



Measuring sustainability consciousness in Italy

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Abstract

Sustainability can be conceived as an ideal state in which society, environment and economy can thrive without harming each other in the present, future and global space. In this paper, we validate the Italian version of the sustainability consciousness questionnaire developed by a Swedish research group. The psychometric construct aims to measure individual sustainability consciousness through a combination of knowingness, attitudes and behaviour. The validation process is based on the hierarchical confirmatory factor analysis model and includes both the long and short forms of the questionnaire proposed in the original study. Specifically, we propose two alternative approaches to validate the short form, one based on the same subset of items as the original proposal and another based on a data-driven strategy that resulted in a different subset of items. Once validated on a national level, the sustainability consciousness questionnaire becomes a valuable tool for researchers and policymakers to assess the sustainability consciousness levels within a national or local population regarding this crucial issue, enabling the design of more precisely targeted policies.

Keywords Hierarchical confirmatory factor analysis · Latent variable models · Sustainability consciousness · Knowingness · Attitudes · Sustainable behaviour

Abbreviations

A-ECO Economic dimension of attitudes towards sustainability

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| | |
|-------|---|
| A-ENV | Environmental dimension of attitudes towards sustainability |
| A-SOC | Social dimension of attitudes towards sustainability |
| A-SUS | Sustainability attitudes |
| B-ECO | Economic dimension of sustainable behaviour |
| B-ENV | Environmental dimension of sustainable behaviour |
| B-SOC | Social dimension of sustainable behaviour |
| B-SUS | Sustainability behaviour |
| CFA | Confirmatory factor analysis |
| CFI | Comparative fit index |
| K-ECO | Economic dimension of knowingness of sustainability |
| K-ENV | Environmental dimension of knowingness of sustainability |
| K-SOC | Social dimension of knowingness of sustainability |
| K-SUS | Sustainability knowingness |
| RMSEA | Root mean square error of approximation |
| SC | Sustainability consciousness |
| SCQ | Sustainability consciousness questionnaire |
| SCQ-L | Long-form of sustainability consciousness questionnaire |
| SCQ-S | Short-form of sustainability consciousness questionnaire |
| SD | Sustainable development |
| SEM | Structural equation model |
| TLI | Tucker and Lewis index |
| UN | United Nations |

1 Introduction

Research on sustainability arises because the unsustainability of our civilisation current models of organisation and development is a fact. Sustainability is a fluid concept that cannot be easily assigned to a single theoretical framework: rather, it permeates many scientific fields and is associated with a variety of definitions and values (UNECE et al. 2013). However, there is now a general consensus that sustainable development is an attempt to bring about global change by striking a balance between economic prosperity, social progress and environmental protection. Everybody has a role in the transition to a sustainable development model, and the transition can only take place through international cooperation and “by governments at all levels working with communities, civil society, educational bodies, scientific and other institutions, media, investors and businesses; and by developing partnerships with traditionally marginalised groups, including women, youth, Indigenous Peoples, local communities and ethnic minorities” (IPCC 2022, pg. 2693). There are plenty of indices to measure the sustainability of a system and plenty of indicators to guide policy actions towards sustainability. In contrast, the measures needed to assess the degree of public awareness of the full meaning of sustainability are few or, at most, focused on a partial aspect of sustainability.

In this paper, we aim to validate the Italian version of the questionnaire developed by Gericke et al. (2019) to measure the sustainability consciousness (SC) of a population. The questionnaire, originally applied to a sample of Swedes, is a comprehensive psychometric tool to assess the degree of SC, a construct wherein individuals’ sustainability knowledge, attitudes and behaviours are embedded. Once validated, this questionnaire becomes a useful tool firstly because it allows researchers and policymakers to assess how aware

and responsible a national or local population actually is regarding such an important and urgent global objective. Secondly, the survey can be run for different layers of the population both for policy evaluations and to target policies promoting public SC. Last but not least, its application to different countries can enable international comparisons. These are useful not only on a descriptive level but also to assess the varying effectiveness of uniform policies applied to different countries. In order to be used both nationally and for international comparisons, the questionnaire must be usefully validated for each country.

The following part of the paper is structured as follows. Section 2 summarises the evolution of the definition of sustainable development and sustainability over time and defines the concept of SC. Section 3 describes the sustainability consciousness Questionnaire, the procedure for conducting the survey in Italy in terms of translation and survey design, and the data sample from the completed questionnaires collected after the survey was conducted. Section 4 describes the methodology used to validate the questionnaire with Italians. Section 5 shows and discusses the results of this validation process and illustrates the distribution of sustainability consciousness among Italians together with the constructs that make it up. Section 6 concludes with some final remarks.

2 Toward the three pillars of sustainable development

The impetuous development that Western countries experienced in the post-Second World War period soon drew the attention of attentive observers to the environmental damage that accompanied the benefits of growth. Several spotlights were thrown on this issue in the 1960 s and early 1970 s. In 1962, Rachel Carson published *The Silent Spring* (Carson 1962), a dystopian narrative later considered the manifesto of the modern environmental movement. The Club of Rome, founded in 1968, published: “The Limits to Growth” (1972), in which it predicted that many natural resources crucial to human survival would be exhausted within a few generations. The UNESCO San Francisco Conference (1969) was entitled: “Man and His Environment: A View Towards Survival”. For the first time in human history, it was said, the balance within the biosphere had to be considered to ensure the quality of human life. In 1972, the United Nations (UN) Conference in Stockholm led to the establishment of the UN Environment Programme and the publication of a collection of essays, *Towards a Steady State Economy*, edited by one of the founding fathers of ecological economics (Daly 1973). The expression Sustainable Development (SD) first appeared in an international document in 1980 (Caradonna 2014), titled: “World Conservation Strategy: Living Resource Conservation for Sustainable Development” (World Wide Fund 1980). The document emphasised the need for a new economic order to halt humanity’s destruction of the biosphere and defined sustainable development as “the management of human use of the biosphere so that it may yield the greatest sustainable benefit for present generations while maintaining its potential to meet the needs and aspirations of future generations” (World Wide Fund 1980, pg.2). A very similar definition was taken up in 1987 in the Brundtland Commission Report: “Our Common Future”. According to the report, a development path is sustainable if it meets the needs of the present without compromising the ability of future generations to meet their own needs (WCED et al. 1987). Twenty years after the Stockholm Conference, in 1992, Rio de Janeiro hosted the UN Conference on Environment and Development. At this meeting, the issues identified in Stockholm were transformed into the new language of sustainable development, and a much broader agenda, called Agenda 21, was created to include both social and environmental

issues (Seyfang 2003). These three pillars of SD were then transformed and increased to eight-millennium goals, 21 targets and 60 indicators for 2000–2015 (Jacob 2017). The Rio Conference also launched the UN Framework Convention on Climate Change that established the need to reduce the concentration of greenhouse gases in the atmosphere and introduced annual meetings between signatories, and the Conferences of the Parties. In 2002, the World Summit on Sustainable Development, also known as Rio+10, was held in Johannesburg to review progress in implementing the outcomes of the Rio Earth Summit. The conference was not a proper step forward: governments did not have the political will to adopt ambitious action plans (Maslin and Lang 2022; Seyfang 2003). In 2012, 20 years after the first Rio Earth Summit, the UN Conference on Sustainable Development or Rio+20 took place, resulting in the outcome document “The Future We Want”, echoing the title of the Brundtland Report. In this document, the phrase “sustainable development” appears over two hundred times (Mensah 2019). In 2012, the Secretary-General of the UN included sustainable development as one of five key priorities in the UN Agenda for Action. The Rio+20 outcomes included a process for the development of new Sustainable Development Goals to take effect 3 years later. In 2015, all UN Member States adopted the 2030 Agenda for Sustainable Development. This gave a major boost to both research and awareness of the holistic nature of the concept of sustainability.

2.1 Sustainability, sustainable development, and sustainability consciousness

Sustainability and SD are often used as synonyms, although these terms do not completely overlap. Sustainability can be understood as a long-term goal for the well-being and survival of the global community, while SD refers to the pathways necessary to achieve the ultimate goal of sustainability. In both cases, there is not yet a clear and universally accepted definition (Ramsey 2015; Bartlett 2012). In essence, however, the most common notion sees sustainability as both an ideal and a necessary state in which society, the environment and the economy can thrive without harming each other, in the present, in the future and in the global space (Mensah 2019; Ben-Eli 2015; Jacob 2017; Giovanni and Fabietti 2014). A system can develop sustainably if all its parts contribute by finding their own way to sustainability. To this end, sustainability is applied to an increasing variety of activities, such as project management (Sabini et al. 2019), tourism (Zhang and Chan 2020), agriculture and supply chains (Magrini and Giambona 2022; Trivellas et al. 2020), quality of urban life (Pacione 2003), working conditions (Spreitzer et al. 2012), and consumption choices (Spaargaren 2020; Golob and Kronegger 2019; Prothero et al. 2011).

A relatively under-researched, albeit important, issue is the extent to which people know the full meaning of the term “sustainability”. The term “sustainability” has long been associated only with the need to protect the natural environment, both in its common usage and in research, which has focused mainly on measuring levels of environmental awareness (Lezak and Thibodeau 2016; Sharma and Bansal 2013); see also Gericke et al. (2019) (pages 37–38) for an overview of environmental awareness measures. Since the formulation of Agenda 2030, there has been a broad consensus that environmental problems and concerns cannot be addressed without including the social and economic dimensions (Le Blanc 2015). Therefore, it is necessary for people to have not only good environmental awareness but also a broader consciousness that includes social and economic issues, in addition to environmental ones. In such a perspective, it makes sense to introduce the expression “sustainability consciousness” (SC) to be intended as an overall concept of awareness. It is worth noting that consciousness is a psychological concept that is

interpreted in different ways. According to Velmans (2009), there are three common meanings of it, namely (i) consciousness as self-awareness of difference from the surrounding world; (ii) consciousness as a state of wakefulness; (iii) consciousness as knowledge (i.e. to be aware of something is to have knowledge about it). Since knowledge can also be unconscious, consciousness does not necessarily mean knowledge. Therefore, consciousness can be operationally interpreted as the experience itself, which can be exemplified by anything we can observe or experience.

Building on the scale proposed by Michalos et al. (2012), a Swedish research group (Gericke et al. 2019) theoretically formulated a new measure of SC that includes all the dimensions of sustainability and operationalised it in the form of the Sustainability Consciousness Questionnaire (SCQ).

The questionnaire captures very well the holistic nature of sustainability; for this reason, it can be considered a good candidate for a common platform to measure SC in local and national contexts. The SCQ has already been used in countries other than Sweden. Berglund et al. (2020) investigated the differences between grade 12 students in Sweden and Taiwan. Vogel (2021) used the questionnaire in its English version with Spanish undergraduate and graduate students. Chen et al. (2022) used a modified version of the SCQ with Chinese primary and secondary school students. To make the questionnaire applicable in Italy, where English is still poorly spoken in general, we translated it into Italian. The consequent validation of the SCQ on the collected sample allowed us to take into account cultural differences between Italians and Swedes that may be reflected in the different relevance of the items that measure SC.

3 The sustainability consciousness questionnaire

In this section we first describe the theoretical framework underlying the SCQ; then, we provide details on the adopted survey plan and describe the data sample used for the validation of SCQ in Italy.

3.1 Theoretical structure of the survey instrument

The SCQ was developed by Gericke et al. (2019) and originally designed for Sweden. The SCQ was created and validated both in a long-form (composed of 49 Likert scale items) and in a short form (reduced to 27 items) highly correlated to the former one but aimed at making the questionnaire easier and quicker to administer.

The questionnaire aims to survey people's cognitive and affective views of sustainable development by relying on three psychological constructs that encompass the 15 sub-themes defined by UNESCO (Buckler and Creech 2014): Knowingness, Attitudes and Behaviour. SC, which encompasses these three constructs, is a multidimensional concept defined by environmental and social psychology. In more detail, Knowingness, in psychological literature, refers to knowledge related to sustainability and is commonly associated with the concept of 'awareness of environmental issues' or 'environmental knowledge.' This dimension includes an understanding of environmental issues and challenges that threaten sustainability, such as climate change, biodiversity loss, and the depletion of natural resources. The theory of environmental information suggests that knowledge is a prerequisite for perceiving the seriousness of environmental threats. When the term 'knowingness' is used in the questionnaire, it refers to the concept of

extended consciousness in cognitive psychology. It differs from the traditional view of the mind as something residing exclusively in the brain and posits that consciousness extends beyond the brain, involving a process that encompasses both the mind and the external world. Thus, 'knowingness' refers to the knowledge and awareness that emerge from the dynamic interaction between the individual and the environment (Velmans 2009). With the term 'attitudes,' we refer to attitudes toward sustainability. They are often studied through the framework of the 'Environmental Attitudes Theory.' This theory focuses on the analysis of beliefs, values, and emotions related to the environment and sustainability. A positive attitude toward sustainability is linked to a greater intrinsic motivation to engage in sustainable behaviours. Research in environmental psychology has shown that positive attitudes can influence behavioural intentions (Schultz et al. 2004). Finally, in the context of sustainability, behaviour is often examined through the 'Theory of Planned behaviour' and the 'Theory of Reasoned Action' (Montano and Kasprzyk 2015). These theories postulate that the intention to engage in sustainable behaviour is predicted by the combination of attitudes, social norms, and the perception of behavioural control. Sustainable actions, such as energy conservation, waste reduction, or the adoption of sustainable lifestyles, are tangible manifestations of 'sustainability consciousness' when positively influenced by attitudes and intentions (Stern and Dietz 1994; Kaiser et al. 2003; Lange and Dewitte 2019).

The SCQ measures three levels of hierarchically ordered latent constructs that combine with the three transversal constructs above mentioned, as illustrated in Fig. 1. At the top level (third level), a global construct denotes the general SC of individuals. At the lower hierarchical level, the SC is decomposed into three second-level constructs, that is, sustainability knowingness (K-SUS), sustainability attitudes (A-SUS), and sustainability behaviour (B-SUS). In turn, each of these second-level constructs can be disentangled in an environmental dimension (ENV), a social dimension (SOC), and an economic dimension (ECO), thus defining nine first-level constructs: K-ENV, K-SOC, and K-ECO that contribute defining the knowingness of sustainability; A-ENV, A-SOC, and A-ECO that contribute defining the attitudes towards sustainability; and B-ENV, B-SOC, and B-ECO that contribute defining the sustainable behaviour.

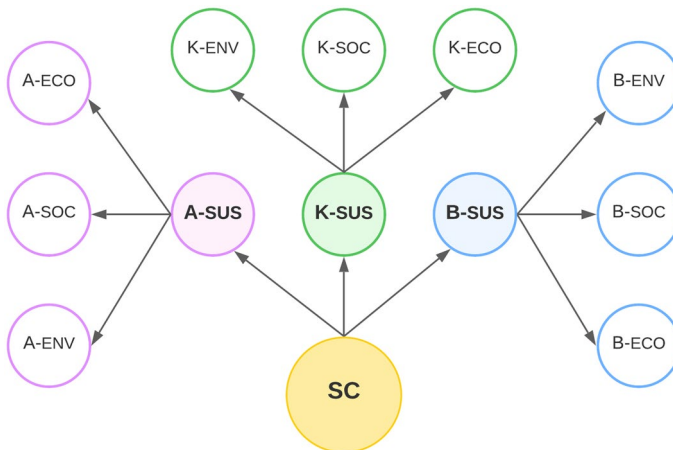


Fig. 1 Hierarchical structure of the latent constructs measured by SCQ

3.2 Italian translation of SCQ, survey plan and data collection

While the SCQ questionnaire was originally developed in Sweden, it is applicable for use in all Western industrialised countries. This adaptability is due to its foundation on UNESCO's criteria during the launch of the Decade of Education for Sustainability. Since UNESCO's initiative, sustainability issues have also been incorporated into school curricula in Italy. Nevertheless, to ensure comprehensiveness, the long-form of SCQ was translated from English to Italian by a professional language translator and translated back again by another. Then, we conducted discussions on the questionnaire questions with a focus group and, subsequently, tested it with a small group of high school and university Italian students, who were asked to indicate whether they encountered interpretive difficulties. No problems were encountered. The entire questionnaire with items in Italian and the corresponding English original formulation is reported in Appendix A.

The online version of the questionnaire was implemented through Google Forms; it was designed not to allow missing data and to guarantee respondents' anonymity. The survey was conducted in various non-consecutive administration windows of approximately 3 months each, running from October 2019. Subsequent waves were scheduled about a year after the previous ones. In each wave, the questionnaire was first distributed to freshmen on the Political Sciences degree course at the University of Florence and subsequently shared on students' social media profiles, leading to a convenience final sample (for each wave) also achieved by word of mouth. At the end of each wave, consistency checks made it possible to exclude some cases from the collected forms due to an incoherent or anomalous sequence of answers.

Data analysed in this work refers to the questionnaires filled in during the first wave (running from October 2019 to January 2020). This wave is the only one that collected answers obtained before the COVID-19 pandemic emergency; thus it should allow the best comparison with the results obtained by Gericke et al. (2019) because it is reasonable to suppose that SC may have undergone some changes during and after the pandemic outbreak. The first wave final sample consisted of 614 respondents, mainly university students under the age of 36 (77.2%).

Given the nature of the selected sample, composed of students, similar to that adopted by Gericke et al. (2019), the reader is cautioned to keep an interpretation of the results illustrated below limited to young Italian students and not to generalise to all Italian people.

4 Methodology

The validation of the Italian version of the SCQ is performed along the same lines of Gericke et al. (2019). In particular, relations among the first-level latent constructs and the observed items as well as relations among latent constructs at first-, second-, and third levels are analysed and tested on the basis of structural equation models (SEM; Duncan 1975; Bollen 1989; Hox and Bechger 1998; Bollen et al. 2008).

SEM is a multivariate technique used to test complex relationships between observed (manifest) and unobserved (latent) variables as well as relationships among two or more latent variables. In detail, special observed variables (indicators or items) are used to

measure the latent variables. In turn, observed and latent variables distinguish between exogenous variables, which are not explained within the model, and endogenous variables which are affected by other variables in the model (plus an error term).

In the following, details about SEM formulation, estimation, and goodness of fit are provided with reference to the setting at issue.

4.1 SEM formulation

A SEM is characterised by a system of multiple equations, distinguishing between two sub-models: (i) a structural model that aims to explain the relationships between latent constructs and possibly latent constructs and exogenous observed variables, and (ii) a measurement model that links observed items to latent constructs. A specific specification of SEM, used in this paper, is represented by the hierarchical (or higher-order) model of Confirmatory Factor Analysis (CFA; Jöreskog 1969). In a hierarchical CFA model, multiple latent constructs (i.e., first-level factors) may be correlated and the covariance structure between first-level factors is explained by multiple second-level factors. If there is a covariance between the second-level factors, one or more third-level factors are also considered

In our framework, the measurement model is to explain the observed variability of the indicators (the items of the questionnaire) by the 9 latent constructs of the first level (i.e. K-ENV, K-SOC, K-ECO, A-ENV, A-SOC, A-ECO, B-ENV, B-SOC and B-ECO). With the structural model, the variability of these latent constructs is explained by the 3 s-level latent constructs (i.e. K-SUS, A-SUS, B-SUS), whose variability is in turn explained by the global SC.

In more detail, the structural model for generic individual i ($i = 1, \dots, n$) can be expressed by the following equation:

$$\boldsymbol{\eta}_i = \mathbf{B}\boldsymbol{\eta}_i + \boldsymbol{\zeta}_i, \quad (1)$$

with

$$\boldsymbol{\eta}_i = \begin{pmatrix} \boldsymbol{\eta}_i^{(1)} \\ \boldsymbol{\eta}_i^{(2)} \\ \boldsymbol{\eta}_i^{(3)} \end{pmatrix}$$

vector of latent constructs, being $\boldsymbol{\eta}_i^{(1)}$ the first-level factors, $\boldsymbol{\eta}_i^{(2)}$ the second-level factors, and $\boldsymbol{\eta}_i^{(3)}$ the third-level factors. Moreover, \mathbf{B} denotes the matrix of regression coefficients and $\boldsymbol{\zeta}_i$ the vector of errors.

The measurement model is defined as

$$\mathbf{y}_i = \boldsymbol{\Lambda}\boldsymbol{\eta}_i^{(1)} + \mathbf{e}_i, \quad (2)$$

where \mathbf{y}_i is the vector of observed item responses, $\boldsymbol{\Lambda}$ is the matrix of factor loadings for the first-level latent constructs, and \mathbf{e}_i is a vector of error terms.

4.2 Estimation approach

In SEM approaches observed item responses are usually assumed to follow a multivariate normal distribution so that the vector of the means and the matrix of covariance contain all the information required for the estimation procedure. In this respect, the widely

used estimation method is the maximum likelihood. When item responses are non-normal (e.g., ordinal), alternative estimation procedures can be used based on the weighted least squares fit function (Wang and Wang 2012). However, when data are ordinal, it is possible to ignore the categorical nature of the variables, providing that the number of categories is at least 5 and data show an approximately normal distribution (Bollen 1989). In the present contribution, we follow this last approach, thus using the maximum likelihood estimator. Estimates are performed with the R package *lavaan*, version 0.6–12 (Rosseel 2022).

4.3 Goodness of fit of SEM models

A series of indices have been proposed in the literature for measuring the goodness of fit of a model; often such indices take into account not only the model fitting but also its parsimony (i.e., the number of free model parameters). These indices integrate the information about the model fit coming from the chi-square test. This tests the null hypothesis that the predicted model and observed data are equal but has a heavy drawback: its reliability is strongly affected by the sample size. Indeed, the larger the sample size is, the better are the chances of obtaining a statistically significant test statistic wrongly suggesting the rejection of the model; on the opposite when the sample size is limited, the test could not be able to reject the null hypothesis suggesting accepting the model even if its fit is poor. Remembering that scholars agree that SEM should be estimated only with a very high number of observations (for example, Kline (2015) recommends that the observations: estimated parameters ratio should be 20–1, others are less radical suggesting at least 10–1), with such sample dimensions the chi-square test will not yield any useful information, and other measures of fit need to be considered.

In what follows the evaluation of the model fit is driven by the Tucker and Lewis Index (TLI; Tucker and Lewis 1973) and by the Comparative Fit Index (CFI; Bentler 1990). We should note that all fit indices have limitations (Xia and Yang 2019) so that a combination of them allows to obtain a more comprehensive sense of model fit than a single index (Tabachnick and Fidell 2007). For CFI and TLI, values equal to or greater than .90 denote a good fit (Bentler and Bonett 1980; Byrne 1998). Another widely used measure of goodness of fit is the Root Mean Square Error of Approximation index (RMSEA; Steiger 1990). An RMSEA lower than .05 indicates a good fit, while a value between .05 and .08 indicates a reasonable fit (Browne and Cudeck 1993; Byrne 1998).

4.4 Validation strategy

The validation of the Italian version of SCQ follows the same lines as the original version, as described in Gericke et al. (2019), distinguishing between a long-form (SCQ-L) and a short-form (SCQ-S) model. In particular, it is worth remembering that the short form of the original proposal was built following a data-driven strategy, by selecting the three items with the highest factor loading for each first-level latent construct.

Table 1 summarizes the estimated (long and short form) hierarchical CFA models on data collected within our study. Thus, referring to the long and short form originally proposed by Gericke et al. (2019) (and denoted in the following as SCQ-L-0 and SCQ-S-0), we started our study validating both these models on our data (respectively SCQ-L-1 and SCQ-S-1).

Then, relying on the modification indices produced as a result of the estimation process of SCQ-L-1 and SCQ-S-1, we added or removed some covariances in order to improve the

Table 1 Hierarchical CFA models estimated to validate the Italian version of the SCQ, with respect to the Gericke et al. (2019) original proposals

| Acronym | Items | Covariances |
|---|-----------------|-----------------------|
| <i>Long form (acronym of the original proposal: SCQ-L-0)</i> | | |
| SCQ-L-1 | Same items | Same covariances |
| SCQ-L-1mod | Same items | Different covariances |
| <i>Short form (acronym of the original proposal: SCQ-S-0)</i> | | |
| SCQ-S-1 | Same items | Same covariances |
| SCQ-S-1mod | Same items | Different covariances |
| SCQ-S-2 | Different items | Different covariances |

fit (SCQ-L-1mod and SCQ-S-1mod). An alternative approach to validate the short form of the model was also adopted, which was based on the same data-driven strategy followed by Gericke et al. (2019) but applied to our data, adjusting for the covariances whenever necessary (SCQ-S-2). This second approach allowed us to take into account possible cultural differences between Swedish and Italian people that may determine a different relevance (in terms of factor loadings) of the observed items.

5 Results

In this section, we provide synthetic indices (quartiles, mean and standard deviation) of the observed item responses in the sample of questionnaires collected in the first wave of our study; we also compare the fit of the proposed hierarchical CFA models listed in Table 1 above. We then illustrate the structural relationships between the latent constructs and provide details of their distributions.

Some differences in the parameter estimations have been observed with respect to the study by Gericke et al. (2019). These differences could be attributed to a slightly lower average age of Swedes with respect to Italians, other than to possible cultural differences between the two populations.

5.1 Preliminary results

Table 2 presents some descriptive statistics summarising the main characteristics of the 49 items that make up the long form of the SCQ. In general, responses to the items are concentrated on high scores (i.e. response categories 4 and 5), with median and mean scores usually higher than 4, with some interesting exceptions. In particular, the social and economic dimensions of behavioural sustainability (B- SUS) have much lower scores, with medians of 2 (item B_SOC_13) and 3 (items B_SOC_05 and B_SOC_15 of factor B_SOC and all items belonging to B-ECO).

To allow comparison with the results of the original Swedish study, Fig. 2 shows the item means of the Italian questionnaire compared to the item means reported in Gericke et al. (2019) (in Table 2 of their paper) The Italian results (purple-filled circles) are generally consistent with the results of Gericke et al. (2019) (pink-filled square dots), as the mean scores are similar in the two studies. The main exception is the items related to the behavioural dimensions (i.e. B-ECO, B-ENV and partly B-SOC), where the mean responses of Italians tend to be higher than those of Swedes.

Table 2 Descriptive statistics for items of the long form questionnaire: first quartile (Q1), median, third quartile (Q3), arithmetic mean, and standard deviation (sd)

| Latent trait | Item | Q1 | Median | Q3 | Mean | Sd | |
|----------------------------|--------------------------|----------|--------|----|------|------|------|
| <i>Knowingness (K-SUS)</i> | | | | | | | |
| Environmental (K-ENV) | K_ENV_03 | 4 | 5 | 5 | 4.21 | 0.97 | |
| | K_ENV_04 | 5 | 5 | 5 | 4.39 | 1.26 | |
| | K_ENV_07 | 3 | 4 | 5 | 4.06 | 1.04 | |
| | K_ENV_14 | 4 | 5 | 5 | 4.41 | 0.79 | |
| | K_ENV_18 | 4 | 5 | 5 | 4.46 | 0.74 | |
| Social (K-SOC) | K_ENV_21 | 3 | 3 | 4 | 3.38 | 1.14 | |
| | K_SOC_02 | 3 | 4 | 4 | 3.54 | 1.11 | |
| | K_SOC_05 | 4 | 4 | 5 | 4.18 | 0.93 | |
| | K_SOC_08 | 3 | 4 | 5 | 4.04 | 1.00 | |
| | K_SOC_09 | 3 | 4 | 5 | 4.08 | 1.04 | |
| | K_SOC_10 | 4 | 5 | 5 | 4.44 | 0.85 | |
| | K_SOC_11 | 4 | 5 | 5 | 4.41 | 0.87 | |
| | K_SOC_15 | 4 | 5 | 5 | 4.32 | 0.90 | |
| | K_SOC_20 | 3 | 4 | 4 | 3.51 | 1.11 | |
| | Economic (K-ECO) | K_ECO_12 | 4 | 5 | 5 | 4.37 | 0.83 |
| K_ECO_16 | | 4 | 4 | 5 | 4.17 | 0.96 | |
| K_ECO_17 | | 3 | 4 | 5 | 3.96 | 1.06 | |
| K_ECO_19 | | 3 | 4 | 5 | 3.75 | 1.03 | |
| <i>Attitudes (A-SUS)</i> | | | | | | | |
| Environmental (A-ENV) | A_ENV_05 | 4 | 5 | 5 | 4.24 | 1.23 | |
| | A_ENV_06 | 4 | 5 | 5 | 4.47 | 0.72 | |
| | A_ENV_10 | 4 | 5 | 5 | 4.65 | 0.64 | |
| | A_ENV_19 | 3 | 4 | 4 | 3.53 | 1.19 | |
| Social (A-SOC) | A_SOC_01 | 4 | 5 | 5 | 4.59 | 0.64 | |
| | A_SOC_02 | 4 | 5 | 5 | 4.34 | 0.85 | |
| | A_SOC_11 | 4 | 4 | 5 | 4.28 | 0.87 | |
| | A_SOC_13 | 3 | 4 | 5 | 3.79 | 1.10 | |
| | A_SOC_14 | 4 | 4 | 5 | 4.29 | 0.82 | |
| Economic (A-ECO) | A_SOC_18 | 5 | 5 | 5 | 4.80 | 0.51 | |
| | A_ECO_03 | 4 | 5 | 5 | 4.64 | 0.65 | |
| | A_ECO_07 | 4 | 5 | 5 | 4.50 | 0.76 | |
| | A_ECO_08 | 4 | 5 | 5 | 4.37 | 0.88 | |
| Economic (A-ECO) | A_ECO_16 | 4 | 5 | 5 | 4.50 | 0.80 | |
| | <i>Behaviour (B-SUS)</i> | | | | | | |
| | Environmental (B-ENV) | B_ENV_01 | 3 | 4 | 5 | 3.98 | 1.12 |
| | | B_ENV_02 | 3 | 4 | 4 | 3.51 | 1.05 |
| B_ENV_03 | | 4 | 4 | 5 | 4.20 | 0.93 | |
| B_ENV_07 | | 2 | 3 | 4 | 3.23 | 1.17 | |
| B_ENV_08 | | 3 | 4 | 5 | 4.04 | 1.05 | |
| B_ENV_10 | | 4 | 5 | 5 | 4.40 | 0.93 | |
| B_ENV_12 | | 3 | 4 | 5 | 3.88 | 1.01 | |

Table 2 (continued)

| Latent trait | Item | Q1 | Median | Q3 | Mean | Sd |
|------------------|----------|----|--------|----|------|------|
| Social (B-SOC) | B_SOC_04 | 4 | 5 | 5 | 4.55 | 0.79 |
| | B_SOC_05 | 3 | 3 | 4 | 3.41 | 1.13 |
| | B_SOC_13 | 1 | 2 | 3 | 2.05 | 1.19 |
| | B_SOC_14 | 4 | 5 | 5 | 4.55 | 0.74 |
| | B_SOC_15 | 1 | 3 | 4 | 2.77 | 1.46 |
| | B_SOC_17 | 5 | 5 | 5 | 4.76 | 0.61 |
| Economic (B-ECO) | B_ECO_06 | 2 | 3 | 4 | 3.14 | 1.14 |
| | B_ECO_09 | 2 | 3 | 4 | 2.72 | 1.31 |
| | B_ECO_11 | 3 | 3 | 4 | 3.38 | 1.21 |
| | B_ECO_16 | 2 | 3 | 4 | 3.07 | 1.27 |
| | | | | | | |

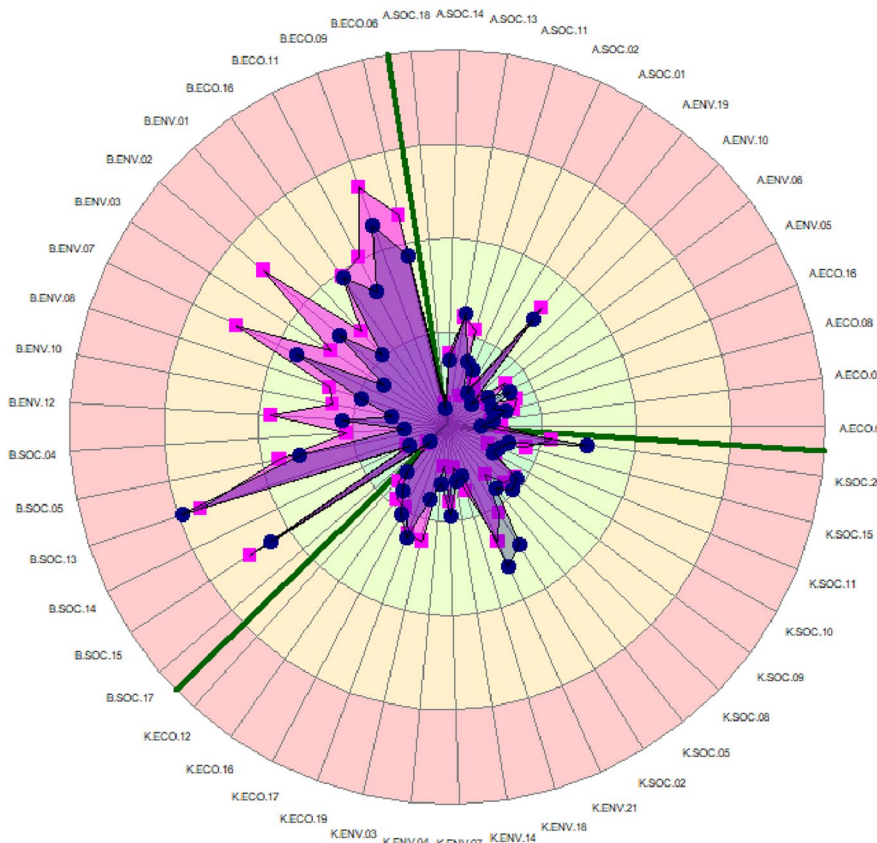


Fig. 2 Target plot (higher values towards the centre of the plot) of the mean scores of the item responses observed in the original Swedish study (filled square pink points) and computed on forms collected in the first wave of our administration plan (filled circle violet points). (Color figure online)

Table 3 Goodness of fit of CFA models for long and short forms of questionnaire: CFI, TLI, and RMSEA

| | CFI | TLI | RMSEA |
|---------------------------|-------|-------|-------|
| <i>Long form (SCQ-L)</i> | | | |
| SCQ-L-0 | 0.921 | 0.917 | 0.033 |
| SCQ-L-1 | 0.872 | 0.864 | 0.039 |
| SCQ-L-1mod | 0.896 | 0.889 | 0.035 |
| <i>Short form (SCQ-S)</i> | | | |
| SCQ-S-0 | 0.953 | 0.944 | 0.041 |
| SCQ-S-1 | 0.910 | 0.899 | 0.044 |
| SCQ-S-1mod | 0.938 | 0.929 | 0.037 |
| SCQ-S-2 | 0.949 | 0.942 | 0.036 |

As a further preliminary analysis, we compare the goodness of fit of the estimated hierarchical CFA models listed in Table 1 through CFI, TLI, and RMSEA, whose values are displayed in Table 3. Looking at those measures, the factorial structure of the questionnaire validated in the original proposal is confirmed for the Italian version, since CFI and TLI reach satisfactory values for both the long form and the short form, with a RMSEA definitely lower than 5%. In particular, the short form is confirmed to have a better fit than the long one (CFI and TLI higher than 90%), as already pointed out in the work of Gericke et al. (2019). Moreover, as concerns the two short forms SCQ-S-1mod and SCQ-S-2, the latter achieves a slightly better fit.

5.2 Analysis of the structural relations among latent constructs

Figure 3 shows the full representation of the structural (Eq. 1) and measurement (Eq. 2) parts of the hierarchical CFA model for the long form SCQ-L-1mod. The standardised regression coefficients (i.e. the elements of the matrix \mathbf{B} of Eq. 1) are shown on the corresponding arrows connecting the latent constructs. As mentioned above, some covariances between indicators were added and others were deleted from the original SCQ-L-0 proposal, following the change indices obtained when estimating the model with our data.

The results of the long-form SCQ for the Swedish data show that SC is manifested mainly in attitudes (A-SUS) and much less in behaviour (B-SUS). In our data, looking at SCQ-L-1mod, SC is expressed more in knowingness (K-SUS), though with a coefficient similar to the Swedish case in absolute terms. The most evident difference between the original and the Italian versions is in the coefficient whereby B-SUS is expressed in the form of economic behaviour (B-ECO). Indeed, B-ECO represents the primary manifestation of behavioural SC (together with B-SOC) under the Swedish frame and, in contrast, is the least important manifestation under the Italian frame.

As noted at the beginning of Sect. 3.1, Gericke et al. (2019) also introduced a short form of the SCQ (reduced to 27 items from the 49 items that make up the long-form SCQ) to make the questionnaire easier and quicker to administer. The short SCQ proposal derived from the data-driven strategy described in Sect. 4.4 resulted in a form that is highly correlated with the long form version.

Figure 4 illustrates the complete representation of the structural and measurement parts of the two short form SCQ-S-1mod (top panel) and SCQ-S-2 (bottom panel) estimated on our data. In particular, the standardized regression coefficients (i.e., elements of matrix \mathbf{B} of Eq. 1) are displayed on the corresponding arrows linking the latent constructs, whereas

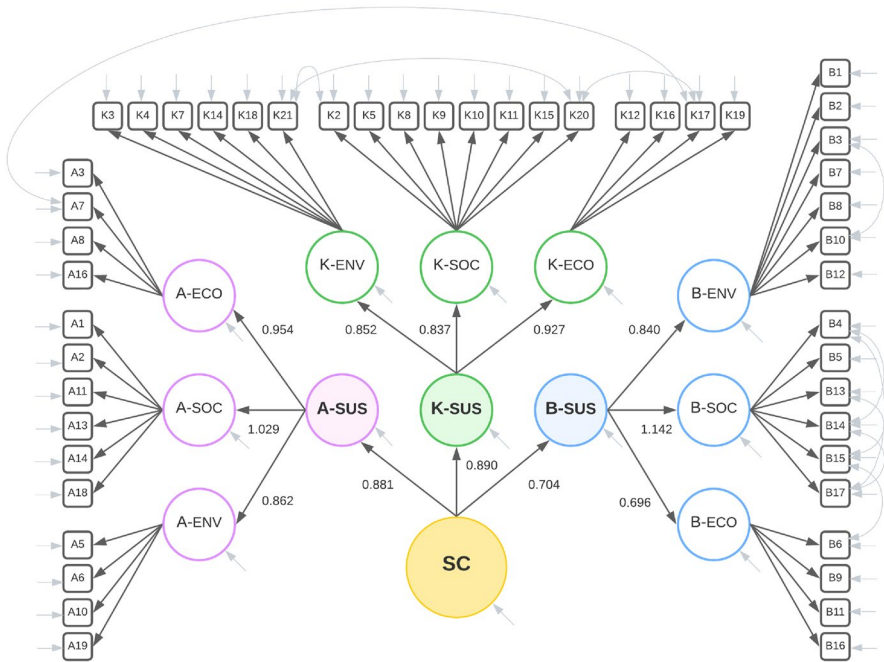


Fig. 3 Factors structure of Italian long form SCQ-L-1mod

the standardized factor loadings (i.e., elements of matrix Λ of Eq. 2) are reported in Appendix B (see Table 4 for SCQ-S-1mod and Table 5 for SCQ-S-2).

In the upper panel of Fig. 4 SCQ-S-1mod (i.e., the Swedish short-form model applied to our data, with the estimated item covariances slightly modified to improve the fit), some differences from the results of the original study stand out. In the original Swedish study, SC influenced A-SUS more than K-SUS and had a third-order effect on B-SUS, whereas, in the short form applied to the Italian data (SCQ-S-1-MOD), SC influences K-SUS and A-SUS to the same extent (the coefficients are 0.864 and 0.860, respectively).

Concerning the relationships between second-level and first-level latent constructs, the estimated factor loadings do not differ significantly between the Swedish and Italian studies. Nevertheless, it is worth outlining a pronounced difference between factor loadings of B-SUS: namely, SC influences behaviour in Italy more than in Sweden (Italy: 0.785, Sweden: 0.557). Moreover, the second-level latent constructs (A-SUS, K-SUS and B-SUS) explain the first-level constructs in a different order. In particular, B-SUS shows significant differences between the two studies. In the Swedish study, B-SUS mainly influences economic behaviour (1.006), and much more so than in Italy, where the factor loading is 0.626. Conversely, in the Italian study, B-SUS mainly influences social behaviour (1.118).

As mentioned at the end of Sect. 4.4, the strategy followed by Gericke et al. (2019) to derive their short-form proposal was entirely data-driven. Thus, samples collected in different countries could result in slightly different short forms. With Italian data, we observed six changes from the list of the original 27 indicators used to estimate the first-level latent constructs (see the bottom panel of Fig. 4 where SCQ-S-2 is displayed). In the Italian and Swedish studies, SC influences the second-level latent variables in the same order and with quite similar factor loadings for A-SUS and K-SUS,

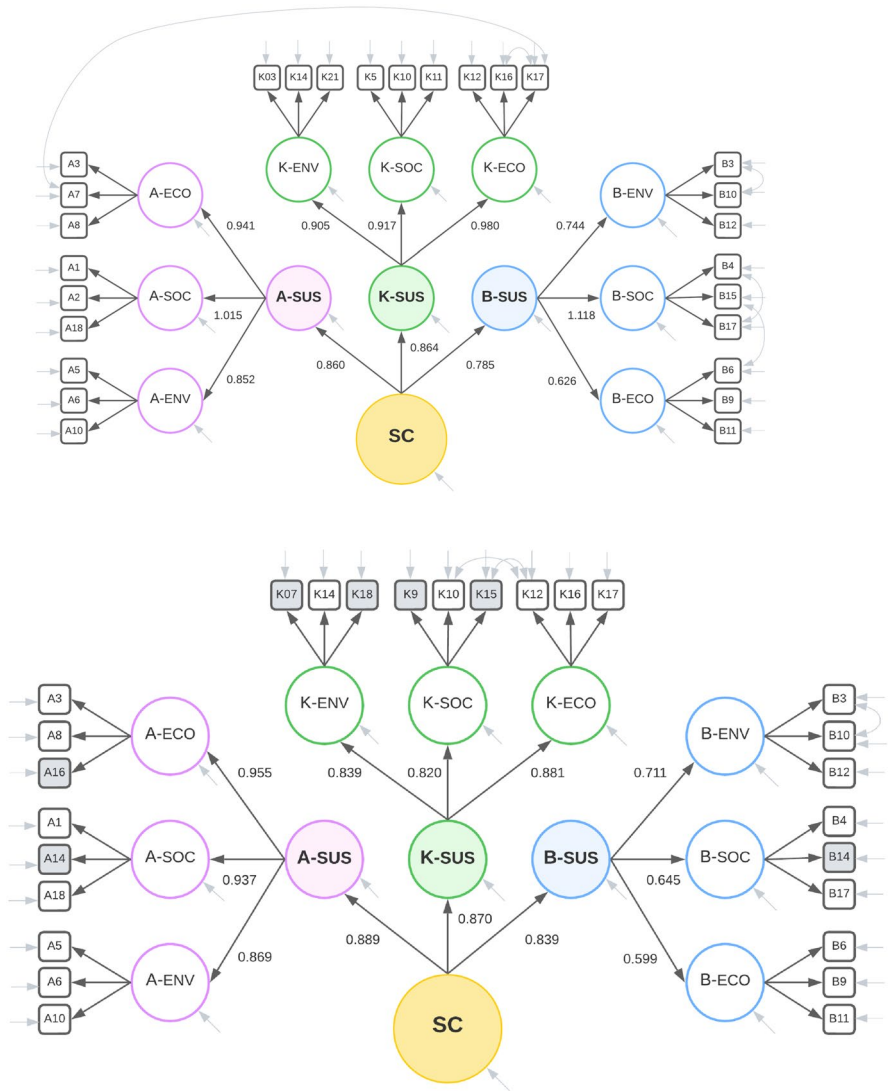


Fig. 4 Factors structure of Italian short forms SCQ-S-1mod (top panel) and SCQ-S-2 (bottom panel). Items grey colored in the bottom panel denote differences between the two forms. (Color figure online)

whereas it influences B-SUS more strongly in the Italian study (0.839) than in the Swedish one (0.557). Hence, according to the Swedish study, the role played by SC in affecting behaviours is weaker than that observed in the Italian study. Moreover, the order in which B-SUS influences the corresponding first-level variables differs between the two studies. In the Italian data, B-SUS first determines environmental behaviour (0.711), then social behaviour (0.645) and finally economic behaviour (0.599), while in the Swedish data the influence of B-SUS on B-ECO and B-ENV is reversed.

Looking at the two panels of Fig. 4 together (i.e., the Italian short forms SCQ-S-1mod and SCQ-S-2), at the highest hierarchical level the global SC mainly affects the attitude (A-SUS) and knowledge (K-SUS) components (standardized coefficients of SCQ-S-1mod equal to 0.860 and 0.864, respectively; standardized coefficients of SCQ-S-2 equal to 0.889 and 0.870, respectively) and at a minor extent the behavioural component (standardized coefficient of B-SUS equal to 0.785 for SCQ-S-1mod and 0.839 for SCQ-S-2). At the second level of the hierarchy, in line with Gericke et al. (2019) A-SUS and the K-SUS contribute similarly to the environmental, social, and economic dimensions. However, some differences between the two Italian short forms arise regarding B-SUS. Indeed, under the frame of SCQ-S-1mod, the main contribution is from the social behaviour (standardized coefficient equal to 1.1118), followed at a certain distance by environmental (standardized coefficient equal to 0.744) and economic behaviour (0.626). Differently, under the frame of SCQ-S-2, the way in which B-SUS influences environmental and social dimensions is inverted. These results partly contrast with that observed in the Swedish data, where B-SUS influences economic and social behaviour more.

5.3 Distribution of the latent constructs

Based on the short forms of the SCQ, estimation of the latent constructs is performed using Eqs. 1 and 2 with estimated matrices \mathbf{B} and $\mathbf{\Lambda}$. Figures 5, 6, and 7 display the distributions of the estimations of, respectively, the global SC and its three components concerning knowledge (K-SUS), attitude (A-SUS), and behaviour (B-SUS), and the corresponding first-level components. All the figures show the distributions for both of the short forms validated on the Italian data, being the SCQ-S-1mod in solid lines and the SCQ-S-2 dotted lines.

A look at Fig. 5 shows that the SC construct has a strongly skewed shape, with a long tail of negative values that are not compensated by positive values. In other words, the presence of individuals with extremely negative levels of consciousness is not compensated by individuals with an extremely positive levels of consciousness. The same type of

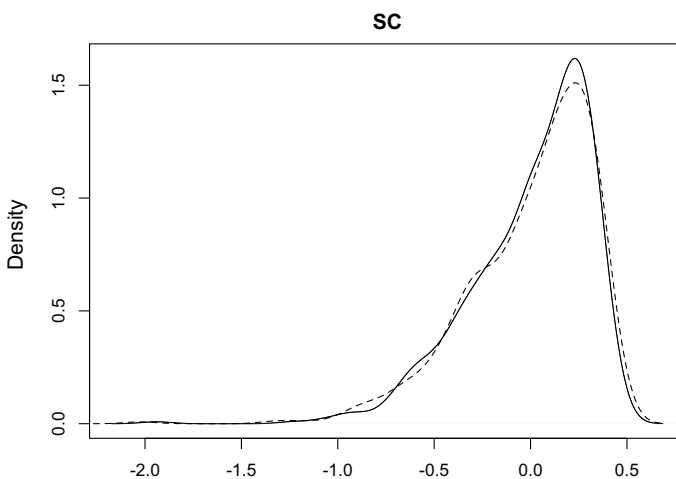


Fig. 5 Distribution of the third-level latent construct SC based on the short form of SCQ (solid line for SCQ-S-1mod and dotted line for SCQ-S-2)

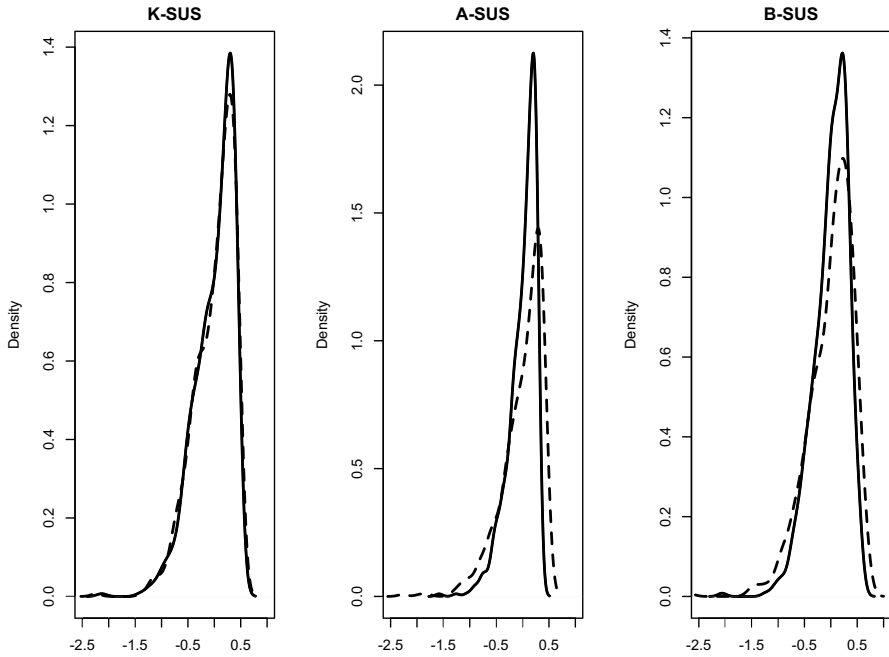


Fig. 6 Distribution of the second-level latent constructs K-SUS, A-SUS, and B-SUS, based on the short form of SCQ (solid line for SCQ-S-1mod and dotted line for SCQ-S-2)

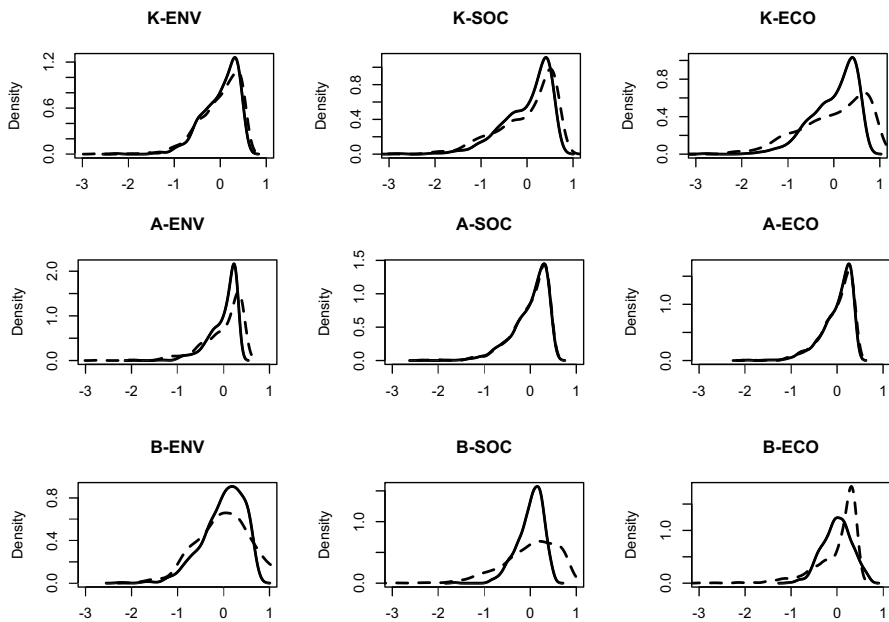


Fig. 7 Distribution of the first-level latent constructs K-ENV, K-SOC, K-ECO, A-ENV, A-SOC, A-ECO, B-ENV, B-SOC, B-ECO, based on the short form of SCQ (solid line for SCQ-S-1mod and dotted line for SCQ-S-2)

distribution is repeated at the second level of the hierarchy (see Fig. 6). In this case, we observe an almost perfect overlap of the two short forms for K-SUS, while the differences for A-SUS and B-SUS increase. Further evidence of the differences between the SCQ-S-1mod and SCQ-S-2 forms can be obtained by examining Fig. 7, which shows the distribution of each first-level latent construct. Considerable and almost perfect overlap between the two types of distribution can be observed for K-ENV, A-SOC and A-ECO, while the other distributions move towards higher positive values under SCQ-S-2 than under SCQ-S-1mod. This is particularly evident for K-ECO, B-SOC, and B-ECO. Moreover, the distribution of B-ENV assessed with the SCQ-S-2 form is less skewed than that assessed with the SCQ-S-1mod.

6 Final remarks

The sustainability consciousness questionnaire (SCQ) developed by Gericke et al. (2019) is an original instrument that fills a gap in the sustainability literature. It is the first psychometric instrument that measured people's sustainability consciousness (SC) in a holistic yet detailed way. The questionnaire makes it possible to collect information about people's attitudes, knowledge and behaviour in the economic, social and environmental domains and to construct latent variables that help to see in detail how strongly and in what form respondents' SC is expressed. In this work, we validated the Italian version of the questionnaire, a preliminary but necessary step towards measuring the latent construct of SC in contexts where it is appropriate to use it in the language of a particular country.

The factorial structure of the questionnaire validated on the original Swedish questionnaire is confirmed also for the Italian version, since CFI and TLI reach satisfactory values for both the long form and the short form, with an RMSEA lower than 5%. In particular, the short form is confirmed to have a better fit than the long one (CFI and TLI higher than 90%), as already pointed out in the validation of the original Swedish questionnaire. Moreover, as concerns the two short forms SCQ-S-1mod and SCQ-S-2, the latter achieves a slightly better fit because of the data-driven strategy (based on selecting the three items with the highest factor loadings for each first-level latent construct) followed in its derivation. For this reason, we suggest the use of the SCQ-S-2 short-form version in the Italian context.

Based on the results of our study, the SCQ can be used in its long and short forms and in a variety of contexts involving high school and university students. It can be used for descriptive and comparative purposes, as well as for studying the effectiveness of educational interventions or the impact of sustainable citizenship policies (Micheletti and Stolle 2012), and for comparisons between communities and countries. Moreover, the addition of control variables in the questionnaire allows for a more in-depth analysis of what may influence SC and is therefore a useful knowledge tool for researchers and policymakers.

Taking a look at the first results we observe that, as in the Swedish study, people present fair SC, which is revealed mainly in knowingness and attitudes. In the attitude items, we can read affective reactions, i.e. emotions and moods, positive or negative feelings towards a subject. Our data-driven model shows that people express their SC into the affective component and knowingness more than into behaviour. This result is coherent with the study on the sample of Swedish and Taiwanese students (Berglund et al. 2020), and of Spanish students (Veget 2021). In the Italian study, SC seems to be reflected in a greater balance of

attitudes, knowingness and behaviour and has a stronger effect on behaviour than the result obtained with the Swedish study.

The sample collected to validate the questionnaire is not representative of the Italian population. However, for the purpose of validation and to enable comparison with the Swedish study, we adopted a sampling design similar to theirs, collecting a convenience sample of high school and university students. Therefore, conclusions based on our study cannot be generalised to the Italian population as a whole. In addition, as shown in Sect. 5, we have some discrepancies in the parameter estimates from those reported by the Swedish study. With the available data, we are unable to attribute these discrepancies with certainty to the slightly different age distribution of the two samples or to other elements. These differences may indeed be associated with disparities in the efficacy of educational programs, distinct cultural or familial backgrounds, among other factors. Future research should prioritise sampling designs that take into account different individual characteristics, including gender, age and educational attainment, to ensure representative samples of whole populations, ideally allowing for full cross-country comparisons.

Finally, the present study is based on a sample of questionnaires collected during the first wave of our administration plan (the only one collecting responses received before the pandemic emergency COVID -19) to allow the best comparison with the results obtained by Gericke et al. (2019). Future research will aim at detecting possible differences in the composition of the SC construct due to changes in the population during and after the pandemic outbreak.

Appendix A: Questionnaire

Sustainability consciousness questionnaire (SCQ)

Wording in English (plain text) and translation into Italian (italics).

Environmental dimension of sustainability knowingness (K-ENV)

Indicate how true the following statements are for you, from 1 = “not at all” to 5 = “definitely true”.

- | | |
|-------------|--|
| K3 | Reducing water consumption is necessary for sustainable development. / <i>La riduzione del consumo di acqua è necessaria per lo sviluppo sostenibile.</i> |
| K4 inverted | Preserving nature is not necessary for sustainable development. / <i>La difesa della natura non è necessaria per lo sviluppo sostenibile.</i> |
| K7 | Sustainable development demands that we humans reduce all sorts of waste. / <i>Lo sviluppo sostenibile richiede che gli esseri umani riducano ogni sorta di rifiuto.</i> |
| K14 | Preserving the variety of living creatures is necessary for sustainable development (preserving biological diversity). / <i>Difendere la biodiversità è necessario per uno sviluppo sostenibile.</i> |
| K18 | Sustainable development requires a shift to renewable natural resources. / <i>Lo sviluppo sostenibile richiede una conversione alle risorse naturali rinnovabili.</i> |
| K21 | For sustainable development, people need to be educated in how to protect themselves against natural disasters. / <i>Per lo sviluppo sostenibile è necessario educare le persone a difendersi dai disastri naturali.</i> |

Social dimension of sustainability knowingness (K-SOC)

Indicate how true the following statements are for you, from 1 = “not at all” to 5 = “definitely true”.

- K2 Improving people’s chances for a long and healthy life contributes to sustainable development. / *Migliorare le probabilità per le persone di vivere a lungo e in salute contribuisce allo sviluppo sostenibile.*
- K5 A culture where conflicts are resolved peacefully through discussion is necessary for sustainable development. / *Lo sviluppo sostenibile richiede una cultura del dialogo in cui i conflitti siano risolti pacificamente.*
- K8 People who exercise their democratic rights are necessary for sustainable development (for example, they vote in elections, involve themselves in social issues, express their opinions). / *Le persone che esercitano i propri diritti democratici sono un ingrediente necessario per lo sviluppo sostenibile (per esempio l’esercizio del voto, il coinvolgimento diretto nelle questioni sociali, l’espressione delle proprie opinioni).*
- K9 Reinforcing girls’ and women’s rights and increasing equality around the world is necessary for sustainable development. / *Lo sviluppo sostenibile richiede un rafforzamento dei diritti delle ragazze e delle donne e una maggiore uguaglianza tra paesi nel mondo.*
- K10 Respecting human rights is necessary for sustainable development. / *Lo sviluppo sostenibile richiede il rispetto dei diritti umani.*
- K11 To achieve sustainable development, all the people in the world must have access to good education. / *Per uno sviluppo sostenibile tutti gli esseri umani devono avere accesso ad una buona istruzione.*
- K15 Having respect for other cultures is necessary for sustainable development. / *Lo sviluppo sostenibile richiede rispetto per le altre culture.*
- K20 For sustainable development, major infectious diseases such as HIV/AIDS and malaria must be stopped. / *Per raggiungere uno sviluppo sostenibile devono essere debellate le principali malattie infettive, come HIV/AIDS e la malaria.*

Economic dimension of sustainability knowingness (K-ECO)

Indicate how true the following statements are for you, from 1 = “not at all” to 5 = “definitely true”.

- K12 Sustainable development requires that companies act responsibly towards their employees, customers and suppliers. / *Lo sviluppo sostenibile richiede che le aziende agiscano responsabilmente nei confronti dei propri dipendenti, acquirenti e fornitori.*
- K16 Sustainable development requires a fair distribution of goods and services among people in the world. / *Lo sviluppo sostenibile richiede un’equa distribuzione di beni e servizi tra la popolazione mondiale.*
- K17 Wiping out poverty in the world is necessary for sustainable development. / *Eliminare la povertà nel mondo è condizione necessaria per lo sviluppo sostenibile.*
- K19 Sustainable development demands that people understand how the economy functions. / *Per avere uno sviluppo sostenibile è necessario che le persone capiscano il funzionamento dell’economia.*

Environmental dimension of sustainability attitudes (A-ENV)

Indicate how true the following statements are for you, from 1 = “not at all” to 5 = “definitely true”.

- A5 (inverted) I think that using more natural resources than we need does not threaten the health and wellbeing of people in the future. / *Penso che usare più risorse naturali di quelle di cui abbiamo bisogno non sia una minaccia per la salute e per il benessere delle persone nel futuro.*
- A6 I think that we need stricter laws and regulations to protect the environment. / *Penso che siano necessarie leggi e regolamenti più stringenti in materia di protezione ambientale.*
- A10 I think that it is important to take measures against problems which have to do with climate change. / *Penso che sia importante adottare misure contro i problemi che riguardano il cambiamento climatico.*
- A19 (inverted) I think it is OK that each one of us uses as much water as we want. / *Penso che sia giusto che ciascuno di noi utilizzi tutta l'acqua di cui ha bisogno.*

Social dimension of sustainability attitudes (A-SOC)

Indicate how true the following statements are for you, from 1 = “not at all” to 5 = “definitely true”.

- A1 I think that everyone ought to be given the opportunity to acquire the knowledge, values and skills that are necessary to live sustainably. / *Penso che a ciascuno debba essere data l'opportunità di acquisire le conoscenze, i valori e le capacità per vivere in modo sostenibile.*
- A2 I think that we who are living now should make sure that people in the future enjoy the same quality of life as we do today. / *Penso che chi sta vivendo adesso dovrebbe assicurarsi che chi vivrà negli anni a venire abbia la stessa qualità della vita attuale.*
- A11 I think that the government should provide financial aid to encourage more people to make the shift to green cars. / *Penso che il governo dovrebbe offrire aiuti finanziari per incoraggiare più persone a passare ad un'auto ecologica.*
- A13 I think that the government should make all its decisions on the basis of sustainable development. / *Penso che il governo dovrebbe prendere ogni singola decisione sulla base dei principi dello sviluppo sostenibile.*
- A14 I think that it is important that people in society exercise their democratic rights and become involved in important issues. / *Penso che sia importante che i cittadini esercitino i propri diritti democratici e che diventino parte attiva sui temi sociali più importanti.*
- A18 I think that women and men throughout the world must be given the same opportunities for education and employment. / *Penso che nel mondo uomini e donne dovrebbero avere accesso alle stesse opportunità di istruzione e lavoro.*

Economic dimension of sustainability attitudes (A-ECO)

Indicate how true the following statements are for you, from 1 = “not at all” to 5 = “definitely true”.

- A3 I think that companies have a responsibility to reduce the use of packaging and disposable articles. / *Penso che le imprese abbiano la responsabilità di ridurre l'uso di imballaggi e articoli usa e getta.*
- A7 I think it is important to reduce poverty. / *Penso che sia importante ridurre la povertà.*
- A8 I think that companies in rich countries should give employees in poor nations the same conditions as in rich countries. / *Penso che le imprese dei paesi ricchi dovrebbero assicurare ai propri lavoratori nei paesi poveri lo stesso trattamento economico di quello garantito ai lavoratori nel proprio paese.*
- A16 I think that people who pollute land, air or water should pay for the damage they cause to the environment. / *Penso che la gente che inquina la terra, l'aria o l'acqua dovrebbe pagare per il danno che causa all'ambiente.*

Environmental dimension of sustainability behaviour (B-ENV)

Indicate how true the following statements are for you, from 1 = “not at all” to 5 = “definitely true”.

- B1 Where possible, I choose to cycle or walk when I'm going somewhere, instead of travelling by motor vehicle. / *Quando posso, scelgo di andare in bicicletta o camminare invece di spostarmi con un mezzo a motore.*
- B2 I never waste water. / *Non spreco mai l'acqua.*
- B3 I recycle as much as I can. / *Riciclo quanto più possibile.*
- B7 I pick up rubbish when I see it out in the countryside or in public places. / *Raccolgo la spazzatura quando ne trovo in campagna o in luoghi pubblici.*
- B8 (inverted) I don't think about how my actions may damage the natural environment. / *Non penso a quanto le mie azioni possano danneggiare l'ambiente naturale.*
- B10 I always separate food waste before putting out the rubbish when I have the chance. / *Quando è possibile, separo sempre i rifiuti organici prima di buttare la spazzatura.*
- B12 I have changed my personal lifestyle in order to reduce waste (e.g., throwing away less food or not wasting materials). / *Ho cambiato il mio stile di vita personale per ridurre i rifiuti (per esempio butto via meno cibo o non spreco materiali).*

Social dimension of sustainability behaviour (B-SOC)

Indicate how true the following statements are for you, from 1 = “not at all” to 5 = “definitely true”.

- B4 When I use a computer or mobile to chat, to text, to play games and so on, I always treat others as respectfully as I would in real life. / *Quando utilizzo il computer o il telefono per chattare, scrivere, giocare, e così via, tratto gli altri con lo stesso rispetto che riserverei loro nella vita reale.*
- B5 (inverted) I often make lifestyle choices which are not good for my health. / *Faccio spesso scelte di vita che non sono buone per la mia salute.*
- B13 I work on committees (e.g., the student council, my class committee, the cafeteria committee) at my school. / *Partecipo a comitati nei luoghi in cui studio (consigli studenteschi, assemblee di classe e rappresentanze).*

- B14 I treat everyone with the same respect, even if they have another cultural background than mine. / *Tratto tutti con lo stesso rispetto, indipendentemente dalla loro estrazione culturale.*
- B15 I support an aid organization or environmental group. / *Sostengo un'organizzazione umanitaria o un gruppo ambientale.*
- B17 I show the same respect to men and women, boys and girls. / *Mostro lo stesso rispetto a uomini e donne, ragazzi e ragazze.*

Economic dimension of sustainability behaviour (B-ECO)

Indicate how true the following statements are for you, from 1 = “not at all” to 5 = “definitely true”.

- B6 I do things which help poor people. / *Compio azioni che aiutano le persone povere.*
- B9 I often purchase second-hand goods over the internet or in a shop. / *Acquisto spesso beni di seconda mano su internet o in negozio.*
- B11 I avoid buying goods from companies with a bad reputation for looking after their employees and the environment. / *Evito di acquistare prodotti di aziende con una cattiva reputazione sul rispetto dei lavoratori e dell'ambiente.*
- B16 I watch news programs or read newspaper articles to do with the economy. / *Seguo notiziari o leggo articoli di giornale che si occupano di economia.*

Appendix B: Estimates of item parameters

See Tables 4 and 5.

Table 4 SCQ-S-1mod: standardized factor loadings, with standard errors and 95% confidence intervals

| Latent trait | Item | St. factor loading | s.e | 95% CI inf limit | 95% CI sup limit |
|--------------------|----------|--------------------|-------|------------------|------------------|
| <i>Knowingness</i> | | | | | |
| Environmental | K_ENV_03 | 0.467 | 0.042 | 0.384 | 0.549 |
| | K_ENV_14 | 0.572 | 0.043 | 0.488 | 0.655 |
| | K_ENV_21 | 0.262 | 0.045 | 0.173 | 0.350 |
| Social | K_SOC_05 | 0.612 | 0.030 | 0.553 | 0.671 |
| | K_SOC_10 | 0.777 | 0.023 | 0.731 | 0.822 |
| | K_SOC_11 | 0.685 | 0.027 | 0.633 | 0.738 |
| Economic | K_ECO_12 | 0.654 | 0.029 | 0.596 | 0.711 |
| | K_ECO_16 | 0.643 | 0.031 | 0.581 | 0.704 |
| | K_ECO_17 | 0.663 | 0.030 | 0.603 | 0.722 |
| <i>Attitudes</i> | | | | | |
| Environmental | A_ENV_05 | 0.281 | 0.042 | 0.198 | 0.364 |
| | A_ENV_06 | 0.657 | 0.030 | 0.598 | 0.717 |
| | A_ENV_10 | 0.777 | 0.028 | 0.722 | 0.832 |
| Social | A_SOC_01 | 0.672 | 0.030 | 0.613 | 0.730 |
| | A_SOC_02 | 0.501 | 0.035 | 0.432 | 0.569 |
| | A_SOC_18 | 0.562 | 0.033 | 0.497 | 0.627 |
| Economic | A_ECO_03 | 0.583 | 0.034 | 0.516 | 0.649 |
| | A_ECO_07 | 0.571 | 0.034 | 0.505 | 0.638 |
| | A_ECO_08 | 0.559 | 0.035 | 0.491 | 0.627 |
| <i>Behaviour</i> | | | | | |
| Environmental | B_ENV_03 | 0.579 | 0.041 | 0.498 | 0.660 |
| | B_ENV_10 | 0.563 | 0.042 | 0.481 | 0.645 |
| | B_ENV_12 | 0.720 | 0.040 | 0.642 | 0.798 |
| Social | B_SOC_04 | 0.401 | 0.056 | 0.291 | 0.511 |
| | B_SOC_15 | 0.338 | 0.051 | 0.238 | 0.437 |
| | B_SOC_17 | 0.406 | 0.056 | 0.296 | 0.517 |
| Economic | B_ECO_06 | 0.359 | 0.049 | 0.262 | 0.455 |
| | B_ECO_09 | 0.450 | 0.049 | 0.353 | 0.547 |
| | B_ECO_11 | 0.634 | 0.054 | 0.529 | 0.000 |

Table 5 SCQ-S-2: standardized factor loadings, with standard errors and 95% confidence intervals

| Latent trait | Item | St. factor loading | s.e | 95% CI inf limit | 95% CI sup limit |
|--------------------|----------|--------------------|-------|------------------|------------------|
| <i>Knowingness</i> | | | | | |
| Environmental | K_ENV_07 | 0.482 | 0.038 | 0.408 | 0.556 |
| | K_ENV_14 | 0.667 | 0.031 | 0.606 | 0.729 |
| | K_ENV_18 | 0.686 | 0.031 | 0.625 | 0.747 |
| Social | K_SOC_09 | 0.762 | 0.022 | 0.718 | 0.806 |
| | K_SOC_10 | 0.809 | 0.02 | 0.769 | 0.849 |
| | K_SOC_15 | 0.719 | 0.024 | 0.671 | 0.767 |
| Economic | K_ECO_12 | 0.588 | 0.031 | 0.527 | 0.649 |
| | K_ECO_16 | 0.762 | 0.024 | 0.715 | 0.809 |
| | K_ECO_17 | 0.759 | 0.024 | 0.711 | 0.806 |
| <i>Attitudes</i> | | | | | |
| Environmental | A_ENV_05 | 0.28 | 0.042 | 0.197 | 0.363 |
| | A_ENV_06 | 0.66 | 0.03 | 0.601 | 0.718 |
| | A_ENV_10 | 0.775 | 0.027 | 0.721 | 0.829 |
| Social | A_SOC_01 | 0.699 | 0.028 | 0.644 | 0.754 |
| | A_SOC_14 | 0.61 | 0.031 | 0.548 | 0.671 |
| | A_SOC_18 | 0.584 | 0.032 | 0.521 | 0.648 |
| Economic | A_ECO_03 | 0.609 | 0.033 | 0.544 | 0.674 |
| | A_ECO_08 | 0.531 | 0.035 | 0.461 | 0.6 |
| | A_ECO_16 | 0.563 | 0.035 | 0.495 | 0.63 |
| <i>Behaviour</i> | | | | | |
| Environmental | B_ENV_03 | 0.588 | 0.042 | 0.505 | 0.67 |
| | B_ENV_12 | 0.708 | 0.041 | 0.628 | 0.787 |
| | B_ENV_19 | 0.575 | 0.043 | 0.491 | 0.658 |
| Social | B_SOC_04 | 0.681 | 0.031 | 0.621 | 0.741 |
| | B_SOC_14 | 0.735 | 0.029 | 0.677 | 0.792 |
| | B_SOC_17 | 0.688 | 0.03 | 0.628 | 0.747 |
| Economic | B_ECO_06 | 0.379 | 0.05 | 0.282 | 0.477 |
| | B_ECO_09 | 0.46 | 0.049 | 0.363 | 0.557 |
| | B_ECO_11 | 0.629 | 0.053 | 0.525 | 0.732 |

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