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ORIGINAL RESEARCH

Is Generation Z more Inclined than Generation Y to Purchase Sustainable Clothing?

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Abstract
Increasing clothing (over)consumption, supported by the fast fashion industry, has caused a significant reduction in clothing costs, raised major sustainability challenges, and highlighted the need for engaging in more sustainable consumption behaviour to mitigate the negative environmental, social, and economic consequences. Although green purchase behaviour is now well understood, extant literature still lacks a comprehensive approach to explain consumers behaviour (especially that of the younger generations) with respect to sustainable clothing. Using survey data collected through a structured questionnaire, this study aims to assess whether Generation Z is more inclined to buy sustainable or eco-friendly clothing than Generation Y. Given the non-random selection of respondents, analysis was conducted using propensity score matching to correct for potential bias based on a set of observable confounders. The results show that Generation Z is more likely to buy second-hand clothing, whereas Generation Y is more interested in clothes made of organic and eco-sustainable fabrics.

Keywords Generation Y · Generation Z · Organic and eco-sustainable clothing · Propensity score matching · Second hand clothing · Sustainable clothing consumption

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1 Introduction

Over the last few decades, many clothing brands favoured by globalisation have utilised fast fashion business models that entail shifting manufacturing to low-cost countries and emerging economies with poor working conditions (Goworek et al., 2012). Fast fashion is a clothing supply chain model that is intended to respond quickly to the latest fashion trends and fast-changing consumer preferences by frequently updating the clothing products available in stores (Zamani et al., 2017), with production characterised by poor quality of materials, low pricing, and trendy styles. The significant growth of the fast fashion industry, with mass production and a shift in the life cycle of garments from seasonal collections to new (almost) weekly collections, has inevitably led to increasing consumption of and demand for clothing industry products (Rausch & Kopplin, 2021). In particular, fashion goods production doubled from 2000 to 2014, with an average increase of 60% in sales per consumer. Consequently, the (fast) fashion industry is now one of the most significant contributors to clothing overconsumption, with serious environmental and societal effects. Furthermore, all these factors have a significant negative environmental impact on both production and consumption. The abundant use of natural resources during manufacturing and the pollution and waste created during the consumption phase are detrimental to the environment (Kozar & Connell, 2010). Throughout the product life cycle, clothing releases harmful chemicals and pollutants into the air and water. In addition, the production of synthetic materials (such as polyester, nylon, and acrylic) is an energy-intensive process that requires large amounts of fossil fuels (petroleum, gas, and carbon) and releases volatile particulate matter and acids such as hydrogen chloride. High water and energy consumption, the use of pesticides and chemicals that pollute the soil, and the final waste of the enormous amount of clothing that must be disposed of make the textile industry one of the most polluting industries on the planet, responsible for 10% of global carbon emissions. Furthermore, it is estimated that only 20% of clothes are recycled or given to someone else while the remaining 80% are dumped in landfills or incinerated in a non-eco-sustainable manner (Barbero-Barrera et al., 2016). Excessive usage of valuable natural resources also has a large environmental footprint; in 2030, 118 billion cubic metres of water are expected to be utilised for global clothing production (Rausch & Kopplin, 2021).

The alarming growth in the overconsumption of fashion products caused by a significant reduction in clothing costs also reflects the disposable product culture in society. In addition, poor working conditions in the (fast) fashion industry have raised ethical issues. It is well known that clothes are often made in countries where workers have limited or non-existent rights and work under unacceptable conditions, such as in unsafe buildings and places with no ventilation, breathing in toxic substances, and inhaling fibre dust or blasted sand. In this regard, the Rana Plaza collapse in 2013, which killed 1134 garment workers in Dhaka, Bangladesh, turned the spotlight on the unacceptable working conditions in the fashion industry.

Globally, increasing clothes (over)consumption and related problems have raised major sustainability challenges and underlined the need for more sustainable consumption behaviour to mitigate negative environmental, social, and economic impacts. This mitigation can be achieved by reducing the frequency of purchases, extending product life by repairing or reusing materials and products, upcycling and recycling materials, and increasing the consumption and purchase of eco-friendly or green products (Kumar & Yadav, 2021), which have a lower environmental impact than conventional products (Elliott, 2013; Mont

& Plepys, 2008; Ritter et al., 2015). In this regard, sustainable fashion first appeared in the 1960s, when people became aware of the environmental impact of this industry (Henninger et al., 2016); however, it has become widespread as a solution to environmental issues in the clothing industry only in recent years (Park & Lin, 2020). Sustainable fashion implies that every stage of a garment's life, from the acquisition of raw materials to actual purchase, should be conducted from a pro-environmental perspective that encompasses storage, usage, maintenance, and disposal (Bianchi & Birtwistle, 2012). Therefore, sustainable fashion refers to clothing production characterised by fabric containing organically grown raw materials (e.g., organically grown cotton), biodegradable or recycled materials, and fibres dyed using natural dyes, etc. (Joergens, 2006) as well as fair working conditions, regional production, and small clothing lines. It is also associated with consumers being aware of the origins of the garment and engaging in long-term use of high-quality products (Pookulangara & Shephard, 2013). As a facet of sustainable fashion, slow fashion emerged in response to the 'unsustainable' business model of fast fashion to enhance sustainability in the fashion industry. Slow fashion promotes ethical conduct, reduced fashion production, prioritising quality over quantity in clothing (Ertekin & Atik, 2014; Fletcher, 2010), and vintage clothes. It also educates consumers to buy clothing created to last over time, made with quality and eco-sustainable materials by fairly compensated labour. Therefore, the keywords for sustainable fashion and slow fashion are reuse, recycle, donate, second-hand, upcycle, and organic. Examples include second-hand clothing and clothing made with organic and eco-sustainable fabrics.

While green purchase behaviour is generally well understood, as numerous studies have covered this topic (Casalegno et al., 2022), the literature still lacks a comprehensive approach to explaining consumer purchase behaviour with respect to sustainable clothing (Rausch & Kopplin, 2021), especially the behaviour of the younger generations. Among these, Generation Y (individuals born between 1981 and 1996), also known as 'Millennials', and Generation Z (individuals born between 1997 and 2012), also known as 'Post-Millennials' or the 'Internet Generation', make up a considerable portion of those becoming increasingly interested in sustainable behaviours and ethically minded. Despite both these generations acknowledging the importance of consuming in a 'green' manner, members of Generation Z seem to be more sustainability-oriented and highly educated consumers than Generation Y and to have a sound understanding of environmental issues and eco-friendly products (Adnan et al., 2017). This study aims to assess whether Generation Z (henceforth, Gen Z) is more inclined to buy sustainable or eco-friendly clothing than Generation Y (henceforth, Gen Y) from two different but related perspectives: a) purchase of second-hand clothing and b) purchase of clothing made with organic and eco-sustainable fabrics. Data were collected via a web survey. To address the problem of potential selection bias, propensity score matching (PSM) was employed.

The remainder of this paper is organised as follows. Section 2 presents a brief literature review, and Sect. 3 illustrates the material and methods. Section 4 describes the results, including a robustness check, and Sect. 5 is devoted to a discussion and concluding remarks.

2 A Brief Literature Review

In the existing literature on the predictors of consumption and purchase of sustainable clothing, some studies show that these are affected not only by factors such as style, trend, or fit, but also by social and environmental awareness (Kumar et al., 2021). According to Connel (2010) and Joergens (2006), sustainable clothing is perceived as unfashionable or unattractive and thus, not aligned with consumers' aesthetic needs. Numerous consumers feel that expensive, higher-quality clothes are not trendy; this perceived lack of style in eco-friendly clothing inhibits demand for these green products. Furthermore, rapidly changing fashion trends imply that consumers' desire for new clothes is constantly growing, and buying fewer clothes with higher prices and quality is not a desirable option (Diddi et al., 2019). Economic factors are always essential in the purchase of any product. However, these are a barrier for green products because sustainable fashion attempts to fight the mass production of clothes, making it difficult to reduce production costs. Thus, consumers perceive these prices as unaffordable, making fast fashion more attractive because of its lower prices (Joergens, 2006). Many consumers prefer buying clothing at lower prices, mostly because of their limited budget that does not allow them to buy many different garments made from organic or recycled fibres to satisfy their wide fashion needs (Diddi et al., 2019). Moreover, a positive correlation has been found between knowledge and behaviour (Hoch & Deighton, 1989; Park et al., 1994). In our context, environmental knowledge is essential to the intention to purchase sustainable products. In this regard, perceived environmental knowledge refers to an individual's perceived awareness of environmental issues and the consequences of human actions on the environment (Jaiswal & Kant, 2018). Therefore, good environmental knowledge can positively impact responsibility and encourage a sustainable lifestyle and therefore, engagement in eco-conscious consumption. Knowledge allows individuals to recognise the attributes and environmental impact of sustainable products, leading to a more positive attitude towards these products (Ansu-Mensah, 2021). Empirical evidence supports a strong relationship between environmental concerns and purchase intention for sustainable products. Environmental concern can be explained as an interest in environmental threats and thus, protection of the environment (Rausch & Kopplin, 2021). In particular, this factor is essential for the evaluation of environmental issues and for forming a sense of responsibility towards the environment. It seems to be a significant variable influencing buying intention by affecting attitudes, subjective norms, and perceived behavioural control (Chen & Tung, 2014; Paul et al., 2016). Thus, it can be an important predictor of purchase intention for sustainable clothing.

Greenwashing has recently emerged as an important theme in sustainable consumption. Specifically, greenwashing indicates the communication strategy (e.g. green claims) that certain organisations use for building a positive, albeit deceptive, image in terms of environmental impact of their products and practices to promote their public reputation as environmentally friendly and convey a green image while withholding negative information (Lyon & Maxwell, 2011). Individuals' greenwashing concerns can negatively impact their green purchasing behaviour because of their scepticism about product evaluation. Thus, consumers can doubt many organizations' green claims, as those positive green claims could be false or hide negative environmental impacts. Moreover, consumers cannot be certain whether their concerns are legitimate. Experts have stated that sustainable fashion promoted through fast fashion retailers could be misleading, as these brands still produce

new lines with an average turnover of 60 days, thereby going against sustainable fashion principles. The fashion industry is based on fast stock turnovers and fashion consumption, which contradicts aspects of slow fashion (Henninger et al., 2016).

Another important concept in this context is pro-environmental behaviour, which refers to individual conduct that consciously seeks to minimise the negative impact of one's actions on the natural world (e.g. minimising resource and energy consumption, and reducing waste production) (Kollmuss & Agyeman, 2002). Many studies have also tried to connect gender to green products purchase. It was found that females show more pro-environmental behaviour and higher inclination towards sustainable consumption (Chekima et al., 2016; Kalamas et al., 2014). However, other studies argue that males have more information about environmental issues and act accordingly (Diamantopoulos et al., 2003). Males are less emotional than females, and along with other differences between the two sexes, this is reflected in their sustainable practices. Kumar and Yadav (2021) showed that gender significantly moderates the relationship between the antecedents of motivation in the green apparel context. Thus, gender is an important variable, and we include it in our study. The level of education is another key demographic variable related to the purchase of green products and is an important factor in social or environmental consumption (Park & Lin, 2020). Further research suggests that there may be a positive relationship between education level and the search for information regarding environmental problems, which may drive reduction of one's own environmental footprint (Ritter et al., 2015). Consumers with higher education levels have more knowledge of sustainable practices and are more committed to sustainable behaviours. Owing to the lack of knowledge about clothing disposal in a responsible manner, many consumers simply throw away unwanted clothing, which is finally dumped in landfills (Joung, 2014). Consumers who pay attention to their clothes disposal practices may have better knowledge of environmental issues and thus, a more positive attitude towards sustainable clothing purchases.

The two most prominent generations of consumers in the clothing industry are Gen Y and Gen Z (Abrar et al., 2021). Previous studies have found that Gen Y is caught up in fashion products, especially apparel clothing (Hill & Lee, 2012; Williams & Page, 2011) and spends a large part of its income on apparel products (Bakewell & Mitchell, 2003). Many studies have pointed out the ethical paradox facing Gen Y which pits the increasing importance and attention this generation pays to sustainability and eco-friendly products against their fashion needs. Although they are positive towards sustainability, their attitudes do not translate into action (Chaudhary & Bisai, 2018). According to Vuong and Nguyen (2018), for Gen Y, self-image typically has more importance than sustainability concerns when taking purchase decisions. For Gen Y, sustainable product purchase is typically an unintentional process, rather than an intentional behaviour, suggesting primarily a hedonistic choice. However, Gen Z seem to be more 'green', sustainability-oriented, and highly educated with a sound understanding of environmental issues and eco-friendly products (Adnan et al., 2017). They are also more inclined towards sustainable brands and more willing to pay a higher price for these products than other generations (Chaturvedi et al., 2020).

3 Materials and Methods

3.1 Data and Variables

This study uses data gathered from a web survey conducted in 2021 on a non-random sample of Italian individuals through a structured questionnaire administered via the web app Limesurvey. Data collection lasted over a month, beginning on August 10 and closing on September 20, 2021. Of the 480 respondents, 172 were from Gen Z while the remaining 308 were from Gen Y. The questionnaire consisted of the following four sections: (a) behaviours and attitudes towards sustainable clothing; (b) clothing purchasing and use habits; (c) sustainable behaviours and attitudes in daily life; and (d) the sociodemographic characteristics of respondents. Before data collection was begun, the questionnaire underwent a pre-test phase, which was useful for improving its comprehensibility and arriving at the final wording.

The list of variables, their values, and some descriptive statistics are presented in Table 1. Overall, two outcome variables and 25 control or matching variables were utilised in this study. Specifically, two binary outcome variables were considered to evaluate the respondents' sustainable clothing purchasing behaviour: *Purchase of second-hand clothing* (0 = No and 1 = Yes) and *Purchase of clothing made with organic and eco-sustainable fabrics* (0 = No and 1 = Yes). Furthermore, control or confounding variables of such purchase behaviours were obtained from various sections of the questionnaire, some of which were in the form of multi-item scales while others were closed-ended questions. In the multi-item scales, answers were rated on a 5-point Likert scale as follows: 1 = strongly disagree, 2 = disagree, 3 = neither agree nor disagree, 4 = agree, and 5 = strongly agree. As regards behaviours concerning and attitudes to sustainable clothing, two multi-item scales were considered. The first scale was *Greenwashing concern* (GWC), which aimed to assess whether respondents were concerned about the possibility that companies engage in deceptive ecological or environmental behaviour and that their products and practices are not sustainability-oriented (Rausch & Kopplin, 2021; Cronbach's $\alpha = 0.865$). It included the following three items: (1) I am concerned that sustainable clothes are not made using eco-friendly materials; (2) I am concerned that clothes are not made under sustainable conditions; and (3) I am concerned that companies are only pretending to have a green image. The second scale was *Subjective or social norms* (SN), which aimed to assess the perceived social pressure on respondents to perform or not engage in a particular behaviour (Rausch & Kopplin, 2021; Cronbach's $\alpha = 0.852$). It included the following three items: (1) My friends expect me to buy sustainable clothes; (2) My family expects me to buy sustainable clothes; and (3) People who are important to me expect me to buy sustainable clothes. Regarding clothing purchasing and usage habits, the following closed-ended questions were asked, with the relative responses indicated in brackets: What are you looking for when you buy your clothing? (style, quality, economy, brand); Where do you usually buy clothes? (buy mainly on the Internet, buy mainly in stores); How many times do you buy new clothing items? (several times a month, once a year); What are the reasons that you no longer wear some of your clothes? (no longer reflect my style, no longer fashionable, I have too many); What do you do with the clothing you no longer wear? (I give it to charity, I leave it in the closet, I throw it away, I sell it on the Internet). For sustainable behaviours and attitudes in daily life, the multi-item scale *Pro-Environmental behaviour* (PEB) was used. It was derived from the pro-environmental

Table 1 Variables, values and descriptive statistics

Variable	Values	Mean	Std. Dev.
Purchase of second-hand clothing	0 = No, 1 = Yes	0.619	0.486
Purchase of clothing made with organic and eco-sustainable fabrics	0 = No, 1 = Yes	0.748	0.437
Gen Y	0 = No, 1 = Yes	0.562	0.497
Gen Z	0 = No, 1 = Yes	0.438	0.497
Males	0 = No, 1 = Yes	0.110	0.308
Middle school diploma	Fraction (ranging 0 – 1)	0.043	0.209
Bachelor's degree	Fraction (ranging 0 – 1)	0.555	0.498
Greenwashing concern	3-item scale (ranging 3 – 15 points)	11.66	3.05
Subjective or social norms	3-item scale (ranging 3 – 15 points)	5.13	2.29
When I buy clothing, I look for style	0 = No, 1 = Yes	0.272	0.446
When I buy clothing, I look for quality	0 = No, 1 = Yes	0.453	0.498
When I buy clothing, I look for economy	0 = No, 1 = Yes	0.338	0.474
When I buy clothing, I look for brand	0 = No, 1 = Yes	0.010	0.071
Pro-environmental behaviour	5-item scale (ranging 7 – 35 points)	28.69	4.41
I usually buy clothes on the Internet	0 = No, 1 = Yes	0.125	0.331
I usually buy clothes in stores	0 = No, 1 = Yes	0.519	0.500
I buy new clothes several times a month	0 = No, 1 = Yes	0.125	0.331
I buy new clothes once a year	0 = No, 1 = Yes	0.229	0.421
I dispose of my clothes when they no longer reflect my style	0 = No, 1 = Yes	0.461	0.499
I dispose of my clothes when they are no longer fashionable	0 = No, 1 = Yes	0.025	0.158
I dispose of my clothes when I have too many	0 = No, 1 = Yes	0.160	0.367
Clothes I no longer wear remain in the closet	0 = No, 1 = Yes	0.099	0.299
I give clothes I no longer wear to charity	0 = No, 1 = Yes	0.633	0.482
I throw clothes I no longer wear into the appropriate recycling bins	0 = No, 1 = Yes	0.308	0.462
I sell clothes I no longer wear on the Internet	0 = No, 1 = Yes	0.231	0.422
I am concerned about the unethical working conditions in companies	5-point scale (1 = 'totally disagree'… 5 = 'totally agree')	4.40	0.904
I always try to fill my washing machine, or I wash my clothes by hand	0 = No, 1 = Yes	0.789	0.409

Source: our data analysis

behaviour scale proposed by Markle (2013) (Cronbach's $\alpha = 0.852$) and aimed to assess the possible behaviours of respondents who consciously try to limit the negative impact of their actions on the natural world with the following seven items: (1) I try to avoid single-use products; (2) I am willing to encourage others to engage in more sustainable activities; (3) I always separate waste; (4) I often leave the TV on without watching it; (5) I often talk to my friends about environmental issues; (6) I leave the tap running when I brush my teeth; and (7) When I purchase products, I consider how their use impacts the environment. Moreover, a multi-response question investigating the washing habits of respondents was asked

(I always try to fill my washing machine; I wash my clothes by hand). Finally, sociodemographic characteristics, such as age, gender, and educational level, were also considered.

3.2 Propensity Score Matching Approach

To answer the research questions, the problem of potential selection bias due to non-random assignment of respondents to the compared groups (Gen Z and Gen Y) was addressed by employing PSM (Rosenbaum & Rubin, 1983). PSM is frequently used in evaluation studies to estimate the average treatment effects when selection is based on observables. However, its applicability is not confined to estimating treatment effects (Frölich, 2007). In this study, PSM was applied outside the realm of treatment evaluation to remove or reduce potential selection bias due to the structure of the sampled data and obtain reliable estimates to compare behaviour data in terms of the sustainable clothing purchasing of Gen Z and Gen Y after balancing for the covariates that characterise the two groups. Using PSM, selection bias can be reduced after matching respondents of the two groups to ensure that they are similar with respect to a set of confounding observed covariates summarised by the propensity score (***PS***); subsequently, the matched groups are compared for each outcome variable. Here, the PS was estimated through a logistic regression model using a binary dependent variable that takes the value 1 for members of Gen Z group and 0 for those of Gen Y, with the confounding variables as covariates. Specifically, borrowing the terminology used in the treatment evaluation context, respondents of Gen Z were considered as the treated group while respondents of Gen Y formed the control one. The latter group was obtained by selecting only respondents that are similar to the treated group in all key characteristics except for gender, based on the PS.

The goal was to identify whether there exists a statistically significant difference and its magnitude between these two similar groups in the following sustainable behaviours: (a) purchase of second-hand clothing; and (b) purchase of clothing made with organic and eco-sustainable fabrics. For this purpose, the average treatment effect for treated (ATT) was estimated. Following the conventional notation under the potential outcomes framework (Rubin, 1974), Y_{i1} indicates the response variable for respondent *i* belonging to Gen Z, Y_{i0} the response variable for respondent *i* belonging to Gen Y, and T_i a variable that takes the value of 1 for Gen Z respondents and 0 for Gen Y respondents. Subsequently, ATT was defined as follows:

$$ATT = E\left(Y_{i1}|T_i = 1\right) - E\left(Y_{i0}|T_i = 1\right)$$

where $E\left(Y_{i1}|T_i = 1\right)$ is the expected value of the response variable for respondents of Gen Z. $E\left(Y_{i0}|T_i = 1\right)$ is the counterfactual, which represents the expected value of the response variable that would have occurred if the same respondent were not in Gen Z, that is, if they were in Gen Y. Given that the counterfactual is an unobserved outcome, a kernel-based matching approach (Heckman et al., 1998) was employed to estimate the ATT. In particular, this algorithm was used to ensure that all the respondents of the Gen Z group were matched with a weighted average of all the respondents of the Gen Y group with weights that are inversely proportional to the distance between the PS of the two groups:

$$ATT = \frac{1}{N_1}\sum_{i=1}^{N_1}\left(Y_{i1} - \sum_{j=1}^{N_0} w_{ij} Y_{j0}\right)$$

where N_1 is the number of Gen Z respondents, and N_0 is the number of Gen Y respondents. Moreover, w_{ij} is the weight defined as follows:

$$w_{ij} = \frac{K\left(\frac{PS(X_i) - PS(X_j)}{h}\right)}{\sum_{j=1}^{N_0} K\left(\frac{PS(X_i) - PS(X_j)}{h}\right)}$$

Here, weights depend on the distance of PS between the treated and matched controls, bandwidth (or smoothing) parameter h, and kernel function $K(\bullet)$. Consequently, the choices of kernel function and bandwidth size are fundamental in kernel-based matching. In this study, the Epanechnikov kernel function was used. Moreover, to take into account the trade-off between the variance and bias of the estimates, different bandwidths (0.01, 0.03, and 0.06) were considered. Evidence suggests that the kernel approach to matching is more precise than the most common alternatives, such as radius and one-to-one matching (Frölich, 2004). The key assumptions behind PSM are that conditional independence is given to the PS (also known as selection on observables or unconfoundedness) and overlap or common support (Rosenbaum & Rubin, 1983). The first requires that beyond the included covariates in PS estimation, there are no (unobserved) characteristics that are associated with both the outcome variables and membership of the two groups being compared, thus ensuring that selection into one of the two groups is based only on observed characteristics. The second requires that for each value of observed characteristics, there is a positive probability of being either in the Gen Z or Gen Y group, thus ensuring a sufficient overlap in the characteristics of Gen Z and Gen Y observations that an adequate match can be found.

4 Results

4.1 PS Estimation, Evaluation of Covariate Balance, and Common Support

The PS was estimated using the variables described in Subsection 3.1 as control or matching covariates. As the *p*-value of the Wald chi-square test of the overall model was smaller than 0.0001, we can conclude that the set of selected covariates was 'significant'. Furthermore, the value of 0.18 of McFadden's pseudoR^2 was quite satisfactory, confirming a good model fit, despite the presence of some non-significant covariates. The results of the parameter estimates are shown in Table 2. The PS values ranged from 0.044 to 0.969, with a mean of 0.436 and standard deviation of 0.236.

A balance test was subsequently performed by comparing the covariate means of the Gen Z and Gen Y groups before and after matching, using a t-test. Furthermore, standardised percent bias (SB) before and after matching and percent bias reduction (PBR) after matching were calculated to ensure that the two groups were effectively comparable with no or negligible bias. All the results are shown in Table 3 for the same set of covariates used for PS

Table 2 PS score estimates

	Coefficient	Std. Err.	z	p > |z|
Male	0.620	0.423	-1.47	0.143
Middle school diploma	-0.079	0.595	-0.13	0.894
Bachelor's degree	-1.233	0.253	-4.88	0.000
Greenwashing concern (GWC)	0.030	0.046	0.66	0.508
Subjective or social norms (SN)	0.142	0.054	2.63	0.009
When I buy clothing, I look for style	0.443	0.273	1.62	0.105
When I buy clothing, I look for quality	-0.883	0.258	-3.42	0.001
When I buy clothing, I look for economy	0.143	0.000	-1.68	0.093
When I buy clothing, I look for brand	-1.012	1.511	-0.67	0.503
Pro-environmental behaviour (PEB)	0.065	0.031	2.08	0.038
I usually buy clothes on the Internet	0.059	0.388	0.15	0.880
I usually buy clothes in stores	0.310	0.269	1.15	0.250
I buy new clothes several times a month	-0.403	0.374	-1.08	0.281
I buy new clothes once a year	0.196	0.300	0.65	0.514
I dispose of my clothes when they no longer reflect my style	0.287	0.251	1.14	0.253
I dispose of my clothes when they are no longer fashionable	0.401	0.746	0.54	0.591
I dispose of my clothes when I have too many	0.028	0.334	0.08	0.933
Clothes I no longer wear remain in the closet	0.104	0.430	0.24	0.809
I give clothes I no longer wear to charity	-0.523	0.298	-1.76	0.079
I throw clothes I no longer wear into the appropriate recycling bins	0.952	0.308	-3.09	0.002
I sell clothes I no longer wear on the Internet	0.508	0.342	-1.70	0.090
I am concerned about the unethical working conditions in companies	-0.674	0.161	-0.42	0.675
I always try to fill my washing machine, or I wash my clothes by hand	-1.325	0.321	-4.13	0.010
Constant	-0.492	1.121	-0.44	0.661

Source: our data analysis

estimation. Before matching, five of 23 covariates showed significant differences between the two groups at the 1% level whereas another covariate presented a significant difference at the 10% level. Moreover, the overall mean and median SB were fairly large, with values of 16.5 and 12.6, respectively. Conversely, after matching, SB was evidently reduced, and no covariates showed a significant difference between the two groups. Bias reduction was also confirmed by the mean and median SB, which decreased considerably, to 4.2 and 2.8, respectively. This finding confirms that the PSM is useful for removing selection bias.

Furthermore, to ensure that there was an overlap in the PS distributions across the two groups, a graph was constructed (Fig. 1). On inspecting the graph, we can observe that the area of common support is fairly large, confirming a favourable condition for the PSM to produce valid estimates.

4.2 Comparison of Purchasing Behaviour

Based on the extant literature, which indicates that Gen Z is more sustainability-oriented than Gen Y, a comparison was made by evaluating whether Gen Z was more inclined than Gen Y to undertake the following two behaviours: (a) purchase of second-hand clothing and (b) purchase of clothing made with organic and eco-sustainable fabrics. The analysis was performed with kernel matching using the Epanechnikov kernel function and different

Table 3 Covariate means, standardized percent bias (SB) in treated and control groups before and after matching, and percent of bias reduction (PBR)

Covariate	Before matching				After matching				PBR (%)
	Gen Z	Gen Y	SB (%)	p > |t|	Gen Z	Gen Y	Bias (%)	p > |t|	
Male	0.095	0.114	-6.4	0.537	0.097	0.103	-1.8	0.868	71.6
Middle school diploma	0.058	0.032	12.8	0.202	0.061	0.052	4.0	0.747	68.7
Bachelor's degree	0.395	0.679	-59.1	0.000	0.408	0.412	-0.7	0.954	98.9
Greenwashing concern (GWC)	11.605	11.701	-3.2	0.755	11.701	11.421	9.2	0.395	-189.8
Subjective or social norms (SN)	5.506	4.833	29.5	0.004	5.448	5.578	-4.0	0.734	86.6
When I buy clothing, I look for style	0.314	0.240	16.6	0.102	0.300	0.298	0.1	0.993	99.4
When I buy clothing, I look for quality	0.326	0.552	-46.7	0.000	0.342	0.331	2.3	0.834	95.2
When I buy clothing, I look for economy	0.372	0.312	12.6	0.214	0.378	0.442	-13.4	0.243	-6.2
When I buy clothing, I look for brand	0.006	0.004	1.8	0.859	0.006	0.007	-1.2	0.924	34.1
Pro-environmental behaviour (PEB)	28.657	28.710	-1.2	0.905	28.646	28.491	3.5	0.755	-190.7
I usually buy clothes on the internet	0.110	0.136	-7.7	0.453	0.110	0.089	6.4	0.523	16.4
I usually buy clothes in stores	0.558	0.489	13.9	0.172	0.555	0.577	-4.5	0.685	68.0
I buy new clothes several times a month	0.098	0.145	-14.1	0.172	0.104	0.152	-14.8	0.189	-5.7
I buy new clothes once a year	0.256	0.208	11.3	0.266	0.250	0.254	-1.0	0.929	91.0
I dispose of my clothes when they no longer reflect my style	0.512	0.421	18.2	0.073	0.500	0.497	0.5	0.961	97.0
I dispose of my clothes when they are no longer fashionable	0.035	0.018	10.4	0.296	0.030	0.029	1.0	0.930	90.2
I dispose of my clothes when I have too many	0.139	0.174	-10.1	0.323	0.146	0.139	2.0	0.854	80.7
Clothes I no longer wear remain in the closet	0.122	0.081	13.4	0.182	0.110	0.087	7.4	0.496	44.7
I give clothes I no longer wear to charity	0.622	0.642	-4.2	0.677	0.628	0.574	11.3	0.316	-166.1
I throw clothes I no longer wear in the appropriate recycling bins	0.227	0.371	-31.8	0.002	0.238	0.250	-2.8	0.790	91.2
I sell clothes I no longer wear on the Internet	0.238	0.226	2.9	0.778	0.244	0.244	-0.1	0.991	95.5

Table 3 (continued)

Covariate	Before matching				After matching				PBR (%)
	Gen Z	Gen Y	SB (%)	p > |t|	Gen Z	Gen Y	Bias (%)	p > |t|	
I am concerned about the unethical working conditions in companies	4.354	4.439	-9.2	0.360	4.348	4.341	0.7	0.950	92.2
I always try to fill my washing machine, or I wash my clothes by hand	0.692	0.864	-42.3	0.000	0.713	0.725	-2.8	0.817	93.3
Mean bias			16.5				4.2		
Median bias			12.6				2.8		

Source: our data analysis

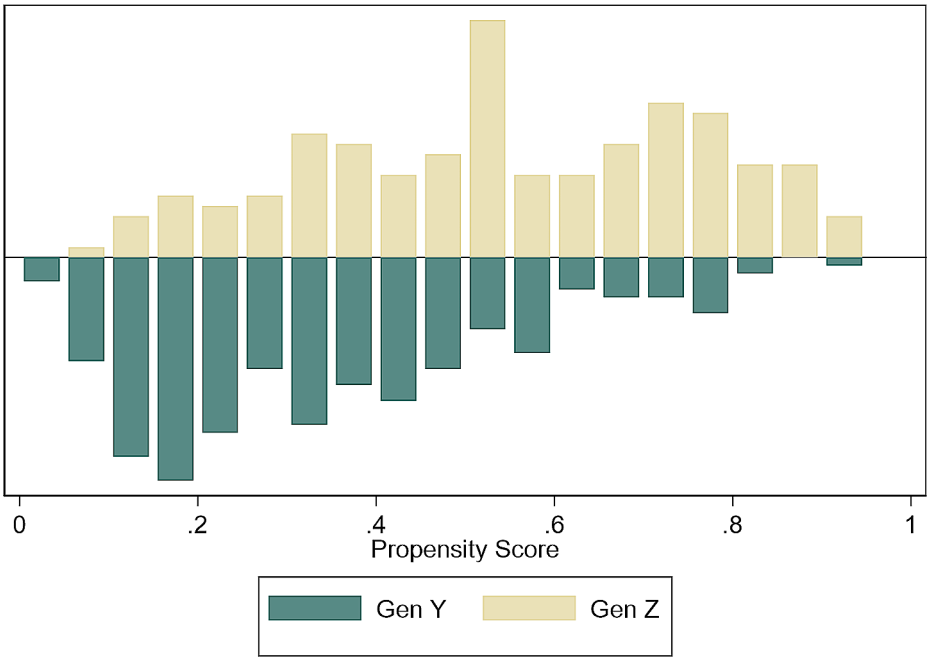

Fig. 1 Density distribution of the propensity scores in the Gen Y and Gen Z groups. (Source: our data analysis)

bandwidths (0.01, 0.03, and 0.06) to take into account the trade-off between the variance and bias of the estimates. The estimates were carried out over the common support. The results in Table 4 show the mean values for Gen Z and Gen Y, their differences, standard errors (SE), and p-values for each outcome variable for both the unmatched and matched samples. They indicate no significant difference between the two generations before matching with respect to the purchase of second-hand clothing. Conversely, after matching, a significant difference was found in favour of Gen Z, which seems more oriented towards buying these clothing items than Gen Y for all considered bandwidth values. The opposite

Table 4 Comparison of purchasing behaviour: unmatched and Kernel Epanechnikov matched estimates

Matching technique	Gen Z	Gen Y	Difference	SE	p-value
Purchase of second-hand clothing					
Unmatched	0.675	0.603	0.072	0.049	0.145
Kernel Epanechnikov					
bandwidth = 0.01	0.682	0.458	0.224	0.067	0.001
bandwidth = 0.03	0.681	0.506	0.175	0.064	0.006
bandwidth = 0.06	0.683	0.505	0.178	0.065	0.006
Purchase of clothing made with organic and eco-sustainable fabrics					
Unmatched	0.657	0.836	-0.179	0.043	0.000
Kernel Epanechnikov					
bandwidth = 0.01	0.657	0.761	-0.105	0.058	0.022
bandwidth = 0.03	0.662	0.807	-0.144	0.055	0.004
bandwidth = 0.06	0.658	0.813	-0.154	0.055	0.003

Source: our data analysis

Table 5 Comparison of purchasing behaviour using 3:1 nearest neighbours and radius matching with radius = 0.01

Matching technique	Gen Z	Gen Y	Difference	SE	p-value
Purchase of second-hand clothing					
3:1 nearest neighbours	0.675	0.511	0.164	0.072	0.012
radius = 0.01	0.682	0.472	0.210	0.067	0.001
Purchase of clothing made with organic and eco-sustainable fabrics					
3:1 nearest neighbours	0.659	0.808	-0.149	0.057	0.009
radius = 0.01	0.658	0.813	-0.154	0.054	0.005

Source: our data analysis

result was found with respect to the purchase of clothing made with organic and eco-sustainable fabrics; Gen Y showed a greater inclination than Gen Z to buy clothing made with organic and eco-sustainable fabrics at all bandwidth values. The opposite result was found with respect to the purchase of clothing made with organic and eco-sustainable fabrics since a preference of Gen Y over Gen Z was observed at all bandwidth values. In this case, the results after matching agreed with those before matching although the magnitude of the difference was reduced.

4.3 Robustness Check

To ensure that the findings outlined above were not affected by the matching algorithm, the analysis was repeated, and the results were compared with those obtained using 3:1 nearest neighbours and radius matching with a radius of 0.01. To make this evaluation and the resulting discussion more concise, we decided not to consider different numbers of neighbours or different values of the radius in this robustness check. Table 5 shows the results for each outcome variable. As seen in Table 4, these estimates are consistent with those obtained using kernel matching, confirming robustness and reaffirming our trust in our results.

5 Discussion and Concluding Remarks

The fast-fashion business model that has developed in recent decades, owing to the rise of an increasingly globalised market, has shifted production to low-cost countries with poor working conditions. This new fashion business model has not only affected the way clothing is produced but also the preferences of consumers, who have found frequently updated clothing products available in stores with trendy styles, low prices, poor quality of materials, and short life cycles. Environmentally, fast fashion has negative effects as it requires the use of a large amount of natural resources during manufacturing and creates pollution and waste during the consumption stage. Slow fashion has emerged in response to the unsustainable business model of fast fashion to improve sustainability in the fashion industry. It is associated with ethical conduct, reduction in fashion production, purchase of quality garments rather than a greater number of garments, and vintage clothing. While green buying behaviour is well studied, much less is known about consumer purchase behaviour with respect to sustainable clothing, especially that of the younger generations. This study aims to compare the sustainable clothing purchasing behaviour of two specific generations, Gen Y and Gen Z, who represent a considerable portion of the population that is recognised as being sustainability-oriented. This study focused on two specific and different attitudes of these generations: purchasing second-hand clothing and purchasing clothing made of organic and eco-sustainable fabrics.

The PSM approach was proposed to deal with the problem of potential selection bias due to the non-random assignment of respondents to the compared groups. In other words, PSM made it possible to reduce the selection bias after matching respondents of the two groups and consequently to create two comparable generations that have different behaviours, with all other conditions being equal.

More specifically, Gen Z seems more likely than Gen Y to purchase second-hand clothing, while Gen Y seems to be more inclined than Gen Z to purchase clothing made with organic and eco-sustainable fabrics. This last result shows that for Gen Y there is a coherence between attitude and purchase of such goods, differently from what stated in some cited literature which suggests that the attitude of Gen Y for purchasing eco-friendly clothing does not always correspond to its actions. A possible explanation for this could be the interest of Gen Y for the use of eco-friendly products favouring the purchase of organic garments that are generally more expensive and maybe perceived as more suited to their fashionable and brand-sensitive behaviour than second-hand clothing. This has also been suggested in the cited literature.

The results obtained lead us to make further considerations. The survey was carried out through the use of a structured questionnaire and on a large scale; however, it could be reconducted on a larger number of members of Gen Y and Gen Z and with the addition of more variables that could affect people's purchasing behaviours. Finally, this study could be deepened by developing separate analyses according to specific variables, such as gender or level of education.

If these results were confirmed on a larger sample, firms that produce organic and eco-sustainable clothes could benefit by considering how to orient their production so it aligns with the preferences and tastes of Gen Y. At the same time, such firms could adopt advertising and differentiated pricing policies to match the interests of Gen Z. Moreover, second-hand purchasing is a fundamental characteristic of the circular economy, extending the

lifecycle of products, and those interested in trading in this market could also enhance their sales policies to align with the interests of Gen Z.

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