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European Consumers' Attitudes towards the Environment and Sustainable Behavior in the Market

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Abstract: The scope of this paper is to analyze European consumers' attitudes and behavior towards the environment. The paper has the following main objectives: measuring homogeneity and heterogeneity within and between European countries with reference to citizens' involvement with environmental issues, verifying the relationship between attitude and behavior, and identifying factors that might favor sustainable actions and consumption. The hierarchical nature of the data requires the estimation of multilevel models, specifically multilevel latent class models to cluster citizens and countries and multilevel logistic regression models to correlate green actions with environmental attitudes and sociodemographic characteristics. Six homogeneous groups of citizens with different levels of sensibility towards environmental topics were identified, and four groups of European countries were identified with similar compositions in terms of clusters of citizens. The analyses indicate that there is a direct influence of attitude towards the environment on behavior. Estimation results also show significant effects of consumers' sociodemographic characteristics.

Keywords: circular economy; sustainability; latent class analysis; regression models; multilevel analysis

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1. Introduction

During the twentieth century, humanity was involved in an unprecedented process of evolution and political, social, and economic change. Scientific and technological progress has significantly expanded, well-being has increased, and our society has assumed a marked urban and industrial character. However, there is a widespread awareness that our development model has taken a dead-end road and that it is necessary to reorient the foundations through which it is possible to guarantee adequate well-being for future generations. The global temperature has risen by one degree Celsius since the preindustrial period, and most climatologists identify the cause of this phenomenon as the greenhouse gases emitted by human activities [1]. In this sense, the concept of green economy emerged from the need to develop a paradigm for the use of resources aimed at achieving inter- and intragenerational equity. Specifically, an economy can be defined as green when it causes low levels of gas emissions, uses resources efficiently, and is socially inclusive [2]. According to the [3], green economy favors growth, creates employment, fights poverty, and safeguards natural resources, which are the capital on which the survival of our planet depends. The objectives of green economy can be summarized in three categories: (1) social equity and the fight against poverty, (2) environmental resilience and protection of biodiversity, (3) and improving the use of resources. However, as [4] writes, green economy strategies will be successful only if they consider the political, economic, and cultural constraints specific to each country; moreover, it is very important to underline that implementing green policies requires non-negligible investments [5]. Overall, the objective of the green economy, which is mostly related to the productive sectors, is that of improving the use of resources, a goal that is linked to the concepts of sustainability and circular economy.

The idea of the circular economy (CE) appeared at the end of the last century; the first scientific papers on the topic were published in the 1980s, and it has received increasing

attention from scholars and practitioners since then [6]. Although this vast literature offers many definitions of the circular economy, the key concept refers to harmonizing economic growth and environmental protection; in brief, we may say that a circular economy regenerates itself. Academics and practitioners increasingly see CE as a promising concept for sustainable development. The theory of circular economy encompasses the principles of ecological economics, recognizing that the Earth's ecological system has limited resources and environmental capabilities [7]. In practice, the circular economy refers to all activities aimed at environmental protection, pollution prevention, and energy efficiency. A popular definition of the circular economy takes advantage of the easy-to-remember 3Rs—reduction, reuse, and recycling—and it describes the practical approach to the concept (see, for example, [8]). Recently, the 3Rs have been extended to the 9Rs, with the scope to describe the transformation from a linear production system to a circular system in detail [9]. Geissdoerfer et al. [10] defined the circular economy as "a regenerative system in which resources input and waste, emissions, and energy leakage are minimized by slowing, closing, and narrowing material and energy loops. This can be achieved through long-lasting design, maintenance, repair, reuse, remanufacturing, refurbishing, and recycling", which comprises almost all the aspects indicated above.

In 2014, the European Commission (the body responsible for proposing new EU legislation) published its 2015 Circular Economy Package with the stated objective of "closing the loop" of product lifecycles [11,12]. In particular, the guidelines state that products should be redesigned so that they are easy to maintain, repair, remanufacture, or recycle, which is another way of describing the principle of the 3Rs. [13] provided an overview of this package. Forerunner countries such as Finland, the Netherlands, and the UK have adopted and applied national-level policies explicitly framed as circular [14,15] conducted a study of seven European nations and found that a shift to a circular economy would reduce each nation's greenhouse gas emissions by up to 70% and grow its workforce by approximately 4%—the ultimate low-carbon economy.

Implementing the concept of circular economy is a challenging task, given the prevalence of a linear mindset in industry and society. According to various researchers, the environmental benefits of a circular economy are easier to perceive than the economic benefits. Implementing circular economy practices often entails industries making extra investments that might not be considered profitable. It is generally believed that policy initiatives favoring the circular economy are required worldwide. In Europe, the current rules do little to foster this market development [16].

There is a vast literature on the factors that might affect enterprises in adopting sustainable practices. For example, a few papers have focused on barriers and enablers to implementing actions regarding CE [17]; others have been more generally concerned with drivers for enterprises to engage in CE practices (see [18,19]). At the company level, factors affecting the choice to undertake sustainability activities are related to age [20], dimensions [21], economic activity sector [22], and the role of the company in the production chain [23]. Among company-level factors that may trigger and sustain the willingness of companies to promote CE, consumers' attitude towards the environment plays an important part. Ethics play a central role in many companies, especially publicly exposed enterprises that have to maintain their reputation [24] using marketing tools, communications, and public relations [23]; these companies are influenced to adopt environmental strategies [25]. Corporate social responsibility (CSR) also plays an important role because when CSR activities are implemented, "stakeholders' expectations increase and the company is forced to meet them and even reinforce them" [26]. According to [27] consumers' environmental consciousness is particularly advanced in European countries with respect to other areas of the world; however, few studies have focused on the differences within and between countries. The scope of this paper is to analyze European consumers' attitudes and behaviors towards the environment, exploiting the rich dataset from the Special Eurobarometer survey 92.4 conducted in December 2019 on a sample of citizens living in the 28 EU countries. Specifically, this paper has the following main objectives: measuring

homogeneity and heterogeneity within and between European countries with reference to citizens' involvement with environmental issues; verifying the relationship between attitude and behavior; and identifying factors that might favor sustainable actions and consumption.

The remainder of the paper is organized as follows. In Section 1, we review the literature on the topic. In Section 2, we present the dataset and some descriptive statistics of the variables used in the subsequent analyses. In Section 3, we introduce the applied methodology. In Section 4, we describe model estimation and the results, and in Section 5, we discuss the results and present conclusions.

Consumers' Attitudes and Behaviors towards the Environment: Literature Review

The Bruntland report, published by the World Commission on Environment and Development in 1987 (https://sustainabledevelopment.un.org/content/documents/5987our-common-future.pdf accessed on 11 January 2023), defined sustainable development as development that satisfies present needs without damaging future generations. This pioneer report on the topic underlines the strict link between environment and development. Since then, many activities and many documents have been proposed at the international level, for example, the United Nations Conference on Environment and Development in Rio de Janeiro in 1992 and the Kyoto Protocol of 1997. After 1992, sustainable development became a priority of the United Nations and the international community. The notion of sustainability is commonly associated with its three main declinations: environmental, economic, and social. Environmental sustainability is the ability of current and future generations to satisfy their needs and to exploit natural resources without compromising the ecosystem. More specifically, it represents the condition of balance, resilience, and interconnection that allows human society to satisfy its needs without exceeding the capacity of the ecosystem or damaging biological diversity [28] Economic sustainability refers, in general, to the conditions under which a certain level of production and consumption can be sustained over time [29]. By social sustainability, the reference literature means the ability to support conditions of human well-being in terms of safety, health, and education equally distributed according to social class and gender [30].

The concepts of sustainability and circular economy share many similarities; the context in which they have developed is dominated by the risk of compromising the opportunities of future generations, for which considerable efforts are required to ensure generational equity in the use of resources [10]. In both cases, technology has a central role, and through innovation and redesign of the development system, it allows for the implementation of efficiency in the use of resources, guaranteeing a competitive advantage [31].

Lieder et. al [6] provided an extensive review of the research on various relevant ideas and the most common practical implementations of the circular economy. A number of complementary definitions of the concept emerged from their work, emphasizing its different but important facets. For example, [32] defined the circular economy as a "realization of closed-loop material flow in the whole economic system", underlining eco-industrial development. In one of the first definitions of the circular economy, [15] also took economic properties into account: "an economy based on a spiral-loop system that minimizes matter, energy-flow and environmental deterioration without restricting economic growth or social and technical progress". The [33] proposed a more comprehensive definition that includes environmental and economic advantages, according to which the circular economy is "an industrial economy that is restorative or regenerative by intention and design". This recent definition incorporates the idea of ensuring the safe entry of bio-nutrients in the biological sphere. Another important notion in this context is the difference between the circular economy and the linear production system; whereas the linear system perceives end-of-life products as waste, the circular economy sees them as resources, which also has an impact on the environment, on resource scarcity, and on economic benefits.

The circular economy was formally adopted in 2002 by the Central Government of China as a new development strategy to protect the environment and limit the production

of pollution. This event led to many scientific publications on both theoretical aspects and practical implementations focusing on the Chinese area and/or authored by Chinese researchers. However, the roots of the topic of CE are in Europe, and various regions of the developed world are increasingly receptive to the concept.

Circular economy can be defined as a new paradigm that decouples economic growth from the consumption of resources, rethinking production and consumption models to reduce waste and reuse materials within infinite production cycles. This new approach to resources applies throughout the entire life cycle of the products, from design to recovery at the end of life, and it has to be adopted by all actors in the production and consumption system—i.e., firms, distributors, and consumers—in order to be successful.

A company can be defined as sustainable when it adopts the following practices: it minimizes or eliminates the use of new materials extracted from the Earth; it creates outputs that can be used by other processes or restored to their natural state, eliminating waste that cannot be used or restored to its natural state; it uses the least amount of energy possible to achieve the desired result; and it uses energy essentially produced from renewable sources [34]

All agents in the production and consumption process play a significant role in the circular economy. Much earlier research focused on non-consumption ecological behavior, such as recycling, appropriately disposing of waste, and saving energy and water [35,36].

Recent research showed that consumers are willing to spend more if a brand adopts sustainability policies [37] and that, in general, the market value of an ethical attitude is now undeniable—so much so that sustainability is now seen as a strategic element capable of triggering new competitive dynamics and playing a pivotal role in competition [38].

As [39] wrote, CE is considered an appropriate tool to attain the 17 Sustainable Development Goals (SDGs) promoted by the EU in 2015 as part of Agenda 2030 (https://sdgs.un.org/goals (accessed on 10 January 2023)). One of the 17 goals of the 2030 United Nations Agenda for Sustainable Development is specifically dedicated to responsible consumption and production (goal 12); however, consumers' attitudes and behavior towards the environment can also have positive and significant direct and indirect effects on the other goals [40]. Therefore, this topic deserves further research and investment.

Chen et al. [41] stated that consumers' behavior is one of the main causes of environmental deterioration and showed that consumers' attitude towards the environment have a direct effect on the purchase of green products. However, as already noted, [27] suggested that similar levels of environmental consciousness may lead to different levels of pro-environmental behavior, depending on the cultural, economic and social context. Their research was conducted on a sample of students living in four European countries (Germany, Portugal, Spain, and Great Britain), asking questions about environmental values, attitudes, and behaviors. The results of the analyses confirmed the existence of significant differences between countries with respect to all investigated phenomena.

The relationship between environmental attitudes and behavior is a debated topic in the reference literature. For example, [42] conducted research on buying disposable vs. reusable diapers and argued that consumers who have fewer concerns about the environment chose products that do not complicate their daily routine. Similarly, [43] examined the topic of encouraging the purchase of sustainable clothing. As a result, it can be stated that even if there is an agreement in the reference literature on the relationship between environmentally friendly attitudes and behavior, it is not clear how strong this relationship is [44], nor which specific factors influence it [45].

According to [46], cultural differences affect consumers' interest in green topics; these differences appear between countries but also within them. For this reason, the data collected on this topic from a sample of citizens in all 28 EU countries by Eurobarometer surveys are of great utility in this field of study. The opportunity to simultaneously analyze data collected in all 28 EU Member States (MSs) is the first original contribution of the present paper to the reference literature; the majority of published papers concentrate on a group of selected European countries. However, policies to increase implementation of

a circular economy and sustainability concern relevant decisions at the European level; therefore, similarities and differences between and within countries must be well known.

2. Data and Descriptive Statistics of the Variables Used for The Analyses

Data analyzed in this paper were collected with the Standard Eurobarometer 92.4 conducted face-to-face (CAPI) in December 2019 on a probabilistic multistage sample of 27,498 European citizens from different social and demographic groups [47]. The 28 countries included in the survey are (alphabetical order) Austria, Belgium, Bulgaria, Cyprus, Croatia, Czech Republic, Denmark, Estonia, Finland, France, Germany (in this dataset, information collected in former East and West Germany is treated separately), Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, and the United Kingdom.

The questionnaires in different languages and the collected data are available at https://search.gesis.org/research_data/ZA7601 (accessed on 10 January 2023). For details on the methodology used for the survey, refer to [47]. In this respect, it is worth pointing out that the number of interviews is almost the same in all countries (1000), except smaller countries such as Cyprus, Luxembourg, and Malta (500). Furthermore, questions refer to general attitudes towards the environment, the impact of environmental issues and of that of plastics and chemicals, and ways of acting to contribute to environmental protection, as well as a special section devoted to the clothing industry.

For our analyses, we concentrated on three types of variables: (i) variables referring to citizens' concerns towards the personal (noise and air pollution), national (air and river pollution, damage to the sea, and waste), and global (extinction of species of plants and animals and climate change) environment; (ii) variables describing eco-friendly behavior through 14 actions in the six months preceding the interview, such as sustainable travelling, buying reusable products, recycling, repairing products, and saving water and energy; and (iii) variables related to social and demographic characteristics, specifically gender, age, living with or without children, political orientation, type of area where living, Internet usage, and economic conditions. Tables 1–3 report the descriptive statistics of the variables considered for the analyses; descriptive statistics were performed by weighting raw data so as to make the samples representative of the countries from which they were collected.

Table 1. Descriptive statistics for variables referring to concern towards the environment (reported as percentages).

Protecting the Environment		***Worried about the Effects of Chemicals on Health***	
Very important	53.4	Totally agree	45.5
Fairly important	40.8	Tend to agree	40.0
Not very important	4.7	Tend to disagree	10.5
Not all important	0.8	Totally disagree	3.2
Climate change in your country		*Worried about the effects of chemicals on the environment*	
Very serious	76.4	Totally agree	47.9
Fairly serious	15.6	Tend to agree	41.6
Not serious	6.9	Tend to disagree	7.6
Climate change in the EU		Totally disagree	1.8
Very serious	77.1	*Consumption habits affect the environment*	

Table 1. *Cont.*

Protecting the Environment		***Worried about the Effects of Chemicals on Health***	
Fairly serious	14.1	Totally agree	24.0
Not serious	5.8	Tend to agree	42.0
Worried about the environment impact of plastics		Tend to disagree	21.0
Totally agree	48.2	Totally disagree	9.0
Tend to agree	41.2	*Most important issues*	
Tend to disagree	7.5	Climate change	52.8
Totally disagree	1.9	Growing amount of waste	46.3
Worried about the environmental impact of microplastics		Air pollution	46.0
Totally agree	49.6	Marine pollution	40.0
Tend to agree	38.5	Water pollution	37.6
Tend to disagree	7.0	Extinction of species	36.6
Totally disagree	2.2	Frequent floods	28.2
Worried about direct effects on daily life and health		Drinking water shortage	23.7
Totally agree	36.0	Noise pollution	8.8
Tend to agree	42.0		
Tend to disagree	15.0		
Totally disagree	5.0		

Table 2. Descriptive statistics for variables referring to environmental behavior (reported as percentages).

Done in the Past Six Months	
Separated most waste for recycling	66.4
Avoided single-use plastic goods	44.6
Bought local products	42.2
Cut down energy consumption	37.3
Spoken about environmental issues	32.1
Repaired a product instead of replacing it	31.7
Avoided buying over-packaged products	31.0
Cut down water consumption	29.1
Chosen a more environmentally friendly way of travelling	27.3
Bought products with an environmental label	21.7
Bought second-hand products	21.1
Avoided unnecessary car trips	21.1
Changed diet to more sustainable food	19.0
Taken part in an environmental activity	6.7

The percentages listed in Table 1 demonstrate a considerable concern among European citizens towards environmental topics. A proportion of 90% of the respondents recognize protecting the environment as important and climate change as a serious problem. In

particular, half of respondents rank the environment as the most important issue to face. However, as we will document below, there are differences across countries, for example, the proportion of respondents who consider environmental protection as very important ranges from 36% in Estonia and Latvia to 81% in Sweden [47].

Table 3. Descriptive statistics for variables referring to respondents.

Left–Right Placement		***Marital Status***	
Left	28.4	Single without children	29.8
Center	35.3	Single with children	5.9
Right	19.2	Multiple without children	32.2
Refusal	17.2	Multiple with children	31.0
Gender		Other	1.0
Man	48.8	*Type of community*	
Woman	51.6	Rural area	29.8
Internet use		Small–medium town	44.5
Everyday	77.6	Large town	25.6
Often	8.5	*Difficulties paying bills*	
Never	12.0	Most of the time	6.0
No Internet	1.9	From time to time	23.5
Average age	48.4	Almost never	68.8
		Refusal	1.6

With respect to environmental behavior, the most performed actions regard waste, recycling, and saving; however, buying local products occupies the third position in the ranking of the most performed actions in the six months before the interview, with a proportion of 42.2% positive responses. Environmental behavior differs across EU MSs; for example, in Romania, citizens performed, on average, 2.8 actions in the reference six months (the lowest values), whereas in Sweden, the average number of actions was 6.9 (Figure 1).

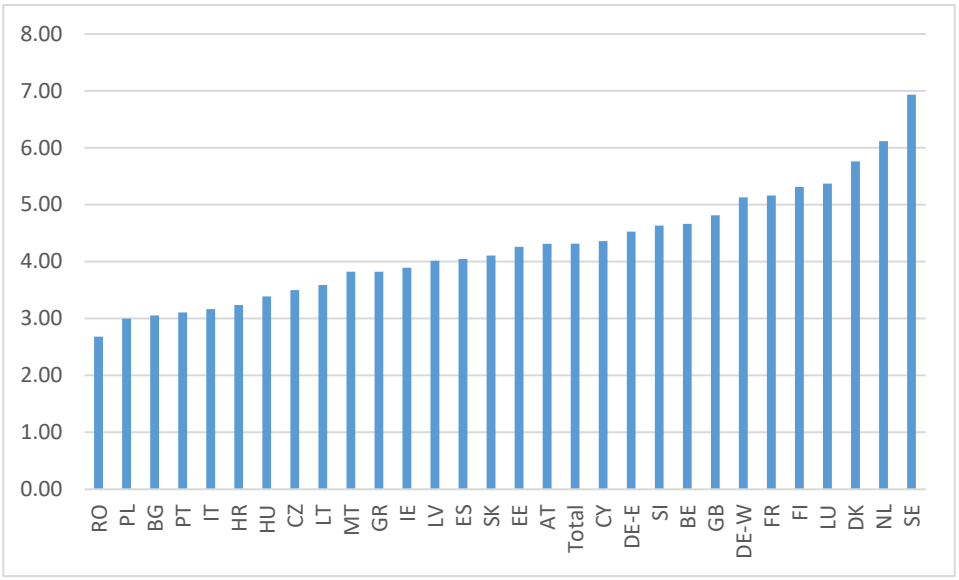

Figure 1. Average number of environmentally friendly actions performed by citizens in the six months preceding the survey by country.

3. Methodology

The hierarchical nature of our data requires the estimation of multilevel models. To evaluate similarities and differences within and between European countries with regard to citizens' attitudes towards environment protection, we applied a multilevel clustering procedure based on latent class (LC) analysis [48]. To identify factors that significantly affect green behavior by citizens in the EU MSs we resorted to multilevel regression models [49]. Using the multilevel approach, it is possible to account for the fact that observations might not be independent because they are nested in higher-level units. An example of this data structure is that of pupils (first-level units) divided into classes (second-level units); educational achievement by students in the same class is due to individual characteristics but also to factors that they have in common, for example, teachers [50,51]. Traditional methods of statistical inference assume that observations are independent; this is not necessarily true in hierarchical structures, as in the classroom example. Multilevel modeling accounts for eventual correlation among first-level units. In our dataset, first-level units are citizens, and second-level units are EU countries. It is very plausible that responses by citizens living in the same country are not independent but influenced by common economic, social, and cultural factors.

Latent class (LC) analysis provides models that explicitly consider the fact that one or more latent variables exist that are not directly observable when studying relationships between observed variables and takes into account the categorical nature of these variables.

Let:

Y_{ijk}, $i = 1, \ldots, I$, $j = 1, \ldots, J$, $k = 1, \ldots, K$ denote the response of individual or level-1 unit i within group or level-2 unit j on indicator or item k;

$s_k = 1, \ldots S_k$ be a particular level of item k;

Z_{ij} be a latent variable with L classes;

L be a particular latent class, i.e., $l = 1, \ldots, L$;

$\underline{Y}_{ij}$ be the full vector of responses of case i in group j; and

$\underline{s}$ be a possible response pattern.

The probability structure defining a simple LC model can be expressed as follows:

$$P(\underline{Y}_{ij} = \underline{s}) = \sum_{l=1}^{L} P(Z_{ij} = l) P(\underline{Y}_{ij} = \underline{s} | Z_{ij} = l) = \sum_{l=1}^{L} P(Z_{ij} = l) \prod_{k=1}^{K} P(Y_{ijk} = s_k \Big| Z_{ij} = l) \quad (1)$$

As specified in Equation (1), the probability of observing a particular response pattern is a weighted average of a class-specific probability ($P(Y_{ijk} = s_k \Big| Z_{ij} = l)$), the weight of which is the probability that unit i in group j belongs to latent class l. As the local independence assumption implies, indicators (Y_{ijk}) are assumed to be independently conditional on LC membership. This model is also referred to as a traditional LC cluster model within the relevant literature [52].

Multilevel latent class modeling [53] is an approach based on the assumption that some model parameters can vary across groups or level-2 units. This is in contrast to traditional latent class modeling, which assumes that the parameters are the same for the whole sample. The multilevel approach allows for variation across level-2 units for the intercept (threshold) of each latent class indicator. This makes it possible to examine how level-2 units influence the level-1 indicators that define latent class membership. This method adopts a random-effects approach rather than a fixed-effects approach, enabling the effects of level-2 covariates to be verified in terms of the probability of belonging to a given latent class.

A multilevel LC model [53] consists of a mixture model equation for level-1 and level-2 units in which a group-level discrete latent variable is introduced so that the parameters are allowed to differ across latent classes of groups:

$$P(\underline{Y}_{ij} = \underline{s}) = \sum_{h=1}^{H} \left[P(W_j = h) \prod_{i=1}^{n_j} \left[\sum_{l=1}^{L} P(X_{ij} = l | W_j = h) \prod_{k=1}^{K} P(Y_{ijk} = s_k \middle| Z_{ij} = l) \right] \right] \quad (2)$$

where:

W_j denotes the latent variable at the group level, assuming value h, with $h = 1, \ldots, H$; and

n_j is the size of group j.

Equation (2) is obtained with the additional assumption that n_j members' responses are independent of one another, conditional on group class membership. The multilevel LC model can include level-1 and level-2 covariates to predict membership.

In the terminology of MLLC modeling, the categories of the latent variable for level-1 units are called clusters, whereas the categories of the latent variable for level-2 units are called classes.

Multilevel regression models [54,55] simultaneously estimate at two levels. The individual level measures the impact of the characteristics of the citizens (level-1 units) in each country (level-2 units) on their green behavior, whereas the country level highlights the similarities (or differences) between EU countries. Using the same notation introduced in the preceding paragraph, a multilevel regression model is specified by:

$$y_{ij} = \beta x_{ij} + u_j + \varepsilon_{ij}$$

where x_{ij} is the vector containing the values of the covariates for observation i in group j; β is the vector of parameters (fixed effects); u_j is the random effect for group j representing factors affecting y_{ij} that are shared within class j after controlling for individual covariates; and ε_{ij} is the error term with the usual assumptions, i.e., that errors are independently distributed as normal with 0 mean and equal variance. The intraclass correlation coefficient (ICC) is the proportion of the total dispersion that is explained by the country level.

4. Estimation Results

The best-fitting MLLC model identifies six homogeneous groups of citizens (clusters) and four homogeneous groups of European countries (classes). Model fit was judged with reference to the BIC index. The selected model shows the lowest values of BIC among models estimated for all relevant combinations of the number of clusters and classes [56].

As indicators of the MLLC model, we used the responses to the questions referring to citizens' concerns and attitudes towards the environment reported in Table 1, whereas the sociodemographic characteristics listed in Table 3 and the number of green actions performed in the six months preceding the interview enter into the model as active first-level covariates. The six clusters of citizens are described below; note that they are presented in decreasing order of citizens' attention to environmental matters.

Cluster 1 has dimensions equal to 33.14% of the sample. These citizens are the most concerned with the environment. They consider climate change a very serious problem in their own country and in the EU. They judge all aspects mentioned in the questionnaire as important, except the risk of frequent droughts or floods. These citizens totally agree on the fact that environmental issues have a direct effect on their daily life and health; that their consumption habits adversely affect the environment in Europe; and that they are worried about the environmental impact of everyday products made of plastic and of microplastics and about the negative impact of chemicals present in everyday products on their health and on the environment. In the six months before the survey, they performed, on average, five green actions. The profile of the typical customer in this segment is a woman aged between 34 and 69, politically left-oriented, with children, living in a large town, with

no economic problems, and using the Internet every day. This is the cluster representing European citizens most involved with environmental problems. This is also the largest cluster.

Cluster 2 represents 13.81% of respondents. In this cluster, we find citizens who judge environmental protection as very important and climate change as a very serious problem both at the national and European levels. These citizens consider as important all aspects related to the environment, except air, noise, and agricultural pollution, as well as the growing amount of waste. They tend to agree on the facts that environmental issues have a direct effect on their daily life and health, that their consumption habits adversely affect the environment in Europe, and about the negative impact of chemicals present in everyday products on their health and on the environment. They strongly agree with the fact that they are worried about the environmental impact of everyday products made of plastic and microplastics. In the six months preceding the interview, they performed, on average, 6.5 green actions—the highest number across the clusters. The profile of the typical customer in this segment is a man; over 58 years of age; politically center- or left-oriented; without children; living in a small, medium-sized, or large town; with no economic problems; and using the Internet every day. This is the cluster representing a group of European citizens very much involved with the environment and mostly active in putting in place green behavior.

Cluster 3 has dimensions of 26.21%. In this cluster, we find citizens who judge environmental protection as fairly important and climate change as a very serious problem both at the national and European levels. The aspects that these citizens mention as important are the risk of frequent droughts or floods, air and noise pollution, climate change, and the growing amount of waste. These customers tend to agree on the facts that environmental issues have a direct effect on their daily life and health, that their consumption habits adversely affect the environment in Europe, that they are worried about the environmental impact of everyday products made of plastic and microplastics, and about the impact of chemicals present in everyday products on their health and on the environment. In the last six months, these citizens performed, on average, three green actions. The profile of the typical customer in this segment is a woman with an age between 15 and 58 years, politically center-oriented, single or in a couple with children, living in a rural area or in a small or medium-sized town, experiencing economic problems from time to time, and not frequently using the Internet. This is the group with the lowest mean age.

Cluster 4 represents 13.10% of respondents. Citizens belonging to this cluster judge environmental protection as fairly important and climate change as not a very serious problem both at the national and European levels. They mention only two aspects as relevant: water pollution and climate change. These respondents tend to agree with the facts that they are worried about the environmental impact of everyday products made of plastic and microplastics and about the impact of chemicals present in everyday products on their health and on the environment. They tend to disagree with the facts that environmental issues have a direct effect on their daily life and health and that their consumption habits adversely affect the environment. In the six months before the survey, these citizens performed, on average, 3.5 green actions. The profile of the typical customer in this segment is a man with an age between 34 and 58 years, politically center- or right-oriented, single with children or in a couple without children, living in a rural area, experiencing economic problems most of the time, and frequently accessing the Web (although not every day).

Cluster 5 has dimensions of 10.38%. Citizens belonging to this cluster judge environmental protection as not important and climate change as not a very serious problem both at the national and European levels. The only aspect that they mention as relevant is noise pollution. These respondents tend to agree to the facts that they are worried about the environmental impact of everyday products made of plastic and microplastics and about the impact of chemicals present in everyday products on their health and on the environment. They tend to disagree to the facts that environmental issues have a direct

effect on their daily life and health and that their consumption habits adversely affect the environment. In the six months preceding the interview, they performed, on average, 2.5 green actions. The profile of the typical customer in this segment is a man with an age either between 15 and 33 or over 70 years, politically center- or right-oriented, without children, living in a small or medium-sized town, experiencing economic problems most of the time or from time to time, and rarely accessing the Web.

Finally, cluster 6 comprises 3.37% of respondents. Citizens belonging to this cluster judge environmental protection as fairly important and climate change as a serious problem both at the national and European levels. The only aspect that they mention as relevant is the risk of frequent droughts and floods. They tend to disagree to the facts that they are worried about the environmental impact of everyday products made of plastic and microplastics, about the impact of chemicals present in everyday products on their health and on the environment, that environmental issues have a direct effect on their daily life and health, and that their consumption habits adversely affect the environment in Europe. In the last six months, they performed, on average, 1.8 green actions—the lowest number of actions across the clusters. The profile of the typical citizen in this segment is a woman over the age of 69 who did not answer to the question on political orientation, is single, living in a rural area, and experiencing economic problems most of the time or from time to time. This is the cluster of European citizens least involved with the environment and performing the fewest green actions. This is a very small cluster representing the oldest citizens with no Internet connection.

Table 4 summarizes the characteristics of the six clusters of consumers.

Table 4. Brief description of clusters (modal values).

	Cluster 1	**Cluster 2**	**Cluster 3**	**Cluster 4**	**Cluster 5**	**Cluster 6**
Protecting the environment	Very important	Very important	Fairly important	Fairly important	Fairly important	Fairly important
Climate change in your country	A very serious problem	A very serious problem	A very serious problem	A fairly serious problem	A fairly serious problem	A very serious problem
Climate change in the EU	A very serious problem	A very serious problem	A very serious problem	A fairly serious problem	A fairly serious problem	A very serious problem
Worried about direct effects on daily life and health	Totally agree	Tend to agree	Tend to agree	Tend to agree	Tend to disagree	Tend to disagree
Consumption habits affect the environment	Tend to agree	Tend to agree	Tend to agree	Tend to agree	Tend to disagree	Totally disagree
Worried about the environmental impact of plastics	Totally agree	Totally agree	Tend to agree	Tend to agree	Tend to agree	Tend to disagree
Worried about the environmental impact of microplastics	Totally agree	Totally agree	Tend to agree	Tend to agree	Tend to agree	Tend to disagree
Worried about the effects of chemicals on health	Totally agree	Tend to agree	Tend to agree	Tend to agree	Tend to agree	Tend to disagree
Worried about the effects of chemicals on the environment	Totally agree	Tend to agree	Tend to agree	Tend to agree	Tend to agree	Tend to disagree
Number of most important issues	8	6	4	2	1	1
Age	34–69	Over 59	15–58	34–58	15–33, over 70	Over 70
Number of of actions	5.0	6.5	3.0	3.5	2.5	1.8

Table 4. *Cont.*

	Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5	Cluster 6
Left–right placement	Center	Left	Center	Center	Right	No answer
Marital status	Couple with children	Couple without children	Single without children	Couple without children	Single without children	Single without children
Gender	Woman	Man	Woman	Man	Man	Woman
Type of community	Large town	Small/medium town	Small/medium town	Village	Small/medium town	Village
Internet use	Every day	Every day	Sometimes	Sometimes	Sometimes	Never
Difficulties paying bills	Almost never	Almost never	From time to time	Almost never	From time to time	From time to time

Our best-fitting model identifies the four classes of European countries depicted in Figure 2. Class 1 is comprises Belgium, Cyprus, Spain, France, Great Britain, Greece, Luxemburg, Malta, Slovenia, and Slovakia. Class 2 includes Bulgaria, Croatia, Hungary, Ireland, Italy, Lithuania, Poland, Portugal, and Romania. Class 3 comprises West Germany, Denmark, Finland, the Netherlands, and Sweden. Finally, class 4 includes Austria, Czech Republic, East Germany, Estonia, and Latvia. Table 5 reports the estimated conditional probabilities linking the six clusters to the four countries. These probabilities describe the composition of clusters of citizens in each class of countries. Countries in class 1 are associated with citizens in cluster 1, countries in class 2 are associated with citizens in clusters 3 and 6, countries in class 3 have the majority of citizens in cluster 2, and countries in class 4 are associated with clusters 4 and 5. In every class of EU MSs, one or two typologies of customers predominate; however, there is a presence of the other typologies with lower percentages. This result indicates heterogeneity between classes of countries, as cluster compositions differ across groups. However, a non-negligible quantity of within-class variability remains, even after multilevel clustering, which might be explained by economic, social, and demographic characteristics specific to each EU MS; this should be a topic of further studies.

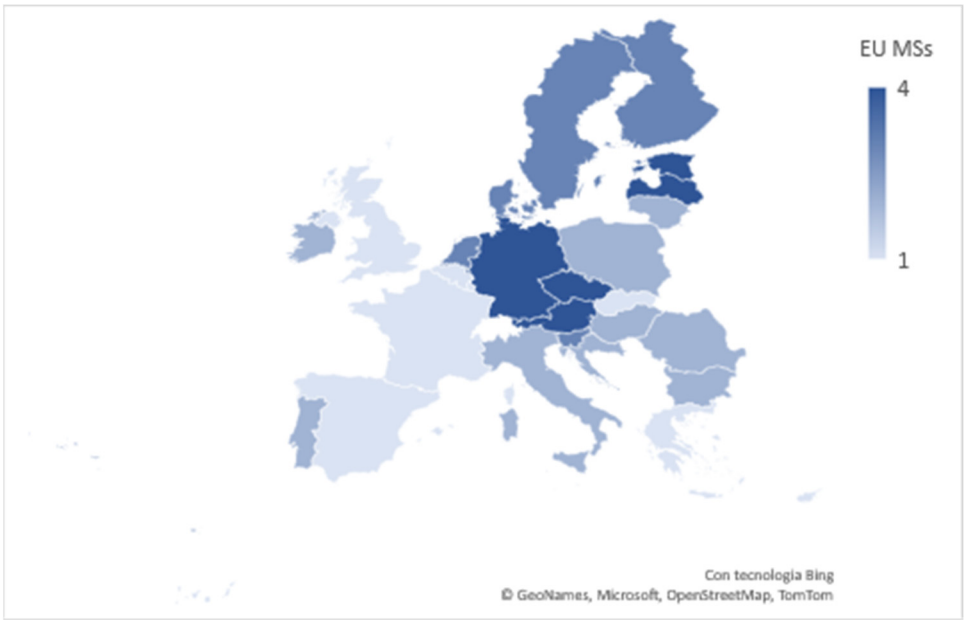

Figure 2. The four classes of EU MSs.

Table 5. MLLC model, estimation results, and conditional probabilities.

	Class 1	Class 2	Class 3	Class 4
Cluster 1	0.4154	0.3471	0.2268	0.2443
Cluster 2	0.1318	0.0253	0.3781	0.1087
Cluster 3	0.2752	0.3808	0.1066	0.1832
Cluster 4	0.0981	0.1057	0.1094	0.2611
Cluster 5	0.0538	0.0992	0.1493	0.1641
Cluster 6	0.0257	0.0418	0.0298	0.0386

The second goal of this paper is to understand which factors most influence citizens' green behavior in order to devise appropriate policies to favor such behaviors in European countries according to the goals of the 2030 Agenda. To this end, we estimated multilevel logistic regression (MLLR) models for the 14 binary variables referring to the actions monitored in the survey and reported in Table 2. Independent variables are the cluster to which each respondent is assigned according to posterior probabilities estimated with the multilevel latent class model and the sociodemographic characteristics reported in Table 3. Results of regression analysis are listed in Table 6; the columns in the table are ordered according to the percentage of respondents having performed that green action in the six months preceding the interview (in decreasing order). Among respondents' sociodemographic characteristics, gender and age were statistically significant in many multilevel logistic regression models. Being female has a positive effect on 11 of 14 actions, being a male has a positive effect only on the action of avoiding unnecessary car trips, and gender has no significant effect on cutting down energy consumption and on speaking about environmental issues. Age has a positive effect on the probability of separating most waste for recycling, buying local products, cutting down energy consumption, cutting down water consumption, and avoiding unnecessary car trips; it has a negative effect on the probability of speaking about environmental issues, choosing a more environment-friendly way of travelling, buying products with an environmental label, buying second-hand products, changing diet to more sustainable food, and taking part in environmental activities. For the other three actions, age was estimated to have a non-statistically significant effect.

Table 6. MLLR model estimation results.

	Separated Most Waste for Recycling	Avoided Single-Use Plastic Goods	Bought Local Products	Cut Down Energy Consumption	Spoke about Environmental Issues	Repaired a Product Instead of Replacing It	Avoided Buying Over-Packaged Products
intercept	−0.1778	0.4667	−0.8973 *	−1.1028 *	−0.8775 *	−0.9466 *	−1.0675 *
cluster 1	0.5062 *	0.7689 *	0.4909 *	0.6241 *	0.7126 *	0.4153 *	0.6955 *
cluster 2	−0.1161 *	−0.1334 *	−0.2179 *	−0.1542 *	−0.2474 *	−0.1812 *	−0.1368 *
cluster 3	1.0335 *	1.1001 *	0.8330 *	0.9646 *	1.0765 *	0.8024 *	0.8758 *
cluster 4	−0.0993 *	−0.0726 *	−0.0842 *	−0.0249	−0.1585 *	−0.0367	0.0201
cluster 5	−0.5993 *	−0.7242 *	−0.3483 *	−0.3943 *	−0.5281 *	−0.1963 *	−0.5852 *
cluster 6	−0.7251 *	−0.9387 *	−0.6736 *	−1.0154 *	−0.8551 *	−0.8036 *	−0.8694 *
age	0.0085 *	−0.0020	0.0071 *	0.0051 *	−0.0054 *	0.0012	−0.0005
man	−0.0816 *	−0.1132 *	−0.0983 *	0.0045	0.0119	0.1541 *	−0.1365 *

Table 6. *Cont.*

left	−0.0711 *	0.0686 *	0.0897 *	0.0530 *	0.2236 *	0.0617 *	0.1212 *
center	−0.0174	0.0060	0.0538 *	−0.0014	−0.0170	−0.0032	0.0507 *
right	−0.0394	0.0051	0.0729 *	−0.0155	0.0335	0.0197	0.0555 *
refusal	0.1279 *	−0.0796 *	−0.2164 *	−0.0361	−0.2401 *	−0.0782 *	−0.2275 *
single without children	0.0325	−0.0009	−0.1224 *	−0.0120	−0.0730	−0.1326 *	−0.0913
single with children	0.1514 *	0.0822	−0.0651	0.2289 *	−0.0661	0.1885 *	0.0317
couple without children	0.0884	0.1361 *	−0.0011	0.0838	0.1447 *	0.0727	−0.0147
couple with children	0.1775 *	0.1448 *	0.0939	0.2439 *	−0.1317 *	0.1901 *	−0.0406
other	−0.1492	−0.2961	−0.0253	−0.3666 *	0.3033	0.0318	−0.2687
rural area	0.1341	−0.4632 *	0.0019	−0.3149	−0.2300	−0.2801	−0.3910
small or medium town	0.0633	−0.4933 *	−0.1536	−0.4003	−0.2076	−0.4240 *	−0.4495
large town	0.0224	−0.4108	−0.2229	−0.3205	−0.1712	−0.3908	−0.4032
difficulties most of the time	−0.3076 *	−0.2159 *	−0.1683 *	−02192 *	−0.0862	0.0501	−0.0372
difficulties from time to time	−0.1375 *	0.0405	0.0447	0.0659	0.0139	0.0599	0.1068
no difficulties	0.2709 *	0.1639 *	0.1956 *	0.0768 *	0.0581	0.0217	0.1385 *
refusal	0.1742	0.0114	−0.0719	0.0765	0.0142	−0.1317	−0.2081 *
Web everyday	0.1520 *	0.2428 *	0.0793 *	0.2679 *	0.2419 *	0.2058 *	0.1740 *
Web sometimes	0.0927 *	0.0905 *	−0.0916 *	0.2055 *	−0.0342	0.2106 *	0.0742
no access	−0.0825 *	−0.1693 *	−0.2023 *	−0.0499	−0.1725 *	−0.2130 *	−0.2950 *
no Internet	−0.1622 *	−0.1639 *	0.2147 *	−0.4235 *	−0.0352	−0.2035 *	0.0469
ICC	0.0630	0.0254	0.0318	0.0149	0.0370	0.0153	0.0302
	Cut Down Water Consumption	**Chose a More Environmentally Friendly Way of Travelling**	**Bought Products with an Environmental Label**	**Bought Second-Hand Products**	**Avoided Unnecessary Car Trips**	**Changed Diet to More Sustainable Food**	**Took Part in an Environmental Activity**
intercept	−1.4235 *	−3.3984	−1.5734 *	−3.5968	−1.9643 *	−1.5613 *	−5.1178 *
cluster 1	0.5853 *	0.5196 *	0.7313 *	0.3523 *	0.5442 *	0.8043 *	0.5672 *
cluster 2	−0.0565	−0.2676 *	−0.0836	−0.2088 *	−0.2204 *	−0.1143 *	−0.1971 *
cluster 3	0.6901 *	0.9846 *	0.9863 *	0.6239 *	0.8099 *	0.8802 *	0.7081 *
cluster 4	0.0160	−0.1383 *	−0.0212	−0.0599	0.0447	−0.1045	−0.2294 *
cluster 5	−0.3717 *	−0.4652 *	−0.4151 *	−0.1943 *	−0.3565 *	−0.4458 *	−0.1626

Table 6. *Cont.*

cluster 6	−0.8632 *	−0.6331 *	−1.1977 *	−0.5131 *	−0.8220 *	−1.0199 *	−0.6862 *
age	0.066 *	−0.0064 *	−0.0054 *	−0.0140 *	0.0041 *	−0.0064 *	−0.0126 *
man	−0.0591 *	−0.0318 *	−0.1351 *	−0.1635 *	0.0696 *	−0.1360 *	−0.0752 *
left-	−0.0049	0.1300 *	0.1896 *	0.2021 *	0.1064 *	0.2316 *	0.3976 *
center	0.0845 *	0.0287	0.0215	−0.0544 *	0.0035	−0.0084	−0.1493
right	−0.0689	−0.0137	−0.0070	−0.0556	0.0207	−0.0375	−0.0187
refusal	−0.0107	−0.1450 *	−0.2041 *	−0.0921	−0.1306	−0.1856 *	−0.2296 *
single without children	−0.0472	0.0539	−0.0410	−0.0049	0.2773 *	−0.0988	0.0691
single with children	0.0001	−0.0104	0.0987	0.2775 *	−0.0785	0.0478	−0.2363
couple without children	−0.1027	−0.0786	0.0564	0.0139	−0.0507	−0.0636	−0.1282
couple with children	−0.0423	−0.1552 *	0.1133	0.1943 *	0.0401	−0.0771	−0.2391
other	−0.0201	0.2856	−0.3414	−0.2024	−0.1747	−0.0549	0.4998 *
rural area	−0.2171	2.2660	−0.4582	2.5606	−0.5296 *	−0.2902	2.0415
small or medium town	−02370	2.4525	−0.3779	2.4823	−0.3797	−0.1939	2.1834
large town	−0.1925	2.7470	−0.2718	2.5035	−0.3059	−0.1173	2.4100
difficulties most of the time	0.0046	−0.0766	−0.2844 *	0.2729 *	−0.0198	0.0166	0.1308
difficulties from time to time	0.0781	0.0261	0.0801	0.1428 *	0.0726	0.0948	0.1731 *
no difficulties	−0.0376	0.0352	0.1575 *	−0.2183 *	0.1203 *	0.0330	−0.1558 *
refusal	−0.0451	0.0152	0.0467	−0.1974	−0.1731	−0.1444	−0.1481
Web everyday	0.0242	0.0802	0.3374 *	0.1182	0.3619 *	0.2868 *	0.5561 *
Web sometimes	0.1357 *	0.0846	0.1619 *	0.0540	0.1953 *	0.3282 *	0.5152 *
no access	0.0357	0.0225	−0.2804 *	−0.1562 *	−0.2184 *	−0.1072	0.0643
no Internet	−0.1956 *	−0.0142	−0.2189 *	−0.0160 *	−0.3389 *	−0.4179 *	−1.1357 *
ICC	0.0327	0.0305	0.0487	0.0700	0.0357	0.5177	0.0511

* p-value < 0.05.

Declaring a left political orientation has a positive effect on performing almost all actions, except separating most waste for recycling and cutting down water consumption. Declaring a center-oriented political opinion has a significant positive effect on avoiding buying over-packaged products, cutting down water consumption, and buying local products; however, the effect of a center-oriented political position is negative on buying second-hand products. For the respondents who declared a politically right orientation, there is an estimated positive effect on the probability of avoiding buying over-packaged products and buying local products. Refusing to give an answer about political ideas

was associated with estimated negative effects on the probability of performing most of the green actions surveyed, with a positive effect only for separating most waste for recycling, whereas in the case of cutting down water and energy consumption and buying second-hand products, the effect is not statistically significant.

Being a single respondent without children has a positive effect only on avoiding unnecessary car trips and has a negative effect on buying local products and repairing products instead of replacing them. If a single respondent has children, there is an estimated positive effect on the probability on buying second-hands products, repairing products, separating waste, and cutting down energy consumption. Couples without children have higher probabilities of performing actions such as speaking about environmental issues and avoiding single-use plastic goods; when there are children in the family, we estimate a positive effect on buying second-hand goods, repairing products, avoiding single-use plastic goods, separating waste, and cutting down energy consumption and a negative effect on speaking about environmental issues and choosing a more environmentally friendly way of travelling. Respondents in other types of families are keener to participate in events and less prone to cut down energy consumption.

Living in a rural area has a negative effect on avoiding single-use plastic goods and unnecessary car trips; living in a small or medium-sized town has a negative effect on the probability of avoiding single-use plastic and repairing goods.

With respect to the economic conditions of the respondents, in the case of declaring difficulties most of the times, the multilevel logistic regression model estimates a negative impact on avoiding single-use plastic goods (also for the category of having difficulties from time to time), separating waste, cutting down energy consumption, and buying goods with an environmental label and local products; the only positive effect is associated with buying second-hand products (also for the category of having difficulties from time to time). For respondents having economic difficulties from time to time, there is also an estimated positive effect on taking part in environmental activities. For respondents with no economic difficulties, the effect is positive on almost all actions, except taking part in environmental activities and buying second-hand products (negative) and for choosing a more environmentally friendly way of travelling, changing diet, speaking about environmental issues, and repairing products (no effect). For respondents who refused to declare their economic situation, there is one statistically significant and negative effect for the action of avoiding buying single-use plastic goods.

Respondents accessing the Web every day show an estimated positive effect for all actions except choosing a more environmentally friendly way of travelling, cutting down water consumption, and buying second-hand products. Respondents rarely accessing the Web has a very similar effects on the 14 actions, except for a negative impact on buying local products and a non-statistically significant effect on speaking about environmental issues. Respondents who have a connection at home but choose not to navigate in the Web show estimated negative effects for many actions, including avoiding buying over-packaged and single-use plastic goods; separating waste for recycling; buying local, second-hand, and products with an environmental label; avoiding unnecessary trips; speaking about environmental issues; and repairing products. Respondents who do not have an Internet connection show estimated negative factors for all actions, except buying local products (positive), choosing a more environmentally friendly way of travelling, avoiding buying over-packaged goods, and speaking about environmental issues (no effect).

5. Discussion and Conclusions

The scope of this paper is twofold. First of all, we wanted to measure heterogeneity between and within European countries with reference to the citizens' attitudes towards the environment. By estimating an MLLC model, we identified six homogeneous groups of citizens (clusters) with different levels of sensibility to environmental topics and four groups of European countries (classes) with similarities in terms of the clusters of citizens.

Then we focused our attention on European citizens' behavior, specifically the factors that might favor European consumers putting into practice actions to preserve natural resources. Our first hypothesis to verify was the causal relationship between attitudes towards the environment and behavior in terms of green actions and sustainable consumption, as proposed in the reference literature (see, for example, [57]). The reference literature also suggests that some consumers' sociodemographic characteristics might influence this type of behavior. For example, young and female citizens are more involved with environmental matters [58].

Estimating logistic multilevel regression models for the 14 actions proposed in the Eurobarometer questionnaire, we found that the six clusters of respondents are good predictors of green behavior; as a general result, the more involved citizens are with environmental issues, the higher the probability that they perform the 14 actions investigated in the survey. We can conclude that attitudes towards the environment directly influence behavior, at least in the EU MSs.

Female citizens are definitely more involved with circular economy matters and more prone to adopt behaviors that protect the environment and save resources. Some actions are more typically put into practice by young respondents, especially actions that require greater involvement, such as finding new ways of travelling or participating in activities such as demonstrations or cleaning natural sites; other actions, especially those linked to waste and savings, are more popular among the oldest citizens. Political orientation is, without a doubt, a factor affecting behavior towards the environment. Left-oriented citizens are the most active, whereas those who do not declare their political ideas tend not to adopt actions that preserve the environment; citizens with a right or center orientation exhibit moderate attention to circular economy issues.

The type of family in which the respondent lives has a significant effect on some of the considered green actions. Families with children are more prone to engage in behavior related to saving, such a reducing energy consumption, buying second-hand goods, and repairing products instead of buying new ones. The presence of children in the family also increases the probability of separating waste for recycling; this might be due to education received in schools by the youngest members of the household.

The area where families live seems not to specifically affect behavior towards the environment; citizens living in rural area, as well as small and large towns, do not considerably differ in terms of the types of actions performed, with the exception of the fact that for those living in the countryside, it is more difficult to avoid car trips.

Economic conditions of the family have an important impact on environmentally friendly behavior, as some green actions imply paying a higher price, such as buying local and products with an environmental label and avoiding the purchase of single-use plastic goods; these actions can be afforded only by best-off families. Somewhat surprisingly, families with the worst economic conditions are not very interested in green actions that might favor savings, except for buying second-hand products.

The Web emerges clearly as a driver of green behavior; citizens accessing the Internet more often show higher probabilities of performing all kinds of actions to protect the environment.

The results of this study provide information that can be used to devise policies to favor green behavior and consumption both at national and European levels. As outlined by estimation results, policies should take into account both the different identified clusters of citizens and their typical profile, as well as the presence of these segments of consumers in the groups of European countries.

Sustainable behavior by customers can be supported by forming an attitude aware of the importance of environmental issues and the shortage of natural resources. Attitude was revealed as the tip determinant of the performance of actions that ensure the closure of the loop as proposed by the concept of CE. The Web appears to be a very penetrating and influencing form media that can be exploited to diffuse correct information and good practices.

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