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ORIGINAL ARTICLE

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Description of green versus environmentally indifferent consumers of wood products in Scandinavia: flooring and decking

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Abstract Swedish and Norwegian potential consumers of eco-labeled wood products in do-it-yourself (DIY) retail stores were investigated in a study that focused on the end customers of two flooring applications and wood for outdoor decks. Data were collected from different populations yielding a multiproduct, multipopulation study. Consumers with preferences for eco-labeled wood products generally focused less on the product type than consumers that reported a low preference for eco-labeled wood properties. The green consumers presented a low price sensitivity and they were more often women. Other characteristics of green consumers observed in the substudies included a higher share of married couples/cohabiters, a secondary education, less advanced plans concerning purchase, and preferences for product warranty. The results can assist producers in making approximate descriptions of green consumers; however, socioeconomic and demographic variables should be complemented by other information that reflects attitudes and intentions to get a more comprehensive idea of green consumers of wood products.

Key words Forest certification · Eco-labeling · Consumer preferences · Market segmentation

Introduction

Forest certification ensures that the wood used in a forest product is sourced from forests that are managed according to specified environmental standards. The most important forest certification schemes in Europe are the Forest Stewardship Council (FSC) and the Program for the Endorsement of Forest Certification Schemes (PEFC). On a global level there are several other forest certification schemes, such as the Canadian Standards Association System, the Sustainable Forestry Initiative, and the American Tree Farm System. The dominating certification scheme and receptiveness of customers to eco-labeled wood in a country or a region depend on export share, land ownership, and the character of the local dialogue about forest conditions.[1] In total, 7.6% of the world's forests are environmentally certified,[2] and 84% of the certified forest area is found in North America and Europe. About 24% of the world's supply of industrial roundwood originates from certified forests. However, only a small percentage of this wood carries certification labels when it is sold to end consumers due to a perceived weak consumer demand for eco-labeled wood, although the current increase of Chain of Custody certificates indicates an upward trend in consumer interest.[2] Because forest certification is a market-driven mechanism, the number and characteristics of "green consumers" are key factors for its development.

Ozanne and Smith[3] identified a group of consumers in the United States that would probably be willing to pay a premium for environmentally certified wood products. These green consumers were described in socioeconomic terms as liberal, female, and well educated. Green consumer groups were also identified by Veisten[4] and Bigsby and Ozanne.[5] Anderson and Hansen[6] found that eco-labeled wood products were preferred by the respondents, but this attribute was generally outweighed by other product characteristics. The authors also identified a group of potential green customers. In an examination of factors underlying preferences for eco-labeled wood products, Hansmann et al.[7] found that eco-behavior was influenced by a sustainability orientation among consumers emphasizing ecological and social aspects of forests and by the communication of label information.

The study of consumers' attitudes toward environmentally certified forest products relates to the wider issue of how consumers respond to eco-labeled products in general. Peattie and Crane[8] gave a critical overview of green market-

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ing in which they concluded that consumers are generally suspicious of green labels. Problems in identifying green consumers in nonwood product areas have been reported by De Pelsmacker et al.,[9] Straughan and Roberts,[10] and Diamantopoulous et al.[11]

The topic on consumer attitudes toward certified wood products also belongs to the body of studies of preferences for wood products. Several surveys of consumers' preferences for wood have looked into preferences for wood, in general, or for specific applications.[12–14] One main finding of these studies revealed that wood is often described and preferred in terms of its varied, harmonious appearance, and by the fact that wood is a natural material.

The purpose of this study was to distinguish and describe consumers that assign high value to the eco-labeling of wood products. In order to provide useful information, for example, in marketing, characteristics of green consumers of wood products should be fairly stable across populations, products, and countries. Therefore, this study includes different substudies conducted in two countries. The common feature of the substudies is a focus on wood products that are subject to direct evaluation by end consumers. The products chosen for this study, decking and flooring, are commonly sold directly to homeowners in do-it-yourself (DIY) retail stores.

The wooden decking market

The European demand for outdoor wood products, for example, residential decking or garden furniture, is strong. Demand for garden furniture and timber decking in the UK has increased substantially in recent years due to higher incomes and home improvement trends presented in magazines and television programs. Increased awareness of the dangers related to the use of traditional wood preservatives, mainly copper chromium arsenate (CCA) and creosote, has resulted in more restrictive regulations in several countries.[15–17] These regulations have caused increased efforts in the industry to develop alternative, environmentally sound methods for wood preservation that can substitute for the traditional preservative treatments. Permitted water-based wood preservatives mainly contain copper oxide (62%–71%), but are free of arsenic. Other methods include pressure treatment with organic biocides or wood modification, such as heat treatment.

The flooring market

Wooden flooring is popular in Europe and the market is large, dynamic, economically important, and sensitive to consumer trends. Some manifestations of this are the increasing diversity of species, designs, and the introduction of customized floorings for installation by the DIY customer.[2,18] Some producers use environmental certification and warranties in their promotion. Customers frequently prefer wooden flooring due to esthetic impressions, but attributes such as resistance and environmental properties are also used to promote flooring products.[13,19] Environmentally certified alternatives of flooring and decking products are available in Scandinavia.

Experimental

Conjoint analysis

To resemble a real choice situation where environmental certification is weighed against other product properties, the conjoint analysis method was chosen for this study. Conjoint analysis is an approach for considering psychological judgments and perceived similarities or differences between choice alternatives.[20] The term refers to methods that estimate consumer preferences from their overall evaluations of experimentally varied attributes.[21,22] In the conjoint experiment, the researcher defines a set of hypothetical products (stimuli) with different selected combinations of levels with regard to a set of predetermined attributes, or factors. The respondents present their overall preferences for each alternative, which enables the researcher to extract both important product attributes (importances) and preferred specifications, or levels, on each attribute (partworths).[20] The method has a wide range of applications, including analysis for strategic positioning, product development, predicting market shares, and assessing the impact of competitor products.[23–25] According to Anderson et al.,[26] conjoint analysis has good predictive power to foresee consumer choice. In general, conjoint analysis involves experiment design, data collection, estimation, and analysis.[20]

Design and data collection

The two main conjoint studies that are compared are described in Table 1. Based on location, product, and application, the two studies can be viewed as five substudies. The remaining differences in research design mainly reflect adaptations of each study to the product and local context. In the decking study, preference responses were collected during a house and garden fair in the Oslo region in Norway. The Swedish flooring surveys include preference information for both living room and kitchen applications among two subpopulations: students at the Swedish University of Agricultural Sciences, and customers at a DIY retail store in Uppsala. All studies were designed as intercept studies where respondents were invited to participate. The product alternatives for evaluation were described in a questionnaire, and the product types were shown in color pictures and as real samples. The decking substudy involved pinewood (*Pinus silvestris*) decking with three different preservatives. The flooring substudy investigated oak, pine, and laminate flooring. The additive, full profile model with an orthogonal and balanced fractional factorial design was chosen. The respondents were asked to rate on a nine-grade scale the likelihood that they would purchase offerings with different combinations of levels of the five factors. In addition to the conjoint questions, socioeconomic, experience, and intentional information was gathered. In the Norwe-

Table 1. Description of studies

Country	Product	Application	Population	*n* (E/NE)	Factors (levels)	No. of alternatives (stimuli)	Description of certification factor
Norway	Wooden decking	Outdoor decking	Visitors at house/garden fair	69/70	Treatment (two organic and one Cu-based preservative); Price (three price levels); Environmental certification (yes/no); Service[a] (yes/no); Ready-to assemble decking (yes/no)	12	Environmentally certified wood according to an international standard (yes/no)
Sweden	Flooring	Living room Living room Kitchen Kitchen	Students DIY-customers Students DIY-customers	44/24 26/45 36/29 22/38	Floor type (pine, oak, and laminate flooring); Price (three price levels); Environmental certification (yes/no); Warranty (yes/no); Instruction-DVD on flooring installation (yes/no)	12	Environmentally certified wood according to an international standard? (yes/no)[b]; Flooring product is environmentally certified according to the Nordic scheme "Svanen" (yes/no)[c]

E, Green consumers; NE, environmentally indifferent consumers
[a] Free advice and service from salesperson
[b] Wooden flooring
[c] Laminate flooring

gian decking study, additional questions concerned age, sex, marital status/cohabitation, education, income, experience of home improvement involving wood, practical experience of outdoor wood improvements, and plans for outdoor improvements. In the Swedish flooring studies, the questions concerned age, sex, income, experience of buying flooring, practical experience of installing new flooring, and plans to install flooring at home.

Estimation and analysis

Incomplete answers were rejected, and conjoint questionnaires with an adjusted R^2 below 0.3 were considered inconsistent and were removed from the sample. The final number of responses (response rate) was 210 (71%) in the Norwegian study, 95 (83%) for students/living room applications, 106 (85%) for DIY customers/living room applications, 94 (82%) for students/kitchen applications, and 95 (77%) for DIY customers/kitchen applications. A statistical comparison of the rejected observations with those that were used in the further analysis concerning the available variables indicated no significant bias. However, the subsamples of persons that provided the answers may deviate from the larger populations to which they belong, that is, the adult population in the Oslo region in the Norwegian study and the adult population in Uppsala and students at the agricultural university.

The samples were divided into three groups of approximately equal size based on the conjoint part-worth utilities of the certification level. Further analyses were carried out on the third of respondents with the highest utility ratings and the third of respondents with the lowest utility ratings for the environmental certification part-worth. The remaining third of respondents was removed from further analysis. A similar approach for comparative analysis has been used in a number of studies; for example, see Cooper and Kleinschmidt.[27] The two subpopulations are presented in Table 1.

For each substudy, the third of respondents with the highest part-worth values for environmental certification was compared with the third with the lowest part-worth values for the same variable. The comparison was conducted with regard to conjoint importance values, describing the importance of attributes in determining a respondent's preference. Corresponding comparisons were also carried out on variables describing the demographics, experience, and intentions. Differences were tested by *t*-tests when the distributions were normal, and according to the Wilcoxon-Mann-Whitney U-test for the nonnormal distributions. Chi-square tests were used for the binary variables.

Results

The results from the Norwegian decking substudy are shown in Fig. 1 and results from the Swedish flooring substudies are shown in Figs. 2–5. The figures present key areas of importance from the conjoint analysis and the additional variables describing demographics and intentions. Statistically significant differences between environmental and nonenvironmental customers are indicated.

The comparisons indicate that consumers who do not value environmental certification are generally more concerned about the product type – reflecting material, treatment, and esthetics – than green consumers. They are also more price sensitive than green consumers, even though this difference was significant only for the subgroup of students considering flooring for kitchen application. In some of the Swedish study cases, slightly inconsistent utilities for the price variable were noticed among green consumers, which implies a low focus and interest in this group for price in relation to other product attributes. In the Swedish study, product warranty was more highly appreciated by the green consumers than by environmentally indifferent consumers.

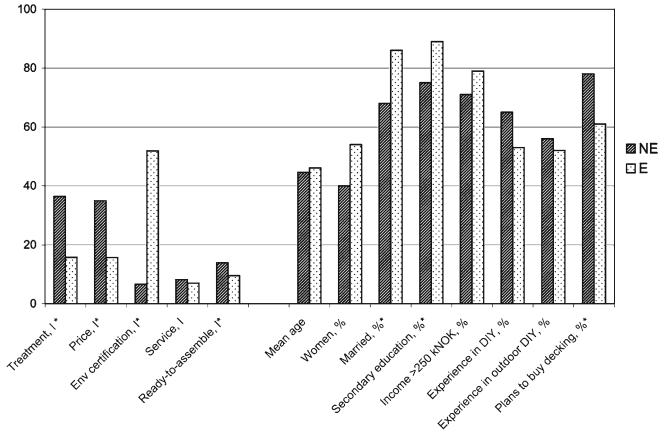

Fig. 1. Conjoint importances and descriptions of environmental (*E*) and nonenvironmental (*NE*) consumers for decking, Norway. *I*, Importance; *asterisk*, significant difference at $P < 0.05$

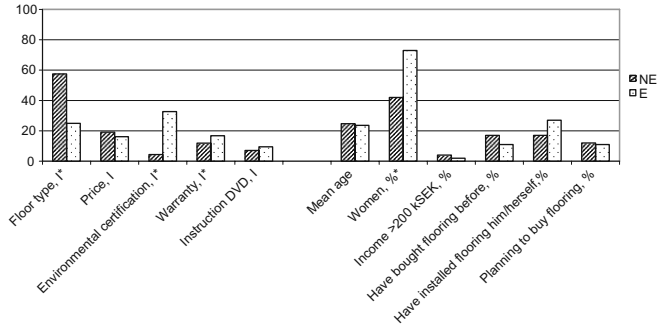

Fig. 2. Conjoint importances and descriptions of environmental (*E*) and nonenvironmental (*NE*) consumers for living room applications (students, Sweden). *I*, Importance; *asterisk*, significant difference at $P < 0.05$

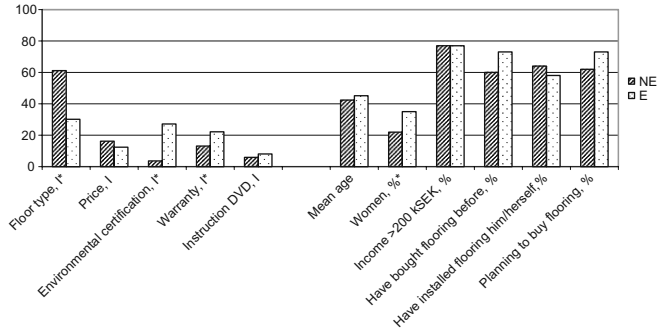

Fig. 3. Conjoint importances and descriptions of environmental (*E*) and nonenvironmental (*NE*) consumers for living room applications [do-it-yourself (DIY) store customers, Sweden]. *I*, Importance; *asterisk*, significant difference at $P < 0.05$

As in several previous studies, our investigation showed a bias toward women in the green consumer group. This difference was found to be statistically significant in two cases. Surprisingly for some, age was not significantly lower among green consumers. Marital status/cohabitation was only studied in Norway where the variable was significantly biased toward green consumers. Apparently, Norwegian

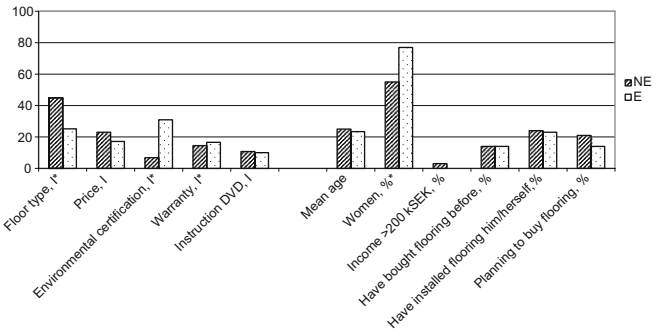

Fig. 4. Conjoint importances and descriptions of environmental (*E*) and nonenvironmental (*NE*) consumers for kitchen applications (students, Sweden). *I*, Importance; *asterisk*, significant difference at $P < 0.05$

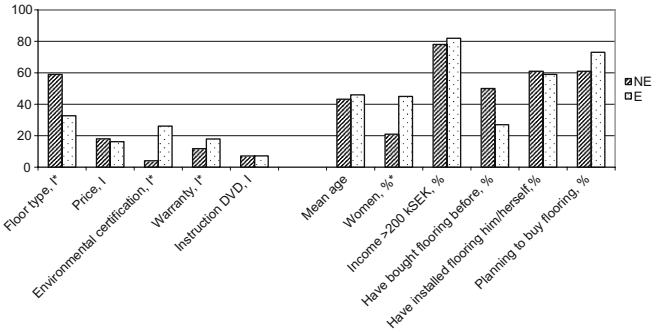

Fig. 5. Conjoint importances and descriptions of environmental (*E*) and nonenvironmental (*NE*) consumers for kitchen applications [do-it-yourself (DIY) store customers, Sweden]. *I*, Importance; *asterisk*, significant difference at $P < 0.05$

couples are more likely to prefer environmentally certified products than single-person households. In Norway, post-compulsory education was also positively associated with green consumerism. Personal income did not appear to be of importance for green preferences in any of the cases. Also, experience did not show any clear association with green consumerism. One interesting difference between the Norwegian and the Swedish studies was found for the variables describing plans. In Norway, respondents planning to buy outdoor decking within the next 3 years were less likely to purchase green wood products than respondents with no such plans. The Swedish outcomes for a similar question were inconclusive.

Discussion

A number of variables presented significant differences between green and environmentally uninterested consumers. Consumers with low preferences for eco-labels focused instead on product type (i.e., material, treatment, and esthetics) and price. It is also possible that women practice green consumerism more frequently. Furthermore, it is interesting that green customers tended to value product warranty more than nonenvironmental customers. This

may be associated with less general experience with wood products or an assumption of a correlation between warranty and environmental corporate responsibility. A further examination of the part-worths in the flooring study suggested that some environmentally indifferent consumers even slightly prefer products without a certification label. One possible reason could be a suspicion that green labels indicate lower quality.

The results provide useful insights for decision makers in the wood industry. Environmentally uninterested consumers place more importance on product type and price than customers preferring eco-labels. Hence, to attract these customers, producers should emphasize that green products have the same quality and esthetic properties as noncertified products.

Demographic and socioeconomic variables, with the exception of sex, are not particularly useful as predictors of environmentally conscious purchasing. This study supports the suggestions made in previous works that green consumerism is more formed by attitudes than by demographic or socioeconomic factors.[28] Our results also confirm those of Straughan and Roberts,[10] Ozanne and Smith,[3] Bigsby and Ozanne,[5] and Anderson and Hansen[6] that socioeconomic and demographic features are predictors of a limited ability to define groups of green consumers. Thus, marketers should find alternative ways to identify and target consumer groups. Green consumerism is associated less with focus on product type and price and a bias toward women. The Norwegian study also suggests possible additional indicators of green consumerism including marital status/cohabitation, education level, and purchasing plans.

Further studies in the wood products area may shed more light on this issue. Themes for research involve investigations of the relationships between green consumerism and customers' attitudes, plans, and values. Qualitative interviews can be used to identify other variables that would be potentially interesting in terms of green purchases. Our study also supports the suggestion of Ozanne and Smith[3] that follow-up studies should be made of actual buyers of environmentally certified wood products.

Conclusions

Green consumers of wood products are less price sensitive and relatively less focused on product type than environmentally indifferent buyers. They probably also have a higher proportion of female individuals. Furthermore, the Norwegian study on decking preferences indicated that environmentally interested buyers were relatively more common among married couples or those cohabiting, and among people with at least a secondary education. Results from the decking substudy also indicated that as the purchase decision approaches, consumers may become less likely to purchase green, environmental friendly wood products. However, the main message of our studies is that environmental arguments and eco-labels have an important impact on many consumers' preferences for wood products in the DIY sector. Another general conclusion from our study is that normal demographic variables provide a limited tool for the identification of potential buyers of certified products. A managerial conclusion states that to win suspicious customers, producers of eco-labeled wood products must show that the green products are at least the same quality and esthetic quality as standard wood products.

References

1. Cashore B, Auld G, Newsom D (2003) Forest certification (eco-labelling) programs and their policymaking authority: explaining divergence among North American and European case studies. Forest Pol Econ 5:225–247
2. United Nations Economic Commission for Europe (UNECE)/ Food and Agriculture Organization (FAO) (2007) Forest products annual market review 2006–2007. United Nations, Geneva
3. Ozanne LK, Smith PM (1998) Segmenting the market for environmentally certified wood products. Forest Sci 44:379–388
4. Veisten K (2002) Potential demand for certified wood products in the United Kingdom and Norway. Forest Sci 48:767–778
5. Bigsby H, Ozanne LK (2002) The purchase decision: consumers and environmentally certified wood products. Forest Prod J 52: 100–105
6. Anderson RC, Hansen EN (2004) The impact of environmental certification on preferences for wood furniture: a conjoint analysis approach. Forest Prod J 54:42–50
7. Hansmann R, Koellner T, Scholz RW (2006) Influence of consumers' socioecological and economic orientations on preferences for wood with sustainability labels. Forest Pol Econ 8:239–250
8. Peattie K, Crane A (2005) Green marketing: legend, myth, farce or prophesy? Qual Market Res 8:357–370
9. De Pelsmacker P, Janssons W, Sterckx E, Mielants C (2005) Consumer preferences for the marketing of ethically labelled coffee. Int Market Rev 22:512–530
10. Straughan RD, Roberts JA (1999) Environmental segmentation alternatives: a look at the green consumer behaviour in the new millennium. J Consum Market 16:558–575
11. Diamantopoulos A, Schlegelmilch BB, Sinkovics RR, Bohlenc GM (2003). Can socio-demographics still play a role in profiling green consumers? A review of the evidence and an empirical investigation. J Bus Res 56:465–480
12. Broman NO (2000) Means to measure the aesthetic properties of wood. Doctoral Thesis, Division of Wood Technology, Luleå University of Technology, Luleå
13. Jonsson R (2005) The end consumer's choice of floorcovering in the Netherlands and the United Kingdom: a comparative pilot study of substitute competition. J Wood Sci 51:154–160
14. Marchal R, Mothe F (1994) Appreciation of oak wood for the French consumers and wood professionals. Annales des Sciences Forestieres 51:213–231
15. European Commission (2003) Commission directive 2003/2/EC of 6 January 2003 relating to restrictions on the marketing and use of arsenic, tenth adaptation to technical progress to Council Directive 76/769/EEC. http://www.europa.eu.int/eur-lex/pri/en/oj/dat/2003/l_004/l_00420030109en00090011.pdf. Cited 15 June 2007
16. Environmental Protection Agency (2005) Chromated copper arsenate (CCA). http://www.epa.gov/oppad001/reregistration/cca/index.htm#general. Cited 15 June 2007
17. Australian Pesticides and Veterinary Medicines Authority (2005) The reconsideration of registrations of arsenic timber treatment products (CCA and arsenic trioxide) and their associated labels – report of review findings and regulatory outcomes, summary report. http://www.apvma.gov.au/chemrev/arsenic_summary.pdf. Cited 15 June 2007
18. GBR (2006) The annual report of the flooring industry Verksamhetsberättelse 2005 (in Swedish). GBR, Stockholm
19. Lindberg A (2004) First impressions last – a Kansei engineering study on laminate flooring at Pergo. LiTH-IKP-Ex – 04/2201-SE. Linköpngs Tekniska Högskola

20. Hair JF, Anderson RE, Tatham RL, Black WC (1998) Multivariate data analysis. Prentice Hall, Upper Saddle River, NJ
21. Green P, Srinivasan V (1978) Conjoint analysis in marketing: new development with implications for research and practice. J Market 54:3–19
22. Van Kleef E, van Trijp HCM, Luning P (2005) Consumer research in the early stages of new product development: a critical review of methods and techniques. Food Qual Prefer 16:181–201
23. Aaker D, Kumar V, Day GS (2000) Marketing research, 7th edn. Wiley, New York
24. Green PE, Krieger AM (1991) Segmenting markets with conjoint analysis. J Market 55:20–31
25. Wittink DR, Cattin P (1989) Commercial use of conjoint analysis – an update. J Market 53:91–96
26. Anderson JC, Jain DC, Chintagunta PK (1993) Customer value assessment in business markets: a state-of-practice study. J Bus Bus Market 1:8–9
27. Cooper RG, Kleinschmidt EJ (1994) Determinants of timeliness in product development. J Innovat Manag 11:381–396
28. Kaiser FG, Wölfing S, Fuhrer U (1999) Environmental attitude and ecological behaviour. J Ecol Behav 19:1–19