Consumers' Consciousness for Sustainable Consumption and Their Perceptions of Wooden Building Product Quality

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Abstract

Wood products are seen globally as an important solution to substitute nonrenewable materials in the construction sector to enhance the life cycle sustainability of buildings. Globally, the most prominent opportunities for sustainability change in housing production lie in multistory residential buildings, which are built mainly of concrete, steel, and bricks. The possibilities of achieving multiple benefits from the use of wood in multistory residential buildings have gained interest among scholars, especially in the 2000s. However, the research has been dominated by views of production (especially construction processes), while scientific knowledge of consumption (especially the occupational phase of buildings) remains very limited. Information about how consumers with differing views of sustainable consumption evaluate the quality of wooden building materials particularly is scarce. This study aimed to investigate consumer perceptions of wooden building product quality and examine how the perceptions connect with consumers' consciousness for sustainable consumption (CSC). The research data were gathered in 2018 by a postal survey sent to 1,000 people living in Finland (response rate 25.6**%**) and analyzed with exploratory factor analysis and the Mann-Whitney *U* test. According to the results, respondents' views of wooden building product quality indicators can be grouped into three factors: technical advantages, environmental sustainability of materials, and social benefits at home. The strength of CSC was found to be linked with respondents' views of wooden building product quality. The results of consumers' CSC views help actors involved in the wood and construction industries better meet consumer expectations both for different aspects of sustainability and for lifestyles.

Cities as built environments contribute to the majority of the use of global resources (Madlener and Sunak 2011). Furthermore, it has been estimated that one-third of global carbon dioxide emissions derives from manufacturing of building materials (all types of buildings) and the use of residential buildings (United Nations Environment Programme 2021). At the same time, rapidly increasing urban population is in need of dwellings that provide good living conditions. Thus, the development of sustainable construction solutions for urban areas is in a key role to both adapt to climate change and to offer comfortable housing conditions for humans (He 2019). In cities, apartment buildings are the most resource-efficient dwelling options (e.g., less living space per capita to be heated or cooled) (Wiedenhofer et al. 2018), explaining why multistory residential construction receives much focus in seeking sustainability change in urban buildings.

Since the early 20th century, the dominant materials in multistory residential buildings have been concrete, steel, and bricks (Urban 2012), and it has been estimated that by 2050, the highest global increase in the stock of building materials will be in such properties (Marinova et al. 2020). Thus, substituting nonrenewable materials with renewable ones in multistory residential construction is a focal area of sustainability change in urban construction (Dangel 2016) that may be enhanced globally through the use of wood (Churkina et al. 2020, Himes and Busby 2020, Pauliuk et al. 2021). Substituting nonrenewable materials with wood brings benefits both for construction (e.g., decarbonization

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and energy efficiency) and for the occupational phase of buildings (e.g., carbon storage and energy efficiency when combined with well-controlled heat, ventilation, and air-conditioning systems) (Dangel 2016, Nore et al. 2017, Amiri et al. 2020).

External drivers (i.e., changes in regulatory frameworks and technological infrastructures) (Toppinen et al. 2019) have been introduced to increase the use of wood in multistory residential buildings, especially in the 2000s (e.g., Dangel 2016). From the perspective of demand in the housing markets, this has resulted in the need for information to understand how consumers accept and evaluate the quality of wooden building products (Viholainen et al. 2020a). Furthermore, it is significant to recognize how these evaluations relate to consumers' overall consciousness for sustainable consumption (CSC) in their everyday lives. For example, for Finnish consumers, living in a home made of wood in urban areas may be linked with other sustainable consumption patterns in their daily lives (Ottelin et al. 2021).

The need for sustainability changes in the residential construction sector is strongly related to the UN Sustainable Development Goals, which bring forth consideration of environmental, social, and economic life cycle sustainability in building (Ogunmakinde et al. 2022). Traditions among construction-sector businesses have been characterized by a focus on building processes, while the occupational phase has received the most attention from consumers (Maloney 2002, Uusitalo and Lavikka 2020, Viholainen et al. 2020b, Lähtinen et al. 2022). From the perspective of the life cycle of the building, this has been a considerable deficiency.

Sustainability change in the construction sector requires producers (e.g., architects) to develop new capabilities that enable consideration of life cycle sustainability aspects already in the design phase (Dokter et al. 2021). In addition, consumers need to accept solutions (e.g., materials and technologies) developed for sustainability change in the residential building sector (Zhao et al. 2015). It is also important that construction-sector professionals do not misunderstand consumer expectations for housing. For example, architects may falsely expect consumers to be willing to pay higher prices for having a home in a wooden multistory building, although this is not straightforwardly the case (Lindblad and Gustavsson 2020).

Consumer preferences for building materials relate to lifestyles (Lähtinen et al. 2021, Ottelin et al. 2021), which connect life cycle sustainability of residential buildings to socioeconomic aspects (Mora et al. 2011, Hasu 2018). Abreast with environmental sustainability, the use of wood in multistory residential buildings also brings opportunities for technological, economic, and social advantages. For example, technical and economic gains may be acquired through off-site prefabrication of modules and use of building solutions with easy repairability (e.g., Brandner et al. 2016, Pelli and Lähtinen 2020), while social benefits connect issues such as aesthetics of living spaces and well-being in housing (e.g., Rhee 2018, Lähtinen et al. 2021).

In all, the benefits of wooden multistory residential construction are linked with broader requests to seek new sources of competitiveness for the construction sector through sustainability and the consideration of customer needs (Jussila et al. 2022). Traditionally, both construction-sector businesses and wood-industry firms have had a strong production focus (e.g., Maloney 2002, Lähtinen and Häyrinen 2022). As a result of that, also studies on consumer expectations or value creation in the wood-industry firms have also been strongly dominated by the views of production (e.g., Stehn and Bergström 2002; Hemström et al. 2011; Brege et al. 2014; Toppinen et al. 2018, 2019; Pelli and Lähtinen 2020). In the context of construction-sector businesses, consumer expectations have been addressed mostly through the opinions of business customers acting as suppliers for future residents (e.g., Kärnä 2004, Swarts 2020).

In recent years, views of consumption (e.g., consumer behavior) have also gained increasing interest among scholars, especially in the context of wooden multistory residential buildings (e.g., Kylkilahti et al. 2020, Viholainen et al. 2020b). Yet, a profound understanding of consumer needs for living in wooden multistory residential buildings is still very limited. As a result of this, businesses in the wood construction sector miss possibilities to enhance their competitiveness through new value creation for future residents and by offering new sustainable building solutions for the housing markets (e.g., Lähtinen et al. 2021, Jussila et al. 2022).

Because industrial construction processes have requirements, for example, for efficiency and speed (e.g., Pelli and Lähtinen 2020), integration of consumers into the building design is a challenge. Currently, consumers seldom have possibilities to affect the material choices in multistory residential building projects (e.g., Lähtinen et al. 2022), although dwellers have been found to have a significant role in sustainability change for residential buildings (Martek et al. 2019). According to Piroozfar and Piller (2013), both sustainability and customer value creation in the construction sector could be significantly enhanced through the uptake of mass-customization tools that would integrate consumers in the building design processes.

In general, consumer acceptance of building with wood and living in wooden homes is higher among consumers in forested countries (Viholainen et al. 2020b). Still, Nordic consumers with urban lifestyles are also more likely to be prejudiced against living in wooden homes than those who appreciate living in less urbanized neighborhoods (Lähtinen et al. 2021). Consumers may also appreciate the sustainability benefits of wood in buildings differently (e.g., environmental, technical, aesthetic, or well-being benefits), and this may further reflect their willingness to live in wooden homes (Lähtinen et al. 2019).

Like marketing research on the wood industries, early research on wooden product quality has concentrated mainly on production-related attributes (i.e., tangible product properties or the views of suppliers) (e.g., Sinclair et al. 1993; Hansen and Bush 1996, 1999). In line with this, the connection between consumer characteristics and perceived quality has been largely bypassed, although the number of consumer studies on wooden materials and products has increased in recent years (e.g., Luo et al. 2017, 2018; Loučanová and Olšiaková 2020; Oblak et al. 2020), focusing on sociodemographics such as gender, age, and education (Holopainen et al. 2014; Høibø et al. 2015; Luo et al. 2017, 2018; Kaputa et al. 2018; Aguilar et al. 2022). However, previous research has generally addressed consumer views or preferences for materials and products, while consideration of quality as a more complex theoretical phenomenon has been lacking.

Previous studies have shown that consumers' environmental orientation affects their perceptions of wooden materials, especially in the case of certified wood products (e.g., Hansmann et al. 2006, Aguilar and Vlosky 2007, Thompson et al. 2010). However, to the best of our knowledge, no studies exist that would have also taken social and economic sustainability values into consideration when investigating the choice of wood products. In this study, we will address sustainable consumption as an environmental, social, and economic phenomenon by using a CSC scale developed by Balderjahn et al. (2013). Earlier, the scale has been used to investigate anticonsumption (Seegebarth et al. 2016, Balderjahn et al. 2020, Ziesemer et al. 2021), fast-moving consumer goods (Balderjahn et al. 2018), university students (Pena-Cerezo et al. 2019), frugal behavior (Suárez et al. 2020), and consumers of fashion (Haines and Lee 2021). However, it has not been adopted in the context of wooden building products or other building materials.

The overall purpose of this study is to fill the gaps in the existing academic information about the linkages between consumer perceptions of wooden building product quality and their CSC, addressed through two aims. The first aim is to add knowledge concerning how consumers perceive the various quality indicators of wooden building products (i.e., interior, exterior, and load-bearing structures). The second aim is to investigate the connections between consumers' perceptions of wooden building product quality indicators and their CSC, addressed from environmental, social, and economic viewpoints.

Literature Review

Research on the perceived quality of wooden materials

Perceived quality is defined as ''the consumer's judgment about a product's overall excellence or superiority'' (Zeithaml 1988). In the existing research, perceived quality has been considered to be subjective rather than objective (e.g., Zeithaml 1988, Steenkamp 1989) and a multidimensional construct (e.g., Stylidis et al. 2020) evaluated with different quality indicators, such as quality cues and attributes (e.g., Olson and Jacoby 1972, Steenkamp 1989, Oude Ophuis and Van Trijp 1995). For example, a product consists of different cues that consumers use as the basis for making judgments about the product (Cox 1962). Furthermore, perceived quality attributes can be defined as product characteristics that deliver functional and psychosocial advantages of a product to consumers (Steenkamp 1990). Another accepted view in the existing literature is that consumers' perceptions of quality attributes before purchase are based on quality cues (Steenkamp 1989).

Previously, research on wood product quality has examined mostly quality attributes in terms of the tangible product properties or views of suppliers (e.g., Sinclair et al. 1993; Hansen and Bush 1996, 1999). For example, Sinclair et al. (1993) tested Garvin's (1984) eight quality dimensions (i.e., performance, features, reliability, conformance, durability, serviceability, aesthetics, and perceived quality) in the case of office furniture, but the study's results failed to support the eight-dimensional structure of quality. Furthermore, a study by Hansen and Bush (1996) divided the quality characteristics of softwood lumber into five dimensions: supplier/salesperson characteristics, supplier facilities, supplier services, lumber performance, and lumber characteristics.

Only a few of the existing wood-industry studies have investigated consumers' perceptions of wood product quality, and the studies therefore lack a theoretical foundation concerning the perceived quality of wooden materials (Harju 2022). For example, in wood-industry studies, perceived quality has been investigated in the context of wooden windows (Costa et al. 2011), wooden furniture, paneling and flooring (Toivonen 2012), wooden interior products (Harju and Lähtinen 2021), and wooden building materials (Harju 2022).

A study by Costa et al. (2011) revealed that various attributes of wooden windows, such as global quality, thermal insulation, acoustic insulation, maintenance, product life, aesthetics, environment, fire resistance, safety, and price, affected consumers' quality perceptions. Furthermore, Toivonen (2012) suggested that product quality included tangible and intangible dimensions consisting of more specific subdimensions. The tangible dimension relates to the physical good, while the intangible dimension addresses services and other intangibles, such as environmental issues. Harju and Lähtinen (2021) grouped the quality indicators of wooden interior products into four factors: products' environmental friendliness, fit with lifestyle and home design, visual and tactile attractiveness, and technical solidity. Their results indicated quality indicators to be connected in various ways with environmental, social, economic, and technological aspects. The results of a systematic literature review by Harju (2022) suggest that the perceived quality of wooden building materials is affected by various quality cues and attributes of wood, such as sensory, social, economic, technical, and sustainability properties.

Consumers' quality perceptions are also influenced by consumer characteristics and situational factors at the purchasing place (e.g., Steenkamp 1989, Oude Ophuis and Van Trijp 1995). In the existing wood product quality research, a few studies have investigated the connections between consumers' sociodemographic characteristics and their quality perceptions (Costa et al. 2011, Harju and Lähtinen 2021). For example, quality perceptions of wooden interior products have been shown to relate to consumers' gender, age, education, forest-sector involvement, and forest ownership (Harju and Lähtinen 2021). However, the interlinkages between other consumer characteristics, such as consumers' CSC and perceived quality, have not been addressed in the existing literature.

CSC

In line with the triple-bottom-line concept (Elkington 1997), sustainable consumption patterns have been defined as mindful consumption that is ''guided and underpinned by a mindful mindset that reflects a conscious sense of caring toward self, community, and nature'' (Sheth et al. 2011). In this definition, caring for oneself concerns happiness, life, satisfaction, and work–life balance; caring for community refers to the valuing of social networks and support for public goods; and caring for nature includes environmental matters, such as environmental protection and the sparing use of natural resources (Balderjahn et al. 2013).

Balderjahn et al. (2013) contributed to the discussion of sustainable consumption by defining CSC as ''an intention to consume in a way that enhances the environmental,

social, and economic aspects of the quality of life.'' They suggested that CSC consisted of three interrelated but distinct dimensions—environmental, social, and economic sustainability—and identified the key factors for the conceptual model (Table 1). They also developed a comprehensive measurement of the CSC by operationalizing consciousness by weighting consumers' personal beliefs on the importance of aspects linked with the three sustainability dimensions.

The CSC scale has been used in several studies (Seegebarth et al. 2016, Ziesemer et al. 2016, Balderjahn et al. 2018, Hüttel et al. 2018, Pena-Cerezo et al. 2019, Balderjahn et al. 2020, Suárez et al. 2020, Haines and Lee 2021, Ziesemer et al. 2021). However, some criticism of the scale has emerged (Gupta and Agrawal 2018, Pena-Cerezo et al. 2019, Quoquab et al. 2019) because CSC does not consider, for example, the behavioral aspect of the consumer (Quoquab et al. 2019). In contrast, the validity of the scale used has not been criticized (Pena-Cerezo et al. 2019). Confirmation for the original structure of the CSC scale was received by Pena-Cerezo et al. (2019) in their measurement of the degrees of CSC among university students. In addition, Suárez et al. (2020) explored the effects of CSC alongside materialism and a consideration of the future consequences of frugal behaviors. Their results showed that the dimensions of CSC had a significant influence on frugal behavior.

Furthermore, the short version of the CSC scale has been used in some studies (e.g., Ziesemer et al. 2016, Balderjahn et al. 2018, Haines and Lee 2021). For example, Balderjahn et al. (2018) examined sustainability-conscious consumers, and Haines and Lee (2021) investigated consumers' consumption patterns and disposal behavior using the short CSC Scale by Ziesemer et al. (2016). The short CSC scale consists of only 12 items obtained from each CSC dimension (i.e., environmental, social, and economic). However, the collaborative consumption subdimension is not included (Ziesemer et al. 2016). In addition, a study by Seegebarth et al. (2016) measured voluntary simplicity and collaborative consumption based on the original CSC scale. Hüttel et al. (2018), Balderjahn et al. (2020), and Ziesemer et al. (2021) also measured only the aspects related to consciousness for voluntary simplicity, collaborative consumption, and debt-free living, representing the economic dimension of the original CSC scale.

In conclusion, perceived quality research in the wood industry has been scarce, and there is limited knowledge of the role CSC plays in consumers' evaluations of quality in the context of wooden building products. The lack of information results in gaps in the understanding of the acceptability of wooden building materials among consumers, which further may affect the potential for sustainability change in the construction sector. To investigate the connections between consumers' CSC (i.e., environmental, social, and economic orientation) and perceptions of wooden building product quality, two steps are taken. First, based on the assumption that perceived quality is a multidimensional construct (Stylidis et al. 2020), this study explores the dimensions of perceived quality by investigating how consumers perceive the various quality indicators of wooden building products (i.e., interior, exterior, and load-bearing structures). The study then examines the interlinkages between consumers' CSC and consumers' perceptions of the quality dimensions of wooden building products. The measurement of CSC is based on the CSC scale of Balderjahn et al. (2013).

Table 1.—Key factors for the conceptual model of consciousness for sustainable consumption (adapted from Balderjahn et al. 2013).

Consciousness for environmental consumption
Recycling and disposing
Packaging
Use of resources and energy
Local/regional production
Climate impact
Consciousness for social consumption
Human rights
Social minimum standards
Child labor/forced labor
Discrimination
Disciplinary sanctions/mistreatment
Fair compensation
Consciousness for economic consumption
Voluntary simplicity
Material simplicity
Durability
Frugality
Debt-free consumption
Financial budget
Safeguarding for future
Price performance
Collaborative consumption
Renting
Leasing
Borrowing

Materials and Methods

The study's material was collected in Finnish with a survey that, alongside the views and knowledge of the general public concerning wood products (see previous results in Lähtinen et al. 2019, Harju and Lähtinen 2021), also investigated the CSC and perceptions of quality indicators of wooden building products. In all, 1,000 people between the ages of 18 and 74 and permanently residing in Finland in the spring of 2018 were invited to participate in the study. The recipients' contact information was collected through random sampling by the Population Register Centre, which governs the official ''Population Information System'' database in Finland. The database does not contain electronic contact information (e.g., e-mail addresses) of residents in Finland, so paper versions of the survey materials (i.e., cover letter and questionnaire) were the primary method of communication with potential respondents.

After two phases of data gathering (the first round in late June, the second in late July), a total of 256 respondents participated in the survey. It should be mentioned that although all the participants were contacted by postal mail only, in the second round of data gathering, they had an opportunity to choose between a paper or an electronic version of the questionnaire (electronic link and QR code given in the reminder letter). The final response rate was 25.6 percent, which is comparable to the typical response rates for postal mail and electronic surveys (Kaplowitz et al. 2004).

The average age of respondents was 53 (information about the age of each recipient was received from the

Population Register Centre in Finland). In comparison, the average age of people between the ages of 18 and 74 in Finland in 2018 was 46 (Statistics Finland 2021). However, other sociodemographic variables (i.e., gender and municipality of residence) were very similar to the Finnish population in 2018 (Statistics Finland 2021), and therefore the data can be considered applicable for analyzing the general consumer perceptions in Finland. Furthermore, the chi-square test of independence (Berenson et al. 2002) was conducted to detect the differences between the respondents. According to the results, there were no indications of statistically significant differences between early and late respondents. Therefore, it was assumed that nonresponse bias would not cause significant risks regarding the reliability of the results.

The questionnaire included several questions on consumer knowledge and opinions concerning issues related to the properties and quality of wood-based products, their usability for different purposes, and forest-sector communication in Finland. Furthermore, to have more profound information on the respondents' CSC, respondents were asked to evaluate the importance of various environmental, social, and economic sustainability aspects in their daily purchasing choices. This study used data on consumers' perceptions of the quality indicators of wooden building products (i.e., exteriors, interiors, and load-bearing structures) and consumers' CSC, which have not been used or analyzed in previous studies. Detailed information on those questions is presented in the Supplemental Material.

To operationalize the wooden building product quality indicators, a literature review of peer-reviewed journal articles addressing consumer behavior regarding wood products was implemented (see also Harju 2022). Table 2 presents the quality indicators and the existing studies examining those indicators. For conceptual validity, all statements were carefully designed for the fit between theoretical and empirical aspects of the characteristics of wooden building products (i.e., interiors, exteriors, and load-bearing structures).

As a result of operationalization, the variables in the statements were connected to various wooden building product quality indicators comprising both general properties of wooden materials (e.g., technical properties and acoustics) and properties more connected to various sustainability aspects (e.g., product certificates, safety, healthiness, and price). Thus, in this study, quality was addressed as a multidimensional construct extending beyond the technical quality properties (e.g., strength grading standards or defects like knots, splits, twists, and wanes for sawn wood). The finalization of the questionnaire was preceded by interviews with the stakeholders from interest organizations representing the different phases of forestry–wood-industry value chains (i.e., the Central Union of Agricultural Producers and Forest Owners, the Finnish Sawmills Association, and the Federation of the Finnish Woodworking Industries). These stakeholders pretested the questionnaire and evaluated the empirical validity of the contents addressed in the questionnaire.

In the questionnaire, CSC was measured through the aspects of environmental, social, and economic sustainability. However, compared to the original CSC scale (Balderjahn et al. 2013), the authors chose to focus on the aspects of voluntary simplicity and collaborative consumption as the main themes of the economic dimension (see Table 1) since, compared to environmental and social sustainability, there were considerably more statements on economic sustainability in the original CSC scale (Balderjahn et al. 2013). To enhance the balance of information between the various sustainability aspects, the items describing debt-free consumption connected to economic aspects were therefore omitted from the questionnaire. In addition, variables on sustainability aspects especially relevant in the forestry–wood-industry value chains (i.e., origin of raw material, energy efficiency in production, and workers' health and safety) were added to the questions (e.g., Holopainen et al. 2014, Lähtinen et al. 2016, Paulin et al. 2018). Detailed information on the statements presented in the questionnaire is presented in Table 3.

The data were analyzed in two stages by using multivariate research methods to identify whether there were any underlying factors in consumers' perceptions of wooden building product quality and if the perceptions described by the factors might relate to the CSC of the respondents. As research methods, exploratory factor analysis (EFA) (Kim and Mueller 1978) and the nonparametric Mann-Whitney U test (Berenson et al. 2002) were implemented with IBM SPSS Statistics software (version 25.0). In the statistical analysis, as evidence of the statistical significance of the analysis results, the threshold values were $0.05 \leq P$ value < 0.1 = suggestive evidence of statistical significance, $0.01 \leq P$ value < 0.05 = moderate evidence of statistical significance, and < 0.01 P value = very strong evidence of statistical significance.

The analysis of the results started with EFA with Kaiser normalization, maximum likelihood estimation, and varimax rotation. In EFA, the data on respondents' perceptions of the quality indicators of wooden building products were used. The assumption of the EFA is that a certain phenomenon may be scrutinized by recognizing latent variables (i.e., factors), which are the covariation in the data of original variables and of which there are fewer compared to the original variables (Kim and Mueller 1978, Henson and Roberts 2006). EFA execution and the quest for a final solution is based on both subjective considerations (e.g., background of theories and empirics) and statistical measures (Kim and Mueller 1978, Henson and Roberts 2006, Beavers et al. 2013).

The Kaiser eigenvalue >1 rule was used in EFA as a statistical background criterion to determine the number of factors to be kept. Simultaneously, the EFA results were also evaluated with Kaiser-Meyer-Olkin measures (with a minimum value of 0.50 for sampling size adequacy) and the Bartlett test of sphericity (i.e., the correlation between the original variables). To retain an original variable in the models, a threshold factor loading value of 0.4 was used. In seeking an empirically valid solution, the conceptual consistency of the factors (i.e., the loadings of the original variable and their signs) were also assessed. As a result of EFA, latent variables illustrating respondents' views of wooden building product quality were gained.

The second and final phase of analysis comprised the implementation of nonparametric Mann-Whitney U tests to assess whether statistical evidence would be gained on the connections between the respondents' CSC and the EFA factors describing the respondents' perceptions of wooden building product quality. The nonparametric Mann-Whitney U test is usable with data based on sets of observations measured on an ordinal or interval scale in comparison with

Table 2.—Peer-reviewed studies used to operationalize the quality indicators of wooden building products in the survey.[a]

Quality indicators of wood products connected to construction	Studies of wood product quality	Studies of other issues connected to wood product quality
Technical properties (e.g., solidity, hardness)	Sinclair et al. (1993), Hansen and Bush (1996, 1999), Costa et al. (2011), Toivonen (2012)	Høibø et al. (2015), Strobel et al. (2017)
Acoustics (e.g., soundproofing properties)	Sinclair et al. (1993), Costa et al. (2011)	Strobel et al. (2017)
Information (e.g., raw material origin, production process, and environmental effects)	Costa et al. (2011), Toivonen (2012)	Hansmann et al. (2006), Holopainen et al. (2014)
Certificates (e.g., Swan Ecolabel, PEFC, FSC)	N/A	Roos and Hugosson (2008), Roos and Nyrud (2008), Thompson et al. (2010), Shoji et al. (2014), Holopainen et al. (2017), Paulin et al. (2018)
Price (e.g., price compared to other materials)	Sinclair et al. (1993), Costa et al. (2011)	Teisl et al. (2002), Fell et al. (2006), Roos and Hugosson (2008), Roos and Nyrud (2008), Luo et al. (2017)
Safety (e.g., fire resistance)	Costa et al. (2011)	Gold and Rubik (2009), Hu et al. (2016), Toppinen et al. (2013)
Health effects (e.g., effects on well-being and indoor air quality, antibacterial qualities)	N/A	Spetic et al. (2007), Gold and Rubik (2009), Jiménez et al. (2015), Hu et al. (2016), Jiménez et al. (2016)
Coziness (e.g., effects on homeyness)	N/A	Hu et al. (2016)
Multifunctionality (e.g., usability for multiple purposes)	Sinclair et al. (1993), Toivonen (2012)	N/A
Longevity (e.g., resistance against moisture and decay, life cycle durability)	Sinclair et al. (1993), Hansen and Bush (1996, 1999), Costa et al. (2011)	Spetic et al. (2007), Gold and Rubik (2009), Høibø et al. (2015), Strobel et al. (2017), Luo et al. (2018)
Personal values (e.g., medium to express one's identity and personal status)	Sinclair et al. (1993)	Ridoutt et al. (2002, 2005)
Origin (e.g., domesticity)	Toivonen (2012)	Holopainen et al. (2014), Paulin et al. (2018)
Environmental aspects (e.g., environmental impacts and sustainability)	Costa et al. (2011), Toivonen (2012)	Toppinen et al. (2013), Holopainen et al. (2014), Høibø et al. (2015)
Innovativeness (e.g., new ways to use wooden materials in construction)	N/A	Goverse et al. (2001)
Constructor or architect (e.g., the expertise of construction company's salespersons or architects concerning use of wood in construction)	Toivonen (2012)	Roos et al. (2010), Hemström et al. (2011), Markström et al. (2018)

[a] N/A = not available.

tests assuming the data to be normally distributed (e.g., Student *t* test and analysis of variance ANOVA). By analyzing the differences in the median values (Nahm 2016), the Mann-Whitney *U* test is the nonparametric equivalent to the Student *t* test to compare two independent samples (Berenson et al. 2002). The Mann-Whitney *U* test was used in group comparisons for CSC regarding environmental, social, and economic sustainability.

To enhance the interpretability of the results of the second stage of analysis, prior to actual calculus, the information on the original CSC statements (i.e., responses on individual variables of environmental, social, and economic sustainability, illustrated in Table 4) of the respondents were compressed into environmental, social, and economic CSC by composing summative variables (for the procedure, see, e.g., Lähtinen et al. 2022). At this point, the internal consistency of the information was also related to statements on each sustainability dimension and measured by calculating values for the Cronbach alpha, which provides information on the suitability of the data on individual variables to be condensed by using summative variables. As a result, for the statements describing CSC for environmental aspects, the Cronbach alpha was 0.857, for social aspects 0.856, and for economic aspects 0.782. Because the values of the Cronbach alpha are very good in terms of environmental and social CSC and respectable in terms of economic CSC (for interpretation of Cronbach alpha values, see DeVellis 2012, pp. 95–96), the results supported the reliability of the scales and combining the statements into summative variables.

The summative variables calculated for each respondent by environmental, social, and economic CSC were then converted into binary variables, which were to be used as categories for CSC strength in the Mann-Whitney *U* test. In binary variable coding, summative environmental, social, and economic CSC variables with Likert scale values of 4 and 5 (i.e., fair or complete agreement with the statement on CSC) were coded with a value of 1 (a proxy for strong CSC), and values between 1 and 3 were given a value of 0 (a proxy for weak CSC). As a result of the second and final stage of our analysis, information on the potential linkages between the respondents' perceptions of wooden building product quality and the strength of their CSC was gained by analyzing the EFA results by binary CSC variables with Mann-Whitney *U* tests.

Table 3.—Statements used in the questionnaire to measure views of respondents on consciousness for sustainable consumption (CSC).

	Statements in the questionnaire
Environmental CSC	I buy a product when it is produced in a material- and energy-efficient manner (e.g., minimizing the amount of waste, utilizing modern technologies)
	I buy a product when it is produced in an environmental manner (e.g., avoiding environmentally hazardous substances or utilizing renewable materials)
	I buy a product when it is made from recycled materials (e.g., promoting the circular economy)
	I buy a product when it can be disposed of in an environmentally friendly manner (e.g., recycling opportunities)
Social CSC	I buy a product when it is of local origin (e.g., supporting local economies)
	I buy a product when workers' human rights are adhered to and workers are treated equally in its production
	I buy a product when minimum standards regarding workers' health and safety have been followed (e.g., work safety and labor code) in its production
	I buy a product when workers' opportunities for professional development are considered (e.g., varying work tasks and gaining expertise) in its production
Economic CSC	When I buy different products, I prefer those I really need and that are purchased based on consideration
Voluntary simplicity	When I buy different products, I prefer those I consider to be useful (e.g., the newness of a product in the markets is not their primary value)
	When I buy different products, I prefer those I consider to be durable and of high quality
	When I buy different products, I prefer those I absolutely need
	When I buy different products, I prefer those I don't consider unnecessary luxuries
	When I buy different products, I prefer those I don't already own (e.g., I don't want to replace a functioning old product with a new one)
	When I buy different products, I prefer those that are in accordance with the principle of frugal consumption (e.g., longevity, repairability)
Collaborative consumption	I want to buy a product because I don't want to borrow it from others (e.g., due to the feeling of exploiting others)
	I want to buy a product because I want to own it and control its use independently (e.g., it is always available for my use, and I know its condition)
	I want to buy a product because I don't want to rent or lease it (e.g., due to special product qualities and challenges on scheduling timetables

Results

CSC among respondents

Table 4 describes the results of respondents' CSC ($n = 256$) by the level of agreement on individual variables. The results show that most statements with which the respondents agreed (81.2% to 94.4% of respondents agreed or strongly agreed, and 0.0% to 4.8% strongly disagreed or disagreed) were linked to economic sustainability, especially views of voluntary simplicity (i.e., respondents' needs for and usefulness, longevity, and quality of products). The statements the respondents agreed with least (8.0% to 17.0% of respondents strongly disagreed or disagreed, and 41.1% to 61.0% agreed or strongly agreed) were connected to environmental sustainability (i.e., energy- and material-efficient production and recycled materials), social sustainability (i.e., workers' opportunities for professional development), and economic sustainability describing collaborative consumption (e.g., borrowing and renting products).

Respondents' perceptions of quality indicators

Respondents' perceptions of variables, which describe different wooden building product quality indicators, are presented in Table 5. The results show that the least important variables (11.8% to 19.6% of respondents considered them ''not important'' or ''not very important'') were information (e.g., product origin, production process, and environmental impacts), product certificates (e.g., Swan Ecolabel, PEFC, and FSC), and personal values (e.g., expressing one's identity by using wood). In contrast, the most important variables (90.9% to 94.2% of the respondents considered them ''quite important'' or ''very important'') were health effects (e.g., effects of wood on well-being, antibacterial qualities, and effects on indoor air quality), coziness (e.g., wood enhances homeyness), and longevity (e.g., resistance against moisture and decay).

Factor solutions for the quality indicators of wooden building products

The implementation of EFA resulted in a three-factor outcome in respondents' perceptions of different wooden building product quality indicators. In all, 10 variables from the survey were included in the final solution, which explains about 66 percent of the variation in our data (Table 6). The omitted variables with a factor loading values smaller than 0.4 (i.e., loadings were not 0.4 or above in any of the three factors) and/or low values for communality were technical properties, price, coziness, health effects, and constructor or architect. The Kaiser-Meyer-Olkin measure of factorability for the results was 0.828, supporting the applicability of the data to be used in EFA. The Bartlett test of sphericity rejected the null hypothesis that no correlation among the original variables existed ($P = 0.000$). According to the three-factor solution, consumer perceptions of different wooden building product indicators relate to perceived technical advantages (Factor 1: technical reliability), environmental sustainability of the materials (Factor 2: certificates and environmental sustainability), and social benefits at home (Factor 3: versatility of materials).

The technical reliability factor consists of the technical properties of wooden materials (i.e., safety aspects, longevity, and acoustics), while the certificates and environmental sustainability factor consists of the environmental sustainability aspects of processes, including infor-

Table 4.—Consciousness for sustainable consumption (CSC) views (% of responses for each statement) of the respondents (n = 256) by sustainability dimensions (Env = environmental; Soc = social; Econ = economic). The variables agreed with least are in italic, and the variables agreed with most are in bold. Likert-scale measures are denoted as follows: 1 = strongly disagree; 2 = disagree; 3 = neither agree nor disagree; 4 = agree; 5 = strongly agree.

CSC scale variables by sustainability dimensions	1 (%)	2 (%)	3 (%)	4 (%)	5 (%)	Mean
I buy a product when . . .						
it is produced in a material- and energy-efficient manner, e.g., minimizing the amount of waste or utilizing modern technologies (Env)	*4.4*	*12.7*	41.8	31.9	9.2	*3.29*
it is produced in an environmental manner, e.g., avoiding environmentally hazardous substances or utilizing renewable materials (Env)	1.6	6.4	25.9	45.0	21.1	3.78
it is made from recycled materials, e.g., promoting the circular economy (Env)	*2.0*	*8.8*	34.3	41.8	13.1	*3.55*
it can be disposed of in an environmentally friendly manner, e.g., recycling opportunities (Env)	0.0	4.4	22.3	48.6	24.7	3.94
it is of local origin, e.g., supporting local economies (Soc)	1.2	7.1	20.9	55.7	15.1	3.76
I buy a product when in its production . . .						
workers' human rights are adhered to and workers are treated equally (Soc)	1.6	2.0	27.9	46.6	21.9	3.85
minimum standards regarding workers' health and safety have been followed, e.g., work safety and labor code (Soc)	1.2	2.8	25.9	44.6	25.5	3.90
workers' opportunities for professional development are considered, e.g., varying work tasks and gaining expertise (Soc)	*3.2*	*4.8*	40.9	35.2	15.9	*3.56*
When I buy different products, I prefer those that . . .						
I really need and that are purchased based on consideration (Econ/voluntary simplicity)	0.4	0.8	8.8	**42.0**	**48.0**	**4.36**
I consider to be useful, e.g., the newness of a product in the markets is not their primary value (Econ/voluntary simplicity)	0.4	4.4	15.7	**46.2**	**33.3**	**4.08**
I consider to be durable and of high quality (Econ/voluntary simplicity)	0.0	0.0	5.6	**49.8**	**44.6**	**4.39**
I absolutely need (Econ/voluntary simplicity)	0.4	1.6	10.0	**39.6**	**48.4**	**4.34**
I don't consider unnecessary luxuries (Econ/voluntary simplicity)	0.8	4.4	29.4	43.5	21.9	3.81
I don't own, e.g., I don't want to replace a functioning old product with a new one (Econ/voluntary simplicity)	0.4	5.2	16.1	41.0	37.3	4.10
are in accordance with the principle of frugal consumption, e.g., longevity or repairability (Econ/voluntary simplicity)	0.0	4.0	14.8	**47.2**	**34.0**	**4.11**
I want to buy a product because . . .						
I don't want to borrow it from others, e.g., due to the feeling of exploiting others (Econ/collaborative consumption)	*2.0*	*15.5*	27.9	33.1	21.5	*3.57*
I want to own it and control its use independently, e.g., it is always available for my use, and I know its condition (Econ/collaborative consumption)	1.6	7.2	14.3	44.0	32.9	4.00
I don't want to rent or lease it, e.g., due to the special properties of the product or due to special product qualities and challenges in scheduling timetables (Econ/collaborative consumption)	*0.8*	*13.9*	24.3	37.5	23.5	*3.69*

mation and certificates. The versatility of materials factor includes variables that describe the social benefits regarding the multifunctionality and innovativeness of wooden materials and the personal values that relate either to using wood and expressing one's identity or to origin by appreciating the domesticity of wood.

From the perspective of products' sustainability and life cycle impacts, technical reliability (Factor 1) and versatility

Table 5.—Variables of wooden building product quality indicators and the proportions of respondent views of their importance (n = 256). The least valued variables are in italic, and the most valued variables are in bold. Likert-scale measures are denoted as follows: 1 = not important at all; 2 = not very important; 3 = neither important nor unimportant; 4 = quite important; 5 = very important.

Wooden building product quality indicators	1 (%)	2 (%)	3 (%)	4 (%)	5 (%)	Mean
Technical properties, e.g., solidity and hardness	0.0	2.8	9.8	55.1	32.3	4.17
Acoustics, e.g., soundproofing properties of wooden materials	1.2	4.7	17.2	50.0	27.0	3.97
Information related to, e.g., raw material origin, production process, and environmental effects	*1.6*	*10.2*	27.8	42.7	17.6	*3.65*
Certificates, e.g., Swan Ecolabel, PEFC, FSC	*1.6*	*11.1*	28.9	41.1	17.4	*3.62*
Price, e.g., price of wood material compared to other materials	0.4	3.5	18.0	54.9	23.1	3.97
Safety, e.g., fire resistance of wood	1.2	3.5	14.5	43.0	37.9	4.13
Health effects, e.g., effects of wood on well-being, antibacterial qualities, and effects on indoor air quality	0.4	2.0	6.7	**36.6**	**54.3**	**4.43**
Coziness, e.g., wood enhances homeyness	0.0	0.8	7.8	**43.8**	**47.7**	**4.38**
Multifunctionality, e.g., usability of wood for multiple purposes	0.0	2.4	16.3	50.4	31.0	4.10
Longevity, e.g., resistance against moisture and decay	0.0	0.0	5.9	**43.4**	**50.8**	**4.45**
Personal values, e.g., expressing one's identity by using wood	*3.9*	*15.7*	26.4	34.6	19.3	*3.50*
Origin, e.g., domesticity of wood	0.0	5.1	14.8	46.5	33.6	4.09
Environmental aspects, e.g., environmental effects of wood	0.4	5.9	16.1	44.3	33.3	4.04
Innovativeness, e.g., the new ways to use wooden materials in construction	1.6	8.3	29.1	44.1	16.9	3.67
Constructor or architect, e.g., the expertise of construction company's salespersons or architects in use of wood in construction	0.8	9.8	19.1	42.2	28.1	3.87

Table 6.—Results from the final rotated three-factor solution for the wooden building product quality. Values in bold are the highest factor loadings in absolute values.

	Communalities (extraction)	Factor 1 Technical reliability	Factor 2 Certificates and environmental sustainability	Factor 3 Versatility of materials
Acoustics	0.323	**0.503**	0.174	0.201
Information	0.795	0.161	**0.850**	0.215
Certificates	0.550	0.255	**0.676**	0.168
Safety	0.628	**0.770**	0.185	0.014
Multifunctionality	0.492	0.239	0.050	**0.657**
Longevity	0.358	**0.529**	0.118	0.255
Personal values	0.466	0.042	0.281	**0.621**
Environmental aspects	0.560	0.273	**0.575**	0.394
Innovativeness	0.525	0.224	0.219	**0.654**
Origin	0.477	0.113	0.415	**0.540**
Cronbach alpha		0.663	0.814	0.760
Eigenvalues		1.413	1.890	1.871
Explained variance, %		11.321	41.427	12.851

of materials (Factor 3) are more connected to the usage phases of houses (e.g., acoustics, safety, and personal values) than certificates and environmental sustainability (Factor 2), with stronger linkages to the manufacture of products and building (e.g., information and certificates on environmental effects). Regarding the views of social and economic sustainability, technical reliability (Factor 1) is characterized by linkages with both social (e.g., safety) and economic (e.g., longevity) sustainability, while versatility of materials (Factor 3) is more strongly connected to social sustainability (e.g., personal values), especially respondents' expectations of a particular lifestyle in housing.

Connections between the strength of CSC and factors of wooden building product quality

The Mann-Whitney *U* test results for the connections between respondents' strength of CSC by sustainability aspects and the latent variables describing respondents' views of wooden building product quality are summarized in Table 7. As can be seen, strong CSC for environmental, social, and economic sustainability showed signs of being statistically significantly connected with latent variables of respondents' views of wooden building product quality (i.e., factors received through EFA).

In relation to all three factors, very strong evidence was found with the Mann-Whitney *U* test that respondents' views differed statistically significantly in terms of environmental CSC ($P < 0.001$). Similar results were found concerning social CSC. However, the evidence regarding technical reliability was at a moderate level ($P = 0.012$). Additionally, in relation to technical reliability, very strong evidence was found that respondents' views differed statistically significantly in connection with economic CSC ($P < 0.001$). Furthermore, in relation to versatility of materials, moderate evidence was found that respondents' views differed statistically significantly in connection with economic CSC ($P = 0.010$).

The results of the Mann-Whitney *U* test do not provide information on how strong or weak CSC affects the opinions of respondents on wooden building product quality factors. To gain such information, comparisons of average factor scores of technical reliability, certificates and environmental sustainability, and versatility of materials between respondents with strong and weak CSC by environmental, social, and economic aspects were made. In all, respondents with strong CSC for any of the sustainability aspects appreciated wooden building product quality factors more than those with weak CSC (Figs. 1 through 3). Regarding differences with indications of statistical significance, strong environmental (Fig. 1) and social (Fig. 2) CSC was connected with higher appreciation of all types of general building product quality properties (i.e., technical reliability, certificates and environmental sustainability, and versatility of materials). In addition, the respondents with strong economic CSC appreciated technical reliability and versatility of materials more than those with weak economic CSC.

Figures 1 and 2 illustrate average factor scores of wooden building products' quality factors by strong and weak CSC that are very alike regarding views on environmental and social sustainability. This indicates that the respondents of this study consciously or unconsciously connect environmental and social sustainability (strong or weak) in their general purchasing behavior. In contrast, Figure 3 on economic CSC shows a different pattern referring to

Table 7.—Connections with the variables of consciousness for sustainable consumption (CSC) and the latent variables of respondents' views of wooden building product quality. Indication of statistical significance is denoted with a P *value, and lack of statistical proof is denoted with "—".*[a]

	Factor 1 Technical reliability	Factor 2 Certificates and environmental sustainability	Factor 3 Versatility of materials
Environmental CSC	<0.001***	<0.001***	<0.001***
Social CSC	0.012**	<0.001***	<0.001***
Economic CSC	<0.001***	—	0.010**

[a] * Suggestive evidence of statistical significance = 0.05 ≤ P value < 0.1; ** Moderate evidence of statistical significance = 0.01 ≤ P value < 0.05; *** very strong evidence of statistical significance = < 0.01 P value.

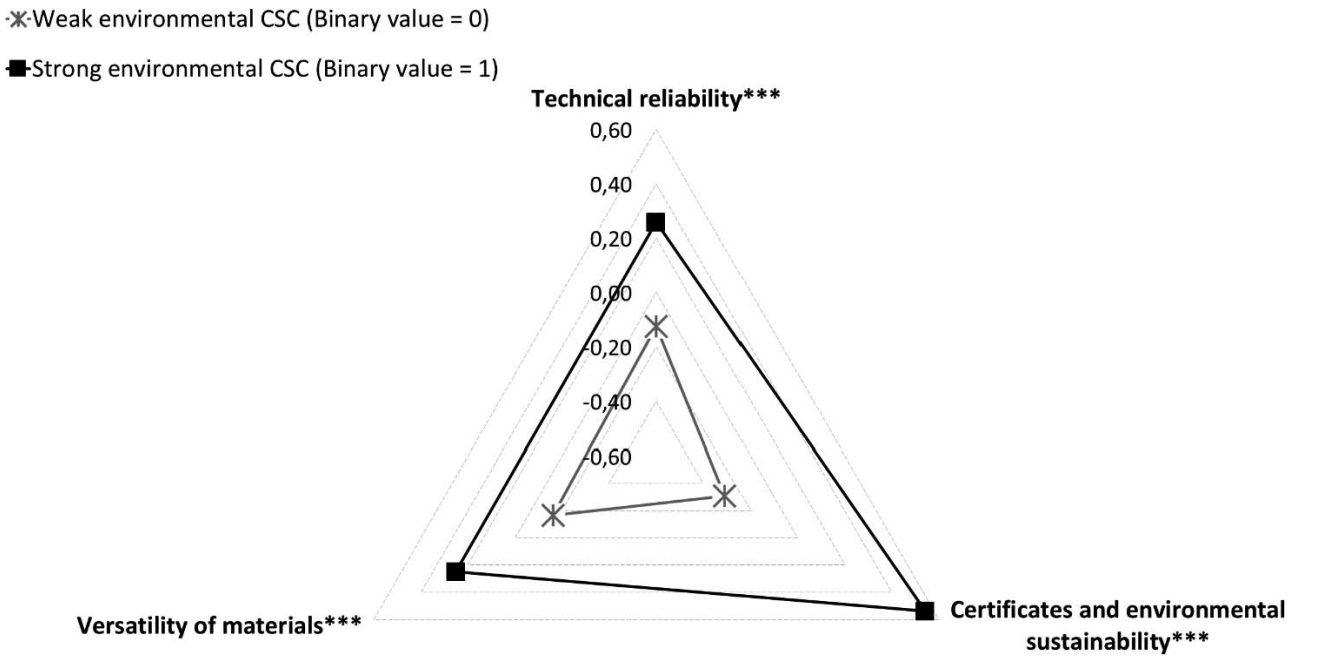

Figure 1.—Differences in average factor scores between respondents with weak and strong environmental consciousness for sustainable consumption.

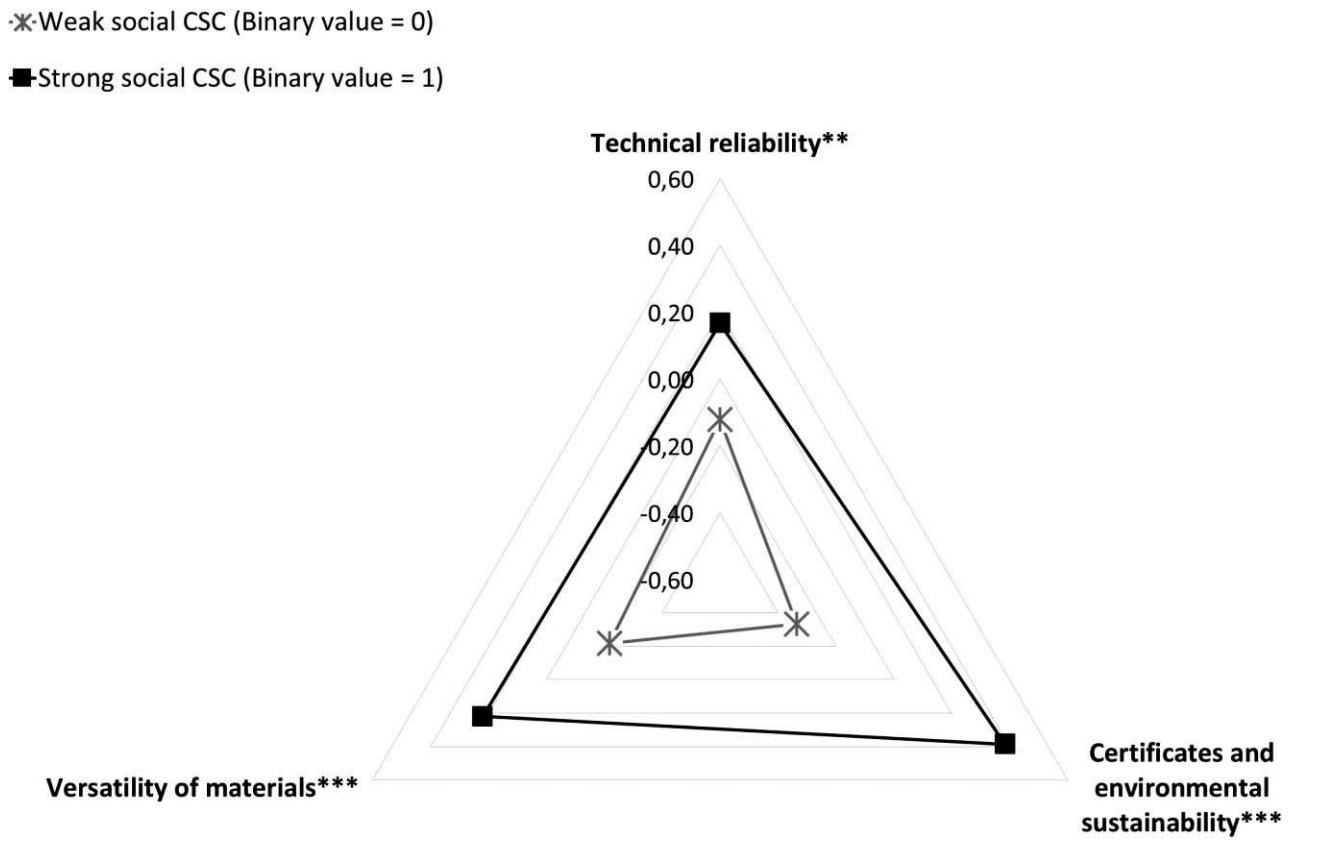

Figure 2.—Differences in average factor scores between respondents with weak and strong social consciousness for sustainable consumption.

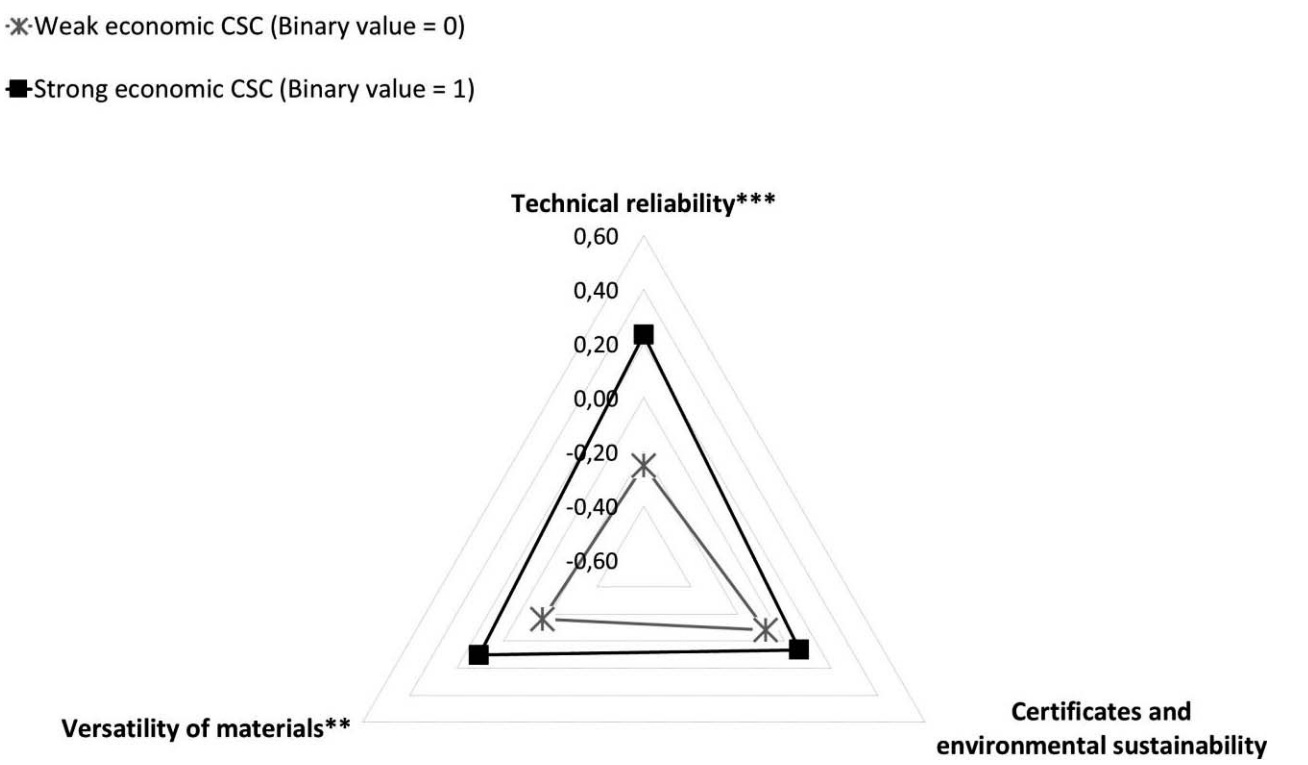

Figure 3.—Differences in average factor scores between respondents with weak and strong economic consciousness for sustainable consumption.

economic CSC being to some extent disconnected from environmental and social CSC.

Discussion

This study's purpose was to contribute to academic information on the linkages between consumers' CSC and their perceptions of wooden building product quality. The study's material was composed of consumer survey data gathered in 2018 with a random sample of 1,000 recipients ($n = 256$, response rate 25.6%) analyzed with EFA and a nonparametric statistical test (Mann-Whitney U test). Regarding consumers' environmental, social, and economic CSC, most of the respondents appreciated economic aspects in their purchasing decisions. For example, respondents bought products that they considered to be useful and durable and after careful consideration. In contrast, respondents did not consider borrowing or leasing a product or whether a product is made of recycled materials or produced in a material- and energy-efficient manner. In addition, consumers did not consider certain worker-related issues, such as their opportunities for professional development. These results indicate that, for some consumers, environmental or social sustainability aspects are not of particular importance in product purchases, but that economic sustainability aspects do matter in their purchasing decisions.

A similar phenomenon is also visible in the evaluations of quality indicators of wooden building products. According to our results, the least valued indicators are those related to environmental and social sustainability, such as certificates, information (e.g., raw material origin, production process, and environmental effects), and personal values (e.g., expressing one's identity by using wood). It seems that the symbolic qualities of wood, such as expressing one's identity, were not appreciated, although previous studies have indicated that the use of wood in housing construction affects perceptions of home owners' identities (Ridoutt et al. 2005). In addition, extrinsic cues informing consumers about the environmental aspects, such as certificates and information, were not considered important. This was in contrast with many studies, in which environmental certification was found to be a favorable and significant attribute (Anderson and Hansen 2004, Roos and Hugosson 2008, Roos and Nyrud 2008, Aguilar and Cai 2010, Paulin et al. 2018).

Furthermore, our results show that longevity, health effects, and coziness are the most important wooden building product quality indicators. The results are in line with previous research. In recent discussions, wooden multistory residential buildings have been found to have a positive image among consumers due to their perceived qualities related to longevity and technical factors (Kylkilahti et al. 2020) and coziness (Häyrinen et al. 2020, Viholainen et al. 2020b). Furthermore, consumers have been found to have a positive opinion of the health effects of wood as a material (Spetic et al. 2007; Kuzman et al. 2012; Jiménez et al. 2015, 2016; Malá et al. 2019; Andac Guzel 2020; Häyrinen et al. 2020; Lakkala et al. 2020).

The results of EFA of consumers' perceptions of wooden building product quality resulted in a three-factor solution, which explained about 66 percent of the variation in the data. The factors were technical reliability, certificates and environmental sustainability, and versatility of materials. Technical reliability related to the various benefits of wood concerning the technical properties of wooden materials, such as the material's longevity and acoustics, and social

benefits, such as safety aspects. The certificates and environmental sustainability factor consisted of the environmental sustainability aspects of processes, including information and certificates, while versatility of materials consisted of variables that were related to the multifunctionality and innovativeness of wooden materials, wood origin, and personal values when using wooden materials.

Regarding the connections between consumers' perceptions of wooden building product quality and their CSC, our Mann-Whitney *U* test results showed that there were statistical indications of differences between respondents in their environmental, social, and economic CSC. The strength of CSC was found to relate to the appreciation of various wooden building product quality properties. More specifically, the technical advantages of wooden building products (i.e., technical reliability) and social benefits of wooden building products (i.e., versatility of materials) were more appreciated by those respondents with strong environmental, social, and economic CSC than those with weak CSC in these aspects.

In contrast with previous results, the environmental sustainability of wooden building products (i.e., certificates and environmental sustainability) was found to be valued more by the respondents who considered environmental and social sustainability in their consumption than those with weak environmental and social CSC, while no evidence of such behavior was found for economic CSC. This is in line with previous research showing that buying decisions motivated by financial sustainability usually do not involve environmental or social aspects (Balderjahn et al. 2013). However, economic CSC may result in beneficial sustainability outcomes, such as in the environmental life cycle impacts, when the valuing of economic sustainability relates to the appreciation of technical quality and longevity of products in use. Evidence of such a phenomenon was obtained by our results.

Furthermore, it is significant to note that a consumer who is conscious about sustainable consumption and interested in environmental, social, or economic sustainability appreciates more the various characteristics of wooden materials compared to those consumers who ignore the sustainability issues in their daily purchasing choices. This indicates that one target group for wooden multistory construction might be consumers who are environmentally oriented but also share the interest for social and economic issues in society. Results are in congruence with the findings of Ottelin et al. (2021) suggesting that favoring wood building is likely connect with other sustainable consumption habits.

The results of this study are useful for wood and construction businesses to better meet consumer expectations, both for different aspects of sustainability and for lifestyles, in their production to enhance the acceptability and desirability of materials in the housing markets. For example, companies could use the information about the importance of various wooden material properties in their marketing communication and promote the aspects of longevity, health effects, and coziness that are highly valued by consumers. In addition, from the marketing perspective, the results provide significant information about how consumers with strong CSC appreciate different properties of wooden building materials. Understanding how consumers' personal values influence their perceptions of these products enables businesses to develop sustainable products that meet the specific needs of consumers, who vary in their values and preferences.

Our results contribute to the scientific knowledge of the topic, which has gained very little attention in previous studies. However, a limitation of the study is that the data provided no information on consumer choices in actual purchasing situations but addressed only their general views of wooden building product quality properties and CSC. In future studies, it would be valuable to investigate consumers' perceptions of quality with experimental data to gain knowledge of how the various quality indicators of wood affect consumer behavior in the actual purchasing context. Because our study provides information only on the views of Finnish consumers, the results cannot be generalized in an international context. In addition, Finland is a forest-rich country with strong traditions of building with wood (detached houses and summer cottages). However, because it has been found that Finnish consumers also have different preferences in the use of wood, the results of our study are a starting point for implementing research on the same topic in broader geographical contexts.

Other significant limitations were related to the chosen methodology and used measurement scales. First, because the Cronbach alpha values were only minimally acceptable in the case of Factor 1 (technical reliability) and respectable in terms of the summative variable for economic CSC (DeVellis 2012), the results must be interpreted with caution, and further investigations and development of the scales are required. Furthermore, because certain quality indicators were overlapping to some extent (e.g., information and environmental friendliness) and some of them had specific examples in the questionnaire, this might have caused response bias and also influenced the analysis results. Another limitation is that the study does not investigate whether consumers perceive the quality indicators in question to connect with wooden building products or examine how they perceive wooden building products in terms of these indicators. In addition, the study does not aim to compare the consumers' views of quality indicators of wooden building products with their views of quality indicators of other building materials. However, these limitations provide several opportunities to address these issues profoundly in future studies. Additionally, in further research, it would be significant to evaluate how consumers' sociodemographic background influences their perceptions of wooden building product quality to recognize the relevant consumer segments for, for example, wooden multistory buildings.

Conclusions

There are strong efforts to increase the use of wood, especially in multistory residential buildings, around the world (e.g., Churkina et al. 2020, Himes and Busby 2020, Pauliuk et al. 2021). Despite this, research on consumers' views is very limited in the context of both construction and the wood industry, although end users have been found to play a significant role in the sustainability change for residential building (Martek et al. 2019). If the use of wood in multistory residential buildings is to enhance the sustainability change in the construction industry, more information is needed on how consumers in different geographical regions appreciate and are willing to accept the use of wood in their homes.

When promoting wooden materials used in building and housing, it is important to recognize that consumers with different values appreciate different properties of wood, and different appreciations may result in multiple sustainability benefits. Our findings show that consumers are not a homogeneous group but rather people showing great variation in both their CSC and their views of wooden building product quality. For example, based on the results, economic CSC aspects were emphasized in respondents' purchasing decisions compared with environmental or social CSC. Because the long life cycles of building products play a fundamental role in enhancing the sustainability of the construction industry, strong economic CSC may also result in environmental and social benefits if products are manufactured responsibly (i.e., raw material extraction and manufacture of products). Furthermore, according to our results, consumers with economic CSC especially value the technical and social benefits of wooden building products (e.g., longevity and safety aspects). Therefore, for such consumers, promoting the environmental friendliness of wood, which is commonly seen as a strength of wooden materials, is not the main key to achieving success in marketing efforts. It is therefore important for practitioners to know what types of wood building product quality characteristics are appreciated by different consumer types and how these properties can be promoted successfully to them.

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