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Modeling the Social Factors That Determine Sustainable Consumption Behavior in the Community of Madrid

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Abstract: This paper defines the social factors that determine sustainable behavior and identifies the elements that promote such behavior. These factors are external from the individual and causal regarding sustainable behavior, an area that receives little attention in literature. It uses a theoretical model, based on existing research, which is tested through a questionnaire with 26 indicators adapted to the Spanish context. In an initial analysis, this model proposed, as determining social factors in the CCS, aspects such as government action, social pressure, influence of the social environment, demographic variables (age, gender, education level), education and information, and market conditions. Finally, it was concluded that 43.4% of the variance of the endogenous latent variable (SCC) can be explained only by three exogenous latent constructions: environmental influences (in particular the influence of family and friends, as well as that generated by cultural factors such as traditions), education and information (specifically related to information on sustainability and the effects of personal consumption on the environment), and market conditions (referring to the positive perception of sustainable products by consumers, including their willingness to pay higher prices than those of conventional products). The rest of the exogenous variables did not have a significant relationship with the endogenous variable. These results are very useful for government institutions, companies that operate in the sector and pro-environmental and pro-social groups, that knowing what motivates people to adopt this form of behavior can design relevant strategies to get positive answers about the environment, the economy and the society.

Keywords: sustainable consumer behavior; sustainability; ecology; social factors; PLS-SEM; structural equations

1. Introduction

Human beings are immersed in a fluid consumer age dominated by a market of disposable products for which replacement is planned from production [1]. This hyper-consumption has caused environmental problems that have intensified globally according to numerous scientific works. For example, the synthesis of the Millennium Ecosystem Assessment reports on the loss of diversity due to the transformation of ecosystems, the degradation of services provided by these systems and increased world poverty [2]. In addition, the Intergovernmental Panel on Climate Change has compiled reports on the warming of the atmosphere and the oceans, the rise in global ocean levels,

increasing concentrations of greenhouse gases in the atmosphere and changes in the global water cycle [3]. Despite the fact that consumers are principally responsible for environmental degradation, new theories concerning their behavior describe consumers who are no longer dominated, aligned and without the power to reflect or exercise autonomy, who are not purely rational, selfish and solely concerned with individual preferences. This leads to the concept of a socialized consumer with a mixture of realist behaviors: susceptible to manipulation, but free to choose, impulsive and reflective at the same time, with conditioned behavior and engaged in the social use of the objects and symbols of consumer society. A consumer that is not isolated but responds to a social context that makes them a carrier of perceptions, representations and values forced and influenced by the reality of their activity, which allows them to see the consumption process as a set of behaviors drawn from the private sphere, lifestyles and social change [4].

This being the case, people's lifestyles determine their habits and behavior with respect to the consumption of resources and the generation of waste, which are considered to have the greatest environmental impact in terms of the generation of greenhouse gases (GG), depletion of the ozone layer and the production of acidifying substances [5]. In this context, the challenge is to change our ways of thinking, feeling and acting, and to change society overall. This would mean favoring desirable sustainable development scenarios, such as changing consumer lifestyles, reducing obsessive consumption and evaluating the advisability of accumulation. The reevaluation of economies on the basis of the quality of their development rather than the rate of growth would also be necessary. This would allow a distinction between efficiency and growth, by which a reduction in growth does not mean sacrificing efficiency, but the consideration of this as a dimension of the limits of environmental sustainability based on responsible consumption [6].

Empirical studies have produced promising data concerning the existence of this type of behavior: consumers that demand further information concerning sustainable products, their origin and their supply chain, who are concerned about the environmental and social impact of what they consume, respond to the influence of reference groups and purchase ecological products, and who are even willing to pay more for sustainable products [7]. Similarly, there is also the development of an environmental protection consciousness involving sustainable practices and consumption [8]. All of these actions presuppose a change in lifestyles towards sustainability.

Theoretically, sustainable consumption originates in ethical consumer studies, which have been addressed using such different disciplines as administration, sociology, psychology, philosophy and economics, with none of these serving to exclusively frame the concept, meaning this is essentially an interdisciplinary study in development [9]. The study of ethical consumerism has referred to a number of scenarios that include: (1) consumer ethics in purchasing behavior; (2) consumer resistance to marketing efforts; (3) the relationship between moral purchasing and sustainability; (4) corporate business, collective and social efforts to create ethical consumption opportunities; (5) the perspectives of academic experts on consumption ethics; and (6) ethical consumption as a conscious project of individuals and small groups. On this basis, the concept used to describe a consumer that is more conscious and responsible concerning the effects of their consumption decisions has evolved into increasingly broad terms with respect to their concern for the environment [10]. Using more specific terms, this consumer has been described as green, ecological, ethical, responsible and socially responsible in the literature [9]. While these terms are not synonymous, all of these concepts share common features that can lead to an integrated term that includes concern for the environment, for the implications of consumer-purchasing decisions in the society they form a part of and the possibility of exercising an influence on, or participating in, improvements to their environment in general. Nevertheless, while there are more or less similar characteristics, there are various types of responsible behavior ranging from the consumption of ecological products to the search for new and more environmentally friendly forms of production and distribution, and behaviors that even question the model of consumer capitalism [11].

Starting from the idea that in order to modify individual patterns of consumption it is necessary to make consumer behavior more sustainable, it is important to consider that this conduct will be the product of cognitive, emotional and motivational processes, and that it will be influenced and even conditioned by a number of circumstantial elements that, according to the literature, can be grouped into two areas: on the one hand, psychological and internal, while on the other environmental and external. That is, while change must be registered in individual behavior, there are external factors that also serve to promote behavior or contribute to the problem by limiting the effectiveness of individual efforts [12]. Until now, researchers have focused on norms, values and individual features derived from internal factors [13]. With respect to studies that analyze and define the effects of external factors on pro-environmental behavior, these are rare or only partial [14–17]. Therefore, in order to better understand the reasons for individual behavior, in addition to an awareness of the psychological factors involved, it is also necessary to understand the context in which they operate since circumstances impose behavioral patterns that lead to certain forms of conduct and inhibit others. In addition, it has been shown that people tend to behave responsibly in their physical and social environment if this environment provides adequate conditions that make such behavior possible [17]. There is also literature stating that, if contextual factors are modified, it is possible to change conduct, meaning the management of these factors could be a successful strategy for promoting sustainable behavior [13]. In the context of individuals, there are social factors that involve norms, conventions and social agreements that determine how people live to achieve both personal and collective wellbeing [17,18].

In this context, the aim of this article is to define the way in which certain social factors contribute to sustainable consumption by generating a model that explains the sustainable consumption behaviors of residents of the Community of Madrid, Spain. The social factors that are presented as exogenous variables that conform the basis for this theoretical model are: environmental influences, education and information, government actions, social pressure, market conditions and demographic variables as age, gender and educational level. By implementing this type of study, it is possible to design pertinent policies and actions oriented towards the promotion of this conduct both nationally and internationally [19].

This model will be tested using Partial Least Squares Structural Equation Modeling (PLS-SEM), and using SmartPLS version 3.2.7 statistical software. Afterwards, this article describes the materials and methods used, including the definition of the sample and data collection, such as the estimation of the theoretical model that defines the working hypotheses and the description of the PLS analysis. The results will be presented, including the evaluation of the measurement and structural model, the hypothesis tests and the evaluation of the goodness-of-fit of the model. Finally, the discussion and conclusions will be exposed.

2. Materials and Methods

2.1. Sample

This study is based on a sample of 139 residents of the Community of Madrid. The distribution of the sample was 66.2% women and 33.8% men. They were aged between 18 and 73; a mean of 38.47.5% of those interviewed had studied at university, 17.3% held a Master's, 14.4% had high school education, and 7.9% had a PhD.

2.2. Data Collection

Data collection was performed during October 2017 using an electronically self-administered questionnaire. The data set initially included 26 indicators or items amounting to 3614 data. These indicators were designed to operationalize the exogenous variables: demographic factors, environmental influences, social pressure, market conditions, government actions, education and information, and the endogenous variable: sustainable consumer behavior.

After debugging the database, the sample finally included 139 observations, with 11 indicators and 1529 data. It includes less than 5% of missing values (see Table 1 for indicator definitions and detailed information).

Table 1. Indicators for Reflective Measurement Model Constructs.

Indicator Variables	Definition
Demographic Values (DEM_VAL)	
DEMVAL_1	Age
DEMVAL_2	Gender
DEMVAL_3	Level of education
Sustainable Consumption Behavior (SCB)	
SCB_1	I perform daily activities to care for and preserve the environment.
SCB_2	I perform concrete activities to promote human rights and social justice.
SCB_3	I consume local products to support the economy of your community.
SCB_4	How motivated do you feel to make changes in your lifestyle in search of more responsible consumption?
SCB_5	How would you rate your responsible consumption behavior?
Environmental Influence (ENV_INFL)	
ENVI_1	Someone from my family or my friends motivates me to follow their footsteps in environment care.
ENVI_2	I have participated as a volunteer in social work or environmental organizations.
ENVI_3	I take advantage of the fact that now there are organic or ecological products in the supermarket to buy them.
ENVI_4	Caring for the environment is a tradition in my family.
ENVI_5	Where I live, it is normal to separate waste for recycling.
ENVI_6	My home has enough space for a garden.
Education and Information (E&I)	
E&I_1	I have taken a course, workshop or talk about an environmental issue or responsible consumption.
E&I_2	A family member, friend or acquaintance has taught me an activity to help me be more responsible in the use of resources (water, electricity, energy).
E&I_3	I am informed about sustainability issues (environment).
E&I_4	I have information about the negative effects the products I consume have on the environment.
Social Pressure (SO_PRE)	
SOPRE_1	I have felt pressured by my friends to perform an activity for the benefit of the environment.
SOPRE_2	I feel obligated to belong to the group of people whom are pro-environmental.
Market. Conditions (MKT_C)	
MKTC_1	Organic products give me more confidence than conventional products.
MKTC_2	I am aware of the advertising campaigns about organic products.
MKTC_3	I think there are many places where you can find products that do not harm the environment.
MKTC_4	I choose an organic product over a traditional one, even if it is more expensive.
Government Actions (GOV_A)	
GOVA_1	In my city, the government does enough to motivate more responsible behavior through equality and social justice.
GOVA_2	The government is responsible for doing what is necessary so I can do things in favor of the environment.

All indicators and data were calculated in an Excel work file and then translated into the CSV format to run Smart PLS software (Smart PLS has a graphical user interface that enables the user to estimate the PLS path model. It is available at www.smartpls.com) [20] to apply PLS-SEM path modeling.

2.3. Theoretical Model Estimation

The theoretical path model was developed by searching in the available literature for variables related to the external factors reported as possible determinants for an individual's more sustainable behavior. Table 1 summarizes the selection of manifest variables or indicators and latent variables or constructs used in the formulation of the initial model proposed and presented in Figure 1.

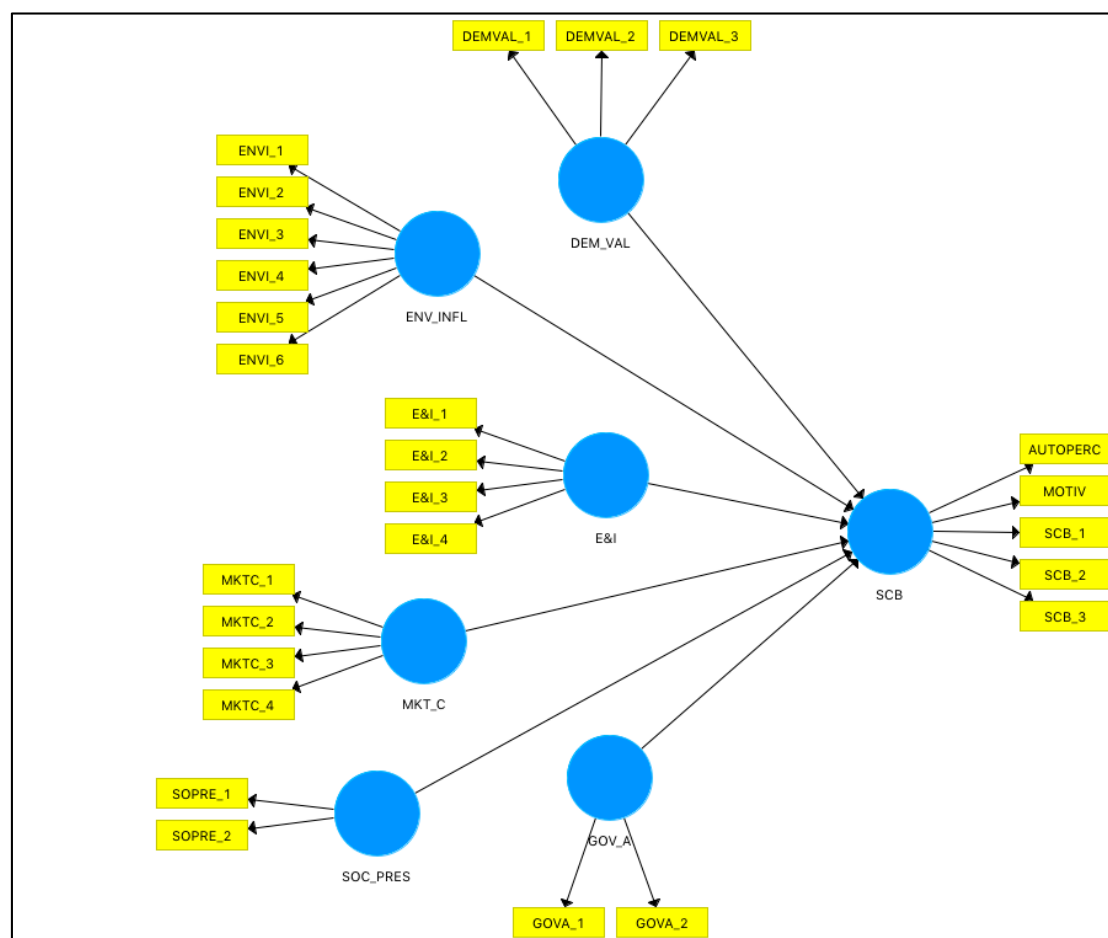


Figure 1. Initial theoretical Path Model (own research).

The inclusion of constructs and the relationships between them to establish the model are based on prior knowledge and research as well as relevant studies on the subject of the motivators for sustainable consumption behavior. The role of the state as a motivator or limiter of this type of behavior through the existence or absence of the necessary conditions for engaging in pro-environmental actions, has already been established see, for example [21–25]. Similarly, the poor enforcement of existing regulations has a greater negative effect than not having them at all [26]. In this sense, we can assume that:

Hypothesis 1 (H₁). *Government actions are decisive in the development of sustainable consumption behavior.*

The social pressure exerted by norms constructed through community life can act as a form of persuasion on everything, from group work to the individual [19], leading to a form of behavior derived from the interest in trying to adhere to these norms. Firstly, in terms of personal values and then, in response to what is imposed by reference groups, particularly if individuals wish to belong to these groups [27]. Normative pressure is also exerted through informal education and the media [25]. Given this case, we can assume that:

Hypothesis 2 (H₂). *Social pressure helps generate sustainable consumption behavior.*

On the other hand, influences from the social environment can be exerted by friends, family and other groups that influence consumers on the basis of the attitudes adopted towards this environment [27]. Power groups in the area can motivate this kind of behavior when people approach them and if the role of the leader develops motivational collective beliefs [19]. This also stimulates the search for identity within a group and the expectation of cooperation with others, seeking to maximize collective gain rather than individual gain [28]. Culture is a medium through which people construct a world view that deeply influences their relationship with the environment [29]. The hypothesis is therefore as follows:

Hypothesis 3 (H₃). *Social environmental influence is decisive in the development of sustainable consumption behavior.*

There are contradictions in the results of research into sociodemographic variables. While some studies confirm that factors such as gender, age and level of education do determine socially responsible behavior, others barely demonstrate a relationship between the variables [19,25,30]. However, we can assume that:

Hypothesis 4 (H₄). *Demographic variables affect sustainable consumption behavior.*

With respect to education and information, while there are studies that show the lack of clarity in the type of relationship generated between this variable and sustainable consumption behavior, it is also believed that formal and informal education and the existence of information on the subject have a major influence on the purchasing decisions of consumers [26]. Similarly, it is known that these variables are decisive in generating patterns of sustainable consumption [5] and serve to explain behavior with a high degree of environmental concern to the extent that the level of education is higher [25]. These data make it possible to affirm that:

Hypothesis 5 (H₅). *Education and information concerning sustainability are decisive in sustainable consumption behavior.*

Market conditions for sustainable products and services also demonstrate contradictory behavior: on the one hand, they can motivate behavioral changes towards more responsible consumption, while on the other they serve as a brake when prices are higher than for traditional products or there is limited availability and promotion of what is on offer [7,25–27,31]. When making purchasing decisions, it is important how individuals perceive the efficiency of products in this market and the factors that influence the costs of substituting one product with another [28]. This leads to the following hypothesis:

Hypothesis 6 (H₆). *Market conditions have a direct relationship with sustainable consumption behavior.*

The proposed model is framed with respect to latent constructs as shown in the diagram of Figure 1. It is assumed as a function of education and information, market conditions,

government actions, social pressure, environmental influences and demographic factors, which lead to the development of sustainable consumption behavior.

2.4. PLS Analyses

For the analysis of data, partial least squares (PLS) were used to evaluate the proposed theoretical model. PLS is a structural equation modelling (SEM) technique that can simultaneously test measurement models (relationships between indicators and their corresponding constructs) and the structural model (relationships between constructs). In addition, PLS can deal with very complex models with a large number of constructions, indicators and relationships [32,33].

In the SEM context, there are three types of measurement models: common factor models (reflective measurement), causal indicators models (formative measurement), and compound models, which can be estimated in Mode A or Mode B, [34], which is an advantage when compared to models based on covariance (CB-SEM). This study only presents indicators as reflective measurements.

A database with 139 observations was used for the PLS-SEM empirical analysis. The data set was drawn from the combination of research projects that have attempted to explain sustainable consumption behavior using one of the variables presented, although never all at the same time. In a first approximation, the minimum simple size for the PLS path model estimation must comply with at least the “ten times” rule [33]. The number of arrows pointing to a specific construction occurs in the SCB structural model with six arrows (Figure 1). In this way, in accordance with the “ten times” rule, $6 \times 10 = 60$ represents the minimum number of observations necessary to estimate the PLS path model of Figure 1. Similarly, in accordance with the recommendations of Cohen [35] for multiple OLS regression analysis, we would need 106 or 130 observations to detect R^2 values of around 0.10, supposing levels of significance of 10% or 5%, respectively, with a statistical power of 80%. According to Nitzi [36], 98 or 135 observations are required to detect a medium effect size of 0.15 with the same levels of significance and statistical power. In addition, Green [37], recommends 97 observations for the same level of analysis with a 5% level of significance. Otherwise, using GPower [38], an analysis program for statistical tests commonly used in social and behavioral research, we would need 43 observations given the same statistical power, effect size and α -level of significance. Therefore, using any of the five recommendations as a reference to define the sample size, this study fully satisfies them. For this purpose, other methods like the inverse square root method or the gamma-exponential method can be used [39].

3. Results

After the model estimate, the SmartPLS software was run, giving three key results: indicator's outer loadings for measurement or common factor models, path or regression coefficients for structural model relationships and R^2 values for the latent endogenous variables. The initial estimates of the resulting model are shown in Figure 2.

The initial model results show the variables with the most important effect on SCB. For example, E&I seems to have the strongest effect with the endogenous variable (0.394), followed by ENV_INFL (0.382). Similarly, the six constructs explain 49.4% of the variance for the dependent variable.

In addition, based on the size of the path coefficients, we must determine whether the relationships between constructs are statistically significant. It would seem that the relationships represented by DEM_VAL $\rightarrow$ SCB, ENV_INFL $\rightarrow$ SCB and E & I $\rightarrow$ SCB are significant. However, it is unlikely that the relationships of the hypothetical path coefficients SOC_PRES $\rightarrow$ SCB, MKT_C $\rightarrow$ SCB y GOV_A $\rightarrow$ SCB are significant. Nevertheless, an evaluation of the measurement models and the structural model is required before drawing final conclusions concerning the meanings of the coefficients and the accuracy of the global model.

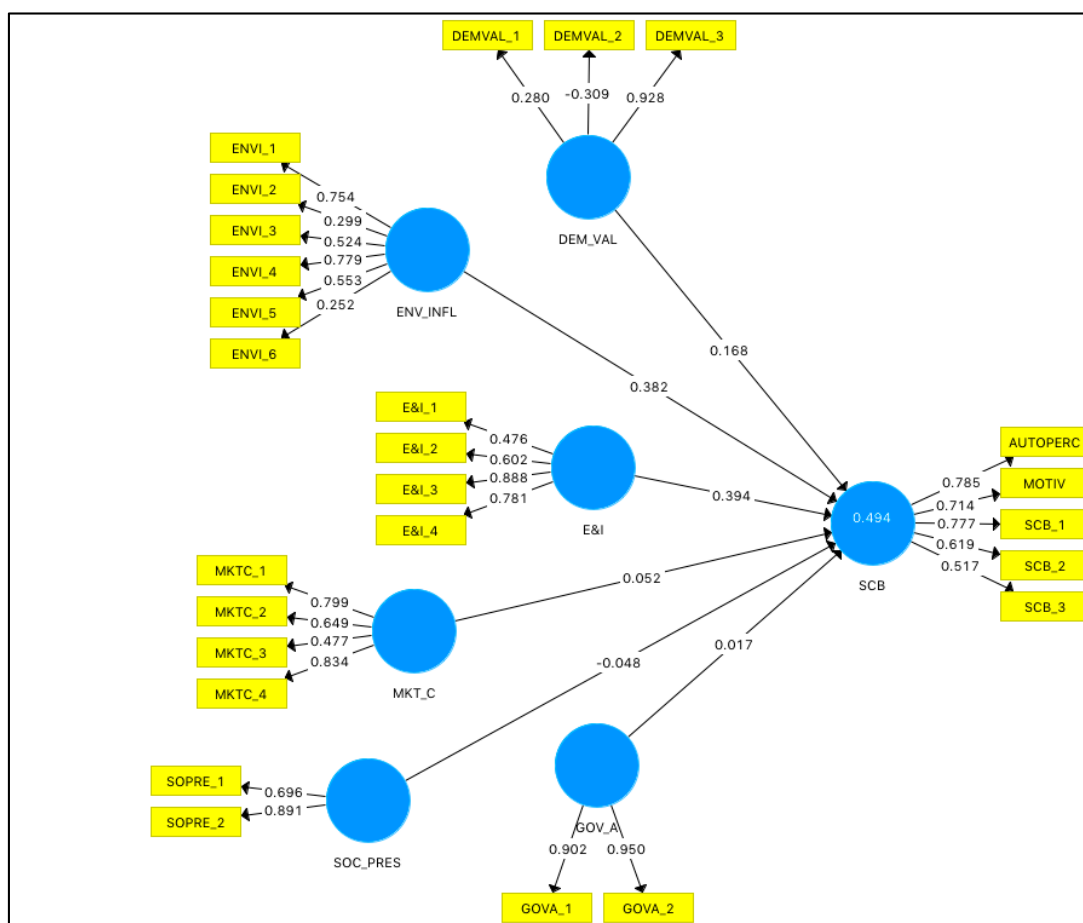


Figure 2. PLS-SEM first results (own research).

3.1. Evaluation of Measurement Models

In order to test the reliability and validity of the measurement models for each construct, the reflective measurement models were evaluated, which served to support their inclusion in the path model [40]. To perform this evaluation, it is necessary to establish the reliability of the indicator, the composite reliability, convergent validity (Average Variance Extracted, AVE), and the discriminant validity.

In principle, it is necessary to verify whether the stopping criteria of the PLS algorithm is reached before the maximum number of iterations, which should be less than that defined in adjustments to the PLS-SEM algorithm parameter (in this case 300 iterations). In this model, the algorithm converged after iteration 10.

According to Hair et al. [40], in order to evaluate reflective measurement models, the outer loadings of the indicator must be greater than 0.708. Maintaining indicators with correlation weights lower than this figure in the model must be considered since their elimination leads to an increase in the composite reliability and the AVE remains above the suggested value threshold. After running the PLS algorithm, it was decided to improve the initial path model, since 13 of the 26 indicators did not achieve the level of reliability for the acceptance indicator. Certain indicators were therefore eliminated and new links were established between constructs, leading to new hypotheses, as shown in Figure 3. In this analysis, the algorithm converged after iteration 8, finding a more rapid and stable solution.

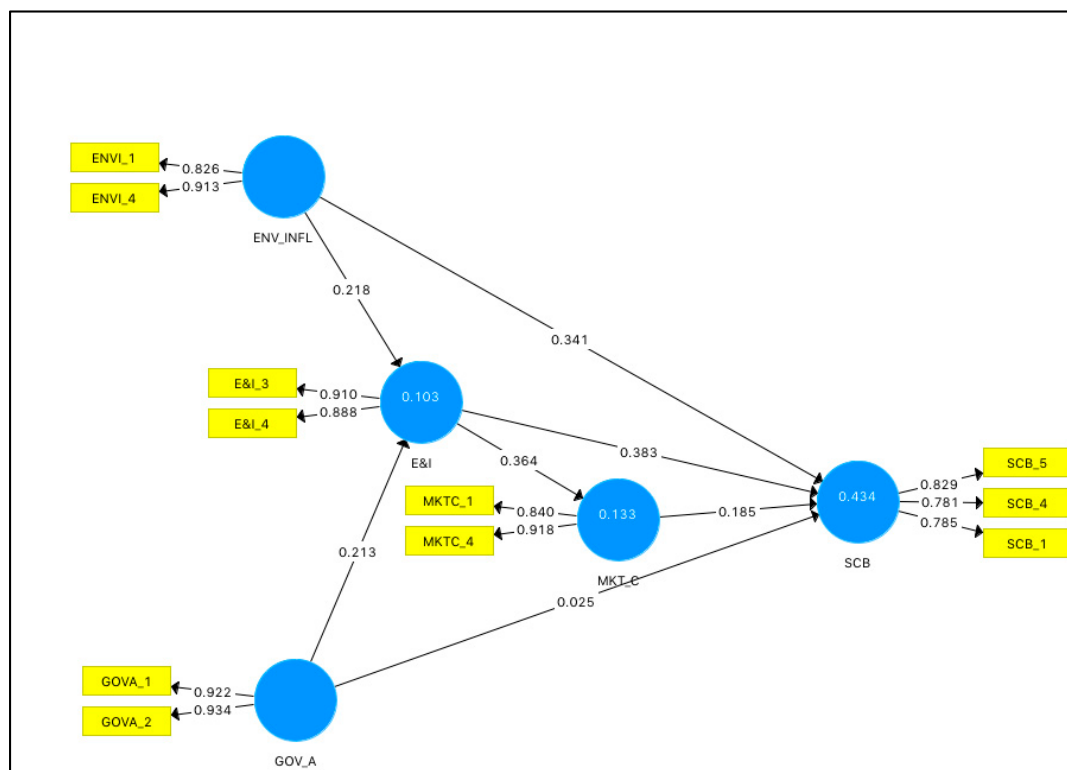


Figure 3. PLS-SEM Path Model improved (own research).

The reliability and validity results for the measurements obtained through the evaluation of the reflective measurement models are shown in Tables 2 and 3.

Table 2. Results Summary for Reflective Measurement Models.

Latent Variable	Indicators	Loadings	Indicator Reliability	Composite Reliability	AVE	Discriminant Validity
ENV_INFL	ENVI_1	0.826	0.682	0.862	0.758	Yes
	ENVI_4	0.913	0.834			
E&I	E&I_3	0.910	0.828	0.894	0.809	Yes
	E&I_4	0.888	0.789			
GOV_A	GOVA_1	0.922	0.850	0.926	0.862	Yes
	GOVA_2	0.934	0.872			
MKT_C	MKTC_1	0.840	0.706	0.873	0.774	Yes
	MKTC_4	0.918	0.843			
SCB	SCB_1	0.785	0.616	0.841	0.638	Yes
	SCB_4	0.781	0.610			
	SCB_5	0.829	0.687			

Table 3. Discriminant Validity Assessment (HTMT Criterion).

Predictors	E&I	ENV_INFL	GOV_A	MKT_C	SBC
E&I	-	-	-	-	-
ENV_INFL	0.316	-	-	-	-
GOV_A	0.299	0.153	-	-	-
MKT_C	0.480	0.160	0.068	-	-
SBC	0.710	0.649	0.211	0.496	-

As can be seen in Table 2, all outer loadings of the reflective constructs are above the threshold value of 0.708. The indicator with the greatest external loading and the greatest reliability of the indicators is GOVA_2 (0.934 and 0.872, respectively), followed by GOVA_1 (0.922 and 0.850), MKTC_4 (0.918 and 0.843), ENVI_4 (0.913 and 0.834) and E&I (0.910 and 0.828). The other indicators have reliability loadings and values above 0.60, which indicates that all constructs are above the values considered acceptable for outer loadings, reliability and validity.

Since Cronbach's alpha coefficient assumes that all indicators receive the same weighting, which could be considered a limitation [41], composite reliability was used to measure the reliability of internal consistency. Nevertheless, it is important to point out that almost all constructs had a Cronbach alpha coefficient above 0.7. This value could therefore be considered the lower limit and the composite reliability the upper limit of the true reliability of internal consistency. In accordance with existing theory, reliability values between 0.60 and 0.70 are acceptable in exploratory research while, in more advanced research stages, values between 0.70 and 0.90 are considered satisfactory [38]. In the reflective measurement model obtained (Table 2), the composite reliability values for all constructs give values above the suggested value threshold. All indicators for the five latent variables are therefore well above the minimum level required for external loadings and composite reliability.

The average variance extracted (AVE) was used as the measurement to establish the convergent validity at the construct level. This measurement is equivalent to the communality of a construct [42]. The AVE value measures the proportion of the variance explained by the construct in such a way that a value of 0.50 or higher indicates that, on average, the construct explains more than half of the variance of its indicators, while an AVE of less than 0.50 indicates that, on average, there are errors in the items other than the variance explained by the construct. The AVE values obtained in the model are well above the reference value in all constructs: ENV_INFL (0.758), E&I (0.809), GOV_A (0.862), MKT_C (0.774) and SCB (0.638), which means the measurements for the five constructs have high convergent validity levels.

The measurement model for constructs with reflective measures is assessed by looking at indicator reliability, composite reliability, convergent validity (AVE2) and discriminate validity (Fornell-Larcker and Heterotrait-monotrait ratio, HTMT criteria) [43]. To assess the discriminant validity and measure how different a construct is from another while identifying phenomena not represented by other constructs in the model [44], the HTMT criterion was used, as can be seen in Table 3. All values are below 0.9 [45] and 0.85 [46]; therefore, the model satisfies this criterion.

3.2. Assessment of the Structural Model

Analysis for the detection of collinearity problems must be performed prior to evaluating the results of the structural model, that is, it must be checked that the estimate does not imply critical levels of collinearity between predictive constructs leading to bias in the coefficients path [42]. The algorithm was run and the collinearity diagnostic observed (Table 4), which shows the VIF tolerance values for structural model analyses. Three sets of constructs were evaluated: GOV_A and ENV_INFL as E&I predictors; E&I as an MKT_C predictor; and GOV_A, E&I, ENV_INFL and MKT_C as SCB predictors.

Table 4. Collinearity Diagnostic Assessment. VIF tolerance values for structural model.

Predictors	Endogenous Latent Variable		
	E&I	MKT_C	SCB
GOV_A	1.012	-	1.064
ENV_INFL	1.012	-	1.068
E&I	-	1.000	1.268
MKT_C	-	-	1.156

As can be seen in Table 4, collinearity between predictive constructs does not show critical values in the structural model since all VIF values are below the threshold of 5, which means handling tolerance values above 0.20, that is, the structural model does not present collinearity problems [42].

To confirm that the measurements of constructs are reliable and valid, there was an evaluation of the structural model results, which represents the relationships that arise between constructs formulated on the basis of the research model hypotheses [44].

To evaluate the predictive precision of the model, the R^2 values of the endogenous latent variables were examined. These represent the combined effects of the latent exogenous variables in the endogenous latent variables. Similarly, since the coefficient is obtained by calculating the square of the correlation of the real and predicted values, it also constitutes the amount of variance in each endogenous construct explained by all endogenous constructs linked to them [40]. The explained variance or R^2 for the endogenous constructs must be greater than 0.1 [47], and since the PLS-SEM algorithm serves to maximize the R^2 values of the endogenous latent variables in the path model, the objective is a high R^2 value. Despite the fact that interpreting this value is based on the specific model and the research discipline used, in general the R^2 values considered are 0.75, 0.50 or 0.25 and endogenous constructs can be described as substantial, moderate and weak, respectively [42]. On the other hand, Ritchey [48] affirms that, in social sciences, R^2 values from 0.04 to 0.16 can be described as moderately weak and from 0.25 to 0.49 are considered moderately strong. Considering this criteria, the execution of the PLS-SEM algorithm gave weak values for the E&I and MKT_C constructs and a moderately strong value for the endogenous construct SCB. (Table 5). Additionally, they all complied with the Falk and Miller rule [47] by being above 0.1. While this cannot be considered a very strong value, the SCB construct can be considered the strongest, explaining 43% of the variance.

Table 5. Variance Explained.

DEPENDENT Constructs	R^2
E&I	0.103
MKT_C	0.133
SCB	0.434

After calculating path coefficients estimates for the structural model, bootstrap analysis was conducted to evaluate their statistical significance. As can be seen in Table 6, of the 7 path coefficients originally proposed (Figure 2), 5 were significant with a confidence level of 99% with another of 95%. The causal relationship established between government actions and sustainable consumption behavior was not significant.

Table 6. Significance Testing Results of the Structural Model Path Coefficients.

Paths	Path Coefficients	Standard Error	Confidence Intervals Bias Corrected	
			Lower Bound	Upper Bound
E&I → MKT_C	0.364	0.084	0.177	0.507
E&I → SCB	0.383	0.073	0.233	0.518
ENV_INGL → E&I	0.218	0.082	0.036	0.364
ENV_INFL → SCB	0.341	0.077	0.177	0.481
GOV_A → E&I	0.213	0.073	0.058	0.346
GOV_A → SCB	0.025	0.070	−0.116	0.155
MKT_C → SCB	0.185	0.079	0.023	0.329

Note: Bootstrap confidence intervals for 5% probability of error ($\alpha = 0.05$).

3.3. Hypothesis Testing

With this information, it is possible to test the still relevant hypotheses, as well as those generated on the basis of new links between variables that arose during improvement of the model (Table 7). The analysis was performed comparing the empirical “t” value with the critical value. When the first is greater than the second, the coefficient is considered statistically significant with a certain probability of error, that is, level of significance [42]. In this context, when contrasting the hypotheses, it can be seen that 5 of the 7 were accepted with a 99% confidence level and one with a confidence level of 95%. Hypothesis 4 was rejected since the empirical value was way below the critical value.

Table 7. Hypothesis Testing.

Hypothesis	Suggested Effect	Path Coefficients	t-Value (Bootstrap)	Accepted?
H1. Environmental influences → Sustainable Consumption Behavior	(+)	0.341	4.446	YES **
H2. Education & Information → Sustainable Consumption Behavior	(+)	0.383	5.257	YES ***
H3. Market Conditions → Sustainable Consumption Behavior	(+)	0.185	2.334	YES **
H4. Government Actions → Sustainable Consumption Behavior	(+)	0.025	0.365	NO
H5. Government Actions → Education & Information	(+)	0.213	2.918	YES ***
H6. Environmental Influences → Education & Information	(+)	0.218	2.643	YES **
H7. Education & Information → Market Conditions	(+)	0.364	4.328	YES ***

Note: *** $t_{(0.01)} = 2.57$; ** $t_{(0.05)} = 1.96$; (+) = Positive relationship.

In addition to identifying significant relationships, it is important to evaluate the relevance of this significance. The fact that a coefficient is statistically significant refers to the degree to which an exogenous construct is associated with an endogenous construct, presupposing there will be an estimated change in the endogenous construct for a unit change in the exogenous construct. In this sense, the purpose of PLS-SEM is to identify not only significant path coefficients in the structural model, but also significant and relevant effects [40]. It is therefore important to not only evaluate the direct effect of one construct on another, but also the indirect effects produced by mediating constructs; this evaluation is performed by measuring the total effect, which is the sum of all direct and indirect effects. The results are shown in Table 8. It can be seen that the majority of the total effects in the model are significant to at least 95%. It is important to point out that the relationship GOV_A → SCB does not change its status from ‘not significant’, even in the presence of the other constructs.

Table 8. Significance Testing Results of the Total Effects.

Path	Total Effect	t Values	Significance Levels	p Values	Standard Error	Confidence Intervals	
						Lower Bound	Upper Bound
E&I → MKT_C	0.364	4.412	***	0.000	0.083	0.184	0.511
E&I → SCB	0.450	6.163	***	0.000	0.073	0.299	0.584
ENV_INFL → E&I	0.218	2.662	***	0.008	0.082	0.042	0.363
ENV_INFL → MKT_C	0.079	2.201	**	0.028	0.036	0.018	0.158
ENV_INFL → SCB	0.439	5.944	***	0.000	0.074	0.279	0.569
GOV_A → E&I	0.213	2.942	***	0.003	0.072	0.052	0.341
GOV_A → MKT_C	0.078	2.439	**	0.015	0.032	0.022	0.145
GOV_A → SCB	0.121	1.640	NS	0.101	0.074	−0.043	0.249
MKT_C → SCB	0.185	2.356	**	0.019	0.079	0.007	0.321

Note: NS = not significant. ** $p < 0.05$, *** $p < 0.01$; (based on $t(55)$, one tail test). Bootstrap confidence intervals for 5% probability of error ($\alpha = 0.05$).

3.4. Evaluation of the Overall Goodness of Fit of the Model

To perform the overall goodness of fit analysis for the model, SRMR (Standardized Root Mean Square Residual) was used. This was obtained when running the PLS bootstrapping. This measure seeks to normalize the difference between the observed correlation and the predicted correlation. That is, the SRMR quantifies how much the empirical correlation matrix differs from the implicit correlation matrix, and therefore the lower the SRMR the better the adjustment of the theoretical model [49]. A value of zero means perfect adjustment, while a value lower than 0.08 is considered a good adjustment [37]. Other authors accept values lower than 0.10 for this criterion [43]. Similarly, when running the bootstrapping procedure, d_{ULS} and d_G measurements were obtained, which are also adjustment measurements, but unlike SRMR, the difference is not expressed in the form of residues but in terms of distributions, which are calculated in two ways: unweighted least squares discrepancy and geodesic discrepancy, respectively [49].

Table 9 shows the results of this analysis. It can be seen that, considering this last criterion, the model displays an adjusted goodness of fit for SRMR, since the original value is below the threshold of 0.10. The model is also adjusted for d_G , but is not suitable for d_{ULS} .

Table 9. Goodness of Overall Model Fit Measures.

Criteria	Original Sample (O)	95%	99%
SRMR			
Saturated Model.	0.087	0.062	0.068
Estimated Model.	0.088	0.074	0.082
d_{ULS}			
Saturated Model.	0.504	0.250	0.301
Estimated Model.	0.506	0.357	0.447
d_G			
Saturated Model.	0.349	0.484	0.541
Estimated Model.	0.351	0.472	0.529

4. Discussion

The aim of this study was to propose a model that defines the social factors determining sustainable consumption behavior. It started by identifying the elements that give significance to the construct “social factors” in existing literature, including in the analysis such aspects as government action, social pressure, social environmental influence, demographic variables (age, gender, level of education), education and information, and market conditions. These were used to construct an initial theoretical model. To verify the relationships between these exogenous variables and the endogenous variable of sustainable consumption behavior, structural equations analysis was performed using the partial least squares (PLS-SEM) modeling and SmartPLS version 3.2.7 statistical software.

Of the six hypotheses initially proposed, three were confirmed, another two were eliminated due to the structural model having path values far below those permitted, while one was not considered significant. This allows us to state that sustainable consumption behavior is determined by education and information ($t = 5.257$)—specifically that which is related to being informed about sustainability topics and the effects of personal consumption on the environment, social environmental influences ($t = 4.446$)—in particular the influence of family and friends, as well as that generated by cultural factors such as traditions, and by market conditions ($t = 2.334$), which refer to the positive perception of sustainable products by consumers, including their willingness to pay higher prices than those for conventional products. In addition, by generating new connections between variables, three more hypotheses were developed and these were confirmed, thereby establishing important causal relationships in the model: being educated and informed about sustainability is also related to market conditions with respect to products and prices ($t = 4.328$). Similarly, the actions of government

($t = 2.918$) and social environmental influences ($t = 2.643$) contribute to education and information. These research findings are supported by the literature identified above. Five of the six confirmed hypotheses were validated with a significance level of 0.01, while the other was validated with a significance level of 0.05. With a statistical power of 80%, the R^2 for the proposed final model was 0.434, and the algorithm converged after iteration 8, which is considered a rapid and stable solution. 43.4% of the variance of the endogenous latent variable (sustainable consumption variable) is explained by the three exogenous constructions: environmental influences, education and information, and market conditions. Taking into consideration the difficulty of defining and measuring some of the variables, we believe these results are more than satisfactory.

These results are of great use for people involved in and committed to the wellbeing of the planet. By learning what motivates people to adopt this form of behavior, governments and their institutions, pro-environmental and pro-social organizations, as well as companies interested in this market niche, could design relevant strategies specifically directed at stimulating positive responses in relation to the environment, the economy, and society.

Nevertheless, this study also had limitations that suggest future lines of research. Given that the concept of sustainable consumption behavior is very broad and complex, it has yet to be clearly defined; thus, it is possible that factors and relationships that could more extensively explain this behavior have been omitted. It is therefore necessary to work towards identifying these variables and design scales to measure them. In this context, there is very recent literature that states that the endogenous variable must also be researched as an exogenous variable that in turn influences it, since there is evidence that the sustainable consumption behavior of consumers, for example, may be the result of their own sustainable purchasing experiences in the past, leading to new intentions to make sustainable purchases [50]. In other aspects, this study also has a limitation because it does not handle the stratified sample of demographic variables (gender, age and level of studies). Thus, future research could complete the PLS-SEM model, including formative indicators, with multigroup analysis considering demographic variables with stratified samples, for example, and the use of new latent variables and their measurement. It would also be interesting to replicate the study using new samples from different countries or cultures in order to perform a comparative analysis that would permit clearer identification of the determinant variables for sustainable consumption behavior.

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