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Abstract – In the future years, innovative bio-textile produced using wood fibers could have high market growth potential due to its lower environmental impacts compared to the cotton production. The aim of this study is to understand whether the younger generations have a greater environmental attitude towards environmentally-friendly clothing (bio-textiles produced with sustainable wood fibers) and the corresponding willingness to pay. A questionnaire was administered face-to-face to a sample of 1,105 Italian consumers to investigate consumer attitudes and willingness to pay (WTP) for wood fiber clothing. The data were analyzed by distinguishing among generation cohorts (Baby Boomers, Generation X, Generation Y1, Generation Y2, and Generation Z). The results show that younger generations attach more importance to environmental impacts in their purchasing decisions than older ones, but purchase less green clothing. Furthermore, WTPs of the younger generations for clothing made of bio-textiles in sustainable wood fibers are more influenced by environmental attitudes, which however do not translate into greater willingness to pay. Making green products accessible to younger generations is critical, as price can be an obstacle to more sustainable consumer behavior. When targeting young consumers, marketing campaigns should reinforce that bio-textile clothing has a positive effect on the environment.

Keywords: Fridays For Future (FFF), wood fibers, sustainable consumption, greenhouse gas (GHG) emissions, environmental attitude, premium price, contingent valuation.

Introduction

Since the young Swedish activist Greta Thunberg started protesting against global climate change policy in August 2018, many young people worldwide have joined climate protests as the Fridays For Future (FFF) movement (Bergmann and Ossewaarde 2020). In a few months, the unconventional FFF movement has involved millions of teenagers from 214 countries and 7,500 cities worldwide and has become one of the most important movement of civic climate activism (Deisenrieder et al. 2020), creating a collective identity around climate protection. As emphasized by Almeida (2019), the climate movement is one of the most extensive social movements in terms of the capacity to hold multiple and simultaneous global actions. These characteristics of climate movements are related to the global dimension of the issue and the ease of dissemination of information and announcements thanks to the new means of communication such as social network and blogs (Farrell 2015). Within the climate movements, the FFF movement has a specificity compared to the other movements as

emphasized by Maier (2019): being mainly composed of young people belonging to the Generation Z with a predominance of female.

Based on requests from the participants to the FFF movement, the political élite should commit to commensurate policies to limit the use of fossil fuels and to reduce the greenhouses gas (GHG) emissions, while the entrepreneurs should adopt more environmentally-friendly activities during the production process. In this context, changing the behavior of financial actors is a key element in reducing the GHG emissions in accordance with the objectives established by the Paris Climate Change Agreement in 2015 (Steffen 2021). As emphasized by Ionescu (2020, 2021a), environmental innovation and green financial behavior – such as introducing green labels for financial products, enacting carbon disclosure requirements, implementing strategies to reduce the use of natural resources and carbon dioxide (CO_2) emissions – are essential drivers to support sustainable development goals and to satisfy the demands of young green consumers. The environmentally-friendly enterprises as-well-as the other financial actors must communicate environmental values within their employees (May et al. 2021) and at the same time raise awareness and inform consumers. Besides, it is important to highlight that green finance has taken on even greater importance in sustainable economic development and climate change mitigation during the COVID-19 pandemic (Ionescu 2021b).

In Europe, to reduce the environmental impacts and the GHG emissions in atmosphere related to the production process, the creation of new value chains and greener is a mandatory aspect as emphasized by the update of the EU Bioeconomy Strategy (2018). The research and implementation of innovative solutions for the production of sustainable bio-based products (e.g., bio-chemicals, bio-fuels) can be considered able to substitute fossil materials in very significant parts of European industry, e.g., construction, packaging, textiles, chemicals, and cosmetics products (Marini et al. 2021). Within these bio-based products, bio-textile produced using wood fibers could have high market growth potential due to its lower environmental impacts compared to the cotton production and other fibers made using cellulose from wood pulp (e.g., viscose). The innovative wood fibers can reduce the carbon footprint by even up to five time compared to fossil-based synthetic fibers (Seppälä et al. 2019). Therefore, bio-textiles produced with sustainable wood fibers can be a good alternative to fibers obtained with fossil fuels available to environmentally-friendly consumers (Paletto et al. 2021). Recently, Notaro and Paletto (2021) estimated that the Italian consumers are willing to pay a premium price ranging from 64% to 128% to purchase a bio-textile product compared to an equivalent produced with fossil fuels. Those authors emphasized that the age of respondents is a key variable in the purchase choices of bio-based products and in the willingness to pay a premium price for eco-friendly products. Additionally, some studies based on the theoretical principles of the Generational

Theory show that environmental attitudes of young consumers – members of Generation Z – may or may not influence purchase intention for environmentally-friendly products (Nguyen et al. 2019) and that price can be a key determinant especially for young generations (Arıker and Toksoy 2017, Appelbaum et al. 2000).

Starting from these considerations, the research questions of the present study are the following: Is Generation Z more environmentally conscious than other consumers? Is the belonging to a specific generation with different social attitudes a key variable in the purchase of eco-friendly products and in the willingness to pay for these products? Does Generation Z have a greater environmental attitude than past generations toward purchasing environmental-friendly products? Are the determinants of the willingness to pay for eco-friendly products for Generation Z different from those of the older generations? To answers these questions attitudes and willingness to pays for three clothing made in wood fibers were investigated using a Contingent Valuation study. The present study extended the consumer sample investigated by Notaro and Paletto (2021) in order to increase the number of individuals of Generation Z, given that this generation is the focus of this study, and analyses willingness to pays and their determinants classifying respondents into generational groups.

The novelty of this study is the comparison of attitudes, purchase behaviors, willingness to pays for environmental-friendly products and their determinants among Generation Z and all previous generations cohorts. This information is particular useful for companies in defining prices and developing targeted strategies for promotion, advertisement and customer retention in new green markets.

The paper is organized as follows: in the following section a review of generations and sustainable consumption is shown, then information is provided on the survey design, the sampling procedure and the estimation methodology. There follows a section introducing the results, which are discussed in the next section. The last section offers some conclusions.

Generations and sustainable consumption

The present study is based on the principles of Generational Theory which asserts that generational cohorts share similar attitudes concerning family life, gender issues, institutions, lifestyle and the future (Dabija and Babut 2019). Generational Theory has been developed with the aim to explain cultural change because the 'era' that an individual is born affects the development of their world view (Knight 2015). In the context of consumer choice, generational cohorts are characterized by similar purchasing and consumption behavior that distinguish them from previous generations (Dabija and Babut 2019). In addition, consumption behavior depends not only on generational cohorts, but also on other variables such as the environment (workplace or home) in which sustainable

consumption takes place (Banyte et al. 2020), the consumer loyalty to a certain brand due to the increase in satisfaction with certain products induced at the neurological level (Mirică Dumitrescu 2019, Drugău-Constantin 2019).

In the literature, there are many classifications of generations based on relevant historical events, economic cycles or revolutionary technological innovations, and the demographic trend in the different geographical areas. In developed countries, the following generations can be identified considering the main demographic periods:

(i) Baby Boomers (1946–1964): generation raised during the period of economic prosperity after the Second World War (Egri and Ralston 2004);

(ii) Generation X (1965-1980): generation characterized by a rebellious and wary culture against institutions due to a disillusionment with the cultural icons in society (Jackson et al. 2011);

(iii) Generation Y or Millennials (1981-1996): generation that entered the world of work during the economic crisis and recession. Generation Y is the first capable of accessing information independently and very easily through Internet and social media (Espinoza et al. 2010). Generation Y can be distinguished in Young Millennials or Y2 (1989-1996) and Old Millennials or Y1 (1981-1988) considering whether they were teenagers or not in 2008 (year of the beginning of the economic crisis);

(iv) Generation Z (1997-2010): the first generation born after the advent of the Internet. This generation is accustomed to the use of digital technology and social media, which have a significant part in their socialization process. They are the most multicultural and global generation (Berkup 2014).

Different characteristics linked to generations lead to different environmental attitudes and sustainable consumption. According to Wright et al. (2003), Baby Boomers have high levels of social concerns but as regard to environmental attitudes there are important variation among them. Social concerns are revealed in sustainable consumption with positive attitude towards fair trade (Benson and Connell 2014).

Generation X is more concerned about health status and in purchase decisions takes highly into account the quality of the product, the service provided, opinions about the product and price, but also environmental issues can be important to them (Appelbaum et al. 2000). They are more nonconformist and less focused on social acceptance (Ordun 2015).

Among all generations, the Millennial generation has been the most analyzed and cited for aspects related to sustainability and sustainable consumption. They draw scholars' attention because they represent a large segment of consumers and have a significant purchasing power (Kim et al. 2009,

Kruger and Saayman 2015). The literature depicts these young consumers as the engine of change for a greener and more sustainable future. They are aware of environmental impacts and the perception of being green is a key factor in attracting the interest of Millennials (Henrichs 2008). Smith and Brower (2012) show that Millennials are careful in the decisions taken and find specific information on how the product is helping the environment. Millennials are not only strongly looking for brands that are considered positive for the environment (Belleau et al. 2007) but are also more willing to pay a premium price for sustainable products. A global study found that 73% of Millennials are willing to pay for sustainability, compared to 66% of global consumers and 51% of Baby Boomers (Nielsen 2015). Smith and Brower (2012) showed that 47% of Millennials are willing to pay a premium price for eco-sustainable services. On the other hand, Generations Y do not seem willing to put the environment before their personal comforts or economic convenience (Hume 2010). Rational and self-oriented motives lead Millennials to act pro-environmentally (Naderi and van Steenburg 2018).

Generation Z has been much less analyzed that Generation Y. The literature shows that members of this generation seem even more sensitive to environmental and social problems than their predecessors (Malikova 2021). They have a pro-sustainable attitude due to increasing awareness of sustainability and previous formal and informal education on environmental issues (Morgan and Birtwistle 2009, Hume 2010) and are aware of the power of making conscious consumption (Diddi et al. 2019). This generation have a positive attitude towards eco-friendly products purchases. They prefer brands that share their sensitivities and concerns about environmental problems and that are actively involved in these issues (Pencarelli et al. 2020). According to Arıker and Toksoy (2017), Generation Z are willing to buy products of companies that carry out Corporate Social Responsibility campaigns only if the preconditions of price and quality are satisfied.

It is now unquestionably recognized that young generations have massive current and future market value (Hume 2010). They have the potential to be catalysts for changes in consumption. However, the positive attitude towards sustainability does not necessarily translate onto sustainable buying behavior (Hume 2010, Bernardes et al. 2018).

Material and methods

Survey administration

The preferences and attitudes towards bio-textile in wood fibers of the five generations (Baby Boomers, Generation X, Generation Y1, Generation Y2 and Generation Z) were investigated using a questionnaire. The questionnaire was prepared following recognized guidelines for DCE (Riera et al., 2012). It was pre-tested with ten consumers characterized by different age classes – at least one for

each generation considered in the survey – to highlight any unclear questions and estimate the compilation timing. The final version of the questionnaire – modified based on pre-test observations – includes sixteen questions divided in three thematic sections (Annex 1).

The first thematic section of the questionnaire includes questions on buying habits for environmentally-friendly products and on factors affecting purchase decisions. In particular, the first question focuses on characteristics considered by the consumers during their purchase decisions (impacts of production process on human health, water quality, air quality, forests, and animals), while the second question investigates the main sectors of environmentally-friendly purchasing distinguishing between food, clothing, furniture, cosmetics, and paper products. For this question, the respondents assign their own percentage of environmentally-friendly purchases considering the following ranges: less than 5%, between 5% and 15%, between 16% and 30%, between 31% and 50%, more than 50%. The other three questions of this thematic section investigate factors (environmental impact of production process, made in Italy, points/gifts, reduced packaging, social commitment) and environmental certifications/brands that influence consumer choices, and the conditions that increase the consumers' propensity to buy more environmentally-friendly products. All questions of this thematic section are aimed to investigate Italian consumer behavior and preferences towards environmentally-friendly products. The second thematic section contains questions about the willingness to pay for three bio-textile products made from wood fibers: respondents could choose between a regular clothing and the same clothing produced with bio-textile fibers using environmentally-friendly production systems. It is assumed that all regular clothing (socks, a T-shirt and a Shirt) are made by 100% cotton grown in industrial plantations in Egypt with elevated soil nutrients and water consumption. These products are offered at 3 € for socks, 15 € for T-shirt and 40 € for Shirt respectively. Bio-textile socks offered are made by 100% eucalyptus (*Eucalyptus* spp.) fibers cultivated in sustainable plantations in Australia whereas bio-textile T-shirt and Shirt offered are made by 100% recycled European beech (*Fagus sylvatica* L.) wood fibers originating from Italian Alpine forests managed according to Sustainable Forest Management (SFM) practices. The prices for the bio-textile socks range from 0 to 16 €, for the bio-textile t-shirt from 0 to 65 € and for the bio-textile shirt from 0 to 140 €. Respondents could select the 0 amount when they were not willing to buy the bio-textile product. The third section of the questionnaire included socio-demographic information.

A sample of Italian consumers identified in fifteen malls and markets located in Italy was interviewed face-to-face. There were two waves of data collection: from October 2018 to July 2019 (ten months) and from September 2019 to January 2020 (five months). In both data collections respondents have been intercepted using a systematic sampling method, selecting one out of four people at the mall or

market entrance or close to it. The data was collected on both weekdays and weekends, considering two-time bands: morning (from 10 to 12.30 a.m.) and evening (from 3 to 7 p.m.) About the days of the week, the percentage of days of data collection was distributed as follows: 40% in weekdays, 30% in Saturdays, and 30% in Sundays. To collect enough information about young generations' preferences, behaviors, and willingness to pay for clothing made of bio-textile fibers, five out of fifteen shopping malls and markets involved in the survey were selected close to universities.

Data processing and estimation methodology

The data collected with the questionnaire were analyzed distinguishing among generations.

The data of Section 1 and 3 were processed to produce the main descriptive statistics for the data collected using the 5-point Likert-scale format (from 1=very low importance to 5=very high importance) and percentage of frequency distribution (%) for other questions. The Chi-square (χ^2) test (α=0.01) was used to determine differences among generations for preferences, attitudes and behaviors towards eco-friendly products.

Section 2 includes the Contingent Valuation (CV) study for estimating consumers' willingness to pay (WTP) for clothing made in wood-based fibers. Contingent Valuation (Mitchell and Carson 2013, Boyle 2017) is a survey-based approach that allows the evaluation of non-market goods on the basis of willingness to pays stated in hypothetical markets. CV is appropriate to assess consumers' willingness to pay for clothing made with wood fibers because they are not currently sold in the Italian market. The payment card elicitation question format was employed. With this elicitation question, respondents pick a price from a card containing a number of selected bid amounts to represent the possible prices of the good being valued. The payment card format is considered a valid and efficient format (Ryan and Watson 2009); it involves a lower cognitive burden for the respondent then open ended and is statistically more efficient than dichotomous-choice (Boyle 2017).

The Cameron and Huppert model (1989) was employed for the parametric estimation of willingness to pay. This model has been widely applied by scholars to estimate payment card data (e.g., Chen et al. 2017, Notaro and De Salvo 2010, 2009). The Cameron and Huppert model considers that the amount selected by respondents is an underestimation of the real WTP, that should be in the interval between the selected value and the next bid amount.

Starting from the individual willingness-to-pay function:

$$WTP_i = X'_i\beta + \varepsilon_i \qquad\qquad\qquad\qquad (eq. 1)$$

where X'_i is a vector of explanatory variables and ε_i the error term, if $\varepsilon_i \sim N(0,\sigma^2)$, the probability that WTP lies between t_j and t_{j+1} is:

$$\Pr(t_j) = \Phi\left(\frac{t_{j+1} - X_i'\beta}{\sigma}\right) - \Phi\left(\frac{t_j - X_i'\beta}{\sigma}\right) \qquad \text{(eq. 2)}$$

Where:

$\Phi(\cdot)$ is the cumulative density function of the standard normal distribution;

t_j is the generic value chosen by the *i*-th respondent among the amounts on the payment card t = (t_1, t_2, … t_J), listed in increasing order, and $t_{J+1} = +\infty$.

The mean willingness-to-pay is obtained by calculating the mean of the predicted WTP values for each respondent.

WTPs were modelled as a function of the following four groups of variables, all of which were dummy-coded[1]:

- Past shopping experience with eco-friendly products related to food (FOOD), clothing (CLOTHING), cosmetics (COSMETICS), and paper (PAPER), coded 1 if the percentage of environmentally-friendly purchases is >5%, 0 otherwise.

- The importance of the effect on human heath (HEALTH), water (WATER), air (AIR), forests (FOREST) and animals (ANIMAL) of products purchased in the past. Respondents could choose only one of the offered options. These variables are coded 1 if the option is chosen, 0 otherwise.

- The influence of specific products' characteristics on their choices: the environmental impact during the production process (ENV PROD), the reduced packaging and/or easily differentiable packaging (PACKAGING), the social commitment of the company (SOCIAL), to be made in Italy (MADEITALY). Each variable is coded 1 for lots or medium influence, 0 if no or little influence.

- Socio-economic variables: being member of an environmental associations (ENVORG), and gender (GENDER) of the respondent.

Results

Preferences, attitudes and behaviors towards environmentally-friendly products

At the end of the data collection, 1,105 Italian consumers participated in the survey. Therefore, the initial consumer sample of Notaro and Paletto (2021) was increased by 409 young consumers (Generation Y young and Z) (+58.8%), resulting in a total response rate of 77%. This high response rate is an indication of validity of the research. The distribution of the sample of consumers by generation and socio-demographics is shown in Table 1.

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[1] The wording of the questions is available in Annex 1.

[Here the Tab. 1]

The results of the second thematic section show that consumers' purchase decisions are mainly influenced by the negative impacts on human health (52.3% of total respondents), followed by the negative impacts on water and air quality (14.7% and 11.3% respectively). The Chi-square (χ^2) test shows statistically significant differences among the five generations (α=0.01, p<0.0001), with Baby Boomers assigning a higher importance to the negative impacts on human health (76.5% vs. 47.8% of Generations Y Young and Z) and young generations to the negative impacts on air quality (13.5% of Generation Y Young and 12.6% of Generation Z vs. 8.6% of Baby Boomers and 6.9% of Generation X), forests (9.1% of Generation Y Young and 11.9% of Generation Z vs. 3.7% of Baby Boomers and 0.6% of Generation X) and animals (11.3% of Generation Z vs. 1.2% of Baby Boomers).

The propensity to buy eco-friendly products is statistically different among the five generation cohorts for food (α=0.01, p=0.0039), clothing (α=0.01, p=0.0068), and cosmetics (α=0.01, p<0.0001) (see Tab. 2). In particular younger generations buy a lower percentage of environmentally-friendly clothing (28% of Generation Z buys at least 15% of environmentally-friendly clothing compared to 38% of Baby Boomers) and cosmetics (59% Generation Z buys at least 15% of eco-friendly cosmetics compared to 73% of Baby Boomers). For furniture and paper differences are not statistically significant.

The Chi-square (χ^2) test shows statistically significant differences among the five generations for the following factors that most influence purchasing decisions: points/gifts (α=0.01, p<0.0001) and reduced packaging (α=0.01, p=0.0002). Baby Boomers attach greater importance to points/gifts and less importance to reduced packaging, while Generation Z attaches greater importance to environmental impacts, although the difference is not statistically significant.

A statistically significant differences among the five generations was also found for the relevance of environmental certifications/brands on consumers' purchasing choices (α=0.01, p=0.0086). Baby Boomers are more interested in fair trade certification (27% vs. 18% of total respondents), while Generation Y Young and Generation Z are more influenced by the environmental certifications/brands remade (17% of Generation Y Young, 21% of Generation Z) and eco-labels (20% of Generation Y Young, 18% of Generation Z). Besides, for the Baby Boomers generation the FSC/PEFC certification of sustainable forest management is considered less important than for the other generations (7% vs. 10% of total respondents). It is interesting to highlight that 8% of total

respondents do not know any of the brands presented in the questionnaire and many of them know a limited number of brands.

Finally, it is worth noting that for Baby Boomers the most important conditions to encourage the purchase of eco-friendly products are clarity on ecological characteristics (15.7%) and the perception of a worsening of the global environmental situation (11.0%), whereas for the other four generations the most important condition is a lower price (19.6% of Generation X, 17.4% of Generation Y1, 22.8% of Generation Y2, and 24.6% of Generation Z). Therefore, the results show that the importance of a lower price for eco-friendly products increases for younger generations. The Chi-square (χ^2) test shows statistically significant differences among the five generations (α=0.01, p<0.0001).

[Here the Tab. 2]

Consumers' willingness to pay (WPT) for bio-textiles

On average, the consumers in our sample display a fair knowledge towards bio-textile products, with Baby Boomers having a higher level of experience and knowledge (52% have purchased a bio-textile product and 41% have heard/read about them) than generations Generation X (32% purchased; 51% heard), Generation Y (44% purchased; 39% heard) and Generation Z (36% purchased; 31% heard).

Table 3 illustrates the parametric willingness to pay means calculated with the Cameron and Huppert model for the three bio-textile products for the five different generations, and the calculated premium price compared to a regular clothing in both absolute and percentage terms. Our respondents are willingness to pay a premium price ranging from 60% to 137% for the purchase of a bio-textile product, depending on the specific product and generation. It is worth noting that the percentage premium prices decrease with the increase in the price of bio-textile products for each generation and overall the younger generations show slighter higher premium prices that Generation X, similar to those of the Baby Boomers generation for socks and the T-shirt. For the shirt, however, Baby Boomers show the highest premium price.

[Here the Tab. 3]

Model estimates are reported in Table 4 for socks made of bio-textile, Table 5 for the T-Shirt and Table 6 for the shirt. Findings reveal that purchasing more than 5% of eco-friendly clothing compared to regular clothing are associated with Z and Y Young generations' WTPs for bio-textile socks (Table 4) and Y Young's WTP for the shirt (Table 6). This is an indication that respondents of younger generations that purchase more eco-friendly clothing are more likely to spend a higher price in

purchasing clothing made of bio-textiles. Among the older generations, past shopping experience with eco-friendly clothing only explains Generation X's willingness to pay for the T-shirt (Table 5) and shirt (Table 6).

Instead, WTPs of Baby Boomer for the three bio-textile products are explained with having purchased more than 5% of eco-friendly paper in the past. Having bought more than 5% of eco-friendly food explains WTPs of Generation Y1 for the T-shirt and the shirt, whereas WTPs of Generation Y Young are positively associated with the purchase of more than 5% eco-friendly cosmetics for the T-shirt and 5% of eco-friendly paper for the shirt, while negatively with food. Overall, the determinants of WTP for Generation Z can be found on past shopping experience with environmentally-friendly clothing but only for the least expensive product, whereas the determinant of WTP for Generation Y and Baby Boomers with respect to past shopping experiences with eco-friendly products are more heterogeneous. For Generation X, no relationship was found with past shopping experience with environmentally-friendly products and willingness to pay.

By examining the main environmentally-friendly characteristics of products that drove purchases in the past, a different effect on WTPs was found for the different generations. The determinants influencing WTPs for Generation Z are the impact of products on human health for the T-shirt and the shirt and the impact on forests and animals for the shirt. However, the opposite was found for the impact on the air for socks. The consideration of the impact on water and air of the products purchased is positively associated with WTPs for the three bio-textile products for Generation Y1, while the impact on human health with socks and the T-shirt, and on forest for the T-shirt. Instead, the eco-friendly characteristics of past purchases are not drivers of WTPs for the Y Young Generation. Impact on water is even negatively associated with WTP for the shirt. Among older generations, the impact on animals was positively associated with WTPs for socks and the T-shirt and on water for socks in Generation X, whereas no ecological features from past purchases were associated with WTPs for Baby Boomers. Overall, WTPs of the younger generations seem to be more influenced by the importance of environmentally-friendly characteristic of past purchases except for the Generation Y Young.

The results of the analyses on the factors influencing the purchase of a product revealed that WTPs of Generation Z have a significant relationship with the consideration of environmental impact during the production process for the T-shirt and shirt and the reduced packaging and/or easily differentiable for the shirt. Giving a medium or great importance to a product to be made in Italy is negatively associated with willingness to pay for socks for Generation Z while it is positive associated for Generations Y for the T-shirt. WTPs for the three bio-textile products for the oldest generations is instead negatively associated with Made in Italy, whereas to give medium or great importance to the

company's social commitment or its support to ethical and environmental projects and easily differentiable packaging influences WTP for socks. Finally, WTPs for all the three products made of bio-textiles are positively associated with eco-friendly packaging for Generation Y Young and negatively for the Baby Boomers generation. As with the past shopping experience with eco-friendly products, no ecological factors influence WTPs of Generation X. In general, WTPs of the younger generations appear to be more influenced by the environmental impacts of the items purchased than the older ones, whereas the social impact influences only the WTP of the oldest generation.

Moving on to socio-economic determinants of WTPs, being a woman has a positive influence on WTPs in the Baby Boomer and Y old generations for socks and in the Y young generation for the shirt. To be a member of an environmental association only influences WTPs in Generation X, specifically for the T-shirt and the shirt. Interesting neither gender than being involved in an environmental association influence WTPs of the Generation Z.

[Here the Tab. 4]
[Here the Tab. 5]
[Here the Tab. 6]

Discussion

The results of the present study evidence that in purchase decisions the impacts on human health are considered more important to Baby Boomers whereas the impact on air quality, forests and animal to Generations Y Young and Z. This result seems to highlight a greater concern of the younger generations for environmental protection, probably due to a higher environmental knowledge and culture of the youngest as pointed out by some authors (Hill and Lee 2012). In a literature review, Dabija et al. (2019) highlighted that members of Generation Z are more green, sustainability-oriented and tech savvy compared to past generations. In addition, members of Generation Z emphasize more the importance of brands being able to connect with them and enhance their experiences and feelings (Dabija et al. 2019).

In the Western countries, traditional mass media and social media have played a key role in raising awareness of environmental problems (climate change, deforestation) among younger generations in recent years (Niankara 2019). In particular, social media facilitates the two-way form of communication and the transfer of information concerning any environmental problems both on a local and global scale. Besides, according to Anderson (2017) information filtered through social media may be one of these personalizing experiences that bring environmental protection issues (such

as climate change) closer to people. Personalization can reduce the psychological distance between the individual and complex environmental problems.

The results show that young generations have a lower purchase rate for environmentally-friendly products then older generations. This general trend may be due to a lower purchasing capacity of the younger generations characterized by lower incomes and/or to a more general behavior-attitude gap. In many cases, the younger generations – especially if they are students or have precarious jobs – live with their parents and/or are economically dependent on their parents. Furthermore, the lower purchase rate of the younger generations may confirm a lack of supply of eco-friendly products that meet the needs of this young market segment. The demand for clothing of younger generations is related to social acceptance and comparison with their own social group (Connell 2010). Conversely, Generation X is more nonconformist and less focused on social acceptance than other generations (Ordun 2015); for these reasons members of Generation X may be more inclined to buy eco-friendly clothing.

Among the conditions that can favor purchases of environmentally-friendly products, the results of this study evidence that a lower price is the key condition for the younger generations (Generation Y and Z). Baby Boomers, on the other hand, also stress the importance of clarity on the ecological characteristics of eco-friendly products. These results confirm that the price and quality of products – with particular regard to clothing – are even more important than ethics when the consumer makes a purchase decision (Beard 2009).

On the other hand, marketing instruments such as environmental certifications/brands, have a low influence on consumer behavior in our study mainly due to a low level of knowledge. However, it is interesting to underline that each generation has a higher level of knowledge and, consequently, of interest for certain environmental certifications/brands. The Baby Boomers generation has a positive attitude towards fair trade, as also highlighted by Benson and Connell (2014) for Baby Boomers in United States. According to Strong (1997), concern and awareness of fair-trade issues strengthened in the 1990s in reference to the success of the Body Shop, Traidcraft and Oxfam Trading highlights. Therefore, the younger generations have not experienced the phase of maximum diffusion of fair trade. These younger generations have placed greater emphasis on remade and eco-labels certifications.

These results are confirmed by the parametric analysis of WTPs with the Cameron and Huppert model. Environmental concern is a major determinant of eco-friendly purchasing behavior (Zimmer et al. 1994), and in our study environmental concerns when purchasing a product generally have a greater influence on WTPs for younger generations than the older ones, while social attitudes impact WTPs of the Baby Boomers generation. These results confirm the previous literature which showed

that young generations pay greater attention to environmental issues (Henrichs 2008, Morgan and Birtwistle 2009, Hume 2010) while Baby Boomers more to social issues (Wright et al. 2003, Benson and Connell 2014). However, environmental attitudes do not translate into significantly larger willingness to pays for the three bio-textile products, and Generation Z show slightly lower premium prices.

The determinants of WTPs also varies in relation to the product evaluated. The attitudinal and behavioral variables that explain WTPs are more numerous for the T-shirt and the shirt than for socks, highlighting that these factors mainly drive the choices of more expensive products whereas they are less important for products sold at lower prices that people can afford more easily. This phenomenon is particularly evident for the Generation Z.

These results as a whole confirm previous findings that price is a determining factor in preventing the consumption of sustainable clothing (Bray et al. 2011) and may explain the gap between environmental attitudes and intentions to purchase eco-friendly products (Vermeir and Verbeke 2006, Connell 2010, Gleim et al. 2013). As previously mentioned, this gap is due to the low income of the younger generations and their economic dependence on their parents. The clothes proposed in this research are sold online from a few German supplier companies for a price around 5 € for socks, 29 € for T-shirts e 89 € for shirts. Our results show that consumers are willingness to buy bio-textile socks and the T-shirt at current market prices, but that the price of the shirt is too high compared to what consumers are willing to pay, indicating that a too expensive price lead to less sustainable purchase intentions. This is especially true for the Generation Z. Respondents of Generation Z have indeed a poor shopping experience with clothing made of bio-textiles and show lower premium prices, particularly for the most expensive product.

It is worth noting that while being made in Italy has a negative relationship with WTP in Generation Z it turns to be positive for Generations Y. This result suggests that being made in Italy could be seen as guarantee of the quality of a bio-textile product for the Generations Y, while Generation Z may give less importance to this feature as it is the most multicultural and global generation (Berkup 2014). WTPs of Baby Boomers are also negatively associated with the Italian origin of the product, but considering the characteristics of this generation and the importance they attach to this attribute in our study, this result suggests that this kind of feature is not required by the oldest generation to a bio-textile product.

Being affiliated to an environmental association can be considered an indication of environmental concern. However, in our study, although young people have higher environmental attitudes (Boeve-de Pauw and Van Petegem 2010) and Generation Z in particular is considered the more interested in the environment than any previous before (Malikova 2021) this variable influences WTPs only of

Generation X. This finding suggests that membership in an environmental association is probably no longer an important way of addressing environmental issues for younger generation, as they can have access to any information on any topic online (Berkup 2014). This insight is confirmed in our study by the lowest percentage of people affiliated to an environmental association in Generations Y young and Z (4.7% and 5.8% respectively) compared to people in the Baby Boomers, X and Y1 generations (14.8%, 7.2% and 8.8%). Furthermore, the literature shows that females are more likely to exhibit environmentally friendly behaviors and are more willing to pay for environmentally-friendly products (Laroche et al. 2001, Loureiro et al. 2002, Fisher et al. 2012), but in our study being a woman only affects WTPs for Generations Y and Baby Boomer.

The main advantages of this study are the large sample which allowed a statistical comparison between generations together with the data collection mode. The main strengths of face-to-face surveys, recommended by the NOAA panel (Arrow et al. 1993), are due to the personal interaction between interviewer and respondent and the greater flexibility/adaptability of this administration system compared to others. An additional advantage but also a limitation of this study is the distribution of the sample of consumers. As the focus of this paper is the Generation Z, we have collected more questionnaires from the Generations Y Young and Z. This is an advantage as we could better represent these generations, but it is also a limitation when comparing the attitudes, behaviors and premium prices of these generations with the older ones. We therefore suggest that future studies should consider having a more balanced sample across generations to obtain more robust estimates.

A further limitation of this research is not having performed internal consistency tests, as our respondents stated their willingness to pay for three different products. If the research budget allows, we suggest that future studies covering more than one product also include internal consistency testing.

Conclusions

With regard to the theoretical implications, the present study provides new data and insights on the Generation Theory. The results show that younger generations have more environmental attitudes than older generations, but it is not taken for granted that these attitudes translate into sustainable consumption. The gap in the translation of attitudes into consumer behavior is due to the low incomes and low economic independence of the younger generations. In addition, the results confirm previous findings that generations Y and Z have a better ecological attitude than Generation X and Baby Boomers, with Generation X proving to be the one with the least environmental attitude. But our results highlight a gap between attitudes and consumer behavior and that this gap is greater for Generation Z, particularly for more expensive products.

With regard to the managerial implications, this study show that the Generation Z has a greater environmental sensitivity than the older generations in purchasing environmentally-friendly products, in particular bio-textiles produced with sustainable wood fibers. Taking into account that Generation Z will be the consumers of the future and that the market for bio-textile commodities is still in its infancy, important market opportunities can be envisaged for bio-textile companies in the coming years. Understanding the determinants that influence Generation Z behaviors becomes important because they are not just current consumers but they represent future consumers. In particular, as Generation Z will become the target market of many companies in the short term, it is vital to develop adequate strategies for promotion, advertising and customer retention. Including sustainability in apparel purchasing decisions can be particularly complicated due to additional evaluation criteria such as aesthetic preferences and fit. As one of the main obstacles to sustainable clothing consumption is the lack of knowledge of the environmental impact related to consumption, when targeting this generation, marketing campaigns should reinforce that the bio-textile clothing has a positive effect on the environment, using specific symbols and terms that are effective in conveying the green message to Generation Z. If Generation Z is attracted to products because they are sustainable, then this could be an important feature of the products in which to build consumer loyalty. However, the size of the potential future market for the eco-clothing industry will likely be determined by the price at which these products are offered. From a practical-managerial perspective, this study further contributes providing information about premium prices for this generation compared to the older ones.

The main limitation of the present study is the over-representation of students with a low income (less than 1,000 € per month) compared to the other categories of respondents. This sample distribution provided a precise picture of Generation Z in Italy today, but it made the comparison with the other three generations (Baby Boomers, Generation X, Generation Y) more complex. A second limitation of the study is that it has focused only on three environmentally-friendly products (socks, T-shirt, shirt) related to the bio-textile industry. The choice to focus only on three bio-textile products is due to the need not to make the questionnaire too long to the detriment of greater comparability among different products.

Future research developments will investigate consumers' attitudes of different generations, behaviors and willingness to pay for different bio-products such as bio-fuel, bio-plastics, and packaging materials. In future steps, different techniques for data collection (e.g., web-based questionnaire) will be adopted and compared.

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Tables

Table 1 - Socio-demographic characteristics of respondents.

Generation	Baby Boomers (*n*=81)	Generation X (*n*=166)	Generation Y old (*n*=80)	Generation Y young (*n=212*)	Generation Z (*n=566*)
Average age	62	47	35	26	21
Gender					
Male	39.5%	36.7%	41.2%	49.1%	45.2%
Female	60.5%	63.3%	58.8%	50.9%	54.8%
Level of education					
Elementary degree	2.5%	0.0%	0.0%	0.0%	0.0%
Middle school degree	16.0%	7.8%	6.3%	2.4%	0.7%
High school degree	55.6%	57.8%	45.0%	26.4%	67.3%
University degree	18.5%	22.4%	32.4%	68.4%	31.9%
Post-University degree	7.4%	12.0%	16.3%	2.8%	0.0%
Occupation					
Students	0.0%	0.6%	1.3%	63.2%	91.9%
Employed	54.3%	91.6%	91.3%	34.9%	7.8%
Retirees	39.5%	0.0%	0.0%	0.0%	0.0%
Unemployed	6.2%	7.8%	7.4%	1.9%	0.4%
Income					
Less than 1000 €	39.5%	29.5%	28.8%	74.1%	95.4%
1001-2000 €	38.3%	50.6%	56.3%	22.6%	4.1%
2001-3000 €	18.5%	16.3%	8.8%	0.9%	0.4%
More than 3000 €	3.7%	3.6%	6.3%	2.4%	0.2%
Member of environmental association					
Yes	14.8%	7.2%	8.8%	4.7%	5.8%
No	85.2%	92.8%	91.2%	95.3%	94.2%

Table 2 - Chi-square (χ^2) test comparing the five generations.

Generation	Observed value	Critical value	GDL	p-value	α
Consumers' purchase decisions related to the impacts	82.5762	31.4104	20	**< 0.0001**	0.01
Propensity to buy eco-friendly products					
Food	35.0989	26.2962	16	**0.0039**	0.01
Clothing	33.2940	26.2962	16	**0.0068**	0.01
Cosmetics	46.6882	26.2962	16	**< 0.0001**	0.01
Furniture	23.5384	26.2962	16	0.1001	0.01
Paper and stationery	17.3776	26.2962	16	0.3616	0.01
Factors that most influence purchasing decisions					
Environmental impacts	13.8002	21.0261	12	0.3137	0.01
Made in Italy	21.7940	21.0261	12	0.0399	0.01
Points/gifts	46.3176	21.0261	12	**< 0.0001**	0.01
Reduced packaging	37.3722	21.0261	12	**0.0002**	0.01
Social commitment of the company	24.5975	21.0261	12	0.0168	0.01
Relevance of environmental certifications/brands on consumers' purchasing choices	59.2806	50.9985	36	0.0086	0.01
Conditions to encourage the purchase of eco-friendly products	99.0210	55.7585	40	**< 0.0001**	0.01

In bold the consumers' attitudes and behaviours with a statistically significant differences among the five generations

Table 3 - Consumers' WTP for bio-textile products for the five generations (€).

Generation	Mean	St.dev	Minimum	Maximum	Premium price	Premium price (%)
Bio-textile socks						
Baby boomers	7.00	2.28	3.00	16.57	4.00	133.33
X Generation	6.45	1.53	2.96	10.71	3.45	115.00
Y Old Generation	7.11	2.75	2.40	16.70	4.11	137.00
Y Young Generation	6.89	1.82	2.97	12.54	3.89	129.67
Z Generation	6.84	2.12	2.79	16.53	3.84	128.00
Bio-textile T-shirt						
Baby boomers	28.61	7.18	22.35	66.12	13.61	90.73
X Generation	27.21	5.90	16.74	61.11	12.21	81.40
Y Old Generation	27.69	6.92	13.53	51.55	12.69	84.60
Y Young Generation	28.62	6.41	16.13	60.72	13.62	90.80
Z Generation	28.25	7.21	14.56	61.44	13.25	88.33
Bio-textile shirt						
Baby boomers	68.56	14.60	43.86	123.19	28.56	71.40
X Generation	64.25	13.27	41.44	132.90	24.25	60.63
Y Old Generation	65.77	16.86	35.01	123.47	25.77	64.43
Y Young Generation	66.50	12.62	41.97	122.44	26.50	66.25
Z Generation	64.22	12.02	40.37	122.55	24.22	60.55

Table 4 - Cameron and Huppert model estimation results: bio-textile socks.

Generations	Baby Boomers	X Generation	Y Old Generation	Y Young Generation	Z Generation
Variables					
CONSTANT	10.21***	5.18***	1.12	5.48***	6.25***
FOOD	-1.04	.27	1.16	.44	-.07
CLOTHING	-.95	.43	-.23	.67**	.53***
COSMETICS	-.51	-.24	.24	.24	.28
PAPER	2.13***	.44	1.47	-.23	.04
HEALTH	-1.40	.24	2.61**	-.32	-.04
WATER	-1.86	.72	2.57*	-.30	-.10
AIR	.45	.30	3.40**	-.43	-.67*
FOREST	-2.33	-.42	3.18	-.56	.24
ANIMAL	2.92	1.27*	-.04	-.31	-.28
ENV PROD	.18	-.23	-.28	.14	.29
PACKAGING	-1.58**	.27	.55	.58*	.35
SOCIAL	1.13*	.17	.38	.12	.33
MADEITALY	-2.09***	.04	-.27	.13	-.71***
ENVORG	-.41	.26	1.65	.19	.62
GENDER	1.00*	.180	1.52**	.45	.12
Sigma	1.89***	1.86***	2.46***	1.75***	2.12***
log_L	-113.73	-229.44	-130.08	-282.45	-848.61
AIC	3.228	2.969	3.677	2.825	3.059
N	81	166	80	212	566

*, ** and *** indicate significance levels at 10%, 5% and 1%, respectively

Table 5 - Cameron and Huppert model estimation results: bio-textile T-shirt.

Generations	Baby Boomers	X Generation	Y Old Generation	Y Young Generation	Z Generation
Variables					
CONSTANT	38.79***	24.39***	2.17	23.04***	21.90***
FOOD	-4.84	-1.28	11.42***	-1.35	2.11
CLOTHING	-.63	2.25**	-1.62	.34	.77
COSMETICS	-.59	.71	.16	3.44**	.79
PAPER	4.32*	-1.51	1.45	.72	-.18
HEALTH	-3.80	.34	6.07*	.91	2.02*
WATER	-8.43	2.53*	10.62***	-.71	1.28
AIR	-.39	.34	12.32***	-.76	-.39
FOREST	-7.73	-2.89	10.49**	-.72	1.65
ANIMAL	.23	4.72**	4.29	.66	1.23
ENV PROD	.97	.19	1.26	-1.58	1.68**
PACKAGING	-2.96	1.42	1.10	2.54**	.82
SOCIAL	2.85	.66	2.11	.77	.82
MADEITALY	-6.62***	.41	3.53*	1.96*	-1.02
ENVORG	-1.03	7.62***	2.78	-2.46	2.02
GENDER	1.99	-.48	2.24	1.18	.58
Sigma	6.39***	5.35***	5.94***	6.44***	7.29***
log_L	-136.64	-250.39	-124.38	-355.63	-1013.34
AIC	3.794	3.222	3.535	3.515	3.641
N	81	166	80	212	566

*, ** and *** indicate significance levels at 10%, 5% and 1%, respectively

Table 6 - Cameron and Huppert model estimation results: bio-textile shirt.

Generations	Baby Boomers	X Generation	Y Old Generation	Y Young Generation	Z Generation
Variables					
CONSTANT	80.83***	56.30***	16.02	56.37***	51.71***
FOOD	-4.73	2.41	20.21**	-5.75*	3.23
CLOTHING	-2.41	4.95*	-2.32	3.66*	1.52
COSMETICS	-6.94	2.17	4.82	1.94	2.57
PAPER	10.91**	-3.35	2.94	5.27**	.55
HEALTH	-4.85	-4.03	9.36	-1.80	3.35*
WATER	-10.77	1.77	17.47*	-4.51*	.41
AIR	-.72	-2.77	23.03**	-.95	-.50
FOREST	-14.07	.09	17.57	1.02	5.01**
ANIMAL	-2.49	3.15	2.28	1.33	3.79*
ENV PROD	2.68	-.86	3.11	-.78	2.77*
PACKAGING	-4.04	3.91	1.82	6.88***	2.22*
SOCIAL	3.95	2.30	1.16	.86	.22
MADEITALY	-10.14**	2.02	6.74	3.39	.16
ENVORG	2.51	12.97***	9.43	-5.44	.87
GENDER	4.88	-.32	6.67	3.18*	-.59
Sigma	13.40***	13.58***	15.35***	11.68***	12.88***
log_L	-139.90	-284.27	-139.84	-336.56	-938.59
AIC	3.874	3.630	3.921	3.336	3.377
N	81	166	80	212	566

*, ** and *** indicate significance levels at 10%, 5% and 1%, respectively

QUESTIONNAIRE

The present survey is aimed to assess the sustainability of the forest-wood chain through the implementation of innovative solutions based on the principles of bioeconomy defined by Updated European Union (EU) Bioeconomy Strategy (2018).
This questionnaire has scientific purposes only and is carried out in compliance with the provisions of the law on the processing of personal data in accordance with the General Data Protection Regulation (EU) 2016/679 (GDPR). The collected data will be processed and presented only in aggregate form in order that no personal reference can be drawn. Thank you very much for the collaboration!

SECTION 1 – CONSUMER PREFERENCES

Q1. Thinking about the environmentally-friendly products that you happened to buy, for which of the following aspects did you pay more attention to? (*only one answer*)
☐ Impact directly on human health
☐ Impact on water pollution
☐ Impact on air pollution
☐ Impact on forests
☐ Impact on animals
☐ Other (*specify*)_____

Q2. What is the percentage of your environmentally-friendly purchases in the following sectors? (*indicate the percentage for each area*)

	Less than 5%	Between 5-15%	Between 16-30%	Between 31-50%	More than 50%
Food	☐	☐	☐	☐	☐
Clothing	☐	☐	☐	☐	☐
Furniture	☐	☐	☐	☐	☐
Cosmetics and hygiene products	☐	☐	☐	☐	☐
Paper and stationery	☐	☐	☐	☐	☐

Q3. At the same price and quality of two products, how is your choice influenced by the following factors? (*indicate your degree of adherence to each of the following statements by choosing a value between 0=for nothing and 3=very much*)

	0	1	2	3
Environmental impact of production process	☐	☐	☐	☐
Made in Italy	☐	☐	☐	☐
Collected points/gifts	☐	☐	☐	☐
Reduced and / or easily differentiable packaging	☐	☐	☐	☐
Social commitment of the company / support to ethical and environmental projects	☐	☐	☐	☐

Q4. What of the following environmental brands / certifications have the greatest influence on your purchasing choices? (*max 3 answers*)
☐ Global Organic Textile Standard (GOTS)
☐ Eco-certification of sustainable management of forests (FSC o PEFC)
☐ Certification of environmental sustainability (Ecolabel, Nordic swan, Blauer angel)
☐ Energy saving certificates (Energy label, TCO, Energistar)
☐ Certifications that guarantee packaging (Packaging label)
☐ Fair trade brands (Fair Trade)
☐ Environmental product declarations (EPD)
☐ Recycled material (Remade, Seconda vita)
☐ Not any
☐ I don't know these brands and certifications

Q5. What of the following conditions would increase your propensity to buy more environmentally-friendly products? (*max 3 answers*)
☐ Higher product quality
☐ Lower price
☐ Greater clarity on ecological characteristics
☐ Systems that ensure greater trust in ecological brands
☐ Reduction of eco-labels to a single, clearer certification system
☐ More information on where to find organic products
☐ A more extensive distribution network
☐ If I perceived an imminent danger to my health
☐ If I perceived an increase in environmental conditions and pollution in my area
☐ If I perceived an increase in global environmental conditions
☐ Other (*specify*) _____

SECTION 2 – CONSUMERS' WILLINGNESS TO PAY FOR BIO-TEXTILE IN WOOD FIBRES

Q6. Are you aware of the existence of bio-textile made using wood fibers produced without intensive use of chemical products and with a saving of water and energy?
☐   Yes, I purchased a product of this type

☐ Yes, I heard/read about it
☐ No

Q7. Considering the following products:

	Option A: SOCKS	Option B: WOOD SOCKS
Material	100% Cotton	100% Eucalyptus fibre
Origin of raw material	Industrial plantations in Egypt	Plantations in Australia where Eucalyptus is a native species
Management	Planting with high water consumption and soil nutrients	Environmentally-friendly plantation

The cost of option A is € 3. How much would you be willing to pay for option B?

☐ 0 €   ☐ 4 €   ☐ 6 €   ☐ 8 €   ☐ 10 €
☐ 12 €   ☐ 14 €   ☐ 16 €   Other_____€

Q8. Considering the following products:

	Option A: T-SHIRT	Option B: WOOD T-SHIRT
Material	100% Cotton	100% Certified wood fibers of European beech
Origin of raw material	Industrial plantations in Egypt	Italian Alpine forests
Management	Planting with high water consumption and soil nutrients	Sustainable forest management (SFM)

The cost of option A is € 15. How much would you be willing to pay for option B?

☐ 0 €   ☐ 20 €   ☐ 25 €   ☐ 30 €   ☐ 35 €   ☐ 40 €
☐ 45 €   ☐ 50 €   ☐ 55 €   ☐ 60 €   ☐ 65 €   Other_____€

Q9. Considering the following products:

	Option A: SHIRT	Option B: WOOD SHIRT
Material	100% Cotton	100% Certified wood fibers of European beech
Origin of raw material	Industrial plantations in Egypt	Italian Alpine forests
Management	Planting with high water consumption and soil nutrients	Sustainable forest management (SFM)

The cost of option A is € 40. How much would you be willing to pay for option B?

☐ 0 €   ☐ 50 €   ☐ 60 €   ☐ 70 €   ☐ 80 €   ☐ 90 €
☐ 100 €   ☐ 110 €   ☐ 120 €   ☐ 130 €   ☐ 140 €   Other _____€

SECTION 3 – PERSONAL INFORMATION

Q10. Gender: ☐ Male   ☐ Female

Q11. Age (*in completed years*): _____

Q12. Place of residence: _____

Q13. Level of education: ☐ Elementary school ☐ Middle school ☐ High school University degree: ☐ Bachelor's degree ☐ Master's degree   ☐ Post-master's degree (*master, PhD*)

Q14. Occupational condition: ☐ Unemployed/unfilled; ☐ Employed ☐ Other (*specify*)_____

Q14bis. If "Employed" specify occupation: _____

Q15. If "Employed", What is your annual income? ☐ Less than 1.000 € per month; ☐ Between 1.000 and 2.000 per month   ☐ Between 2.000 and 3.000 per month; ☐ More than 3.000 per month

Q16. Involvement in environmental associations ☐ NO ☐ YES, (*specify which ones*) _____

Any comments _____
_____
_____