

Socio-Economic Drivers of Sustainable Consumption Behaviour in Rural and Urban Areas: A Partial Least Squares Multi-Group Analysis

Noman Rasheed¹, Dilawar Khan² and Alam Khan³

<https://doi.org/10.62345/jads.2025.14.3.28>

Abstract

Sustainable consumption behaviour can address environmental, social, and economic problems created by unsustainable consumption behaviour; whereas socio-economic factors are crucial factors which influence human consumption behaviour. Therefore, this study conducted a comparative analysis of urban-rural Khyber Pakhtunkhwa regarding the effects of socio-economic factors on sustainable consumption behaviour. The Krejcie and Morgan method was used to determine the sample size, and the multistage cluster sampling technique was used to form the whole sample from the target population. Data from sampled respondents were collected through self-administered questionnaires. Partial Least Squares Multigroup Analysis (PLS-MA) was used to analyse the data. The findings of this study demonstrate that all socio-economic factors included in this study, except Gender, significantly affect sustainable consumption behavior. The coefficients of Gender ($\beta=0.15$, $P<0.05$), education ($\beta=0.44$, $P<0.05$), and income ($\beta=0.35$, $P<0.05$) are positive and statistically significant, which means these variables have positive effects on sustainable consumption behaviour. The coefficient of Gender ($\beta=0.08$, $P=0.43$) is positive; however, it is statistically insignificant. The coefficient of employment status ($\beta=-0.22$, $P<0.05$) is negative, which implies that employed people are more sustainable than unemployed people. The results further show that the effects of socioeconomic factors on sustainable consumption behaviour are more potent in urban areas than in rural areas. Finally, the study presents some valuable recommendations for policymakers and businesses.

Keywords: Sustainable Consumption, Social Factors; Economic Factors; PSL-MGA.

Introduction

Unsustainable consumption poses various challenges for sustainable development. This conventional consumption pattern has resulted in various unmanageable environmental problems (Michaelis & Wilk, 2009). Many environmental problems stem from human production. However, it is human consumption which encourages all types of production and hence consumption is indirectly responsible for various environmental problems (Mortensen et al., 2012). Carbon emissions generated by the entire supply chain of goods and services lead to excessive environmental degradation. Unsustainable consumption patterns lead to depletion

¹Department of Economics, Kohat University of Science & Technology, Kohat, Pakistan.

²Department of Economics, Kohat University of Science & Technology, Kohat, Pakistan.

Corresponding Author Email: dilawar@kust.edu.pk

³Department of Economics, Kohat University of Science & Technology, Kohat, Pakistan.

Note: This article has been extracted from the Noman Rasheed's PhD thesis titled "Impact of Socio-Economic Factors on Sustainable Consumption Behaviour: A Comparative Study of Rural-Urban Khyber Pakhtunkhwa".



Copyright: © This is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license.
Compliance with ethical standards: There are no conflicts of interest (financial or non-financial). This study did not receive any funding.

of natural resources, destroying the natural environment and hampering the welfare of future generations (Arora & Mishra, 2023; Martin et al., 2016). Household consumption accounts for more than seventy per cent of the total world carbon dioxide emissions (Ganglmair-Wooliscroft & Wooliscroft, 2022). Direct consumption, such as the use of fossil fuels for cooking at home, heating residential buildings and travelling by car, leads to many environmental problems (Mortensen et al., 2012; Rafique et al., 2024). Unsustainable patterns of consumption cause biodiversity loss, generate environmental pollution and accelerate undesirable climate changes, which consequently pose threats to water and air quality, aggravate food insecurity and impair environmental and human health. It also causes depletion of non-renewable natural resources, aggravates inequality at the global level and hampers the path of sustainable development (Kopnina, 2016). Unsustainable patterns of consumption generate excessive amounts of solid waste, which consequently degrade ecosystems, contaminate soil and generate untreatable overall environmental pollution (Hoornweg et al., 2013). Along with environmental impacts, unsustainable consumption also leads to widening social inequalities (Wiedmann et al., 2020). The negative environmental and social impacts of sustainable consumption have raised serious concerns among environmental scientists and all other stakeholders, and they consider it imperative to replace unsustainable consumption patterns with sustainable ones (Osuntuyi & Lean, 2022). Against this backdrop, the concept of sustainable consumption emerged, and it was formally defined in the Oslo symposium in 1994. This definition sets out sustainable consumption as consuming goods and services in a way that meets the needs of the current generation and enhances their overall quality of life, minimises the consumption of natural resources for safeguarding the environment and the ability of future generations to meet their needs (Vargas-Merino et al., 2023). Oslo symposium lays out three dimensions of sustainable consumption, which are quality of life, care for the environment and care for future generations (Quoquab et al., 2019). Sustainable consumption can address all problems created by unsustainable consumption. Sustainable consumption leads to improving the quality of life, reducing waste and preventing environmental damage, decreasing the use of energy, encouraging recycling materials (Bui et al., 2022) and ensuring the availability of resources for future generations through reducing resource extraction (Cohen & Munoz, 2016).

Social and economic factors affect human consumption decisions and overall preferences (Vermeir & Verbeke, 2008). Social and economic factors help determine individuals' ability to access resources, their awareness regarding environmental issues and their long-term consumption patterns (Witek & Kuźniar, 2020). Consumers with higher socioeconomic status may be able to purchase environmentally friendly goods and access energy-efficient technologies, whereas consumers with lower socioeconomic status may not be able to purchase sustainable products (Panzone et al., 2016). Furthermore, socio-economic background also offers exposure to Education related to sustainability (Dimitrova et al., 2022). Further, Dimitrova et al. (2022) state that the socio-economic background of a person inclines them to follow pro-environmental values. Socio-economic factors affect the behaviour of urban consumers and rural consumers differently, and hence, these factors may have different effects on the behaviour of urban and rural consumers related to sustainability (Qadri et al., 2025). Several reasons explain disparities in the behaviour of urban and rural consumers. Urban consumers can avail platform-based, environmentally friendly services such as shared cars or bikes, and these services need a large number of consumers and well-established infrastructure, which are available in urban areas, whereas rural consumers do not have access to such environmentally friendly services (Zulauf & Wagner, 2021). Urban consumers face environmental problems directly and hence, they are more concerned about the environment and behave sustainably, whereas rural consumers are less prone to environmental problems; therefore, they are less concerned about the environment and adopt relatively unsustainable behaviour (Dąbrowski et al., 2022). On the other hand, rural consumers may behave more

sustainably as they can observe biodiversity loss more clearly than urban consumers (Zulauf & Wagner, 2021). Keeping in consideration the above arguments, it is imperative to empirically investigate the effect of socio-economic factors on sustainable consumption in urban and rural areas.

This study will make a few profound contributions. First, this study addresses a notable gap in the literature by empirically investigating the effects of socio-economic factors on sustainable consumption behaviour in urban and rural areas of Khyber Pakhtunkhwa. This study carried out a comparative analysis of urban and rural areas regarding the effects of socio-economic factors on sustainable consumption behaviour. Therefore, it is the novel contribution of this study as existing literature lacks such empirical evidence. Second, this study used a very sophisticated and more advanced statistical test of PSL-MGA to examine group differences (urban versus rural), thereby increasing the accuracy of findings of this study, whereas extant studies examined urban-rural differences regarding green consumption behaviour, a narrow approach to sustainable consumption behaviour, using traditional statistical tests. Third, this study can aid the government and policymakers in formulating policies for promoting sustainable consumption behaviour, such as designing education programs related to sustainability. First, marketers can benefit from the findings of this study. The study offers valuable insights about the relationship between sustainable consumption behaviours and socio-economic factors to marketers, too, and they can align their marketing strategies with the findings of this study.

Literature Review

The theoretical justification for the relationship between age groups and sustainable consumption behaviour is derived from Life Course Theory (LCT). LCT theory states that individuals' social roles, such as becoming a parent, transitions in their life, such as entering the workforce or retiring, and historical context, influence their behaviour and decision-making process (Elder Jr et al., 2003). This theory states that these three things determine human behaviour over time. It is inferred from LCT that sustainable consumption behaviour differs across different age groups. Younger consumers are more likely to have environmental awareness and adopt a progressive attitude towards sustainability-laden activities; however, they cannot behave sustainably due to their limited financial resources (Kadic-Magljajlic et al., 2019). Conversely, middle-aged and elderly consumers adopt more sustainable consumption behaviour due to their stable employment and strong financial position (Bulut et al., 2017). Moreover, older consumers are more likely to act for conservation as their parental role raises their concerns for future generations (das Neves, 2025). However, Peluso et al. (2021) state that younger consumers may consume sustainably as they have more environmental knowledge than older consumers. Cottrell (2003) states that young consumers are more enthusiastic about environmental protection and reforms; therefore, they consume more sustainably. Based on these arguments, it is hypothesised that:

Hypothesis H1: Elder people and young people show different patterns of sustainable consumption behaviour.

Value, belief and norms theory supports the relationship between Education and sustainable consumption behaviour. This theory posits that individuals holding strong values are more likely to recognise the consequences of unsustainable consumption and tend to consume sustainable products (Onel, 2024). Education is a key factor which strengthens the link between values and sustainable consumption behaviour. Education can increase the environmental knowledge of a person, i.e. raise their awareness about the environmental consequences of their unsustainable consumption and develop a sense of responsibility and thus foster adherence to biospheric and altruistic values (Çakır Yıldırım & Karaarslan Semiz, 2019). As a result,

Education motivates a person to adopt sustainable consumption behaviour by activating values in them. Education also fosters sustainable consumption behaviour through activation of personal norms (Xie et al., 2021). A person holding strong social and personal norms tends to reduce resource use and consume sustainable products (Čapienė et al., 2022). Education makes people aware of the environmental effects of their consumption, which leads to activation of personal norms and, in turn, stimulates sustainable consumption behaviour (Dursun et al., 2017). The empirical study (Ib) (Kand & Etuk, 20; Migheli, 2021; Wang et al., 2022) also demonstrates the positive effects of Education on sustainability-related behaviour, i.e., pro-environmental behaviour and green consumption behaviour. Based on these arguments, the following hypothesis is formulated.

Hypothesis H2: Education level positively affects sustainable consumption behaviour.

Socialisation theory explains the link between sustainable consumption behaviour and gender differences. This theory states that an individual learns values from their surroundings, such as family, peer groups and educational institutions, and these values motivate them to adopt a particular behaviour (Godin & Langlois, 2021). This theory supports the claim that social values taught women that they have the role of caregiver and nurturer, and this role of women motivates them to be more compassionate and empathetic than men, thus women consume more sustainably than men (Blocker & Eckberg, 1997). Women are more sustainable in private-sphere care-taking behaviours such as purchasing clothes, cleaning and cooking, as these activities are often undertaken by women (Bloodhart & Swim, 2020). Socialisation theory also supports the claim that men behave more sustainably as they have the role of economic provider and engage in market activities. Men adopt sustainable consumption behaviour in home renovation activities and any other practices associated with the homeowner role of men, such as purchasing energy-saving home appliances (Brough et al., 2016). The role of men motivates them to be more rational and competitive than women, and therefore, this role makes men more sustainable than women (Hunter et al., 2004). Xiao and McCright (2012) also state that men adopt more sustainable behaviour in consumption activities which are related to the public sphere, such as membership in environmental groups.

In contrast, women behave more sustainably in consumption activities related to the private sphere, such as buying organic foods and using fewer vehicles. The empirical findings of Witek and Kuźniar (2020) support the claim that women are more sustainable consumers than men, as their study found that women are more inclined towards the purchase of green products than men. In contrast, the study of Mostafa (2007) demonstrates that men show a more positive attitude towards green consumption than women. Based on this discussion, the following hypothesis is formulated:

Hypothesis H3: Gender differences influence sustainable consumption behaviour.

The theoretical connection between household income and sustainable consumption behaviour is inferred from the theory of Value-Belief-Norm (VBN). VBN theory postulates that a person's pro-environmental and sustainable behaviour is determined by their personal values, norms and beliefs, whereas the income of a person enables them to practice values, both biospheric and altruistic, norms and beliefs related to sustainability (Stern, 2000). Therefore, an increase in income is expected to promote sustainable consumption behaviour. VBN theory states that biosphere values point up the significance of environmental protection and preservation, whereas altruistic values raise concerns about the welfare of other people, such as future generations (Gomes et al., 2022). An increase in household income is expected to help activate these personal values by increasing the accessibility of households to sustainable and environmentally friendly products, and hence, higher income leads to higher sustainable consumption behaviour. The second component of VBN theory, belief of a person, emphasizes

that the information and awareness regarding the consequences of unsustainable consumption prioritize environment protection and welfare of others and higher income people are more likely to be aware and have information due to his extended social network and greater accessibility to information regarding environmental risk posed by unsustainable consumption patterns (Nguyen & Dekhili, 2024). Hence, the high income of a person makes him more sustainable in consumption. The third component of VBN theory, personal norms, makes a person feel environmental protection as their duty, and a person holding stronger personal norms is likely to follow more sustainable consumption patterns (Gomes et al., 2022). The higher income of a person enables him to follow personal norms more strongly as his high income increases his affordability and he considers himself in a better position to adopt sustainable preferences (Cheng et al., 2014). Hence, the following values become easy for him, and he can adopt sustainable behaviour without feeling much financial burden.

The literature regarding sustainability and pro-environmental behaviour postulates a positive effect of income on sustainable consumption behaviour. The Prosperity Hypothesis postulates that higher income consumers exhibit more environmental concern and thus they consume more sustainably (Franzen & Meyer, 2010). The reason behind this nexus of income and environmental concern is the diversion of individual preferences towards non-material things such as care for the environment (Kemmelmeyer et al., 2002). Thus, people of the higher income group are likely to adopt more sustainable consumption behaviour.

Grandin et al. (2022) postulate that the temporal nature of environmental issues and the link between time preferences of consumers and their income support a positive relation of SCB with income. Generally, time preferences are measured by temporal discounting in which consumers are asked to choose between two options: avail more immediate and smaller gains or more delayed and larger gains. Reimers et al. (2009) outline that income is one of the factors that affect the time preferences of consumers. Low-income consumers discount more steeply than high-income consumers, meaning that low-income people prefer low but immediate gains and hence, they are present-oriented, whereas high-income people prefer larger and delayed gains, and they are future-oriented. Future-oriented consumers adopt more pro-environmental behaviour than present-oriented consumers. Therefore, high-income people are likely to engage more in pro-environmental behaviour, such as the consumption of green products and recycling, due to their preferences for delayed and larger gains, whereas low-income consumers are expected to purchase unsustainable products due to their preferences for immediate and small gains (Frye et al., 2016). Based on the above-discussed literature, the following hypothesis is postulated:

Hypothesis H4: Household income level has a positive effect on sustainable consumption behaviour.

The social learning theory supports the relationship between sustainable consumption behaviour and employment (Wilhite, 2014). Social learning theory delineates that a person's behaviour is influenced by their observation of other people (Koutroubas & Galanakis, 2022). This theory further supports the claim that people learn sustainable practices in their workplace environment and then adopt these practices in their personal lives. Therefore, the workplace environment is thought of as a stimulating factor of sustainable consumption behaviour (Dibattista et al., 2025). Employment can also influence sustainable consumption as employment increases the purchasing power of a person and can enable them to purchase unsustainable products, which generate waste and pollute the environment (Cohen & Winn, 2007).

The theoretical link between employment status and SCB is also derived from the theoretical link between employment status and pro-environmental behaviour, as sustainable consumption behaviour is a subcategory of pro-environmental behaviour (Guazzini et al., 2025).

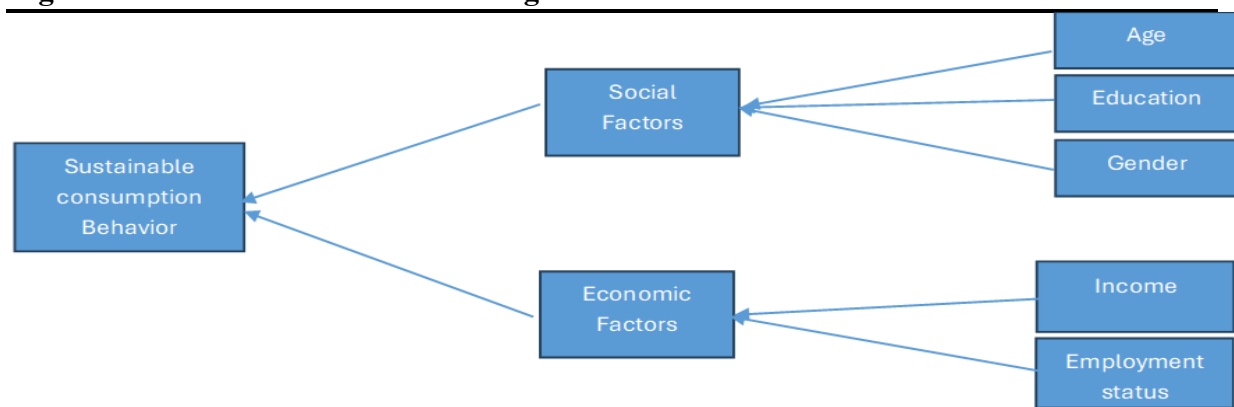
Unemployment can both stimulate and inhibit PEB. Clark et al. (2003) state that adopting PEB is like a provision of a public good, and utility-maximising consumers prefer to trade off some of their private benefits of supplying the public good with the private cost. Clark et al. (2003) further explain that Income is considered an essential factor of PEB as it affects consumers' budget constraints. Unemployment affects the PEB of a person through its effects on income and time constraints. Unemployment causes a fall in income and thus inhibits PEB. Unemployment can also stimulate PEB as the opportunity cost of time decreases during unemployment.

In conclusion, in some cases, PEBs need monetary outlay, while some PEBs mainly need time and effort as input. A PEB needs monetary contribution as input will decrease during unemployment, as the ability to pay for the provision of public goods decreases, and therefore, unemployed people behave less pro-environmentally. While a PEB, which needs time as input, will increase during unemployment as the opportunity cost of time decreases (Meyer, 2016). Based on these arguments, it is concluded that employment status can both stimulate and dissuade sustainable consumption behaviour. The above discussion leads to the formulation of the following hypothesis:

Hypothesis H5: Employment status affects sustainable consumption behaviour.

Figure 1 presents the theoretical framework of this study in diagrammatic form.

Figure 1: Theoretical Framework Diagram



Materials and Methods

This study used a quantitative research design to empirically examine the effects of socio-economic factors on sustainable consumption behaviour in Khyber Pakhtunkhwa, a province of Pakistan. The endogenous variable in this study is sustainable consumption behaviour (SCB), comprising three dimensions: quality of life, care for the environment and care for future generations. The twenty-four-item scale, developed and validated by Quoquab et al. (2019), was used to measure sustainable consumption behaviour (SCB), and a Five-point Likert scale was used to rate each item. The exogenous variables in this study consist of two groups: three social factors (education, gender, and age) and two economic factors (income and employment status). Data for income and age were collected through open-ended questions, and after the Collection of data, groups of income and age were formed following the approaches of Ibok & Etuk (2014; Jami, 2018) and Jami (2022), respectively. Education has five levels: illiterate, secondary, higher secondary, Bachelor, Master and above Master. Income, age, and education were incorporated in the model as ordinal variables. Gender and employment status were added as dummy variables in the model. Gender has two categories, i.e., male and female, whereas employment status (UEMP) was categorised as employed person and unemployed person.

The target population of this study is Khyber Pakhtunkhwa, a province of Pakistan. The province has been divided into seven administrative divisions: Peshawar, Malakand, Hazara, Mardan, Kohat, Bannu and Dera Ismail Khan. A Multistage cluster sampling technique was used to collect data. The pre-established division of the target population was used as the first stage of sampling. First, three divisions were randomly picked, i.e., Peshawar, Kohat and Malakand. In the second stage, districts were selected from each division. From the Peshawar division, three districts were randomly selected out of the five districts, which are Charsadda, Nowshera, and Peshawar. From the Kohat division, three districts, Kohat, Hangu and Kurram, were selected out of five districts and from the Malakand division, four districts, Buner, Lower Dir, Swat, and Upper Dir, were selected out of nine districts. For the selection of sample size, the KMT table, developed by Krejcie and Morgan (1970), was followed. The KMT table suggests a sample of 384 responses is sufficient when the population size is one million or more (Rahman, 2023). However, to increase the reliability of the study's results, five hundred respondents were selected from each area, i.e., urban and rural areas of sampled districts, as the study aimed to comparatively examine the effect of socio-economic factors on sustainable consumption behaviour in rural and urban areas. Respondents of each group were not selected purely randomly, as the estimation technique used in this study needs a reasonable number of respondents in each group. Insufficient sample size of each group and unbalanced sample of sub-groups of a group variable leads to estimation of highly inaccurate parameters (Walther et al., 2025); therefore, caution was exercised in the Collection of data of each group, such as gender and employment status. Some outliers were excluded from the data.

This study used Partial Least Squares Multi-Group Analysis (PLS-MA) to estimate the model. PLS-MGA is an extension of PLS-SEM. It is a method of multi-group analysis within the framework of PLS-SEM and evaluates differences in path coefficients across two or more groups, such as urban residents and rural residents. Therefore, PLS-MGA is an appropriate estimation technique for this study—the estimation of PLS-MGA proceeds in two steps. First, the measurement model was estimated to examine the reliability and validity of the construct. Factor loading assessed the indicators or items' validity, Cronbach's alpha and composite reliability assessed the internal consistency reliability, average variance extracted (AVE), and Heterotrait-Monotrait (HTMT) assessed the convergent and divergent validity of constructs, respectively. To achieve internal consistency reliability, the values of Cronbach's alpha and composite reliability must be greater than 0.70, for convergent validity, AVE must exceed 0.50; and for divergent validity, the value of HTMT must be less than 0.85. The Cronbach alpha value of an item construct always equals 1, and it is not reported (Hair Jr et al., 2021). In the second step, the structural model was estimated by the PLS bootstrap approach to get path coefficients. Smart PLS version 4 was used to estimate the models of this study.

Analysis of Findings

Table 1 presents the descriptive statistics of explanatory variables. It shows the distribution of sample size. Household is the final participant, and only one person from each household was interviewed, as household income is an exogenous variable in this study, and collecting data from more than one member leads to repetition of observation in the data. Table 1 shows observations of each variable for both urban and rural areas. A high percentage of respondents belong to lower income groups, and the percentage of respondents decreases in a group as the income of the group increases in both urban and rural areas. The number of employed participants is higher than the number of unemployed participants in both areas; however, there is a slight difference between employed and unemployed participants. All age groups are roughly balanced; however, Table 1 shows that the higher the age group, the fewer the number of participants it has. In urban areas, the highest number of respondents have Master's and above qualifications and the lowest number of participants have secondary level education,

whereas in rural areas, the highest number of participants have higher secondary education, and the lowest number of participants are illiterate. The ratio of male participants is higher than the ratio of female participants in both urban areas and rural areas.

Table 1: Sample Size Distribution

Urban			
Variables	Categories	Frequency	Percentage
Household Income	20000-70000	117	23.4
	70001-120000	106	21.2
	120001-170000	83	16.6
	170001-220000	99	19.8
	220001-270000	95	19
Employment status(UEMP)	Employed	261	52.2
	Unemployed	239	47.8
Age	18-30	135	27
	31-40	130	26
	41-50	131	26.2
	51-62	104	20.8
Education	Illiterate	100	20
	Secondary	96	19.2
	Higher secondary	98	19.6
	Bachelor	102	20.4
	Master and above	104	20.8
Gender	Male	257	51.4
	Female	243	48.6
Rural			
Variables	Categories	Frequency	Percentage
Household Income	20000-70000	121	24.2
	70001-120000	118	23.6
	120001-170000	101	20.2
	170001-220000	91	18.2
	220001-267000	69	13.8
Employment status(UEMP)	Employed	254	50.8
	Unemployed	246	49.2
Age	18-30	129	25.8
	31-40	137	27.4
	41-50	133	26.6
	51-62	101	20.2
Education	Illiterate	97	19.4
	Secondary	95	19
	Higher secondary	108	21.6
	Bachelor	99	19.8
	Master and above	101	20.2
Gender	Male	270	54
	Female	230	46
Gender	Male	270	54
	Female	230	46

Table 2 presents the results of reliability and convergent validity of variable of all three models. The reliability and validity statistics of SCB were reported as SCB is the only multi-items variable in all three models. Exogenous variables of this study were measured as single-item variable and reliability and validity statistics of single-item variable equals 1 and are not reported (Hair Jr et al., 2021). The results presented in table 2 show that the reliability and convergent validity of latent variable, SCB, were established as the values of CA, and CR are greater than their threshold level of 0.70 and AVE is greater than the threshold level of 0.50.

Table 2: Reliability and Convergent Validity

Variable	Statistics	Model 1 (Complete)	Model 2 (Urban)	Model 3 (Rural)
SCB	CA	0.96	0.96	0.96
	CR	0.96	0.96	0.97
	AVE	0.51	0.54	0.54

Table 3 presents the divergent validity of variables. The result shows that the HTMT ratios between variables are less than the threshold level of 0.85 which means all variables in the model are not correlated and each variable measures a different concept. Therefore, it is concluded that the divergent/ discriminant validity is achieved in MGA model.

Table 3: Discriminant Validity of MGA (HTMT ratio)

Complete					
	Age	Education	Female	Income	SCB
Education	0.19				
Gender (Female)	0.07	0.21			
Income	0.32	0.02	0.08		
SCB	0.32	0.42	0.10	0.41	
UEMP	0.12	0.40	0.41	0.12	0.09
Urban					
	Age	Education	Female	Income	SCB
Education	0.24				
Gender (Female)	0.00	0.22			
Income	0.36	0.02	0.09		
SCB	0.37	0.60	0.15	0.35	
UEMP	0.18	0.46	0.50	0.02	0.17
Rural					
	Age	Education	Female	Income	SCB
Education	0.27				
Gender (Female)	0.24	0.17			
Income	0.09	0.05	0.20		
SCB	0.11	0.22	0.14	0.52	
UEMP	0.40	0.30	0.17	0.23	0.12

Table 4 displays the results of collinearity statistics. As MGA estimates combined effects (complete model) and individual group (Urban and Rural) effects of socio-economic factors on sustainable consumption behavior, therefore, VIF values of each independent variable of all three model were presented in table 5 and the result shows that the VIF values of each variable in all three models are well below the benchmark value of 5. Hence, it is concluded that there is no multicollinearity problem in MGA model.

Table 4: Multicollinearity Statistics (MGA)

Variables	Complete (VIF)	Urban (VIF)	Rural (VIF)
Age	1.19	1.26	1.33
Education	1.23	1.32	1.16
Gender (Female)	1.23	1.38	1.14
Income	1.15	1.18	1.18
UEMP	1.42	1.64	1.38

Table 5 presents the results of MGA. The results under the complete model show the combined effect (urban and rural) of socio-economic factors on sustainable consumption behaviour. The coefficients demonstrate the relation of the endogenous variable with the exogenous variables. The coefficient of age under the complete model is positive and statistically significant, as the p-value is less than 0.5, which implies that consumers of higher age adopt more sustainable consumer behaviour than the younger consumers. The coefficient of age in the case of the urban model is also positive and statistically significant, which also implies that in urban areas, older consumers are more sustainable in consumption. However, the coefficient of age is negative and statistically significant in rural areas, which means that older consumers are less sustainable in consumption than the younger consumers. This finding leads to the acceptance of H1 as H1 is a non-directional hypothesis which specifies only the existence of an age effect on sustainable consumption behaviour, not the direction of effect. The results depicted in Table 5 show that a statistically significant difference exists between urban consumers and rural consumers regarding the effect of age on sustainable consumption behaviour. The coefficient measuring the difference between urban and rural areas in terms of the age effect on sustainable consumption behaviour is positive, which implies that an increase in age leads urban consumers to consume more sustainably than rural consumers. Further, it could be inferred from the results depicted in Tables 5 and 6 that elder consumers are more sustainable in consumption than the younger consumers in urban areas, whereas younger consumers are more sustainable in consumption than the elder consumers in rural areas. The coefficients of education are positive across all three models; however, it has a statistically insignificant effect on sustainable consumption behaviour in rural areas. The positive and statistically significant coefficient of education estimated by the complete model implies that an increase in the level of education leads consumers towards more sustainable consumption behaviour. Hence, H2, which states that education causes improvement in sustainable consumption, is accepted. The coefficient of education in the case of the urban model also implies that education is a significant factor in enhancing sustainable consumption behaviour. However, the coefficient of education in the case of the rural model demonstrates that education has a statistically insignificant role in enhancing sustainable consumption behaviour. The results of MGA presented in Table 6 show that the effect of education on sustainable consumption behaviour is greater in urban areas than in rural areas, and this difference is statistically significant. The results presented in Table 5 show that gender differences also cause a statistically significant difference in sustainable consumption behaviour. As the gender was incorporated as a dummy variable in the model, the reference category is male, and female is the added category. The results show that the coefficient of female (gender) is positive and significant under the model, which means that females are more sustainable than males. This result leads us to the acceptance of H3, which states that gender differences cause differences in sustainable consumption behaviour. The coefficient of female (gender) is also positive but statistically insignificant in the case of the urban model, which implies that urban female consumers adopt more sustainable consumption behaviour than the male consumers, but the difference between urban female and urban male consumers is statistically insignificant. However, the results depicted in Table 5 show that the

coefficient of female (gender) is negative and statistically significant in the rural model, which implies that in rural areas, male consumers have shown more sustainable consumption behaviour than female consumers. The findings depicted in Table 6 show that a statistically significant difference exists between urban areas and rural areas regarding the effect of gender on sustainable consumption behaviour, and the positive coefficient implies that the gender effect on sustainable consumption behaviour is more potent in urban areas than in rural areas. The findings depicted in Tables 5 and 6 demonstrate that income is an important and statistically significant factor of sustainable consumption behaviour. The results presented in Table 6 show that the coefficients of income are positive and statistically significant in all three models, which implies that income is a significant factor in enhancing sustainable consumption behaviour. The results presented in Table 5 show that the coefficient of income is positive and statistically significant, which implies that a statistically significant difference exists between urban consumers and rural consumers regarding the effect of income on sustainable consumption behaviour, and the positive coefficient means that the effect of income on sustainable consumption in urban areas is more substantial than in rural areas. The employment status, another economic factor, was also added as a dummy variable in the model, and the employed person was set as a reference category; the unemployed person was added to the model. The results presented in table 5 show that the coefficient of employment status is negative and statistically significant in joint (complete) model and rural model which implies that employed persons are more sustainable than unemployed persons, however, the coefficient of employment status is positive and statistically significant in urban model which means unemployed consumers are more sustainable in consumption than the employed consumers in urban areas. The results presented in Table 5 show that the coefficient of employment status is positive and statistically significant, which means that the unemployed consumers in urban areas are more sustainable in consumption than the unemployed consumers in rural areas. As the results demonstrate that employment status affects sustainable consumption behaviour, the H5 is accepted as it is a non-directional hypothesis which states only the existence of the effect of employment status on sustainable consumption behaviour. Table 5 also presents values of R² for each model estimated by PLS-MGA. R² values of the complete model, the urban model and the rural model are 0.37, 0.53 and 0.38, respectively, which implies that the variation explained in SCB by exogenous variables of this study is 37 per cent in the complete model, 53 per cent in the urban model and 38 per cent in the rural model. Figure 2 presents the graphical output of PLS-MGA, i.e., the graphical output of the complete model, the urban model and the rural model.

Table 5: Multi-Group Analysis

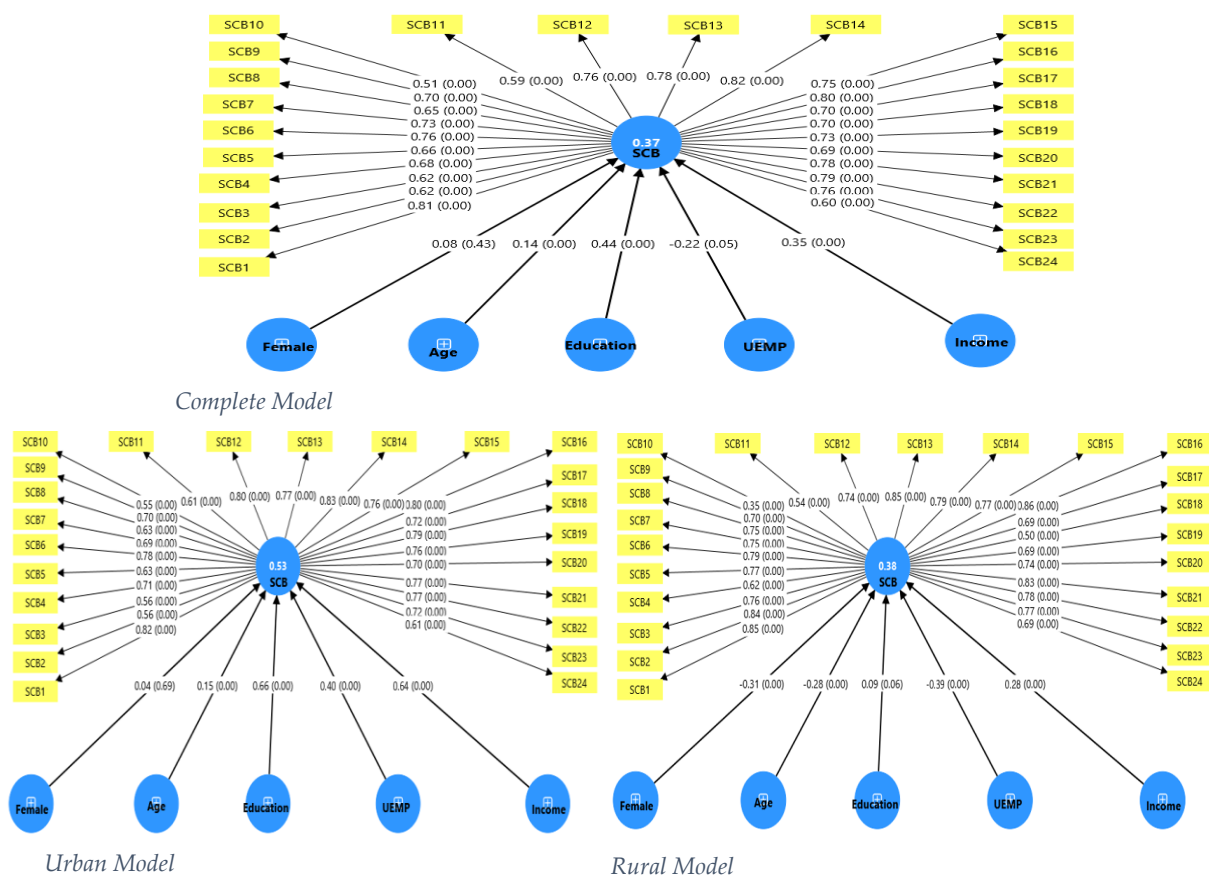
Complete					Urban				Rural			
Variables	Beta	T Value	P Value	R ²	Beta	T Value	P Value	R ²	Beta	T Value	P Value	R ²
Age	0.14	3.50	0.00		0.15	3.75	0.00		-0.28	4.67	0.00	
Education	0.44	11.00	0.00		0.66	16.50	0.00		0.09	1.80	0.06	
(Gender) Female	0.08	0.80	0.43		0.04	0.44	0.69		-0.31	3.44	0.00	
Income	0.35	8.75	0.00		0.64	12.80	0.00		0.28	7.00	0.00	
UNMP	-0.22	2.00	0.05		0.40	4.00	0.00		-0.39	3.90	0.00	
SCB				0.37				0.53				0.38

Note: T statistics equals the absolute value of the ratio of beta to the standard errors.

Table 6: MGA Results of Groups difference

Variables	Difference (Urban - Rural)	P-value
Age	0.43	0.00
Education	0.57	0.00
Gender (Female)	0.35	0.01
Income	0.36	0.00
UEMP	0.79	0.00

Figure 2 presents the graphical output of PLS-MGA which graphically shows measurement model and the structural model (path coefficients). Smart-PLS version 4 presents both measurement model and structural model in a single diagram. Panels a, b and c of Figure 2 present graphical output of complete model, urban model and rural model. The upper portion of the graphical output of each model shows the results of measurement model (factor loadings and their p values) whereas the lower portion shows the structural models (path coefficients and their p values). The 24 indicators of sustainable consumption behavior was denoted by SCB1 to SCB24.

Figure 1: Graphical Output of PSL-MGA

Discussion

The findings of this study demonstrate that age is a significant factor in sustainable consumption behavior. It is inferred from PLS-MGA (complete model and urban model)

findings that consumers become sustainable as their age increases. Therefore, it is concluded that in urban areas, older consumers are more sustainable in consumption than the younger consumers. The theory of life course supports this finding as the theory states that a person's social role changes as he gets older, such as becoming a parent or getting a job and moving out of unemployed status. Consequently, a change in his social role makes him more responsible. He starts consuming sustainably (Elder Jr et al., 2003). However, the results of PLS-MGA show that in rural areas, younger consumers are more sustainable in consumption than older consumers. Young consumers have more environmental knowledge, thus they are more sustainable in consumption (Peluso et al., 2021) and have more enthusiasm for environmental reforms and protection (Cottrell, 2003). Previous empirical research also supports these mixed findings. The study of Witek and Kuźniar (2020) examined the effect of age on green consumption and found that elder consumers are more inclined towards green consumption than the younger consumers, whereas the study of Lazaric et al. (2020) found that younger consumers are more sustainable in consumption than the elder consumers.

Education was found to be a stimulating factor of sustainable consumer behaviour. VBN theory supports this finding, which states that education strengthens the link between values and sustainable consumption behaviour. Education enables a person to get knowledge about environmental problems and their consequences, and thus, education leads them to act in an open biosphere and altruistic values, which consequently result in sustainable consumption (Çakır Yıldırım & Karaarslan Semiz, 2019). The findings of extant empirical research also corroborate this result. The empirical study conducted by Ibok and Etuk (2014), Migheli (2021), and Wang et al. (2022) confirmed that education is a significant factor in stimulating pro-environmental behaviour and green consumption. The findings of MGA (complete model and urban model) show that female consumers are more sustainable than male consumers; however, gender differences create an insignificant difference in sustainable consumption behaviour. At the same time, the findings of the rural model show that male consumers are more sustainable in consumption than female consumers, and the difference between rural male and female is statistically significant. Socialisation theory supports this contrasting result. This theory states that females can be more sustainable in consumption due to their role of caregiver and nurturer, whereas males consume sustainably due to their role of economic provider, and they are primarily engaged in market activities (Blocker & Eckberg, 1997; Bloodhart & Swim, 2020). Previous empirical studies also support this finding. The study of Witek and Kuźniar (2020) found that female consumers are more sustainable in consumption than male consumers, whereas the study of Mostafa (2007) shows that male consumers are more sustainable in consumption than female consumers.

Income is another statistically significant factor enhancing sustainable consumption behaviour. VBN theory corroborates this finding. This theory postulates that income promotes sustainable consumption through social values and norms. An Increase in income leads a person to act upon biospheric values and personal norms related to the protection and preservation of the environment (Gomes et al., 2022) and altruistic values related to the welfare of other people, such as the welfare of future generations (Nguyen & Dekhili, 2024). People holding strong norms are likely to adopt more sustainable consumption practices, and high income enables them to follow sustainability-related personal norms, as high income increases their affordability and they take up environmental protection and resource conservation as their duty; consequently, they start consuming sustainably (Nguyen & Dekhili, 2024). This finding is also corroborated by the empirical finding of Du et al. (2024), whose study found that high income enhances pro-environmental behaviour.

The current study found contrasting results regarding the effect of employment status on sustainable consumption behaviour for urban areas and rural areas. Social learning theory offers justification for this result. This theory states that a person's behaviour is moulded by

watching and observing the behaviour of other people, and the workplace environment provides an opportunity for a person to observe other people and enables a person to learn sustainability-related practices; consequently, they adopt sustainable consumption behaviour. The empirical study of Hicklenton et al. (2019) supported this finding as they found that the workplace environment fosters sustainability-related behaviour. The result of this study also shows that employed people are less sustainable in consumption than unemployed people in urban areas. The justification for this outcome is derived from the study of Clark et al. (2003), who postulate that the behaviour related to sustainability practices is a public good which requires time and effort as resources, and unemployment decreases the opportunity cost of consuming sustainably; therefore, unemployed persons consume more sustainably than employed persons. This finding is corroborated by the study of (Kim et al., 2025), who found that the workload inhibits sustainability-related behaviour and thus, employed people tend to consume unsustainably. The results of multigroup analysis show that the effect of socio-economic factors on sustainable consumption behaviour is more potent in urban areas than in rural areas; thus, the study confirmed that the urban-rural divide regarding sustainable consumption behaviour exists in the study area. The theory of environmental deprivation corroborates this urban-rural divide, which states that urban consumers observe more closely the transformed and degraded environment of urban areas; thus, they follow more sustainable practices due to their heightened concerns for the environment (Dąbrowski et al., 2022).

Conclusion and Recommendations

This study was conducted to empirically examine the effects of socio-economic factors on sustainable consumption behaviour and to analyse differences in urban and rural areas of Khyber Pakhtunkhwa regarding the effects of socio-economic factors on sustainable consumption behaviour. MGA-PLS was used to achieve the objective of the study. The findings of this study demonstrate that socioeconomic factors have a significant role in enhancing sustainable consumption behavior. The findings show that age, education and income have a statistically significant role in stimulating sustainable consumption behaviour in both urban areas and rural areas. In urban areas, the difference between male and female regarding sustainable consumption behaviour is statistically insignificant, whereas male consumers are more sustainable in consumption than female consumers in rural areas, and this difference is statistically significant. In urban areas, unemployed consumers are more sustainable than employed consumers, whereas employed consumers are more sustainable in consumption than unemployed consumers in rural areas, and a statistically significant difference exists between employed and unemployed persons regarding sustainable consumption behaviour. The outcome of MGA demonstrates that there is a statistically significant difference between urban and rural consumers regarding the effects of socio-economic factors on sustainable consumption behaviour, and the effect of these socio-economic factors on sustainable consumption behaviour is more potent in urban areas than in rural areas.

This study presents some valuable recommendations for policymakers. Keeping in view the effects of age and education as found by this study, education programs regarding sustainability should be initiated for less educated and illiterate people and integration of these programs into school education. Further, the study also put forward suggestions for firms and marketers. In urban areas, firms should offer products with sustainable features which ageing consumers mostly consume. In contrast, in rural areas, goods consumed by young consumers should be offered with sustainable features. This selling strategy will increase the sales of firms and will contribute to the promotion of sustainable consumption, too. The findings show an insignificant difference between urban males and urban females; however, in rural areas, females are less sustainable than males. Therefore, it is suggested that firms should design and manufacture goods with sustainable features which females frequently consume, and these products must

be affordable and accessible to rural females. Moreover, education programs regarding sustainability should focus more on educating rural females and stimulating sustainable consumption behaviour of rural females. Generally, sustainable products are expensive and low-income and unemployed consumers cannot afford these products; therefore, it is suggested that low-priced sustainable products should be manufactured, or the government should support the firms to keep the price of sustainable products low. However, employed persons in urban areas are less sustainable; therefore, awareness about sustainable practices should be provided in the workplace.

References

- Arora, N. K., & Mishra, I. (2023). Responsible consumption and production: A roadmap to sustainable development. *Environmental Sustainability*, 6(1), 1–6. <https://doi.org/10.1007/s42398-023-00207-4>
- Blocker, T. J., & Eckberg, D. L. (1997). Gender and environmentalism: Results from the 1993 general social survey. *Social Science Quarterly*, 78(4), 841–858.
- Bloodhart, B., & Swim, J. K. (2020). Sustainability and consumption: What's gender got to do with it? *Journal of Social Issues*, 76(1), 101–113. <https://doi.org/10.1111/josi.12370>
- Brough, A. R., Wilkie, J. E., Ma, J., Isaac, M. S., & Gal, D. (2016). Is eco-friendly unmanly? The green-feminine stereotype and its effect on sustainable consumption. *Journal of Consumer Research*, 43(4), 567–582. <https://doi.org/10.1093/jcr/ucw044>
- Bui, T.-D., Lim, M. K., Sujanto, R. Y., Ongkowidjaja, M., & Tseng, M.-L. (2022). Building a hierarchical sustainable consumption behavior model in qualitative information: Consumer behavior influences on social impacts and environmental responses. *Sustainability*, 14(16), 9877. <https://doi.org/10.3390/su14169877>
- Bulut, Z. A., Kökalan Çimrin, F., & Doğan, O. (2017). Gender, generation and sustainable consumption: Exploring the behaviour of consumers from Izmir, Turkey. *International Journal of Consumer Studies*, 41(6), 597–604. <https://doi.org/10.1111/ijcs.12364>
- Çakır Yıldırım, B., & Karaarslan Semiz, G. (2019). Future teachers' sustainable water consumption behavior: A test of the value-belief-norm theory. *Sustainability*, 11(6), 1558. <https://doi.org/10.3390/su11061558>
- Čapienė, A., Rūteliūnė, A., & Krukowski, K. (2022). Engaging in sustainable consumption: Exploring the influence of environmental attitudes, values, personal norms, and perceived responsibility. *Sustainability*, 14(16), 10290. <https://doi.org/10.3390/su141610290>
- Cheng, Q. L., Wang, J. J., & Yin, L. G. (2014). A research framework of green consumption behavior based on value-belief-norm theory. *Advanced Materials Research*, 962, 1485–1489. <https://doi.org/10.4028/www.scientific.net/AMR.962-965.1485>
- Clark, C. F., Kotchen, M. J., & Moore, M. R. (2003). Internal and external influences on pro-environmental behavior: Participation in a green electricity program. *Journal of Environmental Psychology*, 23(3), 237–246. [https://doi.org/10.1016/S0272-4944\(02\)00105-6](https://doi.org/10.1016/S0272-4944(02)00105-6)
- Cohen, B., & Muñoz, P. (2016). Sharing cities and sustainable consumption and production: Towards an integrated framework. *Journal of Cleaner Production*, 134, 87–97. <https://doi.org/10.1016/j.jclepro.2016.03.033>
- Cohen, B., & Winn, M. I. (2007). Market imperfections, opportunity and sustainable entrepreneurship. *Journal of Business Venturing*, 22(1), 29–49. <https://doi.org/10.1016/j.jbusvent.2004.12.001>
- Cottrell, S. P. (2003). Influence of sociodemographics and environmental attitudes on general responsible environmental behavior among recreational boaters. *Environment and Behavior*, 35(3), 347–375. <https://doi.org/10.1177/0013916502250131>
- Dąbrowski, L. S., Środa-Murawska, S., Smoliński, P., & Biegańska, J. (2022). Rural–urban divide: Generation Z and pro-environmental behaviour. *Sustainability*, 14(23), 16111. <https://doi.org/10.3390/su142316111>
- das Neves, M. A. C. (2025). *Sustainable consumption concerns in different age groups* [Master's thesis, Universidade NOVA de Lisboa].

- Dibattista, I., Berdicchia, D., Mazzardo, E., & Masino, G. (2025). Green norms in the workplace to promote environmental sustainability: The positive effect on green innovative work behaviors and person–environment relationship. *Frontiers in Sustainability*, 5, 1506804. <https://doi.org/10.3389/frsus.2024.1506804>
- Dimitrova, T., Ilieva, I., & Angelova, M. (2022). Exploring factors affecting sustainable consumption behaviour. *Administrative Sciences*, 12(4), 155. <https://doi.org/10.3390/admsci12040155>
- Du, S., Cao, G., & Huang, Y. (2024). The effect of income satisfaction on the relationship between income class and pro-environment behavior. *Applied Economics Letters*, 31(1), 61–64. <https://doi.org/10.1080/13504851.2022.2113463>
- Dursun, I., Kabadayi, E. T., & Tuger, A. (2017). Application of value-belief-norm theory to responsible post-consumption behaviors: Recycling and reuse. In *Proceedings of the International Congress of the New Approaches and Technologies for Sustainable Development* (pp. 1–10). Isparta, Turkey.
- Elder, G. H., Jr., Johnson, M. K., & Crosnoe, R. (2003). The emergence and development of life course theory. In J. T. Mortimer & M. J. Shanahan (Eds.), *Handbook of the life course* (pp. 3–19). Springer. https://doi.org/10.1007/978-0-306-48247-2_1
- Franzen, A., & Meyer, R. (2010). Environmental attitudes in cross-national perspective: A multilevel analysis of the ISSP 1993 and 2000. *European Sociological Review*, 26(2), 219–234. <https://doi.org/10.1093/esr/jcp018>
- Frye, C. C., Galizio, A., Friedel, J. E., DeHart, W. B., & Odum, A. L. (2016). Measuring delay discounting in humans using an adjusting amount task. *Journal of Visualized Experiments*, 107, e53584. <https://doi.org/10.3791/53584>
- Ganglmair-Wooliscroft, A., & Wooliscroft, B. (2022). An investigation of sustainable consumption behavior systems—Exploring personal and socio-structural characteristics in different national contexts. *Journal of Business Research*, 148, 161–173. <https://doi.org/10.1016/j.jbusres.2022.04.046>
- Godin, L., & Langlois, J. (2021). Care, gender, and change in the study of sustainable consumption: A critical review of the literature. *Frontiers in Sustainability*, 2, 725753. <https://doi.org/10.3389/frsus.2021.725753>
- Gomes, G. M., Moreira, N., Bouman, T., Ometto, A. R., & Van der Werff, E. (2022). Towards circular economy for more sustainable apparel consumption: Testing the value-belief-norm theory in Brazil and in The Netherlands. *Sustainability*, 14(2), 618. <https://doi.org/10.3390/su14020618>
- Grandin, A., Guillou, L., Sater, R. A., Foucault, M., & Chevallier, C. (2022). Socioeconomic status, time preferences and pro-environmentalism. *Journal of Environmental Psychology*, 79, 101720. <https://doi.org/10.1016/j.jenvp.2021.101720>
- Guazzini, A., Valdrighi, G., Fiorenza, M., & Duradoni, M. (2025). The relationship between connectedness to nature and pro-environmental behaviors: A systematic review. *Sustainability*, 17(8), 3686. <https://doi.org/10.3390/su17083686>
- Hair, J. F., Jr., Hult, G. T. M., Ringle, C. M., Sarstedt, M., Danks, N. P., & Ray, S. (2021). *Partial least squares structural equation modeling (PLS-SEM) using R: A workbook*. Springer Nature. <https://doi.org/10.1007/978-3-030-80519-7>
- Hicklenton, C., Hine, D. W., & Loi, N. M. (2019). Can work climate foster pro-environmental behavior inside and outside of the workplace? *PLOS ONE*, 14(10), e0223774. <https://doi.org/10.1371/journal.pone.0223774>
- Hoornweg, D., Bhada-Tata, P., & Kennedy, C. (2013). Environment: Waste production must peak this century. *Nature*, 502(7473), 615–617. <https://doi.org/10.1038/502615a>
- Hunter, L. M., Hatch, A., & Johnson, A. (2004). Cross-national gender variation in environmental behaviors. *Social Science Quarterly*, 85(3), 677–694. <https://doi.org/10.1111/j.0038-4941.2004.00239.x>
- Ibok, N. I., & Etuk, S. G. (2014). Socio-economic and demographic determinants of green consumption. *International Journal of Managerial Studies and Research*, 2(9), 47–56.
- Jami, J. (2018). The dilemma of classification of income levels in social research. *The NEHU Journal*, 16(1), 19–30.

- Kadic-Maglajlic, S., Arslanagic-Kalajdzic, M., Micevski, M., Dlacic, J., & Zabkar, V. (2019). Being engaged is a good thing: Understanding sustainable consumption behavior among young adults. *Journal of Business Research*, 104, 644–654. <https://doi.org/10.1016/j.jbusres.2019.02.042>
- Kemmelmeier, M., Król, G., & Kim, Y. H. (2002). Values, economics, and proenvironmental attitudes in 22 societies. *Cross-Cultural Research*, 36(3), 256–285. <https://doi.org/10.1177/10697102036003004>
- Kim, B. J., Lee, S. H., & Lee, J. (2025). The impact of work overload on pro-environmental behavior at work: The mediating role of organizational identification and the moderating role of corporate social responsibility. *Sustainable Development*. Advance online publication. <https://doi.org/10.1002/sd.2776>
- Kopnina, H. (2016). The victims of unsustainability: A challenge to sustainable development goals. *International Journal of Sustainable Development & World Ecology*, 23(2), 113–121. <https://doi.org/10.1080/13504509.2015.1111269>
- Koutroubas, V., & Galanakis, M. (2022). Bandura's social learning theory and its importance in the organizational psychology context. *Psychology*, 12(6), 315–322. <https://doi.org/10.4236/psych.2022.126022>
- Krejcie, R., & Morgan, D. (1970). Sample size determination table. *Educational and Psychological Measurement*, 30(3), 607–610. <https://doi.org/10.1177/001316447003000308>
- Lazaric, N., Le Guel, F., Belin, J., Oltra, V., Lavaud, S., & Douai, A. (2020). Determinants of sustainable consumption in France: The importance of social influence and environmental values. *Journal of Evolutionary Economics*, 30, 1337–1366. <https://doi.org/10.1007/s00191-019-00647-2>
- Martin, J.-L., Maris, V., & Simberloff, D. S. (2016). The need to respect nature and its limits challenges society and conservation science. *Proceedings of the National Academy of Sciences*, 113(22), 6105–6112. <https://doi.org/10.1073/pnas.1525003113>
- Meyer, A. (2016). Is unemployment good for the environment? *Resource and Energy Economics*, 45, 18–30. <https://doi.org/10.1016/j.reseneeco.2016.04.005>
- Michaelis, L., & Wilk, R. R. (2009). Consumption and the environment. In L. R. Koh (Ed.), *Social and cultural development of human resources* (pp. 297–314). UNESCO Encyclopedia of Life Support Systems.
- Migheli, M. (2021). Green purchasing: The effect of parenthood and gender. *Environment, Development and Sustainability*, 23(7), 10576–10600. <https://doi.org/10.1007/s10668-020-01086-w>
- Mortensen, L. F., Reichel, A., Watson, D., Hansen, M. S., & Acosta Fernandez, J. (2012). *Consumption and the environment—2012 update*. European Environment Agency. <https://www.eea.europa.eu/en/analysis/publications/consumption-and-the-environment-2012>
- Mostafa, M. M. (2007). Gender differences in Egyptian consumers' green purchase behaviour: The effects of environmental knowledge, concern and attitude. *International Journal of Consumer Studies*, 31(3), 220–229. <https://doi.org/10.1111/j.1470-6431.2006.00523.x>
- Nguyen, T. P., & Dekhili, S. (2024). What drives responsible consumption in collectivistic developing countries? An analysis of Vietnamese consumers' motivations with value–belief–norm theory. *Business Strategy and the Environment*, 33(7), 7527–7543. <https://doi.org/10.1002/bse.3692>
- Onel, N. (2024). Transforming consumption: The role of values, beliefs, and norms in promoting four types of sustainable behavior. *Journal of Consumer Behaviour*, 23(2), 491–513. <https://doi.org/10.1002/cb.2216>
- Osuntuyi, B. V., & Lean, H. H. (2022). Economic growth, energy consumption and environmental degradation nexus in heterogeneous countries: Does education matter? *Environmental Sciences Europe*, 34(1), 48. <https://doi.org/10.1186/s12302-022-00640-0>
- Panzone, L., Hilton, D., Sale, L., & Cohen, D. (2016). Socio-demographics, implicit attitudes, explicit attitudes, and sustainable consumption in supermarket shopping. *Journal of Economic Psychology*, 55, 77–95. <https://doi.org/10.1016/j.joep.2016.02.004>
- Peluso, A. M., Pichierri, M., & Pino, G. (2021). Age-related effects on environmentally sustainable purchases at the time of COVID-19: Evidence from Italy. *Journal of Retailing and Consumer Services*, 60, 102443. <https://doi.org/10.1016/j.jretconser.2021.102443>

- Qadri, H. M. U. D., Zafar, M. B., Ali, H., & Tahir, M. (2025). Wealth, wisdom, and the will to protect: An examination of socioeconomic influences on environmental behavior. *Social Indicators Research*. Advance online publication. <https://doi.org/10.1007/s11205-025-03492-x>
- Quoquab, F., Mohammad, J., & Sukari, N. N. (2019). A multiple-item scale for measuring “sustainable consumption behaviour” construct: Development and psychometric evaluation. *Asia Pacific Journal of Marketing and Logistics*, 31(4), 791–816. <https://doi.org/10.1108/APJML-08-2017-0186>
- Rafique, N., Khan, D., & Rasheed, N. (2024). Exploring the effect of technological diffusion on energy transition: A path to low carbon economy and sustainability. *Journal of Asian Development Studies*, 13(4), 977–991.
- Rahman, M. M. (2023). Sample size determination for survey research and non-probability sampling techniques: A review and set of recommendations. *Journal of Entrepreneurship, Business and Economics*, 11(1), 42–62.
- Reimers, S., Maylor, E. A., Stewart, N., & Chater, N. (2009). Associations between a one-shot delay discounting measure and age, income, education and real-world impulsive behavior. *Personality and Individual Differences*, 47(8), 973–978. <https://doi.org/10.1016/j.paid.2009.07.026>
- Stern, P. C. (2000). New environmental theories: Toward a coherent theory of environmentally significant behavior. *Journal of Social Issues*, 56(3), 407–424. <https://doi.org/10.1111/0022-4537.00175>
- Vargas-Merino, J. A., Rios-Lama, C. A., & Panez-Bendezú, M. H. (2023). Sustainable consumption: Conceptualization and characterization of the complexity of “being” a sustainable consumer—A systematic review of the scientific literature. *Sustainability*, 15(10), 8401. <https://doi.org/10.3390/su15108401>
- Vermeir, I., & Verbeke, W. (2008). Sustainable food consumption among young adults in Belgium: Theory of planned behaviour and the role of confidence and values. *Ecological Economics*, 64(3), 542–553. <https://doi.org/10.1016/j.ecolecon.2007.03.007>
- Walther, J.-K., Hecht, M., & Zitzmann, S. (2025). Shrinking small sample problems in multilevel structural equation modeling via regularization of the sample covariance matrix. *Structural Equation Modeling: A Multidisciplinary Journal*, 32(1), 46–65. <https://doi.org/10.1080/10705511.2024.2345678>
- Wang, Q., Niu, G., Gan, X., & Cai, Q. (2022). Green returns to education: Does education affect pro-environmental attitudes and behaviors in China? *PLOS ONE*, 17(2), e0263383. <https://doi.org/10.1371/journal.pone.0263383>
- Wiedmann, T., Lenzen, M., Keyßer, L. T., & Steinberger, J. K. (2020). Scientists’ warning on affluence. *Nature Communications*, 11(1), 3107. <https://doi.org/10.1038/s41467-020-16941-y>
- Wilhite, H. (2014). Insights from social practice and social learning theory for sustainable energy consumption. *Flux*, 96(2), 24–30. <https://doi.org/10.3406/flux.2014.9383>
- Witek, L., & Kuźniar, W. (2020). Green purchase behavior: The effectiveness of sociodemographic variables for explaining green purchases in emerging market. *Sustainability*, 13(1), 209. <https://doi.org/10.3390/su13010209>
- Xiao, C., & McCright, A. M. (2012). Explaining gender differences in concern about environmental problems in the United States. *Society & Natural Resources*, 25(11), 1067–1084. <https://doi.org/10.1080/08941920.2011.651191>
- Xie, X., Qin, S., Gou, Z., & Yi, M. (2021). Incorporating green building into architectural education: What can we learn from the value-belief-norm theory? *International Journal of Sustainability in Higher Education*, 22(3), 457–476. <https://doi.org/10.1108/IJSHE-04-2020-0134>
- Zulauf, K., & Wagner, R. (2021). Urban and rural sustainability: Divergent concepts and their consequences for marketing. *Frontiers in Sustainability*, 2, 670866. <https://doi.org/10.3389/frsus.2021.670866>