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WILLINGNESS TO PAY FOR CERTIFIED WOODEN FURNITURE: A MARKET SEGMENT ANALYSIS

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ABSTRACT

Market segmentation techniques were applied to identify and describe potential consumer clusters with highest hypothetical *willingness to pay* (WTP) for certified wooden furniture. Representative samples of the British and Norwegian population were surveyed by telephone and asked to choose between two profiles of wooden furniture, where one was eco-labeled and more expensive. The eco-labeled would certify that the wood originated from sustainable forestry. The survey data allowed for substantiating the attribute segmenting with the hypothetical choice behavior between eco-labeled and unlabeled wood and logit model estimates of WTP. The statistical method to identify the segments was *k*-means cluster analysis, principally using stated importance of product attributes and estimated WTP for eco-labeling as grouping variables.

One segment profiled as an ''eco-segment'' was confirmed by placing a higher value on the dimensions (values) of environmentalism—trusting environmental and outdoor organizations regarding information about forestry and environment, and having a higher rate of membership in environmental organizations. This ''eco-segment'' amounted to more than ¼ of the samples. The British eco-segment could be described as relatively ''greener'' than the Norwegian. The British also had higher estimated WTP for eco-labeling compared to the Norwegians. The eco-segments had their media interest directed more towards intellectual issues than the other segments. Demographically, the eco-segments did not differ significantly from the other segments, except that the British had a greater female majority.

Keywords: Certification, eco-labeling, market segmentation, stated choice, principal component analysis, willingness to pay, wooden furniture, wood products.

INTRODUCTION

Demand for certified or eco-labeled wood products represents a type of green or ethical consumption. Such demand implies that consumers economically weigh, for instance, the environmental and social sustainability of forest management, in addition to basic wood attributes like design, surface, durability, and price (Antil 1984; Ottman 1992; Polonsky and Mintu-Wimsatt 1995). Eco-labeling of wood has been introduced to signal a certified origin in sustainably managed forests (Sedjo and Swallow 2002). Although ''sustainable forest-

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ry'' has been given diverging definitions, and is being certified by various national or transnational bodies, it generally comprises specific measures for biodiversity maintenance and enhancement of outdoor recreation, in addition to the traditional nondecreasing volume or forest cover (Pajari et al. 1999; Rametsteiner and Simula 2003).

There are several approaches to the identification of ecologically oriented market segments of consumers. The first line of approach uses demographic characteristics of potential consumers, since these are easily ascertained when targeting marketing towards a given subset of the population. However, income, education, and age have not been found unequivocally related to ecological concern. Other characteristics such as psycho-graphic indicants have shown to be better predictors (Pickett et al. 1995; Moon et al. 2002).

Research on market segments for eco-labeled wood products has been limited basically to the United States. Ozanne and Smith (1996) applied a segmentation based on homeowners' ranking of a set of twenty-four furniture attributes. The ranking of these attributes was divided into six dimensions using principal components analysis, and the dimensions were entered as grouping variables in cluster analysis. From a five-cluster solution, two segments were described as potential consumers for environmental wood products, amounting to 39% of the sample, with a most eco-oriented segment comprising 18%. Ozanne and Vlosky (1997) applied a segmenting method based on psycho-graphics as grouping variables in cluster analysis. One of the five segments showed both highest *importance of certification* and highest *certification involvement,* and amounted to 40% of the sample.

In Europe, mostly British studies have explored segments of generally eco-oriented or ethically oriented consumers, either with respect to psycho-graphics, demographics, or a combination of these individual characteristics (Tallontire and Rentsendorj 2000). Scandinavian countries and Germany are known for a relatively profiled environmental awareness and having ''green-shaded'' political parties in government or as part of the parliamentary majority behind the government (Tufte and Ali 1998). However, the most advanced European markets for ''green consumerism'' are found in the UK, together with the Netherlands, including awareness about old-growth forest and origin of wood (Burrows and Sanness 1998). British eco-oriented segments have even been categorized into ''eco-sub-segments''; in the early nineties, 11% of the UK market were categorized as ''true-blue greens,'' 11% as ''greenback greens,'' and 26% as ''sprouts'' (Coddington 1993). To our knowledge there is no study on market segmentation focusing on eco-labeled wood products in Britain or other European countries.

Two issues about eco-labeling of wood products should be highlighted: 1) It introduces an intangible attribute to, e.g., wooden furniture—an attribute that can be signaled only (from the producer/seller) by a label or ''stamp of approval''; 2) It is costly; thus voluntary eco-labeling will not take place if expected benefits from consumers' *willingness to pay* (WTP) a price premium for the eco-label attribute is lower than expected costs. It is not obvious that real WTP will be high enough, nor is it obvious that this intangible attribute will divide markets, as tangible attributes do (design, wood species, etc.) (Sedjo and Swallow 2002).

Survey-based analysis may be the only available instrument to gain information about potential demand for eco-labeling. This paper explores and compares the wider potential market for eco-labeled wood in the UK and in Norway. Cluster-based segmentation techniques were applied to identify and describe the market segments with highest stated (hypothetical) WTP for eco-labeled wooden furniture. WTP was estimated from stated choices between unlabeled wooden furniture and an eco-labeled alternative that was more expensive, and only ''certain'' choices of the eco-labeled alternative were accepted to avoid/minimize hypothetical bias (Blumenschein et al. 1998). The eco-label preference was used as clustering variable with other attribute-preference variables. Sets of psycho-graphic vari-

ables were reduced to dimensions by principal component analysis and used to describe and differentiate the segments. The approach in this paper should provide a more realistic detection and description of potential consumer segments of eco-labeled wood, compared to earlier studies assessing attitudinal WTP (not related to a specified eco-labeling) taken at *prima facie* (no reduction of hypothetical bias).

The paper is arranged as follows: The next section describes the steps in the methodology of surveying and segmenting applied to this research. Then the results of the segmentation and segment profiles are presented. Results are discussed and conclusions drawn in the last two sections.

METHODOLOGY

Several steps are necessary to detect and describe market segments for eco-labeled wood, from the collection of survey data to the grouping of these data into clusters that are used to identify and describe consumer segments. The following sub-sections briefly describe the survey, the principal component analysis of other wood furniture attributes to be grouped as dimensions into the cluster analysis, the principal component analysis of the sets of psychometric characteristics to describe the identified market segments, and the cluster analysis.

The survey

The *Living Forests* project, based in Nordic countries, evaluated consumer attitudes and preferences towards wood products in several European countries (DEMOSKOP 1996). For the study of market segments for eco-labeled wood, survey data were collected in the UK and Norway. These two countries were compared for various reasons. While the UK has only 11% forest cover and is an important net-importer of wood, Norway has 29% forest cover and is a net-exporting country (FAO 2002). In the late eighties and the nineties, Norway was considered in the forefront of setting stricter environmental standards and pushing for multi-national agreements. Environmental issues were less profiled in British politics, but at the same time British consumers were given better opportunities to make environmentally related purchase decisions than most other Europeans (Tallontire and Rentsendorj 2000). Forest certification has aimed at meeting the demand of the mass market (Rametsteiner and Simula 2003), and for this study telephone interviews were conducted with representative samples of the British (n = 1,015) and Norwegians (n = 1,014), applying common stratified sampling techniques.[1]

In the first question, the respondents were asked to state the importance of six different attributes of wooden furniture purchase: *design, durability, environmental friendliness, home-made product, wood species,* and *price.* The following questions concerned opinions about eco-labeling, the relative importance of maintaining forest cover versus maintaining biodiversity and enhancing recreational quality, and specific questions about knowledge of the term *sustainable forestry.* The respondent was then asked to imagine that he/she was in a furniture store and was choosing between two pieces of furniture made of wood originating from Nordic forests. The two pieces of wooden furniture were described as similar, except that one was eco-labeled and had a higher price. It was stressed that the use of wood originating from Nordic forests already guarantees that the forest would be replanted, to single out extra WTP for components of sustainable forestry other than maintenance of forest cover.[2]

[1] The telephone survey was carried out in both countries during the last week of November in 1997, administered by BMRB (*British Market Research Bureau*) International Ltd in UK and by MMI *Markeds og Mediainstituttet* AS in Norway. Both companies applied stratified sampling techniques, BMRB stratifying by social grade within the standard region profile of the UK and MMI stratifying by county with a re-stratification with respect to region, age (>15 years), and gender. Also BMRB used age quotas (>16 years). BMRB applied random digit sampling, while the sampling frame for MMI was the list of telephone subscribers (Norway having less unlisted than the UK).

[2] A copy of the questionnaire and basic descriptive statistics of the data can be obtained from the authors.

The base price of the unlabeled option was set at US$332 (UK£200) for the British sample and US$275 (NOK 2000) for the Norwegian sample. The respondents in both countries were split into three-subsamples, and asked to choose between the unlabeled and the more expensive eco-labeled furniture, facing either a 5%, 10%, or 25% price differential. The responses to these binary questions produced a ''raw'' empirical distribution of WTP above or equal to the price differential presented (modeled as 1) versus WTP below the price differential or equal to zero (modeled as 0). The price differential presented had to be varied between sub-samples to allow estimation of WTP for the eco-label, applying logit modeling based on a random utility model (McFadden 1974). By observing a (clearly) reduced number of respondents choosing the eco-labeled option (less 1's) with increasing price differential, the logit model provides estimates of mean and median WTP.

For those choosing the eco-labeled alternative, a follow-up question asked them if they were ''unsure,'' ''fairly sure,'' or ''absolutely sure'' about this choice. Thus, the share of counted eco-label choices (1's) could be restricted to only those being ''absolutely sure,'' and the rest set to 0. Such a type of restriction of hypothetical choices has been found to produce estimates much closer to actual behavior (Blumenschein et al. 1998). On the other hand, for those choosing the non-labeled cheaper furniture, a follow-up question asked if their WTP for eco-labeled furniture was greater than zero dollars, to identify consumers who were indifferent to eco-labeling. Full sample median estimates, based on ''absolutely sure'' choices of the eco-labeled option (treating unsure and fairly sure as choosing unlabeled) and zeroing out the identified indifferent respondents, were 1.5% for the British sample and 1.0% for the Norwegian sample (Veisten 2002).[3]

[3] The logit specification applied to these data is similar to a specification first applied by Bishop and Heberlein (1979) and formally presented by Hanemann and Kanninen (1999). See Veisten (2002) for a more in-depth description.

The questionnaire also included questions about respondents' general attitude towards environmental issues, their confidence in various sources of information about forestry, media use, and media interest. The responses to these variables constituted the base for creating psychometric dimensions. Respondents were also asked about their recreational activity in forests and membership in nature conservation or other environmental organizations, since such active ''action'' may provide a better indicator of eco-oriented consumer behavior than attitudes (Pickett et al. 1995).[4] Finally the basic demographic characteristics were collected.

Principal component analysis of wood furniture attributes

Principal component analysis, or factor analysis, can be used to condense information in sets of variables into a few interpretable combined variables, or *dimensions*.[5] The principal component analysis was performed separately for the British and Norwegian sample, as there were small but important differences between the samples (Veisten 2002). Thus, in some cases the two nationality samples could be divided into different dimensions.

[4] Clearly, the action of registering in an organization working for the protection of nature and environment is different from the action of making a recreational trip in a forest. Arguably, the first action could seem more predictive for eco-oriented purchasing. Yet, *citizen* concern through eco-membership does not necessarily transfer to *consumer* concern when facing eco-labels on wooden furniture. And, even if some active recreational users of forests may support the forest sector and *status quo* rather than certification, such forest use also mirrors a clear interest in the forest land, which is one basic premise for not being indifferent to certified wood products.

[5] Principal component analysis is based on the fundamental assumption that some underlying dimensions, which are smaller in number than the number of observed variables, are responsible for the covariation among the observed variables (Harman 1970). Variables are entered based on *a priori* criteria, and eventually some practical judgment. The number of dimensions retained by the principal component analysis can be decided by examination of eigenvalues (default above unity). The interpretation of each dimension, or principal component, is based on which variables show high correlation with that dimension, and this limit is normally set to loading above 0.4 (Stewart 1981).

TABLE 1. *Dimensions in product attribute influence on purchase of wood furniture.*

	I		II		III	
	UK	Norway	UK	Norway	UK	Norway
Influence on purchase: *made in home country*	−0.02	**0.73**	0.04	−0.01	**0.81**	−0.05
Influence on purchase: *wood species*	**0.79**	**0.42**	−0.04	**0.59**	0.22	−0.27
Influence on purchase: *design*	**0.77**	−0.17	0.26	**0.88**	−0.08	0.15
Influence on purchase: *environm. friendliness*	0.15	**0.73**	0.08	0.03	**0.73**	0.01
Influence on purchase: *durability*	0.19	**0.59**	**0.72**	0.01	0.16	0.10
Influence on purchase: *price*	0.00	0.07	**0.82**	0.03	−0.03	**0.96**
Eigenvalue	1.75	1.65	1.12	1.09	0.95	1.02
Proportion explained	0.29	0.27	0.19	0.18	0.16	0.17

Note: Effective sample sizes were 979 for Norway, and 966 for the United Kingdom. Varimax rotation. The original six attribute variables had values from 0 (''no influence'') to 2 (''a lot of influence''). Interpretation of the principal components: I ''Internal consciousness'' (UK)/''External consciousness'' (N), II ''Price consciousness'' (UK)/''Internal consciousness'' (N), III ''External consciousness'' (UK)/''Price consciousness'' (N).

The variables measuring influence of six product attributes on purchase produced three similar dimensions for the UK and Norway, although in different order. The first dimension for Norway and the third for the UK had high loading on environmental friendliness and home-made product. These represent external or intangible attributes, and it was chosen to simply apply the term ''external consciousness.'' For the Norwegians this also had relatively high loading on wood species and durability. The first dimension for the British and the second for the Norwegians had high loading on design and wood species. This dimension was named ''internal consciousness,'' comprising well-known, tangible product qualities. The second dimension for the UK and third for Norway qualified for the term ''price consciousness.'' For the British, this principal component also had high loading on durability (Table 1).

Principal component analysis of psychometrics

Five classes of dimensions were estimated, based on input from eight attitude-knowledge variables, eleven variables about confidence in sources of information about forestry and sustainability, seven variables related to media use, and ten variables related to media interest. These psycho-graphic dimensions were deemed important for the description of market segments for certified wood products. Psychographic dimensions could also potentially serve as grouping variables for cluster analysis, as an alternative to eco-label WTP and attribute preferences (Ozanne and Vlosky 1997).

The analysis of attitudes towards, and knowledge about, Nordic forestry, resulted in three interpretable dimensions for each country. For two of these, similar terms for both nationality samples were used. With regard to the first dimension, the variables describing negativity towards aspects of Nordic forestry had high loadings; in addition the variable describing knowledge about replanting had high negative loading for the British sample. This principal component was termed ''forestry negativity.'' Environmental interest and knowledge of the term ''sustainable forestry'' were highly loaded on the second dimension, and it was termed ''environmentalism.'' The third dimension had different loadings for the two countries. For the British sample, the variable indicating priority on the biodiversity and recreational aspects of forestry sustainability versus maintenance of forest cover. It was chosen to name this third principal component ''forestry ecologism'' for the UK sample. For the Norwegian sample, the variables indicating knowledge about the accumulation of forest biomass and knowledge that all harvested forest is replanted had high positive loadings on the third dimension. It was chosen to name this principal component ''forestry knowledge'' for the Norwegian sample (Table 2).

The confidence variables were also retained in three principal components. The first two di-

TABLE 2. *Dimensions in opinions/knowledge and in confidence in sources for information related to Nordic forestry and environment.*

Psycho-graphic variables		Psycho-graphic dimensions: United Kingdom	Psycho-graphic dimensions: Norway
Opinions and knowledge related to Nordic forestry and environment	Negative opinion towards Nordic forestry	Forestry negativity	
	Thinks biodiversity is not well taken care of		
	Government negative record		
	Knows all replanted		
	Knows the term "sustainable forestry"	Environmentalism	
	Environmental interest		
	Knows less used than grown		Forestry knowledge (N)
	Gives biodiversity and recreation priority	Forestry ecologism (UK)	
Confidence in sources for information related to Nordic forestry and environment	Public servants		
	Forest industry	Politico-informants trust	
	Politicians		
	Journalists		
	Consumer organizations		
	Recreational organizations	Green trust	
	Environmental organizations		
	Teachers		
	Researchers		
	Preference of third-party certification	Neutral trust (UK)	
	Forest owners		Forest sector trust (N)

Note: Effective sample sizes were at lest 796 for Norway and at least 823 for UK. Varimax rotation.

TABLE 3. *Dimensions in media use and in media interest.*

Psycho-graphic variables		Psycho-graphic dimensions	
		United Kingdom	Norway
Media use	Reads weeklies	Women's weeklies use	
	Reads women's magazines		
	Watches TV	TV use	
	Reads regional papers	Newspaper use (UK)	
	Reads national papers		
	Reads special magazines	Special paper use (UK)	Special paper use (N)
	Listens to radio		Radio use (N)
Media interest	Likes news	Intellecutal interest	
	Likes documentaries		
	Likes politics		
	Likes economics		
	Likes consumer information	Consumption interest	
	Likes home decoration		
	Likes nature/environment		
	Likes advertising		
	Likes TV entertainment	Entertainment interest	
	Likes sports		

mensions were fairly similar for both nations, such that common terms could be used. The first dimension was termed ''politico-informant trust,'' with high loadings on politician, public servant, and journalist confidence. For the British, this dimension also had high loadings on forest industry and consumer organizations, and for the Norwegians high loadings on teachers. The second dimension was named ''green trust,'' with high loadings on the variables for confidence in outdoor-recreational and environmental organizations; teachers also obtained high loading on this dimension for the British sample. The third dimension resulted in a difference between the nationalities. For the British, it had high loading on the dummy variable for preference for third-party certification, that is, certification by a body that would represent neither the forest sector nor another group with vested interest (Vlosky and Ozanne 1997), although its constituency was not specified in the survey. This dimension also had high negative loading on forest owners among the British, and it was simply termed ''neutral trust.'' For the Norwegian sample, on the contrary, the third factor had high loading on forest owner and forest industry confidence, and high negative loading on third-party certification, and it was therefore named ''forest sector trust'' (Table 2).

The principal component analysis of media use variables produced four interpretable dimensions. The first dimension was termed ''women's weeklies use,'' with high loadings on women's magazines and weekly publications. The second dimension was termed ''TV use'' for both countries, although high loading on TV watching also combined with high loading on radio listening for the UK sample, and with high loading on national newspaper reading for the Norwegian sample. The last two dimensions differed between the two nationality samples. For the UK sample, the third dimension was termed ''newspaper use'' with high loadings on national and regional newspaper reading. For the Norwegian sample, the third dimension was termed ''special magazine use,'' that in addition had high loading on national paper reading. The fourth dimension for the UK sample was also termed ''special magazine use.'' For the Norwegian sample, the fourth dimension was named ''radio use'' (Table 3).

The principal component analysis of the media interest gave very similar results for both nationality samples. The first dimension

was termed ''intellectual interest,'' with high loadings on the variables for interest in politics, economics, news, and documentaries. The second dimension was termed ''consumption interest,'' having high loadings on consumer information and home decoration. In the British sample also, nature/environment had high loading, and in the Norwegian sample, advertising had high positive loading. The third dimension was termed ''entertainment interest,'' with high loadings on TV entertainment and sports, but also on advertising (Table 3).

Cluster analysis

The clustering was based on the three dimensions measuring attribute influence on wood furniture purchase together with estimated individual WTP for the eco-label attribute.[6] Also an alternative clustering based on the psycho-graphic dimensions of opinion/knowledge-confidence and media use/interest was performed. Among the various clustering techniques, it was chosen to apply the *k*-means method.[7] Cluster analysis does not provide precise rules for choosing a solution. Among the solutions estimated, a four-cluster solution was judged to represent the lowest number of clusters that gave acceptably interpretable segments. Clusters were named in relation to the highest/lowest values of the grouping variables.

The four-cluster solution identified a most eco-oriented cluster for both nationalities, named ''eco-segment.'' This cluster had highest average individual WTP and highest average values on the external (environmental) consciousness dimension.[8] Since the attribute dimensions did not provide a clear differentiation between the other clusters, they were primarily named according to the level of the WTP. However, the small cluster with second-highest WTP, ''probable eco-segment,'' also had the second-highest values on external consciousness. The following cluster was named ''improbable eco-segment,'' and the cluster with a zero value on estimated WTP was termed ''indifferent segment'' (Table 4).

The alternative clustering based on psycho-graphic dimensions as grouping variables also included relevant eco-oriented ''action variables''—membership in environmental organizations and trips to forests over the last three months. However, the resulting clustering did not provide any clear differentiation between groups of respondents. Although these dimensions and variables did differ significantly between segments identified by product-attribute preferences and WTP, going the other way around applying the psycho-graphics in the clustering didn't work out (only with the exception of media use dimensions). This alternative analysis will not be presented any further.

SEGMENTATION RESULTS

Describing the segments identified by WTP and product attribute dimensions

The four segments estimated by *k*-means cluster analysis were first compared with respect to psycho-graphic dimensions. The primary interest was to assess to which degree the ''eco-segment,'' representing 28% of the

[6] Within market segmentation the use of cluster-based methods have been classified within ''*post hoc* industry-based segmentation.'' These methods are based on the use of variables for the preference of product attributes as grouping variables in the clustering. One variant is segmenting with stated preference methods (conjoint analysis), typically including measurement of preferences for product attribute levels (including price), *part-worth* measurements, demographic/psycho-graphic data, and a buyer choice simulation (Green and Krieger 1991).

[7] All clustering methods attempt to identify and classify observations so that each observation is similar to others in a cluster, which is exactly what segmentation will pursue. The *k*-means method is among the non-overlapping hierarchical cluster methods. Using the statistical package SAS 6.12, the *k*-means method was accomplished by combining the FASTCLUS procedure (an initial disjoint cluster analysis especially suited for larger data sets), giving means, frequencies, and root-mean-square standard deviations from these preliminary clusters as input for computing density estimates for the final *k*-means clusters—the CLUSTER procedure with the HYBRID option (SAS 1997).

[8] The individual WTP was estimated with an enriched version of the logit model including individual characteristics, to obtain a differentiated median WTP between the individuals (Veisten 2002).

TABLE 4. *Four-cluster solution based on WTP for eco-labeling and three product attribute dimensions.*

	Cluster 1		Cluster 2		Cluster 3		Cluster 4	
	UK	N	UK	N	UK	N	UK	N
WTP for eco-labeling	**0**	**0**	39	45	**80**	**82**	60	62
Internal consciousness	−0.05	0.03	−0.05	0.02	0.12	0.07	0.14	−0.12
External consciousness	−0.48	−0.31	−0.31	−0.35	**0.42**	**0.61**	0.29	0.18
Price consciousness	−0.05	0.04	−0.07	0.16	0.08	−0.19	0.02	0.23
Frequency	151	211	264	262	287	267	36	20

Note: The WTP for the eco-labeling of wood furniture was first estimated applying the an enriched alternative of the logit model including individual characteristics (Veisten 2020, and then these estimated individual WTP values were transformed to a 0–100 scale before entering the clustering. The three product attribute dimensions were based on the stated influence of six product attributes on wood furniture purchase (Table 1). Interpretation of the clusters/segments: 1 ''Indifferent segment'' 2 ''Improbable eco-segment'' 3 ''Eco-segment'' 4 ''Probable eco-segment''

British sample and 26% of the Norwegians, has different characteristics than other segments. Indeed, several dimensions reflecting opinions-knowledge, information confidence, and media interest differ significantly between the segments. It was also of particular interest to evaluate the equality between the British and Norwegian eco-segment.

Median WTP was re-estimated for each segment, to verify the clustering with individual WTP from the full sample logit model with individual characteristics (Veisten 2002). For the British sample, the ''eco-segment'' does obtain the highest segment-based median WTP, exceeding 15% with respect to unlabeled wooden furniture with base price U.S.$332. In the Norwegian sample, the small ''probable eco-segment'' (gets a higher segment-based estimate of median WTP than the ''eco-segment'' (approximately 5%, with respect to U.S.$275); but WTP estimates are indeed statistically unreliable from such small samples. The small UK ''probable eco-segment'' also obtained a WTP estimate above the estimate for any Norwegian segment. In any case, regarding these results for the segment-based WTP estimate, the ''probable eco-segment,'' consisting only of 3.5% among the British and 2% among Norwegians, could probably be joined with the ''eco-segment'' into a final estimated broader segment of potential (end-) consumers of certified wood (Table 5).

Looking at the size of the dimension values, the eco-segments in both countries are most ''environmentalist'' in terms of knowledge/interest related to forestry, and for the British also most ''forest ecologist'' (prioritizing biodiversity/recreational sustainability measures). In both countries the ''eco-segment'' has highest trust towards ''green'' (environmental and outdoor) organizations' information about forestry and environment. Further, this segment shows highest interest in ''intellectual'' media content (politics, economy, documentaries, and news) and also in consumption content in media. For media use, no significant differences were found with respect to other segments in either country (Table 5). In both the UK and Norway, the ''eco-segment'' also obtains highest values for the ''action-variables'' (trips to forests and membership in environmental organizations). But for eco-membership, the differences between segments are not significant for the Norwegian sample.

For the significant differences observed where the ''eco-segment'' obtained highest/lowest (extreme) value, exactly the same pattern was found when testing this segment in a pair-wise fashion with the ''improbable eco-segment'' and the ''indifferent segment.'' This applies to both nationalities. For the tests involving the ''probable eco-segment,'' the limited size of this group impairs the test values. However, for the British the ''eco-segment'' differed significantly from the ''probable eco-segment'' in environmentalism, forestry ecologism, green trust, neutral trust, intellectual interest, and consumption interest. For the Norwegians, these two segments only differed significantly in forestry knowledge, intellectual interest, and trips to forests (Table 5, note).

TABLE 5. *Four segments identified by WTP and attribute preferences—psycho-graphic dimensions.*

	Eco-segment		Probable eco-segment		Improbable eco-segment		Indifferent segment		Chi-square	
	UK	N	UK	N	UK	N	UK	N	UK	N
Forestry negativity	−0.14	0.22	**−0.29**	**0.33**	0.14	−0.29	−0.14	−0.08	9.94	24.2***
Environmentalism	**0.70**	**0.34**	0.03	−0.04	−0.34	−0.04	−0.49	−0.16	176***	25.0***
Forestry ecologism (UK)/knowledge (N)	**0.16**	−0.00	−0.20	**−0.75**	−0.13	0.02	−0.16	**0.14**	14.5***	10.7**
Politico-informant trust	−0.05	0.05	0.14	0.33	0.01	0.15	0.02	−0.06	1.59	6.20
Green trust	**0.27**	**0.26**	−0.29	0.15	−0.04	0.07	−0.20	−0.50	27.9***	54.6***
Neutral (UK)/Forest sector (N) trust	0.01	**−0.15**	**0.16**	0.02	0.09	0.12	−0.18	0.07	8.30**	9.61**
Women's weeklies use	0.07	−0.04	**0.16**	0.34	−0.13	−0.05	−0.03	−0.08	6.27	1.31
TV use	0.02	0.02	0.13	0.09	0.04	0.02	0.03	−0.06	1.19	1.47
Special paper use	0.12	0.14	0.02	−0.18	0.07	0.02	−0.06	0.10	2.56	2.38
Newspaper (UK)/Radio (N) use	0.04	0.08	−0.11	−0.03	0.01	0.03	−0.07	0.02	2.14	2.14
Intellectual interest	**0.34**	**0.29**	0.02	−0.07	−0.02	0.04	−0.29	0.01	43.3***	13.7***
Consumption interest	**0.29**	**0.15**	−0.37	0.11	−0.10	−0.02	−0.25	−0.19	38.3***	12.5***
Entertainment interest	**−0.23**	−0.01	−0.07	0.10	0.08	−0.00	**0.22**	−0.07	26.8***	1.71
Trips in forests last three months	**2.93**	**7.63**	2.65	5.83	1.53	5.68	1.90	5.73	40.4***	29.3***
% "eco-members"	**29.3**	8.24	22.2	5.00	12.9	8.02	9.93	4.27	34.2***	3.60
Median WTP (%)	**15.5**	4.92	6.12	**8.38**	2.44	1.60	**0**	**0**		
Percentage of total sample	28.3	26.3	3.5	2.0	26.0	25.8	14.9	20.8		

Note: Dimension values given as segment averages. A Kruskal-Wallis one-way analysis of variance (ANOVA) technique was used to test the null hypothesis of no difference between the segments (*$P < 0.1$/**$P < 0.05$/***$P < 0.01$). By pair-wise testing, the following significant differences between the "eco-segment" and other segments were found: For the British, the "eco-segment" differed significantly from the "probable eco-segment" in environmentalism (1%), forestry ecologism (10%), green trust (1%), neutral trust (10%), intellectual interest (10%), and consumption interest (1%). For the Norwegians, the "eco-segment" differed significantly from the "probable eco-segment" only in forestry knowledge (1%), intellectual interest (10%), and trips to forests (10%). The "eco-segment" in both countries differed from the "improbable eco-segment" and the "indifferent segment" in exactly the same way as indicated by the Kruskal-Wallis test for all four segments together. The Norwegian "eco-segment" also had a significantly higher rate of eco-members than the "indifferent segment."

Comparing the segments on demographics showed few relevant differences, except gender in the British sample, where the more eco-oriented segments had a significantly higher share of women. Also age differed significantly between the segments in both countries, but the values did not increase or decrease monotonically with respect to degree of eco-orientation; in both countries the ''eco-segment'' had an average value of approximately 45, but this was not significantly different from the ''indifferent segment,'' only that both these segments had higher average age than the two other segments (Table 6).

Categorizing the eco-segment by ''greenness''

Although some clear differences in psychographics between the ''eco-segment'' and the other segments have been identified, it was intriguing to plunge deeper and explore eventual ''sub-eco-segments.'' Especially intriguing was investigating if the earlier differentiation of British eco-segments (with WTP for ''green'' consumer goods in general) also would appear with this study's data. Sub-segmentation of (only) the ''eco-segment'' was achieved by a re-clustering using psychographics and ''action variables'' as grouping variables. Following the literature, only a three-cluster solution was estimated for both countries (Coddington 1993).

The British sub-segments of the ''eco-segment'' resulted in being quite homogeneous. They differed primarily in degree of ''greenness,'' just in line with the differentiation by Coddington (1993). The sub-segment that obtained highest values on environmentalism, green trust, and eco-membership could be regarded as representatives of the ''true-blue greens'' (TBG) in these data. TBG are described as eco-oriented consumers that are both environmental activists and willing to pay price premiums for eco-labeled consumer goods. As already indicated, eco-oriented Norwegian consumers seem to score relatively lower than the British on both WTP and eco-

TABLE 6. *Four segments identified by WTP and attribute preferences—demographic characteristics.*

	Eco-segment		Probable eco-segment		Improbable eco-segment		Indifferent segment		Chi-square	
	UK	N	UK	N	UK	N	UK	N	UK	N
Average income (in US$1000)	34.9	47.8	35.0	50.7	34.6	50.9	37.2	52.5	0.70	3.66
Average age	45.1	45.3	36.2	39.2	38.7	40.5	41.0	46.3	31.2***	22.6***
Degree of education	1.99	2.24	1.97	2.18	1.98	2.32	1.94	2.28	0.78	1.93
Degree of urbanization	2.18	2.31	2.37	2.25	2.28	2.23	2.17	2.28	3.76	1.59
% males	**36.9**	56.6	44.4	55.0	59.8	48.1	53.0	64.0	30.4***	12.1***
Percentage of total sample	28.3	26.3	3.5	2.0	26.0	25.8	14.9	20.8		

Note: A Kruskal-Wallis one-way analysis of variance (ANOVA) technique was used to test the null hypothesis of no difference between the segments (*$P < 0.1$/**$P < 0.05$/***$P < 0.01$).

consciousness. Thus, it indicates that the ''true-blue greens'' consumers basically aren't represented in the Norwegian (wood product) market. The Norwegian sub-segment with highest values on environmentalism, green trust, and eco-membership may rather represent ''greenback greens'' (GG), together with the second-greenest British sub-segment. The GG are less activist than the TBG. On the same track, the third-ranked British sub-segment and the second-ranked Norwegian one were named ''Sprouts'' (S), a sub-segment also willing to pay extra but with a lower level of environmental concern than the two greenest sub-segments (Table 7).

For the (small) third-ranked Norwegian sub-segment, there is no suitable name/characterization left from Coddington (1993). This sub-segment obtained quite low values on environmentalism and eco-membership, and a name like ''dubious greens'' (DG) could be proposed. As such, this DG sub-segment does not differ from the (small) Norwegian ''probable eco-segment,'' and both could be placed under the DG umbrella. In the British case the ''probable eco-segment'' segment also qualifies as DG.

The analysis is based on representative samples of the households in each country. It does not seem to be an undue assumption that the (wooden) furniture market (or wood product market) comprises literally all households, such that market segments for wood products basically could be read directly out of these segmentation results.[9] Altogether, the eco-oriented segment would represent somewhat more than ¼ of Norwegian consumers, and approximately ⅓ of British consumers. But while the TBG and GG may comprise up to 22% in

TABLE 7. *Three sub-segments of the ''eco-segment''—re-clustered by psycho-graphic dimensions.*

	''Eco-segment''							
	Sub-cluster II		Sub-cluster I		Sub-cluster III		''Probable eco-segment''	
	UK **TBG**	N **GG**	UK **GG**	N **S**	UK **S**	N **DG**	UK **DG**	N **DG**
Forestry negativity	**−0.26**	0.10	−0.05	**0.27**	−0.04	−0.14	−0.29	0.33
Environmentalism	**0.91**	**0.43**	0.65	0.34	0.35	−0.52	0.03	−0.04
Forestry ecologism (UK)/knowledge (N)	0.14	−0.04	−0.02	0.01	**0.39**	−0.14	−0.20	−0.75
Green trust	**0.40**	0.17	0.19	**0.31**	0.14	0.14	−0.29	0.15
Intellectual interest	**0.41**	**0.41**	0.25	0.27	0.33	−0.13	0.02	−0.07
Consumption interest	**0.40**	0.03	0.26	0.18	0.11	0.24	−0.37	0.11
% ''eco-members''	**36.9**	**8.75**	27.9	8.44	16.9	0	22.2	5.00
% males	**31.5**	59.1	40.7	57.0	42.3	25.0	44.4	55.0
Percentage of total sample	13.0	6.8	8.8	19.2	7.0	0.8	3.5	2.0

Note: Only variables/dimensions with significant differences between sub-segments are included in the table. Interpretation of the sub-segments: TBG: ''True-Blue Greens'' GG: ''Greenback Greens'' S: ''Sprouts'' DG: ''Dubious Greens''

[9] It should be noted that percentage WTP and price premiums are conditional on the base price of the specific wood product, the estimated median WTP in percent for eco-labeled wood would be higher for a cheaper item and lower for a more expensive item (Ozanne and Vlosky 1997). The generalization from wooden furniture to *wood product* markets is based on an underlying assumption that eco-labeling is valued similarly for a $300 furniture piece as for a $300 fixture or utensil, as long as wood is the main material.

the UK, they (GG) are estimated to be a tiny 7% in Norway.

DISCUSSION

The survey method applied for this study has both weaknesses and strengths. Introducing certification and sustainable forestry by phone is a somewhat more defiant task than presenting these issues face-to-face. It could certainly have been preferable to be able to show visual aids for the eco-label description and the hypothetical choices. Still, the interviews were elaborated and executed with the participation of professional marketing research bureaus, and the segmentation results do not indicate predominantly casual answers. The sampling frame was more extensive than in earlier studies (Ozanne and Smith 1996; Ozanne and Vlosky 1997), with drawn samples representing the whole population considered to be germane for the economic evaluation of certification (Rametsteiner and Simula 2003). By phone, the presentation of the linkage between sustainable forestry, certification, and eco-labeling was fairly thorough, and it specified the elements of biodiversity, recreation, and forest cover, and also to the geographical area of the wood-exporting Nordic countries. Thus asking about choice between unlabeled and eco-labeled, and subsequently estimating WTP, was not only attitudinal but related to a specified eco-labeling of wood from Nordic forests. Expressed attitudes, like simply stating the importance of product attributes, are not necessarily well correlated with real behavior (Ajzen and Fishbein 1977). A stated *behavioral intention,* like choosing hypothetically between two specified options, could come closer to actual market behavior, but a ''raw'' *prima facie* WTP estimation would still be defiled by an upward hypothetical bias (Blumenschein et al. 1998). A most important strength with this survey, differentiating it from existing literature on segmentation and eco-label valuation, is the downward adjustment of uncertain eco-label choices and, accordingly, estimated WTP.

Dimensions from principal component analysis will be set by the number of available variables/indicators and by the subjective choices of which variables should be entered together. The numbers of attribute variables in this study were much fewer than what Ozanne and Vlosky (1997) applied, and the resulting dimensions cannot be expected to embrace all relevant dimensions for wooden furniture. An alternative might have been to apply the six attribute variables instead of the three dimensions, but it is significant that the attribute dimensions were similar for both nationalities. For the psychographics the chosen group partition seemed fairly obvious, but with more variables it might have been adequate to separate opinions and knowledge into two groups. Still, both this group and the trust and media groups produced fairly similar dimensions for both the UK and Norway. The *varimax* rotation has been a standard option in various applications of principal component analysis within segmentation and forest research (Ozanne and Smith 1996; Kuuluvainen et al. 1996).

Also the cluster analysis is a subjective statistical method. Various possibilities of grouping variables, clustering technique, and cluster numbers could be considered. The results presented were based on a standard *k*-means technique with product-attribute preference dimensions and WTP for eco-labeling as grouping variables. Other techniques were intended, like Ward and Centroid, but for the attribute/WTP, grouping these seemingly did not work as well as *k*-means; and with the dominating WTP, most observations ended in a single cluster or two clusters. The number of clusters/segments was only slightly less than in Ozanne and Smith (1996) and Ozanne and Vlosky (1997). Augmenting to a five-cluster solution only divided the small ''probable eco-segment'' into two groups with opposite levels on the internal attribute dimension. The ''eco-segment'' was only slightly affected, relative to the four-cluster solution, and only for the British. Thus, increasing from four to five clusters only fuzzed the interpretation. Extending the attribute dimensions with estimated WTP repre-

sents a new feature relative to Ozanne and Smith (1996), and it is deemed to have amended the detection of eco-oriented segments for wood products. An alternative clustering (of the total sample) on psycho-graphics, as Ozanne and Vlosky (1997), did not provide a basis to detect the eco-oriented segment with these data and clustering method (nor did clustering with demographics). However, re-clustering the ''eco-segment'' on psycho-graphics (and ''action'' variables) deepened the description of this segment, providing a greenness scaling that was comparable and confirmable with respect to earlier literature (Coddington 1993).

Dimensions from all applied variable groups, except one, described and differentiated the ''eco-segment'' in a plausible manner. When it comes to media use, practically no differences were found between segments. Of course, the chosen variables of media use may not have been adequate to capture eventual differences.[10] Media interest distinguished more clearly, and the potential eco-oriented wood consumer seems clearly more reachable through media with intellectually oriented content and consumer issues than through sports and entertainment. This may not come as a surprise, but it still represents a psychographic aspect not assessed in the cited literature. The stronger environmentalism and eco-membership in the ''eco-segment'' is compatible with both theory and earlier empirical findings. An important difference between the two populations is that the British eco-segment is relatively positive toward Nordic forestry, while the Norwegian is relatively negative.[11] An important strength in this study is that the psycho-graphic characteristics differentiating the ''eco-segment'' from other segments also apply in pair-wise tests.

The ''eco-segment'' did not differ from other segments in terms of demographic variables, except a higher female share among the British. That British green consumers tend to have a female majority has been documented by earlier research (Tallontire and Rentsendorj 2000). Finding a significant difference for all segments considered together, as found for age, is not particularly useful as long as pairwise comparison shows no difference between the ''eco-segment'' and the ''indifferent segment.'' One could imagine that one of these was composed of middle-aged and the other of young and elderly, implying a useful differentiation, although the average was equal. A similar pattern could be supposed for income (Kriström and Riera 1996). However, the sub-clustering of the ''eco-segment'' by psycho-graphics did not result in any demographic-based diversification, as for instance in ''affluent greens'' and ''young greens'' (Tallontire and Rentsendorj 2000). Compared to Ozanne and Smith (1996), they state only that income level and educational level differentiated at least one of their two potential consumer segments for ''environmentally marketed wooden household products'' from at least one of the other segments. Thus they did not find a clear demographic-based division between eco-segments and other segments.

Although the ''eco-segment'' may be regarded as quite homogeneous in terms of psycho-graphic dimensions, especially the British, a sub-clustering by psycho-graphics did result in a kind of graduation of ''greenness.'' The amount estimated of ''true-blue greens'' (13%) and ''greenback greens'' (9%) in the British sample is quite similar to estimates from earlier research (Coddington 1993). The Norwegian sample shows a somewhat lower level of greenness, whereby the greenest subsegment in the ''eco-segment'' only reaches the category of ''greenback greens'' (7%). This re-clustering provides a more qualified evaluation of the potential consumer segments for eco-labeled wood products then just the sum of the whole ''eco-segment'' and ''probable eco-segment.''

[10] Most individuals watch TV, and will in any case represent an effective medium of communicating commercial messages. However, possibly a diversification of TV channels and also ''special magazines'' could have been made.

[11] Also according to Rametsteiner (1999, p. 83) the British think forest management is most sustainable in Scandinavia, and in North America.

CONCLUSIONS

A market segmentation analysis for the potential market of eco-labeled wood products was performed using cluster analysis of wood furniture attribute preferences and willingness to pay (WT) for eco-labeling. One profiled ''eco-segment'' was confirmed for both the UK and Norway, scoring higher on psychographic environmentalist dimensions, membership in environmental organizations, and trust in such organizations' information about forestry. With the given set of variables, the characterization of the ''eco-segment'' is fairly homogeneous for the two countries. In both countries the ''eco-segment'' shows media interest clearly directed towards more intellectual issues rather than entertainment and sports. This is an important feature of the ''eco-segment'' regarding channels for targeted campaigns from the forest products industry.

However, although similar variables identify the ''eco-segment'' in the UK and Norway, the ''degree of greenness'' is clearly stronger in the British case. The analysis assigns 22% of the British sample to the highest levels of ''green consumerism,'' but only 7% of the Norwegians. The difference also involves the WTP a price premium for certified/eco-labeled wood products, estimated at approximately 15% for the British ''eco-segment'' and only 5% for the Norwegian. Another important difference between the British and Norwegian eco-segments is that the British tend to be more positive towards (Nordic/boreal) forestry. Important for the forest products industry regarding the British market is the eco-segment's preference of a neutral certification body. Demographically, the eco-segment does not differ significantly from the other segments, except that the British has the largest share of females. If we include another tiny segment with relatively high WTP for eco-labeled wood products, together with the profiled ''eco-segment,'' the potential market amounts to nearly ⅓ of British consumers and slightly more than ¼ of the Norwegians. Taking account of the estimated degree of greenness (from ''dubious greens'' to ''true-blue greens''), this study indicates that only the UK market may potentially constitute something more than a niche market for certified wood products.

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