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CONSUMER DECISION-MAKING AND LEGAL AWARENESS IN THE CIRCULAR ECONOMY: A REGULATORY PERSPECTIVE

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Abstract

Linear economic models have been regular business since the industrial revolution, but, the deepening sustainability problems and the accumulation of waste gave birth to the concept of circular economy, which might ease the ecological burden on industries and societies. The operation of such economic models is always backed by rules and regulations developed by national and intranational legislative bodies. The aim of the paper is to investigate the consumers' familiarity with circular economy legislation and how this familiarity correlates with sustainable consumption behavior. The main result highlights a positive and significant link between knowledge of circular legislation and its perceived impact on consumer decisions, confirming that legal information can facilitate more sustainable behaviors. Three distinct segments of consumers according to their level of knowledge and attitude have been identified, suggesting that the public is not homogeneous in relation to the circular economy. Our findings have significant practical and policy implications. First, they suggest the need to strengthen large-scale consumer education and information efforts. Second, the normative implications of the study suggest further efforts to adapt the regulatory framework to sustainability objectives, while ensuring that this framework is coherent and harmonized across countries.

Keywords: circular economy, ecological footprint labelling, EFA, K-Means clustering, legal regulations

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1. INTRODUCTION

The transition toward a circular economy (CE) has emerged as a key strategy to address the environmental and social challenges posed by the traditional linear model of production and consumption. Unlike the "take-make-dispose" paradigm, the circular economy emphasizes extending product lifecycles, reducing waste, and promoting resource efficiency through reuse, repair, recycling, and sustainable design. This systemic shift aligns closely with several United Nations Sustainable Development Goals (SDGs), particularly SDG 12 (Responsible Consumption and Production), SDG 13 (Climate Action), and SDG 11 (Sustainable Cities and Communities). By encouraging more sustainable consumption patterns, the circular economy contributes to global efforts to decouple economic growth from environmental degradation.

Central to the effectiveness of CE strategies is the role of consumers. As end-users, their choices determine the demand for sustainable products, their willingness to participate in reuse or recycling schemes, and their responsiveness to eco-design and labelling initiatives. However, for consumers to make informed decisions that support circular outcomes, they must be aware not only of environmental benefits but also of their legal rights and obligations, such as warranty protections, the right to repair, or access to information on product sustainability. Legal awareness thus becomes a critical enabler of consumer empowerment in the CE. From a regulatory perspective, ensuring that consumers are both protected and informed is essential to achieving broader sustainability goals embedded in the SDGs.

Despite increasing policy momentum behind the CE, a significant gap persists between regulatory ambitions and actual consumer behavior. Many consumers are not fully aware of the legal frameworks designed to support their participation in sustainable practices (e.g., extended product warranties, eco-design standards, or the right to repair). This lack of legal awareness limits their ability to make informed, environmentally responsible decisions and undermines the impact of existing regulatory instruments. In turn, it creates a disconnect between the theoretical potential of the CE and its practical realization at the consumer level. Even where regulations exist, the complexity, inconsistency, or poor communication of legal provisions often leaves consumers disengaged or confused.

Moreover, most CE policies have traditionally focused on producers and supply chains, with less emphasis on the role of consumers as active agents in the transition. Yet consumer decision-making is influenced not only by environmental awareness but also by perceived legal protections (Plotnic, 2020), trust in institutions, and clarity of regulatory messaging. Without a comprehensive understanding of how legal frameworks shape consumer choices, policymakers risk overestimating the effectiveness of circular economy legislation. There is thus a pressing need to explore the interplay between consumer behavior and legal awareness from a regulatory perspective to identify barriers and enablers for more inclusive and effective circular policies.

This research aims to examine the legal framework underpinning the circular economy and assess consumers' awareness and understanding of relevant directives, laws, and regulations, with a focus on how

these legal instruments influence consumer behavior. Additionally, the study explores the potential implications of introducing a mandatory ecological footprint as a regulatory measure. This paper contributes to the evolving discourse on CE governance by emphasizing the often-overlooked intersection between consumer behavior and legal awareness. While much of the existing literature focuses on environmental attitudes, psychological drivers, or economic incentives behind consumer participation, fewer studies investigate how regulatory frameworks shape or constrain decision-making in the circular context. By foregrounding a legal-regulatory perspective, this research offers a more nuanced understanding of the institutional enablers and barriers that influence consumer engagement with circular practices such as reuse, repair, and recycling. It also sheds light on the implications of regulatory design and communication for achieving long-term behavioral change.

The paper's relevance is further underscored by its alignment with international sustainability goals. As countries strive to implement the SDGs, particularly SDG 12 (Responsible Consumption and Production), empowering consumers to make legally informed, circular choices becomes a policy priority. This paper provides valuable insights for policymakers, regulators, and consumer advocacy organisations by identifying legal blind spots that hinder consumer participation and recommending ways to improve legal literacy and regulatory clarity. Ultimately, the paper advances both academic and policy-oriented debates on how to better integrate legal awareness into sustainable consumption strategies, ensuring that CE policies are not only economically and environmentally sound but also socially inclusive and legally effective.

The remainder of the paper is structured as follows: Section 2 reviews the relevant literature on consumer behaviour in the circular economy and legal frameworks. Section 3 presents the methodology. Section 4 discusses key findings on the relationship between legal awareness and consumer decision-making. Section 5 concludes with policy implications and recommendations.

2. LITERATURE REVIEW

Identifying a definition that fully captures the scope and dynamic nature of the CE is challenging, and most authors focus on CE-specific aspects (Elf et al. 2022; Marković et al., 2023; Nieścior & Marišová, 2024). However, some definitions go a long way to the essence of the CE. According to Preston (2012), the CE is an approach that changes the function of resources in the economy, with the aim of extending their life through strategies such as reuse, recycling, remanufacturing, servitization, repair, using waste for energy production, extending the durability of products and cascading the use of materials. This concept is increasingly recognized as an effective way to reduce the carbon footprint of supply chains, primarily through the improvement of waste recycling through industrial symbiosis. It is also seen as a key path to sustainable development in accordance with the principles of the triple bottom line (environmental, economic and social sustainability). Additionally, Kirchherr et al. (2017) define the circular economy as „an economic system that replaces the concept of 'end of life' by reduction, alternative reuse, recycling and recovery of materials in the processes of

production/distribution and consumption“. It operates at the micro level (products, companies, consumers), meso level (eco-industrial parks) and macro level (city, region, nation and beyond), with the aim of achieving sustainable development, while creating environmental quality, economic prosperity and social justice, for the benefit of current and future generations. Finally, CE is an economic activity aimed at saving energy, producing environmentally friendly products, and promoting rational consumption (Mikichurova & Vlialko, 2021; Deák, 2024).

When customers are insufficiently informed about the importance of the CE and its benefits for society and organization, purchasing power can be impacted (Guerreschi & Wielopolski, 2022), and consumption patterns can be changed (Tabas et al., 2025). Although the CE, as a sustainability driver, is already widely represented as a concept and subject of various research in the scientific literature as well as in the discourse of politicians and policy-makers (Goyal et al., 2018), many studies have indicated information asymmetry (Boyer et al., 2021). There is not enough awareness, information or education/training of stakeholders about CE’s meaning, benefits (Osei-Tutu, 2023), and even the regulations and standards governing this area (Rótolo et al., 2022). In support of that, the results of research conducted in Australia by Chakraborty et al. (2023) showed that customer awareness of CE has not been appropriately developed. Therefore, policymakers and companies should primarily be responsible for CE information distribution, environmental communication with all stakeholders, and increasing individual awareness of environmental sensitivity (Kabaja, 2022). Furthermore, Baah et al. (2022) found that regulatory stakeholders, followed by organizational and community actors, most influence CE adoption.

2.1. CE regulation, legislation and standards

Legislation and policies are increasingly being adopted nationally and regionally to define and regulate social relations in the CE field (Steenmans & Lesniewska, 2023). Strong CE regulation can encourage organizations to strengthen their research and development, improve stakeholders' willingness to develop CE (Shang et al., 2022), and “steer consumer behaviour towards sustainable choices” (Mak & Terryn, 2020). Mak and Terryn (2020) notably observed that the existing regulatory framework of EU consumer law and national private laws falls short in supporting the transition toward a CE. Hence, an extensive number of scientific papers dealt with regulation and CE legislation in various areas such as water treatment regulation (Berbel et al., 2023), battery legislation (Barkhausen et al., 2023), waste regulation (Stankevičius et al., 2020), ecodesign regulation (Peiró et al., 2020), and plastic regulation (Alvarez-Risco et al., 2020). Regarding the EU, the European Commission (EC) advanced the CE concept by adopting the first Circular Economy Package I in 2015, which addressed the entire material lifecycle and included key legislative proposals on EU waste law (de Römph & Cramer, 2020). This was followed by the Circular Economy Package II, introduced through a series of policy documents that expanded on the initial measures (de Römph & Cramer, 2020). In 2018, the legislative efforts from the first

package culminated in the adoption of Waste Framework Directive 2018/851, Packaging and Packaging Waste Directive 2018/852 and Landfill Directive 2018/850 (Official Journal of the European Union, 2018). In 2019, the EC adopted the fourth set of measures related to the CE. This was followed in 2020 by a new Circular Economy Action Plan titled "For a cleaner and more competitive Europe", aimed at accelerating the EU's transition to a sustainable economic model (Dobre-Baron et al., 2022). In contrast to the development of EU legislation and regulation, Rótolo et al. (2022) concluded that the lack of adequate policies and legislation is one of the main barriers to adopting CE in the Argentine agricultural sector. Additionally, regulation issues can include waste laws that sometimes hinder reuse, high taxes that make small-scale reuse unprofitable compared to mass production, and tax incentives that favor consumption over service use (Koistila, 2020).

As a support to regulation and legislation, the growing interest in the circular economy over the past decade is also reflected in standards development. In 2018, ISO established Technical Committee ISO/TC 323 for Circular Economy, which now includes 77 member countries and is developing several key standards, such as ISO 59004 (terminology and implementation), ISO 59010 (business model transition), and ISO 59020 (measuring circularity). Alongside these, existing de facto and de jure standards like ISO 14040/14044, Cradle to Cradle Certification, the Ellen MacArthur Foundation standards, GRI, BSI PAS 9017, the EU Circular Economy Package, BS 8001:2017, and ESRS E5 further support circular economy implementation (Dimitrijević et al., 2023). Guerreschi & Wielopolski (2022) proved that certified organizations with environmental ISO standards, such as ISO 14001, improved their performance compared to non-certified organizations.

Although existing research has addressed various aspects of the CE, including general awareness and its key elements, a notable gap in the literature concerning customer familiarity with CE-related regulation and legislation remains.

3. RESEARCH METHODOLOGY

Based on the identified literature gap, a quantitative research method was applied to explore the familiarity of consumers with CE-related regulations and legislation.

3.1. The questionnaire

This questionnaire examines the level of familiarity with laws and regulations related to consumer protection and the circular economy, as well as perceptions of their impact on consumer behavior and business operations. Respondents are asked to rate their knowledge of specific legal acts, such as the Waste Management Law, Consumer Rights Directive, Non-Financial Reporting Directive, etc., using a 5-point scale ranging from 1 (Not at all familiar) to 5 (Extremely familiar). They also assess the purpose of consumer protection regulations in their country on a scale from 1 (Absolutely disagree) to 5 (Absolutely agree), regarding aspects such as the protection of health and safety, economic interests, and legal rights. Additionally, the questionnaire investigates opinions on the potential effects of introducing a mandatory environmental

footprint label on products exported to the EU, again using a 5-point agreement scale. These effects include export limitations, influence on consumer preferences, and impact on product pricing. Lastly, participants evaluate how specific regulations (on waste, by-products, and packaging) affect their consumer decisions by choosing among three options: positive effect, adverse effect, or "I don't know."

3.2. Data collection

A questionnaire was developed by members of the COST Action project named EU Circular Economy Network for All: Consumer Protection through reducing, reusing, repairing (ECO4ALL). The primary goal of the ECO4ALL Action is to enhance information sharing, promote discussion, and conduct outreach efforts for a broad audience, including young people, academics, emerging researchers, public administration staff, the business sector, and civil society in general, on a circular economy that benefits consumers. The questionnaire was distributed through the ECO4ALL members' network to their fellow citizens (private contacts were also distributed to scientists) in 35 countries in the second half of 2024, with 270 respondents completing the questionnaire correctly. All countries are predominantly from Europe where the members of the ECO4ALL project come from (Albania, Algeria, Armenia, Austria, Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, France, Georgia, Germany, Greece, Hungary, Indonesia, Ireland, Israel, Italy, Latvia, Lithuania, Malatya, Moldova, Montenegro, North Macedonia, Portugal, Romania, Serbia, Slovakia, Spain, Sweden, Taiwan R.O.C., Turkey, and United Kingdom). The research targets the legal background of circular economy, the consumers' familiarity with directives, rulebooks, laws and regulations, as well as the effect of such laws and regulations on consumer behavior. It also considers the introduction of a mandatory ecological footprint. The research is a quantitative type with exploratory and explanatory features. The online questionnaire was distributed on a convenience-type sampling basis with the help of the researchers participating in the full-scale ECO4ALL COST Action research. The anonymity of the respondents has been guaranteed, and their consent was provided by them when they filled out the questionnaire.

3.3. Hypotheses

Research has consistently shown that consumer awareness and familiarity with CE policies and regulations have a significant influence on sustainable consumption behavior. According to Kulli et al. (2023), increased consumer knowledge about CE principles, including legal frameworks, positively correlates with behaviors such as choosing reused or recycled products. Similarly, a systematic review by Lopez and Legardeur (2024) highlights that knowledge and attitudes are among the most influential determinants of consumer decision-making in circular economy contexts. Building on these insights, our hypothesis H1 states:

H1. There is a positive and significant relationship between the familiarity of laws on circular economy and their effect on consumer decisions.

$H1_1$. There is a positive and significant relationship between the familiarity of law

on was management and its effect on consumer decision.

$H1_2$. There is a positive and significant relationship between familiarity with the law/rulebook on by-products and its effect on consumer decisions.

$H1_3$. There is a positive and significant relationship between familiarity with the law on packaging and packaging waste and its effect on consumer decisions.

Studies using cluster analysis have shown that consumers can be segmented based on their knowledge, attitudes, and behaviors related to circular economy (CE) principles, even if those studies did not explicitly focus on legal familiarity. For instance, Sousa et al. (2021) segmented Hungarian consumers into four distinct behavioral groups based on CE-related attitudes and awareness using K-means clustering and hierarchical methods. Similarly, Pércsi et al. (2023) clustered participants in the food domain using factorial scores and Ward's method, identifying groups that differed markedly in their understanding of CE. These segmentation studies support hypothesis H2:

H2. Identical clusters can be identified based on familiarity with laws and regulations on the circular economy.

The collected data was analyzed by statistical analysis using descriptive measures, association analysis (Spearman's rank correlation, chi-square statistic and Kendall's tau-b); factor analysis (EFA) as well as hierarchical and K-means clustering were also applied in SPSS v25 and MS Excel. MS Power BI was used to compile the territorial map.

4. RESULTS

4.1. Demographic profile

A total of 270 participants responded to the survey. All the responses could be used to analyze the attitudes towards regulations and laws on consumer rights and ecological footprints. Figure 1 presents the distribution

Figure 1. Distribution of responses by countries illustrated on a map (edited by authors)

of countries in the survey; the darker color represents more responses.

As there were few responses from certain countries, the responses were grouped by region. Table 1 shows the distribution of responses from the different regions. Central Europe, the Caucasus and Western Europe cover 90% of the responses, the Middle East represents 5.56%, and Eastern Europe gave a 2.59% share of the responses. The sample cannot be considered representative; it rather delivers the views and attitudes of the Western and Central European countries, together with the countries from the Caucasus region.

4.2. Consumers and regulations

4.2.1. Familiarity with laws and regulations

According to the responses most of the participants from the countries are somewhat familiar with the laws and regulations on consumer rights, Non-Financial Reporting (NFR), Waste Management, By-Products and Packaging and packaging waste (Medians and Modes are equal to 3 except 'Directive on consumer rights' where the Mode is 4, however, the responses are quite symmetric, therefore, no exact awareness and attitude can be detected (Table 2.)

Figure 2 shows the percentage distribution of the familiarity of consumers, and as the descriptive measures showed, around one quarter of the respondents are somewhat familiar or moderately familiar. Definitely, an awareness-raising program is necessary to achieve a paradigm shift in this area.

The lack of awareness can be detected, as 24.1% of the respondents are not familiar with Non-Financial Reporting (NFR) Directives, and Rulebook on by-products, 19.6% of the respondents are not familiar with Law on packaging and packaging

Table 1. Distribution of responses by regions

Regions	% of responses
Central Europe	56.67%
Caucasus	21.11%
Western Europe	12.22%
Middle East	5.56%
Eastern Europe	2.59%
South-East Asia	0.74%
Scandinavia	0.74%
North Africa	0.37%
Grand Total	**100.00%**

Table 2. Descriptive measures on familiarity of different laws and regulations in connection with consumer rights (edited by authors)

Consumer and Legislations	Mean	Median	Mode	Std. Deviation	Skewness	IQR
Directive on consumer rights	3.11	3	4	1.216	-0.372	2
Non-Financial Reporting (NFR) Directive	2.67	3	3	1.209	-0.051	2
Law on Waste Management	3.09	3	3	1.248	-0.165	2
Rulebook on by-products	2.66	3	3	1.220	0.071	2
Law on packaging and packaging waste	2.88	3	3	1.294	-0.006	2

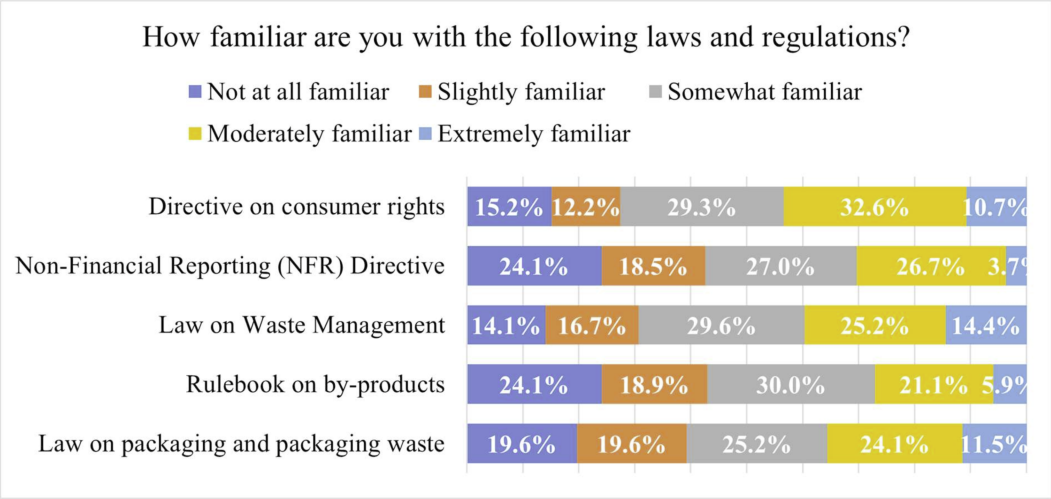

Figure 2. Familiarity of respondents with laws and regulations on consumer rights

waste, and around 05% are not aware of the Directive on consumer rights and Law on waste Management. The proportion of respondents who are aware of these directives is law, ranging from 3.7% (NFR Directive) to 14.4% (Law on Waste Management). These proportions should empower policymakers to launch promotional and educational campaigns to increase familiarity in these countries.

4.3. Existing policies in partner countries

4.3.1. Purpose of the adopted regulations in the field of consumer protection

The respondents definitely agree with the fact that adopted regulations target consumer health and safety, as well as the economic and legal interests of consumers (Table 3). Most of the responses are on the agree and totally agree side, showing that people also require the protection of such interests.

Figure 3 presents the percentage distribution of the responses. In this case, awareness-raising programs would also be useful to make neutral consumers move towards higher responsibility.

4.4. Identification of legal barriers for circular value chain management

4.4.1. Effects of the introduction of a mandatory environmental footprint

According to the responses, consumers would welcome a label showing the ecological footprint value of the products and encourage export and import regulations regarding footprint signs (Figure 4).

Two-thirds of the respondents agree (64.44%) that products without such an ecological footprint label should not be exported to the EU, but still 29.3% are neutral about such a regulation. At the same time, 58.5% of the respondents are positive that consumers' first choice would be a product with such an ecological footprint label, and even 68.89% think that such a label would directly influence the price of the product in the market. Meanwhile, in both cases, 30.4% and 25% of the respondents are neutral, which raises the

Table 3. Descriptive measures of respondents' opinions on protection scopes

Consumer and Legislations	Mean	Median	Mode	Std. Deviation	Skewness	IQR
Protection of consumer health and safety	3.96	4	4	0.975	-0.920	2
Protection of consumers' economic interests	3.73	4	4	1.000	-0.637	1
Protection of legal interests of consumers	3.79	4	4	0.931	-0.543	1

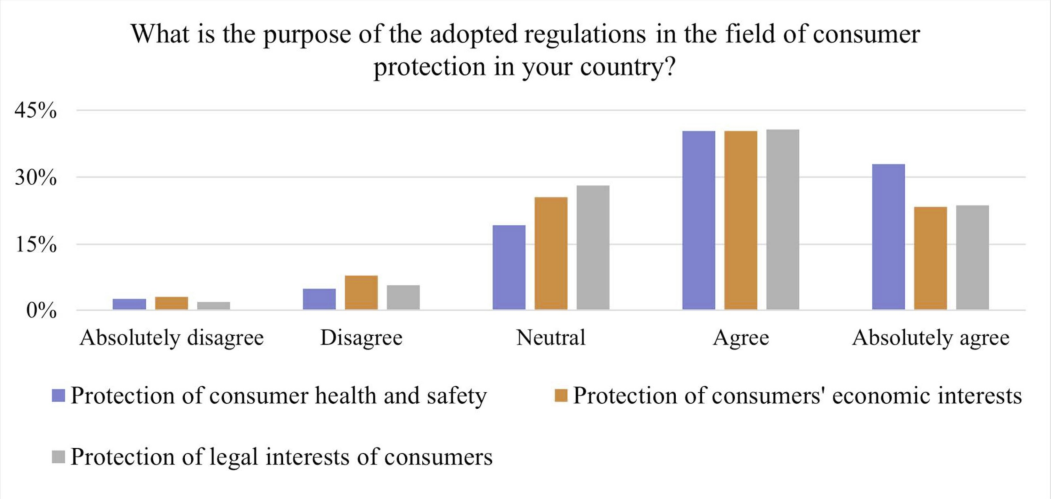

Figure 3. The purpose of the adopted regulations in the field of consumer protection

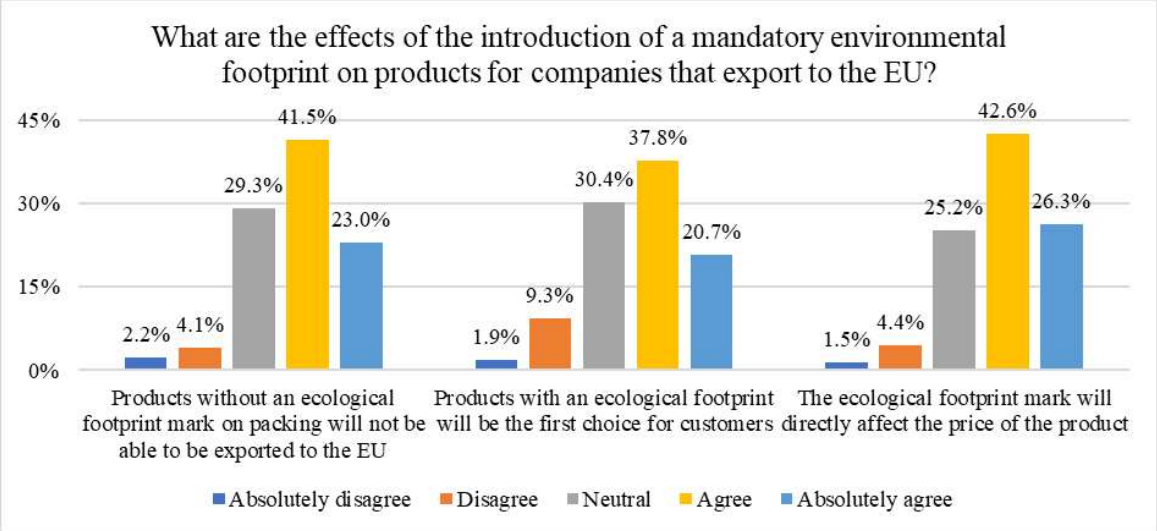

Figure 4. Effects of the introduction of a mandatory environmental footprint on products for companies that export to the EU

question of awareness of people's responsibility for the environment and the awareness of sustainability and circular economy.

Table 4 gives the regular descriptive measures of these responses, and the average not reaching four implies that there is still some space to work on raising familiarity,

awareness and responsibility for our ecological footprint and the ecological footprint of consumer products.

4.4.2. Effect of legislation on consumer decision

The last group of questions on laws and regulations covered the effect of legislation on consumer decisions. Most respondents state that such laws and regulations on waste management, by-products and packaging would positively affect consumer decisions. As Figure 5 shows, over half of the respondents felt a positive effect, around 40% of the respondents felt that it would have a negative effect on consumer decision, however, around 35-40% of the participants could not decide, they answered they did not know. Similarly to the previous cases, awareness raising and educational programmes need to be dedicated by policymakers to make people familiar with the laws and regulations and their potential effects on sustainability and circular economy.

The relationship between the relevant questions was analyzed to better understand the relations between consumer familiarity and their belief about the effect of legislation on consumer analysis. More specifically (1) Law on Waste Management vs. How does

Table 4. Descriptive measures of responses on footprint labelling

Consumer and Legislations	Mean	Median	Mode	STDEV	Skewness	IQR
Products without an ecological footprint mark on packaging will not be able to be exported to the EU	3.79	4	4	0.919	-0.583	1
Products with an ecological footprint will be the first choice for customers	3.66	4	4	0.969	-0.394	1
The ecological footprint mark will directly affect the price of the product	3.88	4	4	0.902	-0.613	2

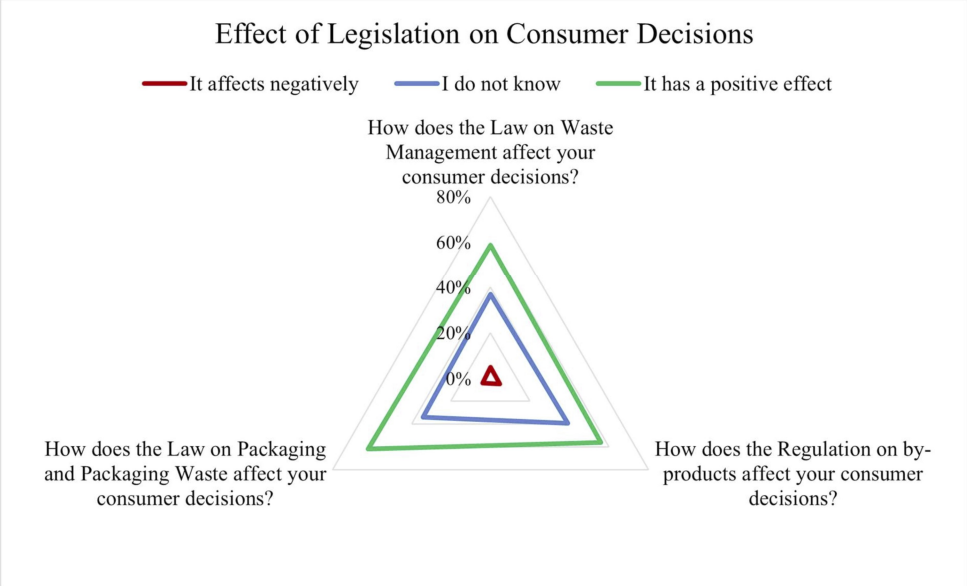

Figure 5. Effect of Legislation on consumer decisions

the Law on Waste Management affect your consumer decisions?, (2) Rulebook on by-products vs. How does the Regulation on by-products affect your consumer decisions?, and (3) Law on packaging and packaging waste vs. How does the Law on Packaging and Packaging Waste affect your consumer decisions?

In order to avoid the problem of having too few responses in the categories the five Likert scale responses were recoded to a three-point Likert scale response option. Therefore, the association could be checked. Overall, significant relationships could be detected, and significant differences could be observed among the different groups. In general, the number of those who could not define a positive or negative effect of legislation on consumer decisions decreased with rising familiarity, meanwhile, the number of participants who are for the positive effect on consumer decision increased with rising familiarity. The number of responses that consider a negative effect of such regulations on consumer decisions has minimally increased with familiarity. Figures 6-8 show the distribution of responses by the paired statements.

The correlation between these two aspects proved to be significant (Spearman rank correlation equaled 0.352 with p=0.000, as well as the Kendall' tau-b coefficient was significant (p=0.000) with a value of 0.33. The relationship between familiarity and the effect on consumer decision proved to be significant as the Chi-square measure gave p=0.000 significance level. Therefore, it is obvious that familiarity and awareness results in a more positive attitude in consumer decisions in the case of regulations on waste management.

The correlation between the above two aspects also proved to be significant (Spearman rank correlation equaled 0.350 with p=0.000, as well as the Kendall' tau-b coefficient was significant (p=0.000) with a value of 0.324. The relationship between familiarity and the effect on consumer decision also proved to be significant as the Chi-square measure equaled 44.930 with p=0.000. Therefore, it can be stated that familiarity and awareness results in a more

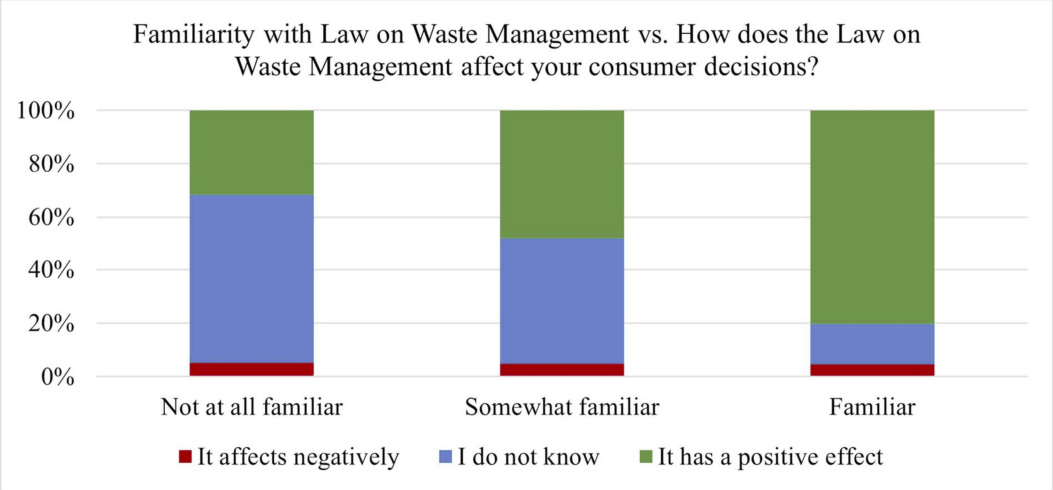

Figure 6. Distribution of responses of familiarity with Law on waste management by how the Law on waste management affect your consumer decisions

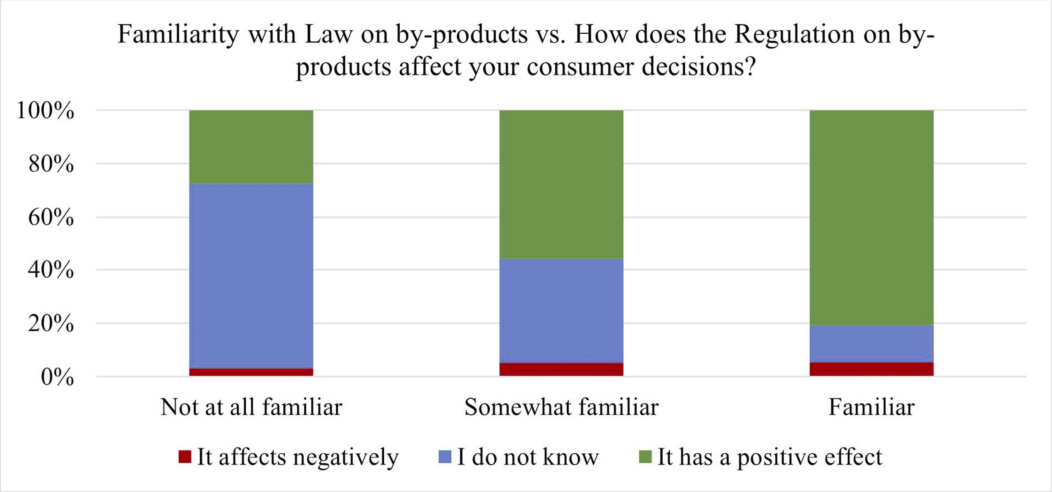

Figure 7. Distribution of responses of familiarity with Law on by-products by how the regulation on by-products affects your consumer decisions

Figure 8. Distribution of responses of familiarity with Law on packaging and packaging waste by how the Law on packaging and packaging waste affect your consumer decisions

positive attitude in consumer decisions in the case of the law of by-products.

In the case of the third correlation, it is also proved that there was a significant relationship between the familiarity with the law on packaging and packaging waste and its effect on consumer decision (Spearman rank correlation equaled 0.365 with p=0.000, as well as the Kendall' tau-b coefficient was significant (p=0.000) with a value of 0.343. The relationship between familiarity and the effect on consumer decision also proved to be significant as the Chi-square measure equaled 54.824 with p=0.000. Therefore, it can be stated that familiarity and awareness results in a more positive attitude in consumer decisions in the case of law on packaging and packaging waste.

4.4. Cluster identification of consumers based on familiarity with legal regulations on the circular economy

According to the hypothesis formulated in the research methodology, well-defined clusters can be identified based on familiarity with legal regulations in a circular economy. In order to determine the clusters and target these consumers specifically, the factors were confirmed, and the reliability of the factors was checked with Cronbach's alpha. Table 5 presents the factor loadings and Cronbach's alpha measure of the factors used for cluster identification.

Exploratory Factor Analysis (EFA) was conducted using Principal Component Analysis (PCA) for extraction and Varimax rotation with Kaiser Normalization. The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy equaled 0.845 with sig. =0.000, indicating an excellent suitability of the data for factor analysis. Bartlett's Test of Sphericity supports the factorability of the correlation matrix, and 71.543% of the information was retained. The analysis confirmed four factors: the "familiarity with laws and regulations for circular value chain management", the "purpose of the adopted regulations", the "effect of a mandatory ecofootprint labelling", and the "effect of legislation on consumer decisions".

Table 5. Identified factors for cluster identification

Factors	1	2	3	4	Cronbach's alpha	Cluster discriminant functions
Familiarity with laws and regulations						
Rulebook on by-products	0.887					
Law on Waste Management	0.868					
Law on packaging and packaging waste	0.849				0.911	
Non-Financial Reporting (NFR) Directive	0.824					
Directive on consumer rights	0.753					
Footprint labelling						Function 1
Products without an ecological footprint mark on packing will not be able to be exported to the EU				0.756		
Products with an ecological footprint will be the first choice for customers				0.716	0.615	
The ecological footprint mark will directly affect the price of the product				0.695		
Purpose of regulations						
Protection of legal interests of consumers		0.901				
Protection of consumers' economic interests		0.880			0.884	
Protection of consumer health and safety		0.863				
Effects of regulations						Function 2
How does the Law on Waste Management affect your consumer decisions?			0.837			
How does the Law on Packaging and Packaging Waste affect your consumer decisions?			0.837		0.794	
How does the Regulation on by-products affect your consumer decisions?			0.765			

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 5 iterations.

Then, hierarchical clustering was applied using the Ward method, with the factor scores assigned during the EFA algorithm to each case to determine the number of clusters among the respondents. Based on the dendogram, the agglomeration schedule, the scree diagram and the agglomeration coefficients (Figure 9), the formation of three clusters seemed reasonable, therefore, K-Means clustering was applied to identify and characterize three clusters (Dörnyei & Tégla, 2024; Lins Galdino & Da Silva, 2024).

Three clusters were identified with 133, 80 and 57 group members with significant differences by the factors (p=0.000), which was visualized with the help of Discriminant analysis. The discriminant analysis identified two main dimensions along which it placed the three clusters (Figure 10). The first dimension combined the purpose of laws and regulations on customer protection and their effect in the circular economy on consumer behavior, while the second dimension combined the familiarity of laws and regulations on circular economy with the existence and demand for an ecofootprint labelling.

Based on the two dimensions the members of the second cluster (marked red, 80 respondents) have a higher familiarity with laws and regulations on circular economy and would welcome a mandatory ecological footprint labelling but do not consider the purpose of such law and regulations on consumer protection important and are neutral on the effect on consumer behaviour (Spearman correlation showed slightly negative correlation between the two dimension (r=–0.018)). On the other hand, the members of the first and the third clusters (blue and green) are less familiar with the laws and regulations on such as a Directive on consumer rights, Non-Financial Reporting (NFR) Directive, Law on Waste Management, Rulebook on by-products and Law on packaging and packaging waste and do not feel a need for ecofootprint labelling. Meanwhile, these two groups behave differently when the purpose of such laws and their effect on consumer behavior is considered. The members of the green group (57 respondents) have a strong negative attitude regarding the effect on consumer behavior and whether these regulations are protecting consumers (Spearman correlation (r=0.093) showed a weak positive correlation, explaining that if there is no knowledge, a more negative attitude could be supposed). On the contrary, the members

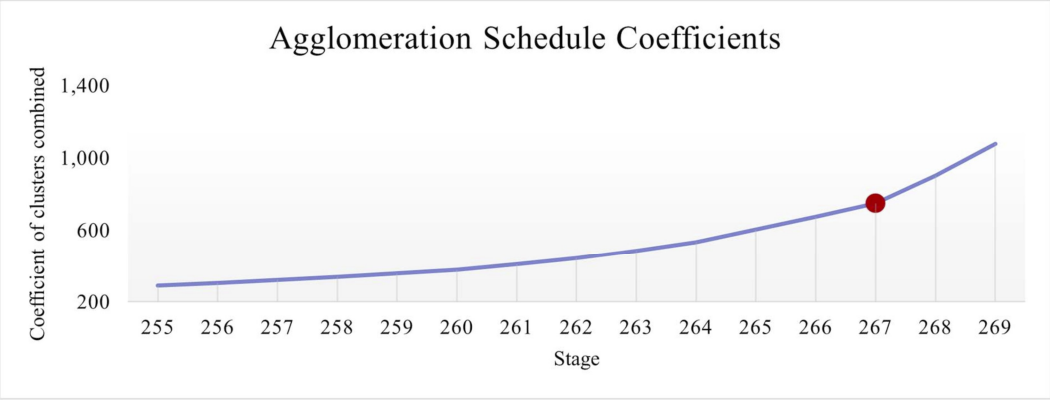

Figure 9. Agglomeration Schedule Coefficients of the last 15 combined clusters

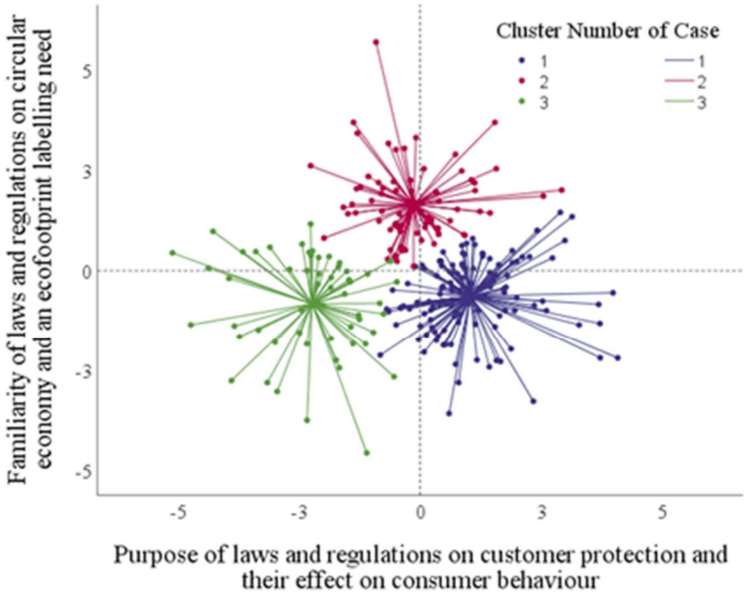

Figure 10. Visualization of the three clusters

of the blue group (133 respondents) despite not being familiar with the laws and regulation consider that such directives and rulebooks would have a positive effect on consumer behavior (r=–0.135, implying slightly negative correlation), and they believe that such regulations are to protect consumer health and safety, economic and legal interests.

Overall, the number of respondents who were identified with no or slight familiarity of laws and regulations on the components of circular economy was higher (green and blue group members altogether equaling 190 respondents) than that of the group who were familiar with such regulations (80 respondents), which implies that awareness raising an information sharing is one of the activities that could target these groups. Furthermore, fewer respondents found a positive effect of such regulations on circular economy on consumer behavior, which reinforces the task of enterprises and policymakers to make the effects of the circular economy more audible.

5. DISCUSSION

The results largely confirm the proposed hypotheses, highlighting the role of knowledge of legislation in guiding circular consumption behavior. Statistical analysis revealed significant positive correlations between consumer familiarity with circular economy laws and their perceived impact on consumption decisions. By analyzing the responses, the results supported the hypotheses as a significant relationship (p=0.000) could be detected between the familiarity of laws and regulations as Law on Waste Management, Rulebook on by-products, and Law on packaging and packaging waste and their counterpart about the effect on consumer behavior, correlation being around 0.3, therefore H1 including $H1_1$, $H1_2$ and $H1_3$ are supported. Furthermore, three significantly different clusters could be identified, supporting H2, and finally, Table 6 summarizes the familiarity and the attitude of the cluster members.

Table 6. Cluster characteristics based on two identified combined dimensions

	Purpose of laws and regulations on customer protection and their effect on consumer behaviour	Familiarity of laws and regulations on circular economy and an ecofootprint labelling need
Cluster 1 (Blue)	+	–
Cluster 2 (Red)	+/–	+
Cluster 3 (Green)	–	–

The general hypothesis H1 was supported by the data: for waste legislation, by-product regulation and packaging and packaging waste legislation, Spearman correlation coefficients were around 0.33-0.36, with high statistical significance (p<0.001). This result indicates a moderately positive relationship: consumers who are more familiar with the legal provisions tend to report that they influence their consumption behavior more than those who are not. In other words, the level of legal awareness of the circular economy is associated with an increase in the weight of consideration of these issues in consumer choices. However, the moderate magnitude of the correlations suggests that legal familiarity, although important, is not the only factor shaping sustainable consumption behavior; other determinants (personal attitudes, convenience, economic incentives, etc.) also play a role, a point also highlighted in the literature (Mak & Terryn, 2020). The finding that consumers' information influences their environmental decisions is in line with previous studies that emphasize the importance of knowledge and awareness in the transition to the circular economy. For example, Camacho-Otero et al. (2020) note that the lack of informed consumer demand is a significant barrier to the adoption of circular models. Our results provide empirical support for this observation: where consumers are aware of the directive or the law (e.g. in the waste or packaging domain), they are more likely to adapt their behavior, which may stimulate demand for circular products/services. Conversely, where ignorance prevails, consumer interest and involvement in the circular economy is likely to be lower - a point in line with the findings of Szilagyi et al. (2022), who identify low levels of public interest and awareness as one of the major barriers to circular economy adoption (Szilagyi et al., 2022). However, consumer informatization does not automatically guarantee green actions, a fact also reflected by the moderated nature of our correlations and discussed in the literature. Mak and Terryn (2020) argue that the role of the consumer in the circular economy needs to be supported by more than simply providing information - a broader mix of policies is needed to incentivize sustainable choices (e.g. facilitating product repair, promoting reuse through sharing services, etc.). Thus, the present results suggest that legal information is necessary but not sufficient: it needs to be accompanied by complementary measures and the creation of practical conditions to make sustainable choices accessible and attractive.

Another crucial aspect highlighted by the analysis is the heterogeneity of attitudes and levels of knowledge among consumers, emphasized by the identification of three significantly different clusters (H2 confirmed). These groups of consumers, obtained by factor analysis and clustering, show distinct profiles in terms of familiarity

with and perceptions of circular legislation:

Cluster 1 ("Uninformed Optimist", ~50% of the sample): includes consumers with little familiarity with circular economy laws, but who are relatively confident in their effectiveness. Interestingly, while not familiar with directives such as consumer rights or waste laws in detail, these respondents nevertheless believe that such regulations are beneficial and aim to protect consumer health and interests. In other words, they support the idea of pro-movement policies and believe in their protective purpose, even if they do not master their specifics. This intuitive optimism points to a capital of trust that can be tapped: once better informed, these consumers could become strong allies of the circular transition, as their basic attitude favors green norms.

Cluster 2 ("Realistically Informed", ~30% of the sample): brings together consumers with the highest level of familiarity with circular legislation. The members of this group are familiar with the laws (from the Consumer Rights Directive to waste, by-products and packaging legislation) and also favor the introduction of new instruments such as mandatory ecofootprint labelling. However, they remain reserved about the actual importance of these laws for consumer protection and are neutral about their effect on consumer behavior. In other words, although well-informed, not all are convinced that the existing regulations actually make a difference in practice or protect them sufficiently. This attitude may reflect a certain skepticism or unfulfilled expectations: knowing the details of the policies in detail, they may identify gaps or problems in their implementation, making them less enthusiastic about the results so far. At the same time, the fact that they ask for additional tools (such as the ecofootprint label) suggests that this segment wants more transparent and consumer-oriented measures, signaling to authorities the need for further innovation in green consumer policies.

Cluster 3 ("Uninformed sceptic", ~20% of the sample): comprises consumers with low knowledge of the legislation and a predominantly negative attitude towards its effects. These respondents are not familiar with most of the circular-economic regulations and, at the same time, do not believe that the relevant laws would protect the consumer or positively influence consumer behavior - on the contrary, they seem to believe that the impact is insignificant or absent. Such a view may indicate distrust in the effectiveness of public policies or a perception of "greenwashing", where legislative efforts are seen as superficial. Szilagyi et al. (2022) note that people with high climate skepticism tend to perceive greenwashing by organizations more acutely (Szilagyi et al., 2022); analogously, in cluster 3 we could find reluctant consumers, who - lacking information - fill their cognitive gap with a critical attitude, assuming that these regulations "don't help anyway". This cluster represents a challenge for policymakers, as it combines the twin deficits of a lack of information and a lack of trust.

The presence of these three distinct segments has important practical and theoretical implications. On a practical level, it suggests that public policy and communication strategies need to be tailored to different audience typologies. A 'one size fits all' approach risks being ineffective: for example, information campaigns are essential for uninformed groups (clusters 1 and 3), but messages need not only to convey

knowledge but also to address skepticism where it exists (cluster 3), perhaps by highlighting the concrete benefits of legislation and examples of success. On the other hand, the well-informed segment (Cluster 2) could be engaged through consultations and participatory initiatives, capitalizing on their interest in tools such as eco-labelling - this group can become a vanguard of circular consumption if policies channel their knowledge and demands in a constructive way. The relevance of a segmented approach is also supported by trends highlighted in another research. For example, a Europe-wide ING survey (2019) shows that although the majority of consumers report concern for the environment, there are wide differences in their level of concrete engagement and information. 66% of Europeans believe that some products have lower environmental impacts, but only a third can actually name a company that has shifted its business model towards reuse or repair - a similar discrepancy to the one found in our study between general awareness and specific knowledge of circular economy initiatives. At the same time, the same ING report notes that many consumers expect external support to change their behavior, either in the form of action from companies (e.g. reducing plastic in shops) or regulation to facilitate sustainable choices. The EU's recent introduction of "right to repair" rules - obliging manufacturers to provide spare parts for an extended lifetime - is an example of a legislative measure responding to these expectations. The fact that in our sample the most familiar group (cluster 2) explicitly supports the need for environmental impact labelling indicates the demand from informed consumers for more transparency and tools at their fingertips for sustainable consumption. On the other hand, the reticence of the less informed groups towards such tools (they "don't feel the need" for an eco-label) suggests that without a minimum of awareness, consumers do not perceive the usefulness of new interventions - again highlighting the need for education and communication to create receptivity.

From an academic and normative perspective, the results of our research contribute to our understanding of the role of the consumer as an actor in the ecological transition in a multi-regional way. Most previous studies have focused either on general attitudes towards the environment or on specific behaviors (such as recycling, buying eco-friendly products), but less on the direct correlation of regulatory knowledge with consumption behavior. We investigated this link and found that, indeed, knowledge of circular economy directives and laws goes hand in hand (to a certain extent) with integrating circular principles into consumption decisions. This perspective, focusing on the consumer protection dimension in the context of sustainability, complements the literature. Mak and Terryn (2020) point out that consumer law should be recalibrated to support sustainability objectives, for example, by encouraging repair and servitisation (the sharing of goods) through specific legal instruments. Our findings - especially those on consumers' willingness to see such instruments (eco-labelling, extended warranties, etc.) applied and the benefits of awareness-raising - provide empirical support for the integration of sustainability concerns into consumer protection policies. They also highlight the challenges: if the vast majority of consumers (around 70% in the sample) are not yet familiar with these legal provisions, then

even the most well-intentioned policies may have limited impact due to insufficient information dissemination among the public.

Last but not least, the discussion has to be related to the transnational context and EU circular economy policies. Our sample, although statistically unrepresentative of the entire European population, included respondents from several areas (Central and Western Europe, Caucasus, etc.), providing indications of generalizable trends. In all the regions analyzed, gaps in familiarity with certain pieces of legislation were evident - for example, ~24% of participants had not heard of by-product regulations or non-financial reporting, and ~20% were unaware of the packaging law. Even for relatively well-publicized directives (consumer rights, waste management), there were notable percentages of non-information. This points to a problem that goes beyond national borders: effective implementation of the circular economy in Europe requires harmonization not only of the legal framework but also of the level of public information. The EC has recently recognized the importance of consumer empowerment in achieving the objectives of the Green Pact. In 2022, the Commission proposed strengthening consumer rights for the green transition - from the right to know the lifespan of products and repair possibilities to measures against greenwashing (European Commission, 2022). The aim of these initiatives is precisely to transform consumers into informed actors in the green transition who are able to make informed, sustainable decisions. Our study provides timely empirical support for this policy direction: we have shown that an informed consumer is more likely to adopt pro-cyclical behaviors, so investment in environmental civic information and education has the potential to amplify the impact of the rules at the behavioral level. At the same time, the identification of the skeptical segment warns that public trust needs to be gained through coherent policies and tangible benefits. Otherwise, the mere multiplication of rules risks generating apathy or resistance. Thus, trans-national harmonization should aim not only at uniformity of EC regulations in different countries, but also at uniformity of communication and education efforts, so that the message of the circular transition reaches consumers from different cultural and economic backgrounds in a tailored and effective way.

Overall, the discussion of these results emphasizes a key message: the European consumer has a central, but still strengthening, role in the circular economy. There are clear signs that, once informed and equipped with the right tools (rights, labels, extended safeguards), the consumer responds positively - a phenomenon also evidenced by the significant correlations identified and the favorable attitudes of some segments. On the other hand, the overall low level of familiarity and the existence of critical perceptions show that we are still far from the full potential of the consumer as an agent of change. This double reality, promising but largely untapped potential, calls for concerted action by policymakers, academia and the private sector to facilitate consumers' contribution to the circular transition.

6. CONCLUSIONS

This study investigated, on a quantitative basis, European consumers' familiarity with circular economy legislation and how this familiarity correlates with sustainable

consumption behavior. By testing a set of hypotheses and applying a suite of statistical analyses (non-parametric correlation, exploratory factor analysis and clustering), we obtained a nuanced picture of the consumer-regulatory relationship in the context of the ecological transition. The main result highlights a positive and significant link between knowledge of circular legislation and its perceived impact on consumer decisions, confirming that legal information can facilitate more sustainable behaviors. We also identified three distinct segments of consumers according to their level of knowledge and attitude, suggesting that the public is not homogeneous in relation to the circular economy: there are both informed pioneers and majorities that are still uninformed or even resistant.

This research addresses a notable gap in the existing literature by examining the underexplored role of legal awareness in shaping consumer behavior within the circular economy. While previous studies have primarily focused on environmental attitudes and psychological drivers of sustainable consumption (e.g., Camacho-Otero et al., 2020; Szilagyi et al., 2022), our study offers new empirical insights by demonstrating that knowledge of legislation is a significant predictor of pro-circular behavior. Compared to authors such as Mak and Terryn (2020), who emphasize the shortcomings of current EU legal frameworks in supporting CE, our findings empirically confirm that familiarity with laws positively influences consumer decision-making. This result also aligns with and supports previous findings by Kulli et al. (2023) and Lopez and Legardeur (2024), who highlight the importance of knowledge and attitudes in the decision-making process. Therefore, our research contributes to a more comprehensive understanding of the regulatory dimension of CE and underscores the importance of integrating legal education and transparency into sustainable consumption policies.

Additionally, these findings have significant practical and policy implications. Firstly, they suggest the need to strengthen large-scale consumer education and information efforts. The fact that only a quarter of a third of respondents say they are at least "moderately familiar" with concepts such as the right to repair, packaging recycling or by-product recovery indicates a knowledge gap that needs to be addressed through dedicated campaigns. Public authorities, at both national and European level, should work with consumer organizations, environmental NGOs and businesses to popularize the principles of the circular economy and key provisions of related legislation. Modern methods of communication (interactive online platforms, apps that inform consumers of their environmental rights, digital labelling, etc.) can be used to increase the visibility of this information. An example of emerging good practice is the European Commission's proposal to introduce clear labelling of the durability and repairability of products, so that buyers know from the outset what to expect from a good they buy (European Commission, 2022). The implementation of such measures, accompanied by their promotion to the public, could raise awareness and thus have a positive influence on consumer behavior.

Second, the normative implications of the study suggest further efforts to adapt the regulatory framework to sustainability objectives, while ensuring that this framework is coherent and harmonized across countries. Our results confirm that

policies matter - consumers react to the existence of laws and regulations by adjusting (to some extent) their behavior. Therefore, extending and refining circular economy legislation across the EU and in partner countries becomes a strategic endeavor. Measures such as banning greenwashing practices and combating planned obsolescence, proposed at the European level, are welcome and, in our approach, necessary: they not only protect consumers from misleading information, but can also increase their confidence that their efforts to consume sustainably have real meaning and support. At the same time, consumer rights need to be extended towards sustainability - e.g. the right to repair, spare parts and long-term software upgrades, the right to information on the environmental footprint of products, etc. - so that sustainable choice becomes the default and easy option for the average citizen. Mak and Terryn (2019) emphasize the limitations of the traditional approach to consumer protection and advocate for the integration of environmental objectives into this area of law. Our findings, which reveal both the benefits of information and the need for additional interventions, support this view: consumer empowerment in the age of the circular economy requires not only information, but also the reshaping of norms to guide behavior towards repair, reuse and waste reduction.

From a European policy perspective, this research highlights the importance of transnational harmonization of efforts. Not all European countries are at the same stage of the circular transition, and the level of consumer familiarity may vary depending on the local context (national legal framework, civic culture, economic priorities). However, the EU's circular economy and climate neutrality goals require convergence: consumers across Europe need to move together on the knowledge and participation curve. Our survey, covering respondents from different regions, suggests that broadly the challenges are similar - for example, the need for information is recurrent. Therefore, pan-European initiatives (such as the European Week for Waste Reduction, green education networks in schools, or shared resource platforms on the circular economy) can be valuable tools to ensure that key messages reach everywhere and that a sense of common endeavor is created. Harmonization of regulations needs to go hand in hand with the exchange of best practices between countries: if one country manages an effective campaign to promote, say, recycling or second-hand shopping, these lessons should be shared and replicated in others.

Scientifically, our research contributes to the literature on the consumer and the circular economy by providing new empirical evidence on the link between knowledge of legislation and consumption behavior. This angle of approach - at the intersection of consumer sciences, public policy and sustainability - has highlighted the bridging role played by the consumer: he is both the addressee of regulations and the factor without which the objectives of these regulations (waste reduction, increased reuse, etc.) cannot be achieved. The study thus demonstrates in an integrated way that consumer protection and environmental protection can and must go hand in hand and reinforce each other. For policy makers, this means that environmental policies should be thought with the consumer at the center of attention, and consumer protection policies should be thought with sustainability in the background - a conceptual alignment that is

already beginning to take shape in EU policy documents.

Limitations of our study include the unrepresentativeness of the sample (which was based on an online convenience survey) and the possibility of response bias (people interested in the topic might be over-represented). Consequently, the results should be interpreted with caution in terms of generalizability. However, the trends identified - the knowledge-behavior correlation and the existence of attitudinal clusters - provide valid hypotheses for future studies and benchmarks for decision-makers. Future research could extend the analysis to larger and more diverse samples, possibly at the Member State level. It could integrate qualitative methods (interviews, focus groups) to deepen the reasons behind the figures (why skeptical consumers are not trusting, what kind of information would change the opinion of an uninformed consumer, etc.). Also, actually assessing observed behaviors (not just self-reported ones) in relation to the level of legal knowledge would be a step forward in validating the causal link between information and action.

In conclusion, the research emphasizes the importance of the consumer as an essential link in the chain of the transition to the circular economy. European consumers have, on the whole, positive intentions and receptiveness to the idea of circularity, but their level of familiarity with their rights and responsibilities in this area remains low. Improving this state of affairs through education, information, and participatory involvement is a prerequisite for the success of circular economy policies. Only by transforming the consumer from a passive, often unaware, actor into an informed, protected and co-interested agent in achieving sustainable goals, will Europe be able to fully realise its ambitions for a green transition and circular economy in the long term. This article provides evidence and arguments in support of such an approach, emphasising that familiarity with the rules and the alignment of consumer attitudes with the goals of these rules are key elements that deserve increased attention from policymakers and the scientific community alike. In sum, protected and well-informed, the consumer becomes the most important ally of the circular economy, ensuring through his or her daily choices the realization of sustainability principles and bridging the gap between public policies and fundamental change in society.

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ДОНОШЕЊЕ ОДЛУКА ПОТРОШАЧА И ПРАВНА СВЕСТ У ЦИРКУЛАРНОЈ ЕКОНОМИЈИ: РЕГУЛАТОРНА ПЕРСПЕКТИВА

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Извод

Линеарни економски модели су редовна пракса још од индустријске револуције, али су продубљивање проблема одрживости и акумулација отпада довели до концепта циркуларне економије, која би могла да ублажи еколошки терет на индустрије и друштва. Функционисање таквих економских модела увек је поткрепљено правилима и прописима које су развила национална и међународна законодавна тела. Циљ рада је да се истражи упознатост потрошача са законодавством о циркуларној економији и како се то познавање повезује са одрживим понашањем потрошње. Главни резултат истиче позитивну и значајну везу између знања о циркуларном законодавству и његовог перципираног утицаја на одлуке потрошача, потврђујући да правне информације могу олакшати одрживије понашање. Идентификована су три различита сегмента потрошача према њиховом нивоу знања и ставу, што сугерише да јавност није хомогена у односу на циркуларну економију. Наши налази имају значајне практичне и политичке импликације. Прво, они сугеришу потребу за јачањем великих напора у образовању и информисању потрошача. Друго, нормативне импликације студије сугеришу даље напоре да се регулаторни оквир прилагоди циљевима одрживости, уз истовремено осигуравање да је овај оквир кохерентан и усклађен у свим земљама.

Кључне речи: циркуларна економија, означавање еколошког отиска, ЕФА, K-Means груписање, правни прописи

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