing its consumption has emerged as a major global hurdle. Understanding human behavior is thus essential for creating a circular economy for plastics. The study aims to gain insights into consumers' buying habits concerning recycled plastic, which has received relatively little attention in prior research on the subject of environmentally friendly consumer behavior. This study draws on the Theory of Planned Behavior to analyze the factors influencing consumer behavior regarding products and packaging made from recycled plastic. To this end, we employed a questionnaire, which was administered to 511 consumers in Italy. Results support that concerns about plastics and perceived efficacy exert a direct influence on attitudes. Additionally, our findings demonstrate that social norms, attitudes, and perceived behavioral control significantly shape purchasing behaviors concerning recycled plastic. The research contributes to extending the Theory of Planned Behavior model in predicting environmental-friendly behavior by adding new empirical evidence and provides valuable suggestions for companies to develop effective communication strategies and policies to redirect plastic consumption behavior towards less-impacting use of plastic.

Keywords Plastic concern · Purchase behavior · Recycled plastic · Theory of Planned Behavior · Recycled packaging · Recycled product

Introduction

The OECD [70] asserts that the unsustainable nature of human activities is evident in the notable harm being caused to ecosystems, human health, and overall quality of life, which are consequences of the swift growth of industrialization and urbanization. Plastic, among others, is posing a significant threat to the environment [35]. Geyer et al. [44] reported that between 1950 and 2015, the global production of new plastic amounted to approximately 8.3 billion metric tons (Mt), out of which more than 6.3 billion Mt were disposed of as waste. Disaggregating the waste, it was found that 9% was subjected to recycling, 12% was subjected to incineration, and the remaining 79% was deposited in

landfills or the natural environment. According to Geyer et al. [44], if the present manufacturing and waste management practices persist, research indicates that the quantity of plastic waste in the form of garbage deposited in landfills or the natural environment could surpass 12,000 Mt by the year 2050.

In light of the critical levels of plastic production and the resulting accumulation of waste, it is essential to actively promote and implement recycling strategies. These strategies should aim to decrease the use of new plastic and lessen the amount of waste sent to landfills, thereby helping to mitigate the environmental hazards associated with plastic. Currently, most plastics are recyclable and can be repurposed [78]. However, the potential for recycling plastic waste is considerably underutilized, as evidenced by Ragaert et al. [78, 79]. The capacity for recycling is constrained due to variations in the sizes of waste streams, the quality of different types of plastic, and geographic or political factors, as noted by Hahladakis and Iacovidou [51] and Gong et al. [45]. Additionally, companies do not demand enough recycled plastic as these products are not considered a valuable resource, since the costs of recycling plastic are higher than those of processing virgin materials [18].

Calvo-Porrall and Lévy-Mangin [20] argue that the adoption of recycled plastic products and packaging by the public can significantly lessen the ecological impact of plastic waste by creating demand for such products and supporting sustainable business models. Scholars and policymakers concur that consumer behavior plays a pivotal role in facilitating the transition to a circular economy [41, 47, 91, 93], and various organizations have initiated campaigns aimed at promoting a shift in people's plastic consumption habits [11, 53]. Although consumers are generally aware of companies producing goods from recycled plastic [66], and show an interest in sustainable products, there is often a gap between this interest and actual purchase behaviors, as observed by Park and Lin [73].

To reduce the use of new plastic products and packaging and provide valuable insights for companies, a deeper comprehension of consumer attitudes and purchasing behavior is thus essential. While previous studies have examined multiple drivers of pro-environmental behavior [30], such as recycling [65], energy conservation [102], and organic food consumption [86], minimal evidence exists regarding the determinants of behavior related to the purchase of recycled plastic products and packaging. Furthermore, the factors influencing different pro-environmental behaviors can vary considerably [29]. The capacity to motivate individuals to adopt more environmentally friendly consumption practices is crucial in addressing the current environmental challenges [31, 39].

The objective of this study, anchored in the theoretical framework of the Theory of Planned Behavior [3–5], is to investigate the factors that influence pro-environmental consumer behavior concerning the purchase of products and packaging made from recycled plastic. This understanding is crucial for promoting the circular economy model, in which materials are recycled into new products, thereby decreasing dependence on the production of new plastics and lessening the environmental impact associated with waste disposal [48].

Specifically, this research explores firstly the impact of plastic concern and perceived efficacy in shaping attitudes towards recycled plastic. Secondly, the research explores the influence of social norms, attitudes, and perceived behavioral control in shaping purchasing behaviors concerning recycled plastic. To accomplish this goal, the study analyzes original data gathered from a survey of 511 consumers in Italy. The findings indicate that concerns regarding plastics and perceived efficacy directly impact attitudes. Furthermore, the results

show that social norms, attitudes, and perceived behavioral control play a significant role in shaping purchasing behaviors related to recycled plastic.

The findings offer valuable information for future consumer-based plastics research and for developing effective communication plans and regulations that promote more sustainable and low-impact plastic usage.

Literature Review and Research Hypotheses

When discussing the factors influencing consumer behavior, the theory of planned behavior [3–5] is often utilized. While this model has faced criticism and competition from other behavioral models, it is still considered a highly effective approach for developing interventions aimed at changing human behavior [106]. The TPB posits that attitudes towards behavioral intentions, subjective norms, and perceived behavioral control (PBC) have a significant influence on shaping both behavioral intention and actual behavior. However, as these factors can vary greatly depending on the circumstances surrounding a specific behavior, further research into behavior prediction is still necessary [3, 87].

Our research extends the application of the TPB framework in the context of consumer behavior toward recycled plastic. First, we look at how the concern of plastic and perceived efficacy can help to shape attitudes toward recycled plastic. These constructs have never been studied before regarding recycled plastic purchasing behavior. Second, we investigate the relationship between plastic concern, perceived efficacy, and recycled plastic purchasing behavior by examining attitudes' previously unknown mediation effect.

According to previous research [81, 84], individuals who have a concern for the environment tend to exhibit eco-friendly consumer behavior. The NEP scale, created by Dunlap and Van Liere in the late 1970s, was designed to measure general environmental concern, but subsequent research has shown that ecological crises do not always lead to environmental-friendly behavior [84, 107]. Owing to the significant harm inflicted by plastic, particularly on marine ecosystems, there has been a shift towards alternatives free from plastic [77]. Recent research indicates that individuals worried about plastic pollution tend to have favorable views on minimizing plastic usage [68] and are more inclined to eschew the purchase of single-use plastic items while shopping for groceries [21]. These findings indicate that plastic concern is a significant predictor of pro-environmental behavior.

Overall, these studies demonstrate a positive correlation between consumers' plastic concern and their likelihood to engage in behaviors that promote sustainability. Plastic concern is identified as a significant behavioral factor that influences consumer decision-making regarding the consumption of recycled plastic products. Therefore, further research in this area is warranted, by setting the following hypotheses:

H1: High plastic concern positively affects individuals' attitudes towards recycled products.

H2: Attitudes mediate the relationship between plastic concern and purchase behavior regarding recycled plastic.

The value-beliefs-norm theory suggests that individual values, beliefs, and norms affect pro-environmental behaviors. Previous research by Stern [87] and Ajzen and Fishbein [5] has shown that environmental beliefs, including perceived self-efficacy, can influence

attitudes, which in turn predict pro-environmental behaviors. Self-efficacy is typically understood as a personal capacity that drives motivation and cognitive resources [7, 105], thereby influencing behavioral choice [7]. In this context, self-efficacy is informed by an individual's self-assessment of prior performance levels, thereby establishing a robust association between past performance and self-efficacy, as described by Vancouver et al. [101]. Although self-efficacy has been studied in measurable settings, such as organizational contexts [28], sports [42], and health [8], more recent research has begun to examine the role of self-efficacy in prosocial and altruistic activities, such as pro-environmental behavior, which may not offer immediate or tangible rewards [104]. In particular, self-efficacy has been demonstrated to foster pro-environmental attitudes, like recycling [88, 89], and the adoption of reusable shopping bags [62], while also influencing consumer behavior towards food conservation, thereby mitigating environmental issues. However, research on the function of perceived self-efficacy in shaping attitudes toward recycled plastic purchases is limited. Thus, our hypotheses are as follows:

H3: The perceived efficacy of buying recycled products positively affects individual attitudes.

H4: Attitudes mediate the relationship between perceived efficacy and purchase behavior regarding recycled plastic.

Krumpal [61] posits that individuals adopt specific actions in pursuit of social acceptance and adherence to social norms. According to Cialdini and Trost's [27] definition, social norms are guidelines and expectations that shape and restrict human conduct within a group without the enforcement of laws. These norms may be categorized as either descriptive or injunctive influencers on human motivation, as outlined by Cialdini et al. [26]. Descriptive norms embody beliefs about others' actual behaviors, signifying what is typical based on the majority's actions. In contrast, injunctive norms comprise beliefs or rules regarding what others morally endorse or reject, indicating the behaviors one should adopt to avoid social disapproval.

The extent to which social norms are internalized by individuals determines their impact on behavior [97], with adherence to injunctive norms likely influenced by individuals' strategic calculations regarding social status, and internalized norms having a stronger association with behavior.

Numerous field experiments have confirmed the significant effect of social norms on pro-environmental behaviors [14, 19, 23, 69, 72, 90]. For instance, Muralidharan and Sheehan [68] found that social norms significantly impact consumer intentions to avoid plastic packaging, while Borg et al. [15] reported that social norms strongly affect consumers' avoidance of single-use plastic items such as cups, bags, and takeaway boxes. Moreover, Byerly et al. [19] underscored the significance of social norms in consumer decision-making and their capacity to inspire pro-environmental behaviors in various domains, including recycling, energy consumption, and other activities [95]. In contrast, Bertoldo and Castro [13] argued that social norms negatively impact recycling behavior. There are few or no social costs of not participating, and social models predict recycling behaviors less than personal norms and environmental identity. However, a specific focus on how social norms affect consumer behavior toward recycled plastic consumption remains unexplored. Thus, we suggest the following hypothesis:

H5. The presence of social norms has a positive impact on purchase behavior regarding recycled plastic.

The TPB model [3] suggests that factors such as social norms, perceived behavioral control, and attitudes toward a specific behavior can shape an individual's behavioral intention. Thurstone [98], an early contributor to the field, defined behavioral attitude as a combination of an individual's inclinations, feelings, preconceived notions, fears, beliefs, and other related factors toward a specific subject. Numerous studies have examined attitudes as underlying factors for pro-environmental behaviors [58]. The literature presents a diverse range of results concerning the relationship between attitudes and pro-environmental behavior. Vermeir and Verbeke's [103] study indicates that attitudes exert a more significant influence than societal norms on sustainable consumption decisions. Ha and Janda [49] discovered that attitudes serve as the primary predictors of the intention to purchase energy-efficient products. Similarly, Tonglet et al. [99] posited that recycling attitudes are the key determinants of recycling behavior. Conversely, Bortoleto et al. [16] found that attitudes toward waste prevention did not directly influence prevention behavior, instead, personal norms played a mediating role in this impact. Similarly, Moser [67] utilized the TPB as a theoretical framework to identify key antecedents of sustainable product purchasing behavior and found that attitudes did not serve as a significant predictor. Since a specific focus on how attitudes affect consumer behavior toward recycled plastic consumption has not been addressed before, we propose the following hypotheses:

H6. Attitudes towards recycled products positively affect purchase behavior regarding recycled plastic.

Exploiting the TPB framework, several studies have demonstrated the significance of perceived behavioral control in stimulating behavior, along with personal characteristics. (e.g., [6]). Perceived behavioral control is defined as an individual's assurance in accomplishing a behavior [3]. Consequently, an individual's high perceived behavioral control to achieve a specific behavior strengthens their conviction in successfully performing that behavior, thus heightening the likelihood of adopting said behavior [2].

However, despite evidence for the beneficial function of perceived behavior control, research on recycling-related concerns has yet again produced inconsistent results. While some studies have pinpointed perceived behavioral control as the key determinant of various pro-environmental actions, like recycling waste and batteries [17, 63], others have established that perceived behavioral control indirectly impacts recycling via other mediating elements [34]. Additionally, some scholars have found that most consumers feel uncertain when assessing the environmental sustainability of plastic packaging [57] due to the existence of conflicting environmental logic [92].

Considering the abovementioned contrasting evidence, as well as the fact that buying products with recycled plastic content is still unexplored, we posit the subsequent hypothesis:

H7. The impact of perceived behavioral control on the purchase behavior regarding recycled plastic is positive.

Figure 1 presents the model to be tested.

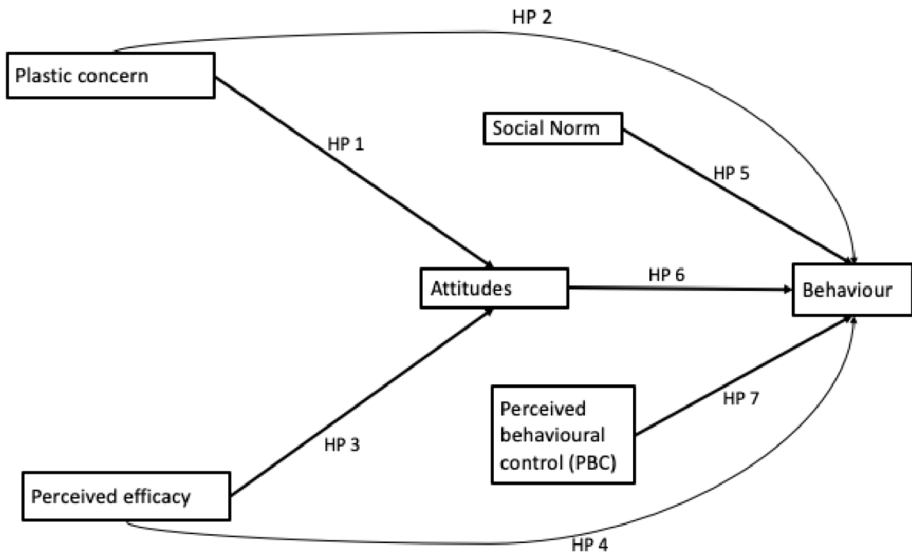


Fig. 1 The paths of the model

Methodology

Data Description

We surveyed a representative sample of the Italian population to test the hypotheses concerning purchasing behavior related to recycled plastic, as outlined in the preceding section.

The questionnaire was developed to reduce standard method variance in behavioral research, which may compromise its reliability. To guarantee the clarity of the questionnaire, an initial assessment was conducted with two potential respondents, following the recommendations of Tourangeau and Yan [100]. All identified deficiencies were addressed before its distribution.

We collected data through an electronic questionnaire during the first three months of 2020, using a commercial surveying service provider to select participants from an online access panel to ensure representativeness in terms of gender, age, residency, and education among Italians between the ages of 18 and 75. The representativeness of the data was evaluated using the Dillman formula [36] after 511 comprehensive questionnaires were gathered. The formula suggests that a sample size of 384 or greater is adequate; therefore, we gathered several responses exceeding this threshold. The sample size of 511 was also consistent with Salant and Dillman's [82] recommendation of a sample size of 400 for generalizing to a population with a 95% confidence level and a 5% margin of error in studies involving human dimensions. Table 1 presents descriptive statistics of the participants.

We took steps to minimize the potential bias caused by common method variance and conducted a post hoc test to ensure the accuracy of the questionnaire responses. To test for the presence of common method variance, we used Harman's single-factor posthoc test [75]. This test involves examining the eigenvalues of the factors to determine whether a single factor explains most of the covariance among the variables. The results showed

Table 1 Descriptive statistics of the participants

Age	Number	Percentage	Annual income in euros	Number	Percentage
18–24	51	10.0%	Less than 10.000 €	34	6.7%
25–34	83	16.2%	10.000 – 19.999 €	83	16.2%
35–44	107	20.9%	20.000 – 29.999 €	126	24.7%
45–54	121	23.7%	30.000 – 39.999 €	79	15.5%
55–70	149	29.2%	40.000 – 49.999 €	50	9.8%
Total	511	100%	50.000 – 59.999 €	19	3.7%
			60.000 – 69.999 €	18	3.5%
Gender	Number	Percentage	70.000 – 79.999 €	9	1.8%
Female	257	50.3%	80.000 – 89.999 €	10	2.0%
Male	254	49.7%	90.000 – 99.999 €	2	0.4%
Total	511	100%	100.000 – 109.999 €	3	0.6%
			110.000 – 124.999 €	1	0.2%
Education	Number	Percentage	125.000 € or more	1	0.2%
Middle school or lower	52	10.2%	Not stated	76	14.9%
High school	291	56.9%	Total	511	100%
Batchelor degree	48	9.4%			
Master's degree	98	19.2%			
MBA or Doctorate	22	4.3%			
Total	511	100%			

the presence of at least eight distinct components with eigenvalues greater than 1.0. We determined that common method variance was not an issue because Harman's single-factor posthoc test did not reveal factors accounting for most covariance across the variables [85].

Measurement of the Constructs

The measurement of purchase behavior regarding recycled plastic was based on studies by Dodds et al. [38] and Bao et al. [10]. A seven-point Likert scale was employed to evaluate the intention of the participants, based on two items. Afterward, these two items were merged to create a single factor that demonstrated acceptable internal consistency, as verified by a Cronbach's alpha coefficient of 0.75.

A commonly used semantic scale was adopted for measuring attitudes to encompass both affective and cognitive components [90]. Four items were created to test attitudes, and we used a 7-point Likert semantic scale to rate respondents' views on a set of qualities. For the first item, the scale was from "pointless" to "useful," for the second, from "irresponsible" to "responsible," for the third, from "unnecessary" to "necessary" and for the fourth, from "not recommended" to "recommended". These items were subsequently combined into a single factor that demonstrated high internal consistency with a Cronbach's alpha of 0.85.

The development of a scale for measuring perceived behavioral control was based on the foundational work of Grob [46]. In this instance, three items were utilized to evaluate perceived behavioral control. Also in this case, the level of agreement of the participants was gauged through a 7-point Likert scale, and the resulting items were aggregated to form a single factor that exhibited strong internal consistency (Cronbach's alpha = 0.81).

Our study was anchored in the preceding research by Do Valle et al. [37] and Gadenne et al. [43], from which we identified three items to measure social norms. We employed a 7-point Likert scale for the assessment of respondents' alignment with social norms. The responses were combined to produce a single factor that showed substantial internal consistency (Cronbach's $\alpha=0.81$).

We used items proposed by Huang [54] and Sharma and Dayal [83] to measure perceived efficacy. We created three items and asked respondents to rate their degree of agreement on a 7-point Likert scale. Cronbach's α of the single factor derived by integrating all elements was 0.88.

To determine plastic concerns, the researchers drew upon Bang et al.'s [9] early work on environmental concerns, as well as more recent studies by Maichum et al. [64] and Li et al. [56]. The plastic concern scale consisted of two items, rated on a Likert scale ranging from one to seven, and was based on a recent study by Cavaliere et al. [21]. The two items were merged into a single factor, and the resulting scale demonstrated good internal consistency (Cronbach's $\alpha=0.77$). Descriptive statistics for the constructs used in the study can be found in Appendix Table 5.

Results

A structural equation model was employed to analyze the collected data and evaluate the hypotheses. This process involved firstly assessing the measurement model and secondly testing the hypotheses.

Assessment of the Measurement Model

Confirmatory factor analysis was conducted to examine the qualities of the measures. Table 2 displays the fit indices for the measurement model, including chi-square difference (2), degrees of freedom (df), chi-square statistic adjusted for degrees of freedom (2/df), comparative fit index (CFI), Tucker-Lewis index (TLI), root-mean-square error of approximation (RMSEA), and p of Close Fit (PCLOSE). According to Barrett [12], a satisfactory model fit would result in a non-significant chi-square outcome. However, Iacobucci [55] argues that the chi-square statistic is sensitive to sample size, and it frequently rejects the model when large samples are employed. Therefore, a favorable model fit may be characterized by a comparative fit index (CFI), a Tucker-Lewis index (which should typically be 0.95 to indicate a good fit), and an RMSEA (which should usually be 0.08 to indicate a satisfactory match).

The convergent and discriminant validity of the measurement model were evaluated using the Average Variance Extracted (AVE) and Maximum Shared Variance (MSV) for each variable, which are presented in Table 3. These indicators enable an assessment of whether the construct pieces that are theoretically linked are connected, which is known as convergent validity [33]. Instead, discriminant validity assesses whether the components in a concept are unrelated to other things [50]. Typically, an AVE score greater than 0.5 suggests that the constructs have high convergent validity. When AVE levels exceed MSV values, discriminant validity is not an issue [52].

Table 2 Evaluation of the measurement model

Model	χ^2	df	χ^2/df	CFI	TLI	RMSEA
Measurement model	388***	130	2.93	0.948	0.954	0.059

*** $p < 0.001$

Table 3 Reliability and validity outcomes

	CR	AVE	MSV	MaxR(H)	Per- ceived efficacy	Attitude	PCB	Social Norm	Behavior	Plastic con- cern
Per- ceived effi- cacy	0.882	0.714	0.520	0.891	0.845					
Attitude	0.852	0.657	0.272	0.852	0.522	0.811				
PCB	0.818	0.601	0.457	0.824	0.489	0.194	0.775			
Social Norm	0.820	0.603	0.480	0.823	0.514	0.240	0.676	0.777		
Behavior	0.734	0.580	0.507	0.740	0.712	0.432	0.538	0.693	0.762	
Plastic con- cern	0.782	0.645	0.194	0.823	-0.426	-0.411	0.057	-0.005	-0.313	0.803

CR: In academic research, if the Composite Reliability (CR) value exceeds 0.7, it is deemed acceptable

MaxR(H): When the value of MaxR(H) reaches 0.80, the value is considered acceptable

AVE: Convergent validity is assessed using the Average Variance Extracted (AVE), with a score of 0.5 or higher indicating a considerable degree of convergent validity

MSV: When the value of Maximum Shared Variance (MSV) is less than the AVE, discriminant validity is confirmed

Verification of Hypotheses

Once the measurement model was evaluated, we determined it to be sufficient for testing the hypotheses based on the acceptable goodness-of-fit indices. The proposed structural equation model had a variance of 0.458 (Fig. 2).

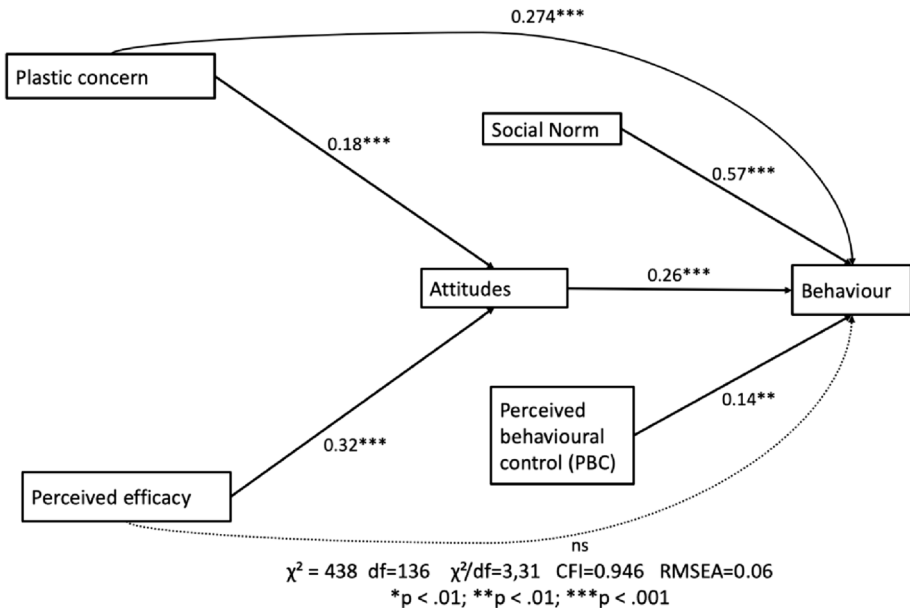


Fig. 2 The paths of the model

The coefficients of the model indicate a robust and statistically significant correlation between plastic concern and attitudes (H1) ($b=0.18$, $p<0.001$), as well as between perceived efficacy and attitudes (H3) ($b=0.32$, $p<0.001$). Moreover, the study found significant positive relationships between social norms and purchase behavior concerning recycled plastic (H5) ($b=0.57$, $p<0.001$), and attitudes and behavior purchase concerning recycled plastic (H6) ($b=0.26$, $p<0.001$). Finally, the analysis also revealed a significant and positive relationship between perceived behavioral control and purchase behavior regarding recycled plastic (H7) ($b=0.14$, $p<0.01$).

To evaluate H2 and H4, the study computed the direct and indirect impacts of attitudes on purchasing behavior concerning recycled plastic. The mediation effect was evaluated by conducting 5,000 bootstraps resamples using the bias-corrected bootstrap approach, which yields appropriate statistical power [24]. The results showed that H2 was supported, while H4 was rejected. Consequently, it was discovered that attitudes function as a mediating factor between plastic concern and purchasing behaviors related to recycled plastic. Furthermore, these attitudes act as a full mediator between perceived efficacy and the purchasing behavior concerning recycled plastic products. The direct effect, indirect effect, and mediator are all presented in Tables 4.

Discussion

Theoretical Contributions

Our research contributes to a better understanding of the beliefs that shape the development of favorable attitudes toward recycled products. Specifically, we found that plastic-related concern has a direct impact on positive attitudes towards recycled products or packaging and, indirectly, on the likelihood of purchasing such products. Previous studies have also provided strong empirical support for the role of environmental concern in driving pro-environmental behaviors [71]. Focusing on plastic issues, Chi [25] found that environmental concern positively affects the probability of buying eco-friendly plastic products. In our study, we focus on products with recycled plastic and shed light on the fact that plastic concern represents one of the new drivers in influencing consumers' decision-making process.

Second, our research suggests that plastic-related concern represents another specific environmental-related concern that should be more extensively analyzed in future study. For instance, purchase behavior regarding recycled plastic [15] could be better explored also concerning plastic concerns. Moreover, future research leveraging the scale proposed in our study could also test and validate an appropriate scale for measuring and assessing plastic-related concerns.

Our research also makes a significant contribution to the ongoing discussion concerning the impact of perceived self-efficacy by providing fresh empirical evidence that challenges the inconsistent findings reported in prior studies. Our study supports the observations of Kollmuss and Agyeman [60], which suggest that perceived self-efficacy can influence attitudes. However, we discovered that perceived self-efficacy does not have a direct effect on the purchase behavior concerning recycled plastic, which contrasts with other research that suggests consumer self-efficacy can directly impact sustainable behaviors [96].

Our findings add to the existing body of knowledge based on the Theory of Planned Behavior (TPB) model's ability to predict eco-friendly behavior. Firstly, our study

Table 4 Results of the mediation tests

	Direct effect (Sig.)	Indirect effect (Sig.)
Plastic concern – Attitude – Purchase behavior regarding recycled plastic	0.274 (0.001)	0.054 (0.001)

validates the model's efficacy and its components (i.e., social norms, attitudes, and perceived behavioral control) in predicting environmentally conscious behavior, such as purchasing recycled plastic products. For instance, our results indicate a significant positive correlation between perceived behavioral control and plastic recycling behavior, thereby confirming the crucial role of one's capability to adopt specific green buying behavior [1, 76]. Secondly, social norms exhibit a more substantial influence than attitudes and perceived behavioral control over purchasing behavior. Our findings confirmed the assumption that social norms significantly impact consumers' buying behavior regarding recycled plastic, highlighting how behavior is not only influenced by individual attributes. Consumers' willingness to engage in sustainable behavior is heavily influenced by the behavior of others in their social context [74]. When people perceive that others do not share environmental concerns, they may feel powerless to make an impact and lose motivation to engage in environmentally friendly behaviors [15]. Lastly, our study furthers understanding of the determinants of attitude and its mediating role. Specifically, the empirical models reveal that plastic-related concern and perceived self-efficacy have a positive impact on attitude, which ultimately acts as a complete mediator of the positive association between self-efficacy and the behavior of purchasing recycled plastic products.

Policy and Managerial Implications

Since plastic concern and self-efficacy positively influence attitudes, policymakers could design education campaigns that emphasize the environmental benefits of plastic recycling to push for products made from recycled plastic indirectly. Awareness campaigns could also focus on the role of descriptive (related to observing others' overt behaviors) and injunctive (based on the inference of others' approval) norms. Here, identifying opinion leaders could effectively change consumer behavior.

Recognizing the influential role of social norms in shaping consumer behavior, as identified in our study, awareness campaigns could strategically focus on two types of norms: descriptive and injunctive, as detailed by Keys et al. [59]. Descriptive norms involve observing others' overt behaviors [80], and campaigns can highlight this by presenting real-life examples of individuals or communities engaged in sustainable practices, like using products made from recycled plastic. This method leverages the human tendency to mimic the actions of others, particularly when these actions are viewed as positive or beneficial. Injunctive norms, which pertain to perceptions of others' approval or disapproval [40], can be accentuated through endorsements by influential figures or opinion leaders. Collaborating with such influential individuals or entities, such as celebrities, esteemed community members, or organizations renowned for environmental advocacy, can significantly impact public opinions and, subsequently, consumer behaviors.

We believe that public policies should design instruments encouraging companies to make use of recycled plastic in their products or packaging. Guidelines aimed at standardizing the creation of robust claims and the communication of environmental benefits could contribute to establishing a fair and transparent communication process. This, in turn, could promote the adoption of products and packaging made from recycled plastics. In addition, managers could design marketing campaigns following

the abovementioned indications to stimulate the consumption of recycled plastic products.

Since consumers seem to recognize the added value of recycled plastic, managers should invest resources to find new opportunities for recycling plastic or design plastic products or packaging with recycled content. In this context, we explicitly recommend that managers actively seek collaborative pathways with actors along the supply chain. For instance, initiatives such as industrial symbiosis [32] could foster innovative solutions, like combining byproducts from various industries with recycled plastics.

Conclusions

This paper employed a structural equation model to examine the factors that influence consumers' decisions to purchase recycled plastic products or packaging. Specifically, we investigated the impacts of plastic concern, self-efficacy, attitude, social norms, and perceived behavioral control on purchasing decisions. Our research reveals that concerns about plastics and perceived efficacy exert a direct influence on attitudes. Additionally, our findings demonstrate that social norms, attitudes, and perceived behavioral control significantly shape purchasing behaviors concerning recycled plastic. Thus, consistent with previous research based on the TPB, this study supports the notion that social norms, attitudes, and PBC play significant roles in determining consumers' purchase behavior regarding recycled plastic. Moreover, our study suggests that attitudes serve as a mediating factor between concerns about plastics and purchasing decisions related to recycled plastic. These attitudes also function as a complete mediator in the relationship between perceived efficacy and the purchasing behavior for recycled plastic products.

From a theoretical standpoint, our study offers two primary contributions. Firstly, it underscores how concerns about plastics significantly influence people's perceptions of recycled products and their purchasing tendencies, thereby highlighting the role of these concerns in guiding consumer decisions. Secondly, it provides evidence that perceived self-efficacy affects attitudes but does not directly correlate with purchasing behaviors. The practical implications of our research suggest that educational campaigns emphasizing the benefits of plastic recycling and the impact of social norms could positively influence consumer behavior. Furthermore, governmental policies should advocate for recycled plastic, thereby enhancing the use of recycled plastic products. From a managerial perspective, managers are encouraged to investigate recycling opportunities and develop products that incorporate materials based on these findings. Despite the relevance of our findings, the study presents some limitations which could inspire future research on this topic. First, the inquiry depends on self-reported data that are founded on individual perceptions instead of factual conduct. While numerous studies have established the validity of self-reported data [94], upcoming research should endeavor to obtain data by directly observing purchase behavior concerning recycled plastic. Moreover, since our measure is quite generic, future research should focus on specific behaviors to investigate whether there are differences in the effect of the variables included in our model.

Second, our research focuses on environmental factors and overlooks the influence of other aspects such as price, quality, etc. Further investigations could investigate how these

aforementioned factors might create contrasting priorities in a consumer. Experimental designs such as conjoint analysis may be suitable methodological choices.

Third, our research focuses on a sample representative of the Italian population. Even though cultural values could be considered homogeneous across Western countries, future research could test our model in emerging countries such as BRICS countries.

In conclusion, even though we explored five potential factors that may affect behavior, including perceived efficacy, attitude towards plastic recycled products, perceived behavioral control, and social norms, prior research indicates that contextual factors could also impact eco-friendly conduct [22]. Therefore, future research forthcoming studies ought to incorporate supplementary variables like individual attributes, contextual factors, and behavioral determinants into our model to substantiate the impact of these determinants on purchase behavior relating to recycled plastic.

Recycled plastics constitute a significant area of future research within the framework of the circular economy. It is essential that forthcoming studies thoroughly investigate this topic in the ensuing years. Alongside examining consumer behavior, it is imperative to explore additional research avenues. Future research should aim to examine the issue from a more macroscopic perspective, encompassing an analysis of market trends, potential impacts on supply chains, and the wider economic ramifications of integrating recycled plastics across various industries. Additionally, another area for further investigation includes delving into the emerging concerns associated with recycled microplastics and their potential adverse effects on human health.

Appendix

Table 5 Descriptive statistics for the study variables

Construct	Items	Min	Max	Average	Std. Dev.
Behavior	I usually buy products made from recycled plastic or packaged in recycled plastic	1	7	4.90	1.11
	Between two equivalent products, I prefer to buy the one with recycled plastic packaging rather than one made of non-recycled plastic	1	7	5.34	1.22
Social Norm	Friends, relatives, and people around me would like me to buy products made from recycled plastic or packaged in recycled plastic	1	7	4.53	1.42
	Friends, relatives, and people around me would approve of my purchases of products made from recycled plastic or packaged in recycled plastic	1	7	5.08	1.31
	Friends, relatives, and people around me buy products made from recycled plastic or packaged in recycled plastic	1	7	4.60	1.20
Perceived efficacy	Buying recycled products helps to conserve natural resources	2	7	5.64	1.16
	Buying recycled products saves energy, water, and other resources	1	7	5.52	1.21
Attitudes (buying recycled plastic products/package-ing is:)	Buying recycled products helps to support the market in the transition toward the circular economy	1	7	5.44	1.17
	Pointless for environmental protection / Useful for environmental protection	1	7	5.75	1.67
	An unnecessary behavior / A necessary behavior	1	7	5.74	1.65
	Irresponsible / Responsible	1	7	5.86	1.66
	Recommended / Not recommended	1	7	2.84	2.13
Perceived Behavioural Control	I have multiple opportunities to buy recycled products in my everyday life	1	7	4.60	1.28
	I am fully informed about where to buy recycled products	1	7	4.40	1.33
Plastic concern	I have the financial resources to buy "recycled" products (including those that use recycled packaging)	1	7	4.69	1.28
	The problem of plastic in the oceans is not overrated/exaggerated enormously by the media, by the news media	1	7	2.92	1.90
	I often think about the problem of plastic in the oceans	1	7	3.29	1.70

Authors' Contributions F.C. conceptualization of the paper, data collection, analyses, and writing the main parts of the paper. N.M.G. conceptualization of the paper, data collection, analyses, and writing the main parts of the paper. E.B. analyses, writing the main parts of the paper. F.T. conceptualization of the paper, data collection, analyses, and writing the main parts of the paper. A.A. writing the main parts of the paper, supervision; F.I. analyses, writing the main parts of the paper, supervision.

Funding Open access funding provided by Scuola Superiore Sant'Anna within the CRUI-CARE Agreement.

Data Availability Availability Data is registered and stored in compliance with the general rules for scientific data management.

Declarations

Ethics Approval and Consent to Participate Not applicable.

Consent for Publication The authors offer their consent for the publication of this article.

Competing Interests The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Open Access This article is licensed under a Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if changes were made. The images or other third party material in this article are included in the article's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit <http://creativecommons.org/licenses/by/4.0/>.

References

1. Agrawal C, Duggal T (2021) A study of consumer switching behaviour in the Indian context with respect to recycled products. In: Examining the intersection of circular economy, forestry, and international trade. IGI Global, pp 142–153
2. Ajzen I (2002) Perceived behavioral control, self-efficacy, locus of control, and the theory of planned behavior I. *J Appl Soc Psychol* 32:665–683
3. Ajzen I (1991) The theory of planned behavior. *Organ Behav Hum Decis Process* 50(2):179–211
4. Ajzen I, Fishbein M (1980) Understanding attitudes and predicting social behavior. Prentice Hall, Englewood Cliffs
5. Ajzen I, Fishbein M (2010) Predicting and changing behaviour. The reasoned action approach. Psychology Press (Taylor & Francis), New York
6. Bamberg S, Möser G (2007) Twenty years after Hines, Hungerford, and Tomera: A new meta-analysis of psycho-social determinants of pro-environmental behaviour. *J Environ Psychol* 27:14–25
7. Bandura A (2002) Environmental sustainability by sociocognitive deceleration of population growth. In: Schmuck P et al (eds) Psychology of sustainable development. Kluwer Academic Publishers, The Netherlands, pp 209–238
8. Bandura A (2005) The primacy of self-regulation in health promotion. *Appl Psychol: Int Rev*
9. Bang HK, Ellinger AE, Hadjimarcou J, Traichal PA (2000) Consumer concern, knowledge, belief, and attitude toward renewable energy: an application of the reasoned action theory. *Psychol Mark* 17(6):449–468
10. Bao Y, Bao Y, Sheng S (2011) Motivating purchase of private brands: effects of store image, product signatureness, and quality variation. *J Bus Res* 64(2):220–226
11. Bates CH (2010) Use of social marketing concepts to evaluate ocean sustainability campaigns. *Soc Mar Q* 16:71–96
12. Barrett P (2007) Structural equation modelling: adjudging model fit. *Personal Individ Differ* 42(5):815–824


13. Bertoldo R, Castro P (2016) The outer influence inside us: exploring the relation between social and personal norms. *Resour Conserv Recycl* 112:45–53
14. Bodin Ö (2017) Collaborative environmental governance: achieving collective action in social-ecological systems. *Science* 357:eaan1114. <https://doi.org/10.1126/science.aan1114>
15. Borg K, Curtis J, Lindsay J (2020) Social norms and plastic avoidance: Testing the theory of normative social behaviour on an environmental behaviour. *J Consum Behav* 19(6):594–607
16. Bortoleto AP, Kurisu KH, Hanaki K (2012) Model development for household waste prevention behaviour. *Waste Manag* 32(12):2195–2207
17. Botetzagias I, Dima AF, Malesios C (2015) Extending the Theory of Planned Behavior in the context of recycling: the role of moral norms and of demographic predictors. *Resour Conserv Recycl*. <https://doi.org/10.1016/j.resconrec.2014.12.004>
18. Bucknall DG (2020) Plastics as a materials system in a circular economy. *Phil Trans R Soc A* 378(2176):20190268
19. Byerly H, Balmford A, Ferraro PJ, Hammond Wagner C, Palchak E, Polasky S et al (2018) Nudging pro-environmental behavior: evidence and opportunities. *Front Ecol Environ* 16:159–168. <https://doi.org/10.1002/fee.1777>
20. Calvo-Porrall C, Lévy-Mangin JP (2020) The circular economy business model: examining consumers' acceptance of recycled goods. *Admin Sci* 10(2):28
21. Cavaliere A, Pigliafreddo S, De Marchi E, Banterle A (2020) Do consumers really want to reduce plastic usage? Exploring the determinants of plastic avoidance in food-related consumption decisions. *Sustainability* 12(22):9627
22. Cecere G, Mancinelli S, Mazzanti M (2014) Waste prevention and social preferences: the role of intrinsic and extrinsic motivations. *Ecol Econ* 107:163–176
23. Centola D, Becker J, Brackbill D, Baronchelli A (2018) Experimental evidence for tipping points in social convention. *Science* 360:1116–1119. <https://doi.org/10.1126/science.aas8827>
24. Cheung HY, Lau KT, Lu TP, Hui D (2007) A critical review on polymer-based bio-engineered materials for scaffold development. *Compos Part B* 38(3):291–300
25. Chi NTK (2022) Ethical consumption behavior towards eco-friendly plastic products: Implication for cleaner production. *Clean Responsible Consum* 5:100055
26. Cialdini RB, Reno RR, Kallgren CA (1990) A focus theory of normative conduct: recycling the concept of norms to reduce littering in public places. *J Pers Soc Psychol* 58:1015–1026
27. Cialdini RB, Trost MR (1998) Social influence: social norms, conformity and compliance. In: *The Handbook of Social Psychology*. McGraw-Hill, New York, pp 151–192
28. Combs GM, Luthans F (2007) Diversity training: analysis of the impact of self-efficacy. *Hum Resour Dev Q* 18(1):91–120
29. Corsini F, Gusmerotti NM, Testa F, Iraldo F (2018) Exploring waste prevention behaviour through empirical research. *Waste Manag* 79:132–141
30. Corsini F, Laurenti R, Meinherz F, Appio FP, Mora L (2019) The advent of practice theories in research on sustainable consumption: past, current and future directions of the field. *Sustainability* 11(2):341
31. Corsini F, Gusmerotti NM, Frey M (2020) Consumer's circular behaviors in relation to the purchase, extension of life, and end of life management of electrical and electronic products: a review. *Sustainability* 12(24):10443
32. Corsini F, De Bernardi C, Frey M (2024) Industrial symbiosis as a business strategy for the circular economy: identifying regional firms' profiles and barriers to their adoption. *J Environ Plan Manag* 67(5):1148–1168
33. Cunningham WA, Preacher KJ, Banaji MR (2001) Implicit attitude measures: consistency, stability, and convergent validity. *Psychol Sci* 12(2):163–170
34. Davies J, Foxall GR, Pallister J (2002) Beyond the intention-behaviour mythology: an integrated model of recycling. *Mark Theory* 1:29–113
35. de Sousa FDB (2021) The role of plastic concerning the sustainable development goals: the literature point of view. *Cleaner Responsible Consum* 3:100020
36. Dillman DA (2011) *Mail and internet surveys: the tailored design method--2007 update with new internet, visual, and mixed-mode guide*. John Wiley & Sons
37. Do Valle PO, Reis E, Menezes J, Rebelo E (2004) Behavioral determinants of household recycling participation: the Portuguese case. *Environ Behav* 36(4):505–540
38. Dodds WB, Monroe KB, Grewal D (1991) Effects of price, brand, and store information on buyers' product evaluations. *J Mark Res* 28(3):307–319

39. Eppel S, Sharp V, Davies L (2013) A review of Defra's approach to building an evidence base for influencing sustainable behaviour. *Resour Conserv Recycl* 79:30–42
40. Eriksson K, Strimling P, Coultas JC (2015) Bidirectional associations between descriptive and injunctive norms. *Organ Behav Hum Decis Process* 129:59–69
41. European Commission (2020) Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee of the Regions. A new Circular Economy Action Plan. For a cleaner and more competitive Europe, COM(2020) 98 final. <https://doi.org/10.2775/855540>
42. Feltz DL, Short SE, Sullivan PJ (2008) Self-efficacy in sport. *Hum Kinet*
43. Gadenne D, Sharma B, Kerr D, Smith T (2011) The influence of consumers' environmental beliefs and attitudes on energy saving behaviours. *Energy Policy* 39(12):7684–7694
44. Geyer R, Jambeck JR, Law KL (2017) Production, use, and fate of all plastics ever made. *Sci Adv* 3:ae1700782
45. Gong Y, Putnam E, You W, Zhao C (2020) Investigation into circular economy of plastics: the case of the UK fast moving consumer goods industry. *J Clean Prod* 244:118941
46. Grob A (1995) A structural model of environmental attitudes and behaviour. *J Environ Psychol* 15(3):209–220
47. Gwozdz W, Reisch LA, Thøgersen J (2020) Behaviour change for sustainable consumption. *J Consum Policy* 43:249–253. <https://doi.org/10.1007/s10603-020-09455-z>
48. Gusmerotti NM, Testa F, Corsini F, Pretner G, Iraldo F (2019) Drivers and approaches to the circular economy in manufacturing firms. *J Clean Prod* 230:314–327
49. Ha H, Janda S (2012) Predicting consumer intentions to purchase energy-efficient products. *J Consum Mark* 29(7):461–469
50. Ha S, Stoel L (2009) Consumer e-shopping acceptance: antecedents in a technology acceptance model. *J Bus Res* 62(5):565–571
51. Hahladakis JN, Iacovidou E (2018) Closing the loop on plastic packaging materials: what is quality and how does it affect their circularity? *Sci Total Environ* 630:1394–1400
52. Hair JF, Anderson RE, Tatham RL, Black WC (2006) *Multivariate data analysis with readings*, vol 6. Pearson Prentice Hall, New York, NY
53. Heidbreder LM, Bablok I, Drews S, Menzel C (2019) Tackling the plastic problem: a review on perceptions, behaviors, and interventions. *Sci Total Environ* 668:1077–1093
54. Huang H (2016) Media use, environmental beliefs, self-efficacy, and pro-environmental behavior. *J Bus Res* 69(6):2206–2212
55. Iacobucci D (2010) Structural equations modeling: fit indices, sample size, and advanced topics. *J Consum Psychol* 20(1):90–98
56. Li G, Li W, Jin Z, Wang Z (2019) Influence of environmental concern and knowledge on households' willingness to purchase energy-efficient appliances: a case study in Shanxi, China. *Sustainability* 11(4):1073
57. Lindh H, Olsson A, Williams H (2016) Consumer Perceptions of Food Packaging: Contributing to or counteracting environmentally sustainable development? *Packag Technol Sci* 29:3–23. <https://doi.org/10.1002/pts.2184>
58. Kaiser FG, Ranney M, Hartig T, Bowler PA (1999) Ecological behavior, environmental attitude and feelings of responsibility for the environment. *Eur Psychol* 4:59–74
59. Keys N, Thomsen DC, Smith TF (2016) Adaptive capacity and climate change: the role of community opinion leaders. *Local Environ* 21(4):432–450
60. Kollmuss A, Agyeman J (2002) Mind the gap: why do people act environmentally and what are the barriers to pro-environmental behavior? *Environ Educ Res* 8(3):239–260. <https://doi.org/10.1080/13504620220145401>
61. Krumpal I (2013) Determinants of social desirability bias in sensitive surveys: a literature review. *Qual Quant* 47(4):2025–2047
62. Lam S (2006) What makes customers bring their bags or buy bags from the shop? A survey of customers at a Taiwan hypermarket. *Environ Behav* 38:318–332. <https://doi.org/10.1177/0013916505278327>
63. Lizin S, Dael MV, Van Passel S (2017) Battery pack recycling: behaviour change interventions derived from an integrative theory of planned behaviour study. *Resour Conserv Recycl* 122:66–82. <https://doi.org/10.1016/j.resconrec.2017.02.003>. (ISSN 0921-3449)
64. Maichum K, Parichatnon S, Peng KC (2017) Factors affecting on purchase intention towards green products: a case study of young consumers in Thailand. *Young* 16(5):330–335
65. Matthes E, Selge S, Klöckner CA (2012) The role of parental behaviour for the development of behaviour specific environmental norms – the example of recycling and reuse behavior. *J Environ Psychol* 32:277–284. <https://doi.org/10.1016/j.jenvp.2012.04.003>
66. Meng MD, Leary RB (2021) It might be ethical, but I won't buy it: perceived contamination of, and disgust towards, clothing made from recycled plastic bottles. *Psychol Mark* 38(2):298–312

67. Moser SC (2010) Communicating climate change: History, challenges, process and future directions: communicating climate change. *Wiley Interdiscip Rev: Clim Chang* 1(1):31–53. <https://doi.org/10.1002/wcc.11>
68. Muralidharan S, Sheehan K (2016) “Tax” and “Fee” message frames as inhibitors of plastic bag usage among shoppers: a social marketing application of the theory of planned behavior. *Soc Marketing Q* 22(3):200–217. <https://doi.org/10.1177/1524500416631522>
69. Nyborg K, Anderies JM, Dannenberg A, Lindahl T, Schill C, Schluter M et al (2016) Social norms as solutions. *Science* 354:42–43. <https://doi.org/10.1126/science.aaf8317>
70. Organisation for Economic Co-operation and Development (2012) OECD environmental outlook to 2050: The consequences of inaction. OECD Publishing, Paris. <https://www.oecd.org/g20/topics/energy-environment-green-growth/oecdenvironmentaloutlookto2050theconsequencesofinaction.htm>. Accessed 6 Jul 2022
71. Otsyina HR, Nguhiu-Mwangi J, Mogoia EGM, Mbuthia PG, Ogara WO (2018) Knowledge, attitude, and practices on usage, disposal, and effect of plastic bags on sheep and goats. *Trop Anim Health Prod* 50:997–1003
72. Otto IM, Donges JF, Cremades R, Bhowmik A, Hewitt RJ, Lucht W et al (2020) Social tipping dynamics for stabilizing Earth’s climate by 2050. *Proc Natl Acad Sci USA* 117:2354–2365. <https://doi.org/10.1073/pnas.1900577117>
73. Park HJ, Lin LM (2020) Exploring attitude–behavior gap in sustainable consumption: comparison of recycled and upcycled fashion products. *J Bus Res* 117:623–628
74. Pieters RGM (1991) Changing garbage disposal patterns of consumers: motivation, ability, and performance. *J Public Policy Mark* 10:59–76
75. Podsakoff PM, Organ DW (1986) Self-reports in organizational research: problems and prospects. *J Manag* 12(4):531–544
76. Prakash G, Pathak P (2017) Intention to buy eco-friendly packaged products among young consumers of India: a study on developing nation. *J Clean Prod* 141:385–393
77. Prince-Ruiz R, Finn JA (2020) Plastic free: the inspiring story of a global environmental movement and why it matters. Columbia University Press
78. Ragaert K, Delva L, Van Geem K (2017) Mechanical and chemical recycling of solid plastic waste. *Waste Manag* 69:24–58. <https://doi.org/10.1016/j.wasman.2017.07.044>
79. Ragaert K, Huysveld S, Vyncke G, Hubo S, Veelaert L, Dewulf J, Du Bois E (2020) Design from recycling: a complex mixed plastic waste case study. *Resour Conserv Recycl* 155:104646. <https://doi.org/10.1016/j.resconrec.2019.104646>
80. Rivas A, Sheeran P (2003) Descriptive norms as an additional predictor in the theory of planned behaviour: a meta-analysis. *Curr Psychol* 22:218–233
81. Roberts JA (1996) Green consumers in the 1990s: profile and implications for advertising. *J Bus Res* 36(3):217–231
82. Salant P, Dillman DA (1994) How to conduct your own survey. John Wiley & Sons, Inc, New York
83. Sharma N, Dayal R (2016) Drivers of green purchase intentions: green self-efficacy and perceived consumer effectiveness. *Glob J Enterp Inf Syst* 8(3):27–32
84. Shetzer L, Stackman RW, Moore LF (1991) Business-environment attitudes and the new environmental paradigm. *J Environ Educ* 22(4):14–21
85. Steensma HK, Tihanyi L, Lyles MA, Dhanaraj C (2005) The evolving value of foreign partnerships in transitioning economies. *Acad Manag J* 48(2):213–235
86. Steg L, Vlek C (2009) Encouraging pro-environmental behavior: An integrative review and research agenda. *J Environ Psychol* 29(3):309–317. <https://doi.org/10.1016/j.jenvp.2008.10.004>
87. Stern PC (2000) New environmental theories: toward a coherent view of environmentally significant behavior. *J Soc Issues* 56:407–424
88. Taberero C, Hernández B (2011) Self-efficacy and intrinsic motivation guiding environmental behavior. *Environ Behav* 43:658–675. <https://doi.org/10.1177/0013916510379759>
89. Taberero C, Hernández B, Cuadrado E, Luque B, Pereira CR (2015) A multilevel perspective to explain recycling behaviour in communities. *J Environ Manage* 159:192–201. <https://doi.org/10.1016/j.jenvman.2015.05.024>
90. Testa F, Russo MV, Cornwell TB, McDonald A, Reich B (2018) Social sustainability as buying local: soft policy, Meso level actors and social influences on purchase intentions. *J Public Policy Mark* 37:152–166
91. Testa F, Di Iorio V, Cerri J, Pretner G (2021) Five shades of plastic in food: which potentially circular packaging solutions are Italian consumers more sensitive to. *Resour Conserv Recycl* 173:105726. <https://doi.org/10.1016/j.resconrec.2021.105726>

92. Testa F, Gusmerotti N, Corsini F, Bartoletti E (2022) The role of consumer trade-offs in limiting the transition towards circular economy: the case of brand and plastic concern. *Resour Conserv Recycl* 181:106262
93. Testa F, Pretner G, Iovino R, Bianchi G, Tessitore S, Iraldo F (2021) Drivers to green consumption: a systematic review. *Environ Dev Sustain* 23:4826–4880. <https://doi.org/10.1007/s10668-020-00844-5>
94. Testa F, Sarti S, Frey M (2019) Are green consumers really green? Exploring the factors behind the actual consumption of organic food products. *Bus Strateg Environ* 28:327–338
95. Thaler RH, Sunstein CR (2009) *Nudge: Improving Decisions About Health, Wealth, and Happiness*. Rev. and expanded ed. Penguin Books, New York
96. Thøgersen J, Crompton T (2009) Simple and painless? The limitations of spillover in environmental campaigning. *J Consum Policy* 32:141–163. <https://doi.org/10.1007/s10603-009-9101-1>
97. Thøgersen J (2006) Norms for environmentally responsible behaviour: an extended tax-onomy. *J Environ Psychol* 26:247–261
98. Thurstone LL (1928) Attitudes can be measured. *Am J Sociol* 33(4):529–554
99. Tonglet M, Phillips PS, Read AD (2004) Using the Theory of Planned Behaviour to investigate the determinants of recycling behaviour: a case study from Brixworth, UK. *Resour Conserv Recycl* 41:191–214. <https://doi.org/10.1016/j.resconrec.2003.11.001>
100. Tourangeau R, Yan T (2007) Sensitive questions in surveys. *Psychol Bull* 133(5):859
101. Vancouver JB, Thompson CM, Williams AA (2001) The changing signs in the relationships among self-efficacy, personal goals, and performance. *J Appl Psychol* 86(4):605
102. Van der Werff E, Steg L (2015) One model to predict them all: predicting energy behaviours with the norm activating model. *Energy Res Soc Sci* 6:8–14. <https://doi.org/10.1016/j.erss.2014.11.002>
103. Vermeir I, Verbeke W (2008) Sustainable food consumption among young adults in Belgium: theory of planned behaviour and the role of confidence and values. *Ecol Econ* 64(3):542–553
104. Wang J, Li M, Li S, Chen K (2022) Understanding consumers' food waste reduction behavior—a study based on extended norm activation theory. *Int J Environ Res Public Health* 19(7):4187
105. Wood R, Bandura A (1989) Impact of conceptions of ability on self-regulatory mechanisms and complex decision making. *J Pers Soc Psychol* 56:407–415
106. Yuriev A, Dahmen M, Paillé P, Boiral O, Guillaumie L (2020) Pro-environmental behaviors through the lens of the theory of planned behavior: a scoping review. *Resour Conserv Recycl* 155:104660. <https://doi.org/10.1016/j.resconrec.2019.104660>
107. Zimmer MR, Stafford TF, Stafford MR (1994) Green issues: dimensions of environmental concern. *J Bus Res* 30(1):63–74

Authors and Affiliations

Filippo Corsini^{1,2}  · **Natalia Marzia Gusmerotti³** · **Edoardo Bartoletti⁴** · **Francesco Testa⁴** · **Andrea Appolloni³** · **Fabio Iraldo⁴**

✉ Filippo Corsini
filippo.corsini@santannapisa.it

Natalia Marzia Gusmerotti
natalia.marzia.gusmerotti@uniroma2.it

Edoardo Bartoletti
edoardo.bartoletti@santannapisa.it

Francesco Testa
francesco.testa@santannapisa.it

Andrea Appolloni
andrea.appolloni@uniroma2.it

Fabio Iraldo
fabio.iraldo@santannapisa.it

¹ Sustainability and Climate Interdisciplinary Center, Sant'Anna School of Advanced Studies, Pisa, Italy

² Institute of Management, Sant'Anna School of Advanced Studies, Pisa, Italy

³ Department of Management and Law, University of Rome Tor Vergata, Rome, Italy

⁴ Institute of Management, Sant'Anna Scuola Universitaria Superiore Pisa, Pisa, Italy