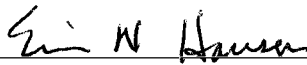


AN ABSTRACT OF THE DISSERTATION OF

Roy C. Anderson for the degree of Doctor of Philosophy in Forest Products
presented on May 9, 2003.

Title: An Analysis of Consumer Response to Environmentally Certified,
Ecolabeled Forest Products

Abstract approved:



Eric N. Hansen

Historically, researchers have used surveys, focus groups, and anecdotal evidence to evaluate consumer response to environmentally certified, ecolabeled forest products. These methods generally measure consumer attitudes toward certified forest products. Since the strength of the correlation between attitudes and behavior has long been questioned, consumer response to certified forest products is not fully understood. Therefore, a major goal of this research was to better understand consumer response to environmentally certified, ecolabeled forest products by directly observing purchase behavior. This was accomplished by designing an experiment in which consumers were presented with a choice between virtually identical forest products, the only differences being the presence/absence of an environmental certification ecolabel, and in some cases, a price premium on the ecolabeled product. During this experiment, the presence of the ecolabel was associated with increased sales, so long as there was no price premium on the ecolabeled product. The strength of this association was weakened when the ecolabeled product cost 2 percent more than the non-

ecolabeled product. In other words, these results suggest that price is a more compelling product attribute than the ecolabel. This experiment was the first to empirically demonstrate that forest certification ecolabels do have an effect on consumer behavior. In addition to the experiment, two surveys were conducted to better understand how consumers form their preferences for forest products, and to determine which values, attitudes, and beliefs are held by those most likely to purchase ecolabeled forest products. The surveys revealed that respondents who: were younger, willing to pay extra for ecolabeled forest products, exhibited past environmentally friendly purchase behavior, believe environmental claims on product packaging, and were more politically liberal were most likely to buy ecolabeled forest products. It is important to note that no associations were found between any of the measured values and those most likely to purchase ecolabeled forest products. This finding suggests that in order for ecolabels to be successful in the long term, marketing efforts are needed, which explicitly link the ecolabel symbol to values. Such a linkage will allow consumers to express their values through the purchase of ecolabeled products. This practice of linking values to a product is widely believed to be a powerful influence on consumer behavior. The surveys also revealed that ecolabeled forest products are preferred to non-ecolabeled forest products for most consumers. However, the strength of this preference pattern varies significantly among consumers. This finding suggests that a market segmentation strategy is required to effectively market environmentally certified, ecolabeled forest products. Therefore, the associations between attitudes, values, and beliefs with those most likely to purchase ecolabeled

forest products is practically significant for forest certification agencies and environmentally certified forest landowners and manufacturers because it can be used for market segmentation, and to begin building brand recognition, awareness, and identity for forest certification ecolabels. Finally, the research questions posed in the experiment and survey were carefully designed to be nearly identical. This “duality” allowed a comparison of the results obtained by each method. Such a comparison revealed, as has long been suspected, that the results differed by method. This finding has important implications for further research on this topic.

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An Analysis of Consumer Response to Environmentally Certified, Ecolabeled
Forest Products

By
Roy C. Anderson

A DISSERTATION

Submitted to
Oregon State University

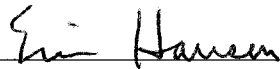
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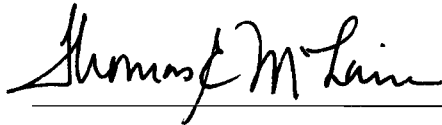
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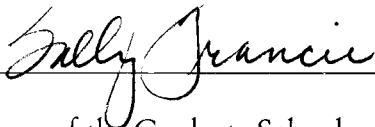
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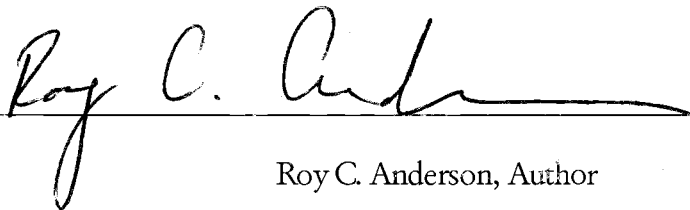


Head of the Department of Wood Science & Engineering



Dean of the Graduate School

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Roy C. Anderson, Author

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The author is sincerely appreciative of the following people: Dr. Eric Hansen for his guidance and advice throughout this research. Jennifer Anderson for the unconditional support she has offered throughout the entire PhD process. Thanks, Jennie, I could not have done it without you! Dr. Ernesto Wagner, fellow student and friend. Ernesto, your presence challenged me to do my best; the experience would not have been the same without you. Also, Roy R. and Marianne Anderson for their generous financial support. Finally, Adam Taylor, friend, fellow PhD candidate, and coffee drinker. Adam, thanks for listening to me recount the sometimes painfully slow progress on my dissertation research during our many coffee breaks.

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An Analysis of Consumer Response to Environmentally Certified, Ecolabeled Forest Products

Introduction

According to the *Green Gauge Report*, which is published annually by RoperStarch Worldwide, society's concern about environmental issues is currently at, or near, historically high levels. As a result, in the last 20 to 30 years the concept of environmental marketing has materialized. This concept is defined as satisfying consumer wants and needs, but doing so in a way that minimizes impacts on the natural environment. This form of marketing has been popularized in both the marketing literature and by companies seeking a strategy that enables them to market their products in a socially responsible, sustainable manner.

Compelled to take action by environmental groups, a response to the environmental marketing movement from the forest products industry has been the development of forest certification and ecolabeling programs. Forest certification is independent, third party verification that a landowner's forest management practices are environmentally sound and aimed at sustainability. The products derived from certified forests may then be marketed with a special logo, i.e. ecolabel, which is intended to communicate the product's "environmentally friendly" status to consumers.

Forest certification continues to grow rapidly all around the world. One reason for this growth is that forest landowners and manufacturers believe that offering ecolabeled, certified forest products will allow them to gain competitive advantage over their non-certified peers. Existing data about consumer response to ecolabeled forest products comes from surveys about consumer attitudes, focus groups, and anecdotal evidence. These methods can be effective for gauging *potential* consumer response and market size. However, a person's expressed attitude toward a concept does not always match their behavior toward the concept. Therefore, a major contribution of this research is the application of a new method that empirically gauges *actual* consumer response to ecolabeled forest products. In other words, we measured whether the Forest Stewardship Council ecolabel, the ecolabel of one of the world's largest forest certification schemes, had an effect on actual consumer behavior.

A second contribution of this research is that a survey was designed and administered, which recreated the buying scenario faced by the consumers involved in the actual purchase behavior study. Although different people participated in each study, this "duality" allowed a comparison of the results obtained from each method of measuring consumer response to ecolabeled forest products.

A final practical contribution of this research is that it provides marketing information to forest products manufacturers and certification

agencies. For example, focus group research conducted by Teisl et al. (2002) has shown that consumers may attach little meaning to the images currently used as forest certification ecolabels. Teisl et al. (2002) suggest the reason for this finding is that consumers want the ecolabels to contain additional, standardized information about improvements to specific environmental features so that consumers can easily compare between products. An alternate viewpoint is that the current images used in forest certification ecolabels may become more effective with the introduction of branding efforts, which explicitly associate a meaning with the image used in forest certification ecolabels. To this end, we conducted a consumer survey that measured: 1) consumer response to ecolabeled forest products, and 2) a variety of demographic, psychographic, and behavioral factors that we hypothesized would be associated with consumer response to ecolabeled forest products. The survey instrument used during the consumer survey was developed and tested during a survey of students at Oregon State University. The manuscript developed from the student survey is the final chapter in this dissertation. Forest certification agencies and certified forest product manufacturers can use the survey information to identify a relevant value proposition for their product and to begin developing a brand that links the ecolabel image with the value proposition. Previous studies on the topic of consumer response to forest certification have not addressed this issue.

Objectives

Consumer behavior with respect to forest certification and ecolabeling is not fully understood. Therefore, this dissertation strives to accomplish the following objectives:

- Evaluate the effect of ecolabeled forest products on end-use consumer behavior.
- Evaluate end-use consumers' price sensitivity to ecolabeled forest products.
- Identify and measure a set of consumer characteristics, i.e. demographics and psychographics, which are associated with those most likely to purchase environmentally certified forest products.

The information will: 1) provide insight into the real market potential for ecolabeled, certified forest products, and 2) provide insight about potential strategies for enhancing the effectiveness of ecolabels.

An Overview of Consumer Behavior Methodology Used in Forest Products Research and This Dissertation

Roy C. Anderson

Eric N. Hansen

Abstract

Historically, the field of forest product marketing has placed little emphasis on consumer behavior research. Therefore, this article provides a broad overview of consumer behavior research and then focuses on the development of consumer behavior research in the field of forest products marketing. Several of the traditional methods used for assessing forest product consumer behavior are identified and we discuss the development of a new method for better understanding forest product consumer behavior. Such a review is important to document the development of consumer behavior research in the field of forest products marketing.

Introduction

Forest product marketing researchers have spent little time studying final consumers to learn how psychological and sociological behavior factors influence demand for forest products. Presumably, this is because of the commodity nature of many primary forest products, the auction-style method used to sell them, and their frequent use as components in larger products such as homes. Thus, instead of final consumers, most academic forest products marketing studies have focused on the behavior of industrial buyers (e.g. Smith 2002, Weinfurter and Hansen 1999, Hansen and Bush 1996, Michael and Smith 1995, Vlosky and Smith 1994, and Bush et. al. 1991). Alternately, many have descriptively characterized the size of markets and types and quantities of materials used (e.g. Forbes et. al. 2001, Haas and Smith 1997, Eastin, et. al. 1998, Smith 1991). In addition, non-academic papers written by forest product consultants commonly examine forest product demand factors linked to economics and population demographics (e.g. Taylor 1999, NAIHB 2002).

We suggest that the marketing implications associated with the recent emergence of forest certification and ecolabeled forest products (EFP's) have driven increased research in the forest products marketing community regarding final consumer behavior, and its effect on consumer demand for forest products. Therefore, using insight gained from our recent consumer behavior research experience, we offer a description of the methods employed and practical advice,

both of which are aimed at improving the next generation of consumer behavior research in the field of forest products marketing.

Consumer Behavior Research

Consumer behavior (CB) is the scientific study of the processes consumers use to select, secure, use, and dispose of products and services that satisfy their needs. Its development is intricately interwoven with that of psychology and sociology. For example, concepts such as attitude, values, motivation, personality, perception, cognition, social influence, and cultural influence have all played a major role in explaining consumer behavior.

Most view the field as a science dedicated to creating theory, which explains CB. Robertson and Kassarian (1991) identify two approaches, which have formed the basis of CB theory generation. First, the micro approach has focused on the individual and the cognitive and psychological factors that affect their consumer decision-making. Examples include specific constructs such as variety seeking, risk, uncertainty, or expertise. Robertson and Kassarian (1991) characterize this type research as insightful, but the specificity of the research construct limits the comprehensiveness of the resulting consumer behavior models. For example, Folkes and Kiesler (1991) describe Bettman's (1979) information processing theory of consumer choice as a micro approach because it emphasizes a specific buying situation where the focus is on variables such as product attributes (quality and price), the characteristics of the decision-making task (information format), and the task-related characteristics of the decision

maker (expertise and involvement). Thus, the model largely ignores sociological and cultural influences on consumer behavior.

The macro approach, on the other hand, has focused on the influence of others and the socio/cultural environment, so that discoveries hold across different times and places. Within this approach, the goal is the same – understanding consumer behavior, but the perspective is broadened to include the meaning of product purchase and ownership in a social and cultural context. Examples include Nicosia's (1966) *Consumer Decision Processes*, Engel et. al's. (1968) *Consumer Behavior*, and Howard and Sheth's *Theory of Buyer Behavior* (1979).

Consumer Behavior Research Methods

Similar to other studies in the social sciences, CB research methods generally take one of two forms – 1) qualitative, or 2) quantitative. A third form – interpretive is less common and will not be discussed here (for more about interpretive consumer behavior research, the interested reader should see Calder and Tybout (1987). Dooley (2001) defines qualitative research as field observation analyzed without statistics. Similarly, Calder and Tybout (1987, p. 137) describe qualitative research as, "... people's thoughts about their consumption, manifested verbally or otherwise, which are both the data and the result of the research". There is considerable debate about the "scientific" merit of much qualitative consumer research because much of it defies statistical analysis, thereby rendering the underlying theory untestable. Opponents of the method argue that results are

not generalizable, inherent bias arises from the unique reality through which the researcher interprets his or her observations, and analysis and interpretation are awkward because of the unstructured form of the data. The last point emphasizes a fundamental difference between qualitative and quantitative research, the latter involves standardized procedures for representing constructs in numerical form. The advantage of using a quantitative approach is that the data can be tested using rigorous statistical tools to see if it proves a hypothesis. Qualitative proponents, on the other hand, argue the purity of the data arising from direct observation and unstructured interviewing in a natural setting is the biggest advantage of qualitative research. In other words, qualitative observations are not distorted by efforts to categorize and quantify responses in a manner convenient for the researcher to analyze quantitatively.

Consumer Behavior Research in Forest Products (FP)

Historically, building products, i.e. structural lumber, structural panels, and engineered wood products, have been the single largest forest products market (excluding pulp and paper). The importance of these products and markets to forest products manufacturers is illustrated by Rich (1970) who reported that 38 percent of lumber sales were to the residential construction market. The situation has not changed much since 1970. Taylor (1999) reported that new residential construction accounted for about 40% of lumber consumption and repair and remodeling accounts for another 30% of total domestic lumber consumption. Similarly, Sinclair (1992) stated that the market for building products was so

important to many forest products companies that their corporate policies were structured around the need to produce structural softwood lumber products.

Rich (1970) identified a series of factors in three categories that influence consumer demand for building products: First were economic factors such as consumer purchasing power, comparative prices between new and existing homes, and interest rate levels. Second were demographic factors such as population growth, population age distribution, family size, educational levels, occupational status, and population mobility. Third were psychological and sociological consumer behavior factors that affected consumer demand. Examples include consumer attitudes toward forest products, deeply held values that guide behavior, and social class. Rich (1970) noted a dearth of research about the psychological and sociological consumer behavior with respect to forest products. An examination of more recent forest product marketing textbooks supports this idea. Juslin and Hansen (2002) and Sinclair (1992) did not address psychological and sociological consumer behavior issues as a demand-driving factor for building products.

One possible explanation for the lack of consumer research is the culture and historical development of the forest products industry. For example, it is reasonable to assume that many primary forest products producers don't focus on customer wants and needs because widely accepted, long standing grading rules and standards, to which many forest products must conform, have caused forest products to become commodities or commodity-like. Therefore, instead of

focusing on the customer, firms are driven by the cost and availability of the natural resource and the quest for maximum efficiency in production. Thus, the basis of competition and source of differentiation among firms in the industry is production efficiency. Another possible explanation is the derived demand nature of many forest products. Forest products typically pass through several distribution channel intermediaries, which causes the manufacturer to be somewhat removed from the final consumer. For example, a final consumer is often interested in buying a house, not the pieces of structural lumber and structural panels that are used to make the house.

Some early exceptions to Rich's observation about the lack of research among final forest product consumers, include the following: Blomgren (1965) identified the strong psychological appeal of wood among most people because wood suggests strength and security. Glenn et. al. (1965) identified four family "personality" types, which influenced the style of house preferred. Werthman (1966) identified differences in preferred house design and features by social class. Rich (1972) identified social trends affecting final consumer demand for housing.

More recently, a search of the AGRICOLA agriculture, forestry, and animal science database using the word 'consumer' revealed that final consumer research has emerged in the realm of secondary forest products. Sinclair and Smith (1989) studied final consumer perceptions of CCA treated lumber. Stureson and Sinclair (1991) surveyed US households on perceptions of ready-to-assemble (RTA) furniture. Pakarinen (1999) surveyed 115 shoppers at a major furniture retailer in Finland. Damery and Fiset (2001) surveyed homeowners,

architects, and contractors in New England regarding their decision making process in the purchase of siding materials. Bumgardner and Bowe (2002) surveyed undergraduate students regarding their perceptions of selected commercially important wood species. Note that all of the previous studies employed a research design that involved the use of a survey to measure consumer attitudes and perceptions.

Recent Experience in FP Consumer Behavior Research

The last piece in the research puzzle regarding final forest product consumer behavior has been the emergence of forest certification, which is independent verification that forest management practices meet some agreed upon set of criteria. A variety of certification schemes exist and several allow for a logo, or ecolabel, to be placed on products originating from certified forests. The assumed marketing implication is that final consumers will see higher value in certified forest products because of their more “environmentally-friendly” status. Forest products marketing researchers have been busy trying to verify that assumption.

The first studies about consumer response to environmentally certified forest products (EFP's) were surveys designed to assess consumer attitudes toward EFP's and consumer willingness-to-pay for certified forest products (Winterhalter and Cassens 1994, Ozanne and Smith 1996, Ozanne and Vlosky 1997, Ozanne and Smith 1998, Gronroos and Bowyer 1999, Forsyth et. al. 1999, Ozanne et. al.

1999, Spinazze 1999, Vlosky et. al. 1999). Several of these studies also identified consumer segments likely to purchase EFP's.

Conjoint Analysis is another approach used by several researchers to determine the importance consumers place on environmental certification relative to other product attributes (Anderson and Hansen 2003a, Bigsby and Ozanne 2002, and Cooper et. al. 1996).

A third approach is qualitative focus group research, which has centered on whether consumers understand, believe, and care about the information presented on forest certification ecolabels (Teisl et. al. 2002).

A fourth approach is the direct observation of consumer behavior with respect to certified forest products. To date, no results from this type of study have been published. However, one of the manuscripts contained in this dissertation as well as Virginia Tech study conducted concurrent with this one used this approach (Anderson and Hansen 2003b, and Gomon and Smith 2003). Since research using this method is just emerging, we felt it would be of value to other researchers to provide information about our experience, so that subsequent research efforts wishing to use such a method can build upon what has already been completed and avoid pitfalls.

Research Objectives

The concept of attitude as a means of explaining social behavior first occurred in 1918 (Ajzen and Fishbein 1980). This idea has been challenged several times. Notably, LaPiere (1934) investigated racial prejudice by accompanying

young Chinese couple on a trip through the United States. They called upon 251 restaurants, hotels and other establishments. They were refused service only once. About six months after the trip LaPiere mailed a questionnaire to each establishment visited during the trip. He received 128 replies, and over 90% said they would not serve Chinese race guests in their establishment. Similarly, Festinger (1964) noted a lack of published material supporting the reasonable notion that changes in attitudes should lead to changes in behavior toward their objects. Finally, Wicker (1969) found only weak correlations in a review of studies that measured attitudes toward a psychological object and measured behavior toward those same objects. In an effort to bypass the apparent weak link between attitude and subsequent behavior, we designed a study to measure actual behavior with respect to EFP's.

The original objectives of the study were:

- Evaluate the effect of ecolabeled forest products on final consumer behavior.
- Evaluate final consumers' price sensitivity to a premium for ecolabeled forest products.
- Test for correlates between final consumer characteristics such as knowledge, attitude, and values and their purchase behavior with respect to ecolabeled forest products.

Proposed Methods

The Forest Stewardship Council (FSC) oversees and administers one of the largest forest certification schemes in the world (FSC 2003). FSC's certification scheme allows for products originating from certified forests to

display an ecolabel, a logo that can be displayed on the product or its packaging so that consumers are signaled which products originate from certified forests. Through this process, FSC is able to provide a credible guarantee to consumers that the product comes from a well-managed forest.

In our study, we wanted to observe the effect of the FSC ecolabel on consumer purchase behavior. Therefore, we designed an experiment in which two products would be placed in side-by-side bins at several lumberyards/home-improvement centers in Oregon or the Pacific Northwest. The products in each bin were to have been identical except for the following:

- Ecolabel - The research design called for the product in one bin to bear the FSC ecolabel, while the product in the other bin did not. This key difference was to have been held constant throughout the study.
- Price - We also wanted to test the effect of price on consumer behavior. Therefore, the design called for a period when the prices in each bin were equal. Second, a period when the ecolabeled product was a given percentage more expensive.

We also felt that few consumers knew what the FSC ecolabel represents, e.g. well-managed forests. Therefore, we wanted to test the effect of a point-of-purchase display near the FSC certified bin. The display featured the FSC logo and text explaining what the logo represents. This variable was manipulated between stores rather than between bins.

We expected to track sales of ecolabeled versus non-ecolabeled product using the SKU (stock keeping unit) number, of each since they would be

electronically scanned at the cash register each time a consumer bought a piece of plywood. In this manner, data was to have been captured every time a purchase was made.

Finally, we believed that each person's unique set of beliefs, values, and attitudes influenced their purchase decision. Knowledge of such information would have provided considerable insight as to why consumers behaved in a given manner. Therefore, we designed a post-purchase questionnaire to measure those items. It was to have been completed by each person after they purchased a product from one of the bins.

Significant Real World Challenges

In the process of implementing the research design, we encountered a variety of distinct challenges:

First, identifying an FSC certified product was difficult because markets for environmentally certified forest products are still in development. We wanted to study a primary forest product because, in our opinion, using a relatively featureless product eliminated potential confounding variables such as style and fashion that may have been encountered with, for example, furniture. Therefore, our initial choice was dimension softwood lumber because it is a simple product with high turnover. Locating a manufacturer capable of supplying steady quantities of FSC certified softwood dimension lumber was difficult. We used our own contacts and those of the Certified Forest Products Council to identify two main candidates. The first was unwilling to participate as a supplier because they

sort out the best lumber for export markets, thereby, rendering the remaining lumber unsuitable for retail sale. The other manufacturer was enthusiastic about the project, but their environmentally certified structural softwood is kiln-dried hem/fir. Structural softwood lumber consumers in Oregon demand green (not kiln-dried) doug-fir. This peculiarity of the local market was verified in a pilot test of the project at a Pacific Northwest chain of retail lumberyards. In 5 months only about 60 pieces of kiln-dried hem/fir lumber sold. We also unsuccessfully attempted to secure a steady supply of FSC certified pine boards.

A second problem we encountered was finding a retailer willing to participate in the study. We originally contacted a large, independent home-improvement center in Oregon. They were unwilling to participate because they carried very few certified products. Their experience with EFP's was that it was difficult find vendors capable of offering a steady supply. Thus, they felt that conducting a study in their store using EFP's would create an expectation among their customers that certified forest products were readily available while their experience was that certified forest products were subject to spotty supply (Anonymous 2001). Next, a small, local lumberyard initially agreed to participate, but later backed out claiming that 1) they did not want to take on the extra inventory needed to do the study, and 2) they did not have enough display space to place the ecolabeled and non-ecolabeled product side-by-side. After that, we secured participation with the local branch of a Pacific Northwest lumberyard chain. They too backed out when they could not find a steady supplier of FSC certified dimension lumber. We also contacted a retail distributor of hardwood

flooring and lumber, and a small chain of lumber retailers in the Los Angeles, California, but both were unwilling to participate.

Eventually we identified a product and retailer, and began conducting a pilot test. At this point a third problem emerged. Recall that we wanted to implement a post-purchase survey. This proved difficult because sales of the product were too slow to have a researcher in the store to administer the questionnaire. Therefore, we placed a stack of questionnaires at each cash register and instructed the cashiers to give a questionnaire to each customer who bought the KD hem-fir. Of the approximately twenty transactions that took place, not a single customer completed a survey. It is unclear whether the cashiers forgot to give the questionnaire to consumers or if the consumers were not willing to complete it. Our initial idea to solve this problem was to collect each customer's name and phone number or address so that we could contact them at a later point to have them complete a post-purchase questionnaire. However, such a protocol compromises the confidentiality of the survey because the responses are not anonymous. The OSU Institutional Review Board denied the proposed protocol.

Our Response

It was clear that the challenges of spotty supply of certified product and a retailer's willingness to participate were related. Therefore, rather than first identifying a certified product and then approaching a retailer, we switched our focus to finding a retailer willing to participate and then determining a product. Using this strategy, we were able to secure the participation of The Home Depot,

the world's largest home improvement retailer, and a company that gives preference to vendors capable of supplying FSC certified forest products. After discussion with personnel at their corporate offices, we decided to use a certified product that was already in their stores - $\frac{3}{4}$ " x 4' x 8' BCX grade, sanded plywood. Using the sanded plywood was a bit of a compromise because it introduced additional product differences, aside from ecolabeled and non-ecolabeled. For example, different manufacturers made the ecolabeled and non-ecolabeled plywood. Also, there were different numbers of plies in the core of the ecolabeled and non-ecolabeled plywood. We judged these differences to be relatively unimportant, but obviously, the ideal situation would have been to have the presence/absence of the ecolabel as the only physical difference between the products.

At this point two new challenges arose. First, we had anticipated being able to use electronic scanner data to track plywood sales by transaction because of the unique SKU numbers associated with each plywood type. However, we were only able to obtain sales reports for each SKU number once per week. Thus, we couldn't get the number of pieces sold per transaction. This meant that we couldn't be sure if each piece sold was an independent event. Therefore, it was possible that a single consumer, who purchased a large quantity of either type of plywood, could have skewed the results. Second, although, we had secured participation from The Home Depot and had discussions with their corporate level personnel about how to carry out the study, we needed to establish contacts

at the local stores. This proved to be another hurdle because store personnel were uninterested in additional responsibilities resulting from the project. We quickly learned that it was vital to the success of the study to establish one store employee as the person that was responsible for carrying out the logistics of the project. Chapter 2 (page 29) of this dissertation provides a more comprehensive description of the methods used and our response to the various issues.

Eventually, we were able to begin a full-scale study that directly monitored the effect of the FSC ecolabel on consumer behavior. However, we still needed to implement a survey to begin gaining insight into why there was an effect. Therefore, given our negative experience trying to implement a post-purchase survey, we instead decided to conduct a store intercept survey of consumers shopping in the lumber department. The questionnaire used a conjoint analysis design that exactly replicated the product attributes of the $\frac{3}{4}$ " x 4' x 8' BCX grade, sanded plywood. The survey also included questions about attitudes, beliefs, values, and demographics that we hypothesized to be related to the consumer's responses to the conjoint design. We did this because we felt that conjoint analysis could be used as a proxy for actual behavior. The development of the questionnaire was based on a review of the literature and a "pilot-test" conducted on nearly 300 undergraduate students at Oregon State University. Chapter 3 (page 54) of this dissertation provides a comprehensive description of the student survey and Chapter 4 (page 85) describes The Home Depot consumer survey.

Conclusions

In general, FSC certified forest products manufacturers were willing to participate in our study. Presumably, this is because they are interested in learning how consumers will respond to EFP's and because they want to find new markets for their certified material. Despite manufacturer's accommodating attitudes, the fact remains that EFP's have not significantly penetrated most forest products markets. Therefore, finding a steady supplier of a suitable product may continue to be troublesome.

Our experience was that forest products retailers were much more bureaucratic and much less willing to participate. This difference between manufacturers and retailers likely stems from the fact that we were asking retailers to do something out of their ordinary operations. For example, in some cases we were asking the retailer to bring in a new product from a new vendor, use up valuable display space on virtually identical products, and create extra work for their employees. Manufacturers, on the other hand, simply had to supply certified product to a vendor, something they were already doing. Anecdotal information from other researchers that have attempted to conduct research with forest products retailers suggests that our experience was not unique.

Although we experienced several challenges conducting research about the psychological and sociological aspects of consumer demand for forest products, we believe future research using slight modifications to the methods used in this dissertation is warranted. The most critical next step is to carefully tie behavior to

specific individuals. A method that would likely be successful is to directly observe consumer purchase behavior using the ecolabeled next to a non-ecolabeled product scenario, but have a self addressed, postage paid, post-purchase survey physically attached to the product. The advantages of such a method are:

1. The researcher can measure the attitudes, beliefs, values, etc. of the purchasers as opposed to intercepts of store consumers. This would allow a more precise determination of the psychological and sociological factors associated with each consumer's decision.
2. The consumer could complete the survey at his or her convenience.
3. It would be anonymous and therefore not compromise anyone's privacy.
4. An accurate response rate could be determined by comparing the number of units sold with the number of returned surveys.
5. When products are used where a consumer might buy multiple pieces, a question on the survey could determine how many pieces each consumer bought, thereby, addressing the independent events issue.

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Consumer Preferences for Ecolabeled Forest Products: A Quasi-Experimental Approach

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Abstract

During this quasi-experimental study, consumers at two The Home Depot stores in Oregon were offered a choice between ecolabeled $\frac{3}{4}$ " BCX grade plywood and non-ecolabeled $\frac{3}{4}$ " BCX grade plywood. Both types of plywood were nearly identical in all other respects. The project was designed to meet the following objectives: 1) determine whether retail consumers were more likely to purchase the ecolabeled or non-ecolabeled plywood when: a) the price was equal between ecolabeled and non-ecolabeled; b) the ecolabeled was priced at an approximately 2% premium over non-ecolabeled. And 2) begin exploring the effect of explanatory information about the ecolabel when it is displayed at the point of purchase. During each experimental treatment, the total quantity sold for each plywood type was recorded. The chi square goodness-of-fit test was used to determine whether the proportion of ecolabeled sold equaled the proportion of non-ecolabeled sold in each treatment. In other words, one would expect equal proportions between ecolabeled and non-ecolabeled materials if the variables *ecolabel* and *price* had no effect on purchase behavior. Results from the prices equal treatment indicated that a larger proportion of consumers purchased ecolabeled plywood than would be expected if the ecolabel had no effect. Results from the ecolabeled priced at a 2% premium treatment indicated that a larger proportion of consumers purchased the cheaper, non-ecolabeled plywood than would be expected if price and ecolabel had no effect. *Information* was another variable manipulated during the study. In one store, ecolabel information was placed at the

point of sale, to test the hypothesis that information explaining what the ecolabel represents would increase the proportion of ecolabeled sales; in the other store, there was no explanatory ecolabel information. This condition was held constant for the duration of the experiment. The results failed to show any significant effect of the information on the proportion of ecolabeled plywood sales relative to non-ecolabeled sales. These findings are important because this is the first study to empirically demonstrate that forest certification ecolabels do have an impact on consumer behavior.

Introduction

In 1992, the United Nations held a conference in Rio de Janeiro, Brazil regarding sustainable development. The program addressed an array of environmental issues and a primary outcome was the adoption of Agenda 21, a plan for achieving global sustainable development in the 21st century. In addition to Agenda 21, delegates from one hundred seventy countries signed a commitment to develop a set of international forest principles – scientifically based criteria for measuring sustainable management of forests around the globe (Crossley 1996). Thus, the stage was set for monitoring and improving the state of the world's forests.

Despite these developments, several environmental non-government organizations (ENGO's) perceived the international forest principles, existing governmental forest management policies, and consumer boycotts on various forest products to be ineffective in reducing deforestation and promoting sustainable forest management (Viana et. al. 1996). Therefore, they introduced an alternate mechanism for enhancing forest sustainability – *forest certification* – a procedure for independently identifying: 1) forests that are well managed according to predetermined ecological, economic, and social criteria; and 2) products that originate from well managed forests (Viana et. al. 1996).

Forest certification was conceived as a market-based incentive for promoting sustainable forest management under the assumption that consumers would reward those in the forest products industry capable of: 1) complying with a

given forest certification scheme's forest management criteria; and 2) offering consumers products from those certified forests. In order to function as conceived, two mechanisms were created that allow a manufacturer to differentiate certified forest products from similar non-certified products. They are: 1) *chain-of-custody auditing* – the process of verifying that wood fiber harvested from a certified forest is not mixed with non-certified wood fiber during manufacturing and distribution. Through this process, a product can be conclusively traced to its origin in a certified forest from any point in the value adding chain; and 2) *ecolabeling* – an on-product or on-packaging label that indicates it comes from a certified forest. The presence of an ecolabel allows consumers to differentiate certified products from similar non-certified products based on independently verified environmental criteria.

In 2002, the global area of forestland certified under five major certification schemes rose to just over 120 million hectares (296 million acres) (UNECE 2002). Most of this growth occurred after 2000 when several new forest certification schemes emerged (UNECE 2002). The increasing area of certified forests and subsequent availability of certified products, combined with pressure from ENGO's have caused several market intermediaries to implement purchasing policies that favor vendors capable of supplying certified forest products. Examples include retailers such as The Home Depot, Lowes, and IKEA who all prefer to buy and sell certified, ecolabeled wood products (The Home Depot 2003, Lowe's 2003, and IKEA 2003). Although few in number, these companies

are influential because they are the three largest wood buyers in the world (Rainforests 2003).

Consumer Response to Ecolabeled Forest Products

Even though several of the world's largest forest products retailers have made commitments to sourcing and selling ecolabeled, certified forest products, consumer response to such products is not completely understood. The most compelling questions to be answered include: 1) Do retail consumers prefer ecolabeled forest products? And 2) If they do, what percentage are willing-to-pay a premium for them?

To address these questions, a number of studies have surveyed various consumer groups to gauge their attitude toward EFP's (e.g. Winterhalter and Cassens 1994, Ozanne and Smith 1996, Ozanne and Vlosky 1997, Ozanne and Smith 1998, Gronroos and Bowyer 1999, Forsyth et. al. 1999, Ozanne et. al. 1999, Rametsteiner 1999, Spinazze 1999, Vlosky et. al. 1999). Generally, these studies found that consumers hold favorable attitudes toward EFP's and that consumers would likely purchase EFP's. Several used contingent valuation, a non-market method of estimating economic value, to show that a "willing-to-pay more" consumer segment exists, because depending on the type of product and the size of the premium, anywhere from 16% to 68% of consumers expressed a willingness-to-pay more for EFP's (Forsyth et al. 1999, Ozanne and Vlosky 1997, Winterhalter and Cassens 1994, Irland 1993).

Another group of studies used conjoint analysis, a widely used technique in consumer behavior studies, to model how consumers form preferences among product attributes. Ecolabeling was among the attributes examined, and these studies found that consumers prefer ecolabeled forest products to non-ecolabeled forest products (e.g. Anderson and Hansen 2003a, Bigsby and Ozanne 2002, and Cooper et. al. 1996). However, for most of the consumers surveyed, product attributes other than ecolabeling were more important when forming preferences. This means that the majority of consumers would be willing to purchase a non-ecolabeled product if it had a preferred level of a more important attribute, for example, a lower price, but no ecolabel. Finally, the conjoint studies also suggested that a “willing-to-pay more” consumer segment exists, since for such a group; the ecolabel attribute is more important than all other attributes (including price) when forming product preferences.

The range of studies described above, measured consumer attitudes toward ecolabeled forest products. Consumer attitudes are widely viewed as predictors of consumer behavior. However, the strength of the attitude/behavior linkage has long been questioned (LaPiere 1934, Smith and Swinyard 1983, Wicker 1969). Therefore, as opposed to measuring consumer attitudes with respect to EFP's, this study was designed to directly measure consumer-purchasing behavior with respect to EFP's.

Objectives

The objectives of this study were to: 1) determine whether retail consumers were more likely to purchase the ecolabeled or non-ecolabeled plywood when: a) the price was equal between ecolabeled and non-ecolabeled; b) the ecolabeled was priced at an approximately 2% premium over non-ecolabeled. And 2) begin exploring the effect of displaying explanatory information about the ecolabel at the point of purchase.

Methods

This study sought to determine the behavioral outcome when consumers are presented a choice between ecolabeled and non-ecolabeled, $\frac{3}{4}$ " x 4' x 8' BCX grade, sanded plywood. This was accomplished by displaying the ecolabeled and non-ecolabeled plywood for sale in adjacent product bins at two The Home Depot stores in Oregon. This research design (Table 1) was "quasi-experimental" because subjects were not randomly assigned to the treatment they received. Instead, they 'selected' their own treatment based on 1) choosing to shop at The Home Depot, and 2) buying ecolabeled or non-ecolabeled plywood during the study.

Table 1. Observation of Consumer Behavior Research Design.

	Treatment 3			
	Information - present explaining meaning of FSC logo Store 1 - *Albany, OR		No information - present explaining the meaning of the FSC logo Store 2 - Eugene, OR	
	BIN 1 Ecolabeled	BIN 2 Non-Ecolabeled	BIN 1 Ecolabeled	BIN 2 Non- Ecolabeled
Treatment 1 Prices equal	\$22.59/sheet	\$22.59/sheet	\$22.59/sheet	\$22.59/sheet
Treatment 2 Prices not equal	\$21.98/sheet	\$21.49/sheet	\$22.59/sheet	\$22.10/sheet
*The price per sheet of plywood changed between treatment 1 and 2 at Albany because of changing market conditions				

There were three experimental variables: 1) the presence/absence of *ecolabel*. Plywood in one bin had an ecolabel and plywood in the other bin did not. This condition was held constant for the entire experiment. 2) the relative *price* between bins. During treatment 1, the plywood in the ecolabeled and non-ecolabeled bins was equally priced. During treatment 2, the plywood in the ecolabeled bin was priced at approximately a 2% premium over that in the non-ecolabeled bin. 3) The presence/absence of *ecolabel information*. In one store, an approximately 7" x 10" display was placed on a pillar adjacent to the plywood bins. The display featured the FSC logo and the following text, "The presence of this logo is your assurance from the Forest Stewardship Council that this wood product comes from a well-managed forest". In the other store, no information was present.

If ecolabel and price had no effect on consumer purchase behavior and all other things were equal, one would assume that the proportion of total sales from each bin would be equal. A chi square goodness-of-fit test was used to test whether the observed proportion sold for each type differed significantly from the assumption of equal proportions. Any statistically significant, observed differences in the proportion of sales for each plywood type were attributed to the effect of the ecolabel or price. Similarly, if the variable *ecolabel information* had no effect on consumer purchase behavior, then one would assume that the proportion of ecolabeled and non-ecolabeled sold would be equal between stores. The chi square goodness of fit test was used to test the observed proportion of ecolabeled sold in each store against the assumption of equal proportions.

Each treatment started with 2 units or 88 sheets of non-ecolabeled plywood on hand and continued until they sold out. Thus, the duration of the treatment was determined by the sales rate of non-ecolabeled plywood. The ecolabeled plywood was an existing item for both of The Home Depot stores; which meant that it was continually restocked as part of each store's normal operating procedures. The non-ecolabeled, on the other hand, was a special order item. Thus, it had to be restocked via communication between the researcher and The Home Depot regional buying office. Because the non-ecolabeled reordering process was quite lengthy, it was not restocked during the course of each treatment. In several instances this meant that toward the end of the treatment, consumers had picked through the available stock and left only a few pieces of damaged, defective, or 'ugly' plywood in the non-ecolabeled bin. Meanwhile, the

ecolabeled bin was fully stocked. Sales results for the periods when the non-ecolabeled bin was stocked with few sheets were not included in the analysis.

The real-world nature of this study adds to its external validity and it is one of the study's strengths. However, it comes at the cost of lowered internal validity. For example, The Home Depot's inventory tracking system required that the ecolabeled and non-ecolabeled plywood be sourced from different vendors. Thus, the ecolabeled product was sourced from Roseburg Forest Products and the non-ecolabeled from Boise. Although the products were the same grade and thickness, there were several minor differences (Table 2). These differences were not controlled in the experimental design and they potentially confounded the results. However, in the analysis they were not treated as confounding factors¹.

Table 2. Uncontrolled differences between ecolabeled and non-ecolabeled plywood used to study consumer purchase behavior

Difference	Plywood Type	
	Ecolabeled	Non-ecolabeled
Number of plies	5	6
Manufacturer	Roseburg Forest Products	Boise

Both plywood types had unique SKU (stock keeping unit) numbers. This meant that every time a consumer purchased either plywood type, it was electronically scanned by a cashier and accounted for in The Home Depot's inventory tracking system. In this manner, researchers collected and retrieved data in the form of weekly sales reports for each plywood type. However, weekly, as opposed to transaction-based sales data posed a problem because we could not be

¹ See *Confounding Variables* in the limitations section for further discussion of this issue.

sure that a different person bought each piece of plywood sold, or if one person bought a large quantity of a single type. In the following analysis, each piece sold was treated as an independent event².

Predictions

The experimental design allowed testing of the following predictions:

Prediction 1: Several studies (i.e. Ozanne and Vlosky 1997, Forsyth et al. 1999) suggested that consumers possess positive attitudes relative to EFP's and would prefer to buy EFP's. Therefore, it was predicted that:

P1 *When prices are equal, the proportion of sales for the ecolabeled plywood will be greater than the proportion of sales for the non-ecolabeled plywood.*

Prediction 2: Several studies (i.e. Bigsby and Ozanne 2002, Anderson and Hansen 2003a) indicated that consumers preferred ecolabeled products to non-ecolabeled forest products, but that this product attribute was less important than other attributes such as price. Therefore, it is predicted that:

P2 *When ecolabeled plywood is priced at a premium, a greater proportion of consumers will trade off the presence of an ecolabel for lower priced non-ecolabeled plywood.*

Prediction 3: Teisl et al. (2002) found that consumers desired information about how to use and interpret forest products ecolabels. Therefore, it was predicted that:

P3 *Information about the meaning of the ecolabel at the point-of-purchase will cause the proportion of ecolabeled sales to be greater than the proportion of non-ecolabeled.*

² See *Independent Events* in the limitations section for further discussion of this issue.

Results and Analysis

Treatment 1 - Prices equal between ecolabeled and non-ecolabeled:

P1 *When prices are equal, the proportion of sales for the ecolabeled plywood will be greater than the proportion of sales for the non-ecolabeled plywood.*

Table 3 shows that 271 of 403 pieces sold during treatment 1, or 67.2%, were ecolabeled. These data provide strong evidence that a greater proportion of consumers purchase ecolabeled plywood than non-ecolabeled when prices are equal ($p < .0001$, Chi-square goodness of fit test).

Table 3. Sales trial results under equal price treatment

		Treatment 1 Prices Equal	
		Non-Ecolabeled	Ecolabeled
Eugene Information absent	Pieces sold	24	143
	Chi-square test	$p < .0001$	
Albany ³ Information present	Pieces sold	108	128
	Chi-square test	$p = .1930$	
Combined	Pieces sold	132	271
	Chi-square test	$p < .0001$	

Treatment 2 - Prices not equal. Ecolabeled priced at a 2% premium to non-ecolabeled:

P2 *When ecolabeled plywood is priced at a premium, a greater proportion of consumers will trade off the presence of an ecolabel for lower priced non-ecolabeled plywood.*

³ Examination of the data at the store level suggests a location effect. This issue is addressed in the discussion section.

Table 4 shows that 103 of 279 pieces sold during the treatment, or 36.9%, were ecolabeled. These data provide strong evidence that consumers purchase non-ecolabeled plywood to ecolabeled plywood when the ecolabeled is priced at a 2% premium ($p < .0001$, Chi-square goodness of fit test). In other words, the majority of consumers purchase cheaper, non-ecolabeled plywood instead of more expensive ecolabeled plywood.

Table 4. Sales trial results under prices not equal treatment

		Treatment 2 Ecolabeled 2% more	
		Non-Ecolabeled	Ecolabeled
Eugene Information absent	Pieces sold	88	45
	Chi-square test	$p = .0002$	
Albany Information present	Pieces sold	88	58
	Chi-square test	$p = .0130$	
Combined	Pieces sold	176	103
	Chi-square test	$p < .0001$	

Treatment 3 – Ecolabel Information present/absent

P3 *Information about the meaning of the ecolabel at the point-of-purchase will cause the proportion of ecolabeled sales to be greater than the proportion of non-ecolabeled.*

In Eugene, where there was no ecolabel information, 188 of 300 pieces of plywood sold during the experiment, or 62.7 % were ecolabeled. This compares to Albany, where 186 of 382 pieces sold during the experiment of which 186, or 48.7% were ecolabeled and ecolabel information was present. These data

provided no evidence that the presence of ecolabel information induced a greater proportion of consumers to purchase ecolabeled plywood.

Discussion

Location Effect

The results of the prices-equal treatment suggest a location effect. In Albany, consumers showed a trend toward purchasing a greater proportion of ecolabeled, but the difference was not statistically significant ($p = .1930$, Chi square goodness-of-fit test). These results were in contrast with Eugene, where consumers clearly purchased a greater proportion of ecolabeled plywood when prices were equal. Aside from attributing the observed difference between towns to random variation, a possible explanation is that consumer beliefs, attitudes, and values, which all influence behavior; differ between these two towns. Table 5 illustrates differences between Home Depot consumers in each town (Anderson and Hansen 2003b). US census data (US Census Bureau 2002) also revealed educational differences between these two towns. For example, 43.6 percent of Albany residents had a high school or less education. This compared to 35.0 percent of the Eugene residents. In addition, 18.3 percent of Albany residents possessed a bachelors or graduate degree, compared to 29.2 percent of Eugene residents. Given the Census data and the survey results, one could tentatively assume that Eugene consumers were 'greener' than Albany consumers, and therefore, they were more likely to purchase ecolabeled plywood.

The possibility that Albany consumers differed from Eugene consumers also suggests that treatment 3 - the presence/absence of ecolabel information in each store, was confounded by location. It was hypothesized that ecolabel information would have a positive effect on ecolabel sales. However, the information was displayed in Albany, where one could assume the typical consumer was less green. Therefore, it is possible that the hypothesized positive effect of explanatory information in Albany could not overcome the effect of ‘greener’ attitudes and behavior in Eugene.

Table 5. Comparison between Eugene and Albany Home Depot consumers

Variable	Eugene <i>n</i> = 158 Mean	Albany <i>n</i> = 146 Mean	<i>p</i> - value (independent samples t-test)
<i>Political affiliation</i> (1= very liberal; 7 = very conservative)	3.94	4.33	.028
<i>Willingness to pay more for and EFP</i> (1 = 0%, 2 = 5%, 3 = 10%, 4 = 25%, 5 = 50%, and 6 = more than 50%)	2.23	1.88	.001
<i>Purchase organic foods</i> (1= never; 7 = always)	3.39	3.03	.062
<i>Environmental Purchase Behavior</i> (sum of 4 item scale; higher score indicates greater tendency to purchase environmentally friendly products)	16.34	15.48	.158
<i>Recycling</i> (1= never; 5 = always)	5.83	5.62	.206

The size of the consumer segment that is “willing-to-pay more” for EFP’s

A series of national studies have consistently shown that a segment of the US population is “true blue” greens. They compose less than 10% of the population, but they are deeply concerned about the environment and are willing to take action on their concern, in part, through the purchase of eco-friendly

products (Roper Starch Worldwide 2003). During the ecolabeled priced at a premium treatment, ecolabeled sales accounted for a significant proportion (36.9%) of all pieces sold. This “willing-to-pay more” proportion of the sample is within the range found in other studies specific to ecolabeled forest products, yet, it is larger than the 10% of the general population deemed to be “true blue” greens who are willing to act on their environmental concern. Thus, it is likely that the 2% premium was within a willingness-to-pay threshold for many consumers. It is also likely that the size of this ‘eco-friendly’ segment would shrink as the size of the premium for ecolabeled products increased. For manufacturers and retailers there may be some optimal premium level, which allows full or partial recovery of certification costs, yet is low enough that a substantial percentage of consumers are willing-to-pay the premium. Future experiments, with a greater number of treatments, can test consumer sensitivity to a range of ecolabeled price premiums.

Consumer Choice

Bettman (1979) characterizes consumers as wishing to attain some goal, which they attempt to meet by interacting with the choices available in their environment. Thus, the concept of choice is a key theme in the consumer decision-making process. Bettman (1979) also suggested that consumer decision processes are influenced, in part, from external sources of information, e.g. price, ecolabel, and point-of-sale display information. The placement of identical products in side-by-side bins was required to test the effect of the experimental variables. This is because the side-by-side placement offered consumers a

convenient basis of comparison. However, such a scenario is not the norm in most retail lumberyards. In fact, the high cost of retail floor space means that once a consumer decides to enter a given store, they generally have very few choices available within a product class, e.g. there is normally only 1 type of $\frac{3}{4}$ " sanded plywood available at The Home Depot. This suggests that a store, which offers an EFP and no other alternatives in a given product class, may be able to command a small price premium because the consumer has no readily available basis of comparison. Collins Pine, one of the ecolabeled forest products market pioneers, successfully used this exclusive distribution strategy with several of its ecolabeled forest products (Quinn 2003).

Limitations

Confounding Variables

The plywood product in each bin had differences aside from those controlled in the experimental design, i.e. different manufacturers and a different number of plies. It was assumed that these were of little importance compared with the treatment variables – ecolabel and price.

In a survey of over 300 The Home Depot consumers at the Albany, OR and Eugene, OR stores, conjoint analysis revealed that the product attribute, manufacturer, carried only 12% of the importance relative to other product attributes in forming preferences for plywood panels (Anderson and Hansen 2003b). Thus, there is evidence that manufacturer is not an important product

attribute. More troublesome is the differing number of plies issue. Conjoint analysis revealed that the number of plies was the second most important attribute after certification status, carrying about 27% of the relative importance compared to 42% for certification (Anderson and Hansen 2003b). In contrast, Schwager (2002) and Pinski (2002) downplayed the importance of the number of plies, asserting that for the typical do-it-yourself The Home Depot customer, the number of plies is not a highly important attribute.

Independent events

Each store was only able to provide the total number of pieces of each plywood type sold per week. Thus, there is no way of knowing, for example, if the 30 pieces of ecolabeled plywood sold in week 3, were purchased by 30 different consumers, 1 consumer, or any combination in between. The Home Depot personnel were questioned to address this issue, and they described the typical sales pattern of $\frac{3}{4}$ " BCX grade, sanded plywood as being not 'lumpy' (Schwager 2003). This means that, because this plywood grade is typically used by do-it-yourselfers in "project" type applications, it is unusual for a single customer to purchase large quantities of the product. This is in contrast to unsanded CDX grade $\frac{3}{4}$ " plywood also sold at The Home Depot, which is typically used in construction applications and therefore is commonly sold in large quantities. During data analysis, the assumption was made that each sheet sold represented a single sale. Despite the assumption, the results appear fairly stable. For example, since the calculation of p -values in significance tests is sample size dependent, if

one were to assume that for each treatment the mean number of sheets sold per transaction were ten, then the difference in proportion of ecolabeled and non-ecolabeled sold is still significant at $\alpha = .05$ (chi square goodness of fit test).

No follow-up questionnaire

The original study design called for consumers to complete a questionnaire after purchasing either type of plywood. The questionnaire data would have provided insight about consumer motivations in their choice between ecolabeled and non-ecolabeled plywood; information that could have been valuable to those seeking to formulate an ecolabeled forest product marketing strategy. This part of the design was dropped after pilot tests showed that very few consumers were willing to take the time to complete the questionnaire at the store. An alternative would have been to collect each consumer's contact information and then administer the survey by phone or mail. However, it was not possible to collect consumer contact information because of privacy issues. An improvement for subsequent research designs might be to place a survey and self-addressed-stamped-envelope on each product (or inside product packaging) so that the consumer could complete and return it at their convenience. Such a strategy would also address the independent events issue because the questionnaire could include a question about the quantity purchased.

Conclusions and Managerial Implications

The results of this study demonstrate that: 1) a majority of consumers purchased ecolabeled plywood when there was no price premium; 2) a majority of consumers purchased non-ecolabeled plywood when a 2% ecolabeled price premium was introduced; 3) explanatory information about the meaning of the ecolabel does not necessarily influence the proportion of ecolabeled product sold.

When the ecolabeled plywood was priced at a 2% premium, it accounted for a sizable proportion (37%) of the pieces sold. This occurred despite the fact that: 1) a cheaper and nearly identical alternative was available only a few feet away, and 2) price was found to be the most important purchase decision factor for forest products (Forsyth et al. 1999). Thus, a key managerial implication that can be drawn from this finding is that manufacturers and retailers may be able to obtain a small price premium for ecolabeled forest products when they are sold under normal retail conditions, e.g. when consumers have no convenient basis of price comparison. A second managerial implication is that manufacturers/retailers offering ecolabeled forest products priced at the prevailing market conditions should be able to increase their market share relative to non-ecolabeled competing products. This is because consumers purchased a statistically significant, larger proportion of ecolabeled product when it was equal in price with the non-ecolabeled product.

This exploratory study focused on a limited geographic area and a single forest product. It is likely that the results would have varied with changes in one or both of these factors. For example, a replication of this study using wooden furniture, would introduce intangible product attributes such as fashion, style, and

artistic quality. Therefore, results from such a study would likely differ from the results of this study, which used a relatively featureless, commodity-like plywood product. Thus, application of these results to any broader population or other ecolabeled forest products is speculative; further research across a range of products and locations is needed to produce more generalizable information about the effect of ecolabels on forest product consumer behavior.

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Segmenting Consumers of Ecolabeled Forest Products

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Abstract

It is widely believed that consumers evaluate and purchase products based on their attitude toward the various attributes a product possesses. Therefore, the objectives of this research were to: 1) evaluate the preference for, and relative importance of, the product attribute environmental certification. 2) Segment respondents into two groups – those most likely to purchase ecolabeled forest products (EFP's) and those not likely to purchase EFP's. 3) Identify demographic, psychographic, and behavioral variables associated with those identified as most likely to buy EFP's. The results indicate that for ¾" panels of sanded plywood, the typical respondent preferred ecolabeled to non-ecolabeled and rated it the most important attribute. Thus, we found that most consumers held strong, positive attitudes toward the product attribute environmental certification. However, the preference for, and importance of, the ecolabel varied significantly among individuals. Therefore, we identified a segment comprised of about 50% of the respondents that would be most likely to buy EFP's. We also determined that members of this segment were more likely to be: willing to pay extra for EFP's, younger, politically liberal, more likely to have engaged in past environmentally friendly purchase behavior, and more likely to believe environmental information displayed on products. Such information can be used to develop effective product positioning strategies.

Introduction

In the last four decades, environmental degradation has become a significant social concern (Wellford and Starkey 1996). Environmental issues such as global warming, pollution, and world population growth are featured prominently in the media. Stisser (1994) pointed out that society's rising level of concern about such issues has market implications. For example, a series of national surveys have shown that increasing numbers of Americans consider themselves green consumers, e.g. those that consider a product's environmental attributes/impact in their purchase decision. Accordingly, many manufacturers have taken note of the trend, and green products have become pervasive (Ottman 1998).

In the case of the forest products industry, social concern about environmental degradation has focused on deforestation, illegal logging, and forest sustainability (WWF 2003). To begin proactively addressing these forest related environmental issues, environmental non-government organizations (ENGO's) introduced the concept of forest certification during the mid 1990's (Hansen and Juslin 1999). In essence, environmental forest certification is a process by which an independent third party verifies that a forest landowner's forest management practices are sound.

In order to communicate a forest landowner's commitment to sound forest management to consumers, ecolabels are an additional component of third-party forest certification programs. They are an on-product, or on-packaging

trademark, whose presence is intended to inform consumers that ecolabeled products (i.e. lumber, paper, plywood, etc.) are derived from environmentally certified forests. Since ecolabeled forest products (hereafter called EFP's) are judged to possess enhanced environmental attributes compared to non-ecolabeled forest products, the underlying assumption is that some consumers will discriminate their purchases in favor of EFP's. Indeed labels have been shown to have an effect on consumer behavior. For example, the presence of unit price labels on retail shelves caused relatively low price conscious consumers to become more price conscious (Miyazaki et al. 2000). Less clear is the impact of ecolabels. Hartman (1996) notes that the Recycling Seal is the only one of the environmental seals of approval that has widespread recognition and is regarded as a positive influence on consumer behavior.

Thus, the obvious question is – have consumers responded positively to ecolabeled forest products? At the actual purchase behavior level, the empirical evidence is limited, but it corroborates the assumption that most consumers would prefer EFP's, as long as they do not carry a price premium (Anderson and Hansen 2003a, Gomon and Smith 2003). Thus, given the limited, but demonstrated existence of a market for EFP's, a logical next step from a marketing perspective is consumer segmentation to identify EFP target markets. Although this has already been done in several studies, (Anderson and Hansen 2003b, Bigsby and Ozanne 2002, Forsyth et al. 1999, Ozanne and Smith 1998, Ozanne and Vlosky 1997) we present an alternate method for identifying a target market that builds on the Anderson and Hansen (2003b) work.

Market Segmentation

Market segmentation, a term first coined by Smith (1956), is one of the most talked about and acted on concepts in marketing (Green and Krieger 1991). Semenik and Bamossy (1995) define it as the process of taking the total heterogeneous market and breaking it into smaller submarkets that are more homogeneous. Green and Krieger (1991) offer a more detailed explanation of the concept:

- Market segmentation presupposes heterogeneity in buyers' preferences (and ultimately choices) for products/services.
- Preference heterogeneity for products/services can be related to person variables, situational variables, or their interactions.
- Companies can react to (or possibly produce) preference heterogeneity by modifications of their current product/service attributes, distribution, and advertising/promotion.
- Companies are motivated to do so if the net payoff from modifying their offerings exceeds what the payoff would be without such modification.
- A firm's modification of its product/marketing mix includes product line addition/deletion decisions as well as the repositioning of current offerings.

Wind (1978) identified two general approaches that have been applied to market segmentation. They are: 1) a priori – the researcher chooses a variable (or variables) of interest and then classifies buyers according to the designation. In this type of segmentation, the number of segments, their relative size, and their description are known in advance (Green and Krieger 1991). 2) Post hoc – the researcher chooses a set of interrelated variables, measures them for each person,

and then classifies respondents into groups based on the similarity of the measured variables. In this type of segmentation, the number of segments, their relative size, and their description are determined after the fact (Green and Krieger 1991). In most market segmentation studies, an individual appears in one and only one segment (Green and Krieger 1991).

Wedel and Kamakura (1998) identified six criteria, frequently mentioned in the literature, which can be used to determine the effectiveness of segmentation strategies. They are: 1) identifiability – the extent to which a firm can identify distinct customer groups with easily measured variables. 2) Substantiality – the degree to which the identified market is large enough to profitably target. 3) Accessibility – the degree to which a firm can reach the target market through promotion and distribution. 4) Responsiveness – the degree to which a target segment uniquely responds to marketing efforts. 5) Stability – the degree to which an identified segment remains consistent in composition and behavior over time. 6) Actionable – the degree to which identification of target segments provides guidance for decisions on the effective specification of marketing instruments.

A key benefit arising from effective market segmentation efforts is the strategic insight gained when one compares the product offering/marketing mix to the identified market segments. Green and Krieger (1991) submit that this is done in two stages. First, a researcher/firm assesses how the identified segments differ in terms of product attribute preferences (or other aspects of the offerings that relate to buyer choice). Second, the researcher/firm considers the implications of preference heterogeneity for: 1) changing the firm's current offerings; 2) reaching

selected segments; and 3) evaluating whether the contemplated changes are profitable. This last point is important because it implies that these strategic considerations are done in the context of competing products.

Market Segmentation by Environmental Preferences

Identifying a target market is essential for any firm adopting a green marketing strategy. To this end, a number of academic and consultant studies have attempted to identify and characterize green consumers using demographic and psychographic variables. Perhaps the best known of these is the *Green Gauge Report*, which is published annually by Roper Starch Worldwide. This report has identified five consumer segments including: 1) True Blue Greens – those most committed and likely to act on their environmental concerns. They are approximately 9 percent of the population and tend to be more highly educated and regularly access the Internet. 2) Greenback Greens – those willing to pay the most for green products. They are about 6 percent of the population and although they don't have the time and inclination to act totally green, they are willing to act in accordance with their ideology. 3) Sprouts – those considered to be environmental fence sitters because they are concerned about the environment only with respect to specific issues. They make up about 31 percent of the population. 4) Grouzers – this segment is very uninvolved in environmental issues. They make up about 19 percent of the population and typically believe that environmental problems are too big for them to solve through changes in their personal behavior. 5) Basic Browns – this group believes that environmental

indifference is mainstream. They comprise about 33 percent of the population and tend to be lower income, blue collar, and less educated.

Market Segmentation for EFP's

Bigsby and Ozanne (2002) identified four market segments for wood outdoor furniture in New Zealand using a conjoint analysis and cluster analysis technique. They concluded that two segments, or about 58 percent of the sample, placed a high value on environmental attributes. Demographic information about the respondents in each segment did not provide a thorough basis of identification or description. Forsyth et al. (1999) surveyed 300 home-improvement store consumers in British Columbia using a multiattribute model of a forest product to determine the importance of three environmental attributes relative to eight other product attributes. From that data, they identified four market segments using cluster analysis. They concluded that respondents in two of the identified clusters (about 40 percent of the respondents) would be most likely to purchase EFP's. However, they were unable to conclusively differentiate between the segments based on gender, age, occupation, and place of residence. Ozanne and Smith (1998) conducted a national survey of single-family homeowners. They created a seven-item scale consisting of two dimensions to measure consumer attitudes toward EFP's. From that data, they identified six relatively homogenous market segments using cluster analysis. They concluded that one segment of about 25 million Americans would most likely seek EFP's. Relative to the other study respondents, members of this segment were described as politically liberal,

Democrats, female, members of an environmental organization, fairly well educated, concerned about the environment, and having high levels of self-reported environmental knowledge. Ozanne and Vlosky (1997) surveyed US homeowners, using the same seven item scale to measure of attitude toward EFP's, but extended the Ozanne and Smith study by identifying those willing-to-pay a price premium for a range EFP's. They identified a segment of about 16.5 million Americans that would most likely seek out and buy EFP's priced at a premium. Relative to the other respondents, members of this segment were described as politically liberal, a member of both the Democratic Party and an environmental organization, and most likely female.

Objectives

The area of forestland environmentally certified continues to grow despite the fact that the impact of forest certification ecolabels on consumer behavior is not fully understood. Therefore, the three main objectives of this study were to: 1) Assess respondent preferences among four plywood product attributes, with special attention on the relative importance respondents place on environmental certification. 2) Segment respondents into two groups a) those who rate environmental certification as an important product attribute, and b) those who rate environmental certification as an unimportant product attribute. 3) Identify a set of explanatory variables useful for predicting segment membership. Such a model is useful, since we believe that respondents who place the highest importance on environmental certification represent a target market for EFP's.

Methods

Conceptual Framework

It is widely accepted that products are comprised of attributes that extend beyond the physical product (Levitt 1986, Sinclair 1992, Juslin and Hansen 2002). It is also widely believed that consumers evaluate and decide to purchase products based on their attitudes toward the product attributes they deem important (Fishbein and Ajzen 1975). Thus, it is useful to understand consumer attitudes with respect to the product attribute, environmental certification.

Attitudes have been defined as an enduring positive or negative evaluation of an object (Ajzen 2001, Petty et al. 1997, Eagly and Chaiken 1993). From this definition, we infer that attitudes have a valence. It is also known that attitudes can be held more or less strongly (Sengupta and Johar 2002). Thus, we also infer that attitudes have a relative importance. Given this information about attitudes, we suggest that conjoint analysis can be used to estimate the valence and relative importance of consumer attitudes toward the product attribute, forest certification.

Ajzen (1991) advanced the theory of planned behavior, which holds that people act in accordance with their intentions, which are determined by an interaction of their attitude toward the behavior, subjective norms, and their perceived control over a behavior. Thus, according to the theory, attitudes can be used to predict behavior (Ajzen 1991). Ajzen (2001) suggests that strongly held attitudes are thought to be stable over time, difficult to change, and less likely to be changed by situational factors, therefore they are better predictors of behavior.

Following this line of reasoning, we suggest that the measurement of attitude toward the product attribute, forest certification, as achieved through conjoint analysis, can be used to identify those most likely to purchase EFP's.

Given the assumption that our measurement of attitude can be used to segment consumers, it becomes useful to identify demographic, psychographic, and behavioral variables significantly associated with one's attitude toward the forest certification product attribute because such information can be used to make strategic marketing decisions. Therefore, we reviewed the major conceptual literature in the consumer behavior and environmental consumer behavior areas. From this review, we hypothesized that the demographic, psychographic, and behavioral constructs depicted in **Figure 1** are correlates of consumer's attitude toward the forest certification, product attribute.

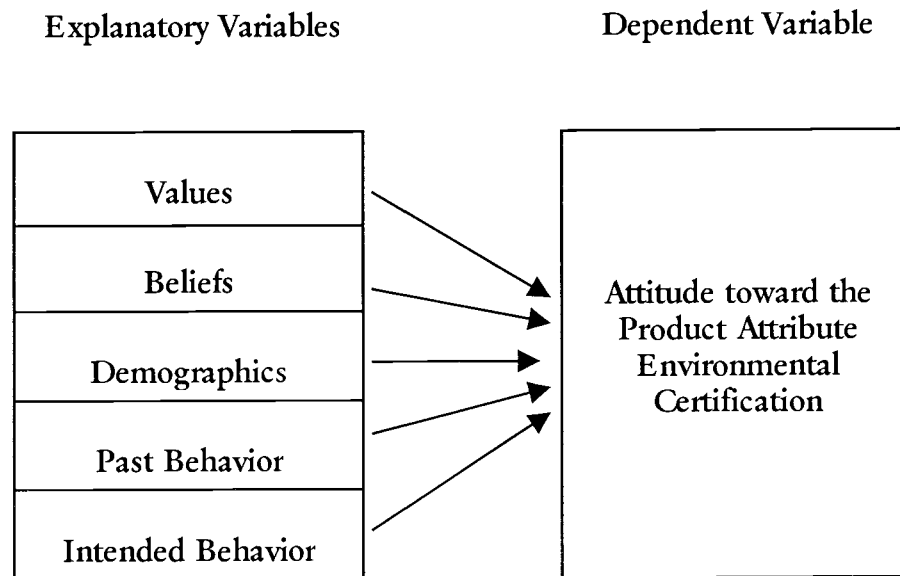


Figure 1. Independent-effects, conceptual model of correlates to attitude toward the product attribute environmental certification

Hypothesized Correlates to Respondent Attitudes

Values – Rokeach (1973 p.5) defined a value as “an enduring belief that a specific mode of conduct is personally or socially preferable to an opposite or converse mode of conduct or end state of existence.” Kahle (1996) stated that values were the most abstract form of social cognition that individuals used to guide behavioral responses to classes of stimuli. Thus, according to Kahle (1996), similar to attitudes, but at a more abstract level, it is believed that individuals use values to guide their behavior. Homer and Kahle (1988) demonstrated that values were causally linked to attitudes. Given the theoretical and empirical linkage between values and attitudes we hypothesized that values are correlated with the

consumer attitudes toward the product attribute, environmental forest certification.

Beliefs - Attitudes have been widely conceptualized as having three components: 1) cognition – the beliefs an individual has about an object; 2) affect – the feelings an individual has about an object; and 3) behavior – the intention an individual has to do something about an attitude object (Solomon 2002). Although attitudes can be formed through different sequences of these three components, it is assumed that most attitudes form in the following manner: First, a person forms beliefs (cognition) about an attitude object. Second, a person subjectively evaluates his or her beliefs and forms a feeling for the object (affect). Third, a person forms an intention to act in some manner with respect to the object. Finally, the person engages in a relevant behavior toward the object (Solomon 2002). Therefore, given the theoretical importance of beliefs in the formation of attitudes, we used a variety of scales to measure the beliefs that consumers hold regarding environmental forest certification.

Intended Behavior – Early efforts at predicting behavior from attitudes focused on measuring a consumer's attitude toward a product (Azjen and Fishbein 1980). Such models were later adapted to reflect intended behavior as an intermediate step between attitude toward an object and behavior toward that object (Azjen 1991). Therefore, we included a measure of intended behavior with respect to the purchase of EFP's as an explanatory variable.

Past Behavior - Festinger's (1957) cognitive dissonance theory stated that when a person is confronted with inconsistencies between his or her attitude and

behavior, he or she will take some action to resolve the dissonance between the attitude and behavior. We applied this concept by measuring past behavior with respect to the purchase of other environmentally friendly products. We hypothesized that those displaying past environmentally conscious purchase behavior were more likely to have a strongly held positive attitude toward the product attribute environmental certification so that they maintain consistency between their past behavior and their attitude toward the product attribute environmental forest certification.

Demographics - Demographics are used to describe a population's structure in terms of its age, income, education, and occupation (Hawkins et al. 2001). These types of variables are useful in segmenting markets and identifying consumer behavior trends across large groups of consumers. However, at the individual level they often lack significant correlation with observed attitudes (Ozanne and Bigsby 2002). Despite this observation, we included them in our model because of their ease of acquisition, usefulness in segmentation (when significant), and stability over time.

Operationalizing the Conceptual Model

Survey Instrument - to operationalize the theoretical constructs depicted in **Figure 1**, we created a questionnaire that was divided into two sections – a *dependent* measure and several *explanatory* measures

Dependent Variable

In the first section of the survey, respondents were asked to imagine they were purchasing a piece of plywood, while considering the product attributes – price, manufacturer, number of plies in the panel, and environmental certification. For each of the attributes, two levels were defined. For example, a panel with five plies or six plies. A definition was given for each level of each attribute on the questionnaire. The attributes were selected based on their relevance to study objectives and the degree of prominence in product literature (APA 2002). The attribute levels were specified to duplicate those of existing product offerings at big-box type, home improvement centers.

Eight hypothetical versions of a piece of sanded plywood, each with differing levels of the attributes, were created using a fractional, orthogonal conjoint design. This conjoint design was presented to the respondents as shown in **Figure 2**. The task of each respondent was to rank the eight versions of a piece of plywood in order from most to least desirable. This scenario of comparing different versions of similar products is thought to realistically recreate the purchase process a consumer encounters in real life (McCullough, 2002). Statistical analysis of each respondent's rankings yields the valence and relative importance they place on each of the four product attributes. We used each respondent's relative importance ranking for the attribute environmental certification as a criterion for classifying respondents into one of two categories: 1) those that rated environmental certification as highly important, and 2) those that

rated the attribute not highly important, thereby, creating a binary dependent variable.

Card A Rank_____ Price: \$22.59/sheet Certification: environmentally certified Core: 5 ply Manufacturer: Roseburg Forest Products	Card E Rank_____ Price: \$22.10/sheet Certification: environmentally certified Core: 5 ply Manufacturer: Boise Cascade Corporation
Card B Rank_____ Price: \$22.10/sheet Certification: not environmentally certified Core: 6 ply Manufacturer: Boise Cascade Corporation	Card F Rank_____ Price: \$22.59/sheet Certification: not environmentally certified Core: 6 ply Manufacturer: Roseburg Forest Products
Card C Rank_____ Price: \$22.59/sheet Certification: not environmentally certified Core: 5 ply Manufacturer: Boise Cascade Corporation	Card G Rank_____ Price: \$22.10/sheet Certification: environmentally certified Core: 6 ply Manufacturer: Roseburg Forest Products
Card D Rank_____ Price: \$22.10/sheet Certification: environmentally certified Core: 6 ply Manufacturer: Roseburg Forest Products	Card H Rank_____ Price: \$22.59/sheet Certification: environmentally certified Core: 6 ply Manufacturer: Boise Cascade Corporation

Figure 2. 8 Hypothetical pieces of sanded plywood with systematically varied attribute levels

Explanatory Variables

The second part of the questionnaire measured the explanatory variables that we hypothesized to be correlated with the relative importance consumer's place on environmental certification. We operationalized the explanatory variables through a series of Likert-type scales, most of which were adapted from previous studies. The variables, scales, and their reliability as determined from this study (where appropriate) were as follows:

Values

LOV (List of Values) – Respondents reported how important 9 values were in their daily life and then selected one value from the list of nine that was most important. Cronbach's Alpha = .90. From Kahle and Kennedy (1988).

Altruism – Respondents reported how likely they would be to engage in six specific behaviors that can generally be described as helping someone in need. The scale used for each item was 1 = I wouldn't do this and 7 = I would do this. A composite score for this variable was computed by summing the items in the construct. Cronbach's Alpha = .74. Adapted from Rushton, Chrisjohn, and Fekken (1981).

Beliefs

Environmental Concern – Respondents answered four questions regarding their level of concern for the state of the natural environment. The scale used for each item was 1 = agree and 7 = disagree. A composite score for

this variable was computed by summing the items in the construct.

Cronbach's Alpha = .88. Adapted Dunlap and Van Liere (1978).

Perceived Consumer Effectiveness – Respondents reported the degree to which they believed their individual actions as consumers affected the state of the natural environment. The scale used for each item was 1 = agree and 7 = disagree. A composite score for this variable was computed by summing the items in the construct. Cronbach's Alpha = .63. From Straughan and Roberts (1999).

Understanding of Environmental Certification – Respondents reported whether or not they understood why products were environmentally certified. The scale used for this item was 1 = agree and 7 = disagree. Single item scale, from Ozanne and Vlosky (1997).

Importance of Environmental Packaging – Respondents reported their attitude about the importance of displaying environmental information on product packaging. The scale used for this item was 1 = agree and 7 = disagree. Single item scale, developed for this study.

Credibility of Environmental Packaging – Respondents reported their attitude about the credibility of environmental claims made on product packaging. The scale used for this item was 1 = agree and 7 = disagree. Single item scale, developed for this study.

Awareness of Forest Certification – Respondents reported whether they had heard of forest certification prior to completing the questionnaire. The

response choices were either 1 = yes; 2 = no. Single item scale, developed for this study.

Knowledge of Forest Certification – Respondents reported their personal level of knowledge about forest certification on a scale from 1 = know nothing about and 7 = know a great deal about. Single item scale, developed for this study.

Knowledge of Environmental Issues – Respondents reported their knowledge of five general environmental issues - acid rain, world population growth, global warming, pollution from pesticides, and destruction of the rain forest. The scale used for each item was 1 = know nothing about and 7 = know a great deal about. A composite score for this variable was computed by summing the items in the construct. Cronbach's Alpha = .94. Developed for this study.

Political affiliation – Respondents reported their political affiliation on a scale where 1 = extremely liberal and 7 = extremely conservative. Single item scale, from Ozanne and Vlosky (1997).

Intended Behavior

Willingness to pay (WTP) - we asked each respondent to assume that they were going to purchase a $\frac{3}{4}$ " x 4' x 8' piece of plywood that cost \$20. We then asked them how much more they would be willing-to-pay for the plywood if it were environmentally certified. Their response choices were: 0%, 5%, 10%, 25%, 50%, and more than 50%. Adapted from Ozanne and Vlosky (1997).

Past Behavior

Items for both of these measures were adapted from Cooper et al. (1996).

Engagement in Environmentally Friendly Behavior – Respondents reported their engagement in three environmentally friendly behaviors including – recycling, joining/supporting an environmental organization, and boycotting purchases from specific companies whose products damage the environment. The scale used for each item was 1 = never and 7 = always. Cronbach's Alpha = .70. Developed for this study. A composite score for this variable was computed by summing the items in the construct.

Engagement in Environmentally Conscious Purchase Behavior – Respondents reported how often they intentionally purchased organic fruits and vegetables, recycled paper products, environmentally friendly detergents, and products not tested on animals. The scale used for each item was 1 = never and 7 = always. A composite score for this variable was computed by summing the items in the construct. Cronbach's Alpha = .76. Developed for this study.

Demographics:

Demographics – respondents reported their gender, age, income, education, and whether they were a professional contractor or a do-it-yourselfer.

Data Collection

The sample frame in this study consisted of lumber department consumers at two The Home Depot stores in Oregon. This group was chosen because big

box type, home improvement centers have become important outlets for forest products. For example, according to former The Home Depot CEO, Arthur Blank, the company is the world's largest home improvement retailer and accounts for about 10% of all lumber sold worldwide (Blank 1999).

Data were collected for this research through a self-administered questionnaire, which was adapted from a questionnaire used in a previous study of college students (Anderson and Hansen 2003b). Several minor changes improved the questionnaire, making it shorter and easier to complete.

During the Fall of 2002, researchers intercepted consumers shopping in the lumber department at the two The Home Depot stores. Potential respondents were approached by researchers and asked to complete a questionnaire. All data was collected on Saturdays.

Respondent profile

A total of 378 questionnaires were completed, of which 303 or 80.1% were usable. The unusable questionnaires were either incomplete (50 questionnaires) or incorrectly completed (25 questionnaires). Since the data was collected at stores in two cities, t-tests were performed to check if the responses differed by location. At $\alpha \leq .05$, there were no significant differences in the average relative importance for any of the product attributes. Among the explanatory variables, willingness-to-pay was the only variable that was significantly different at $\alpha \leq .05$. Since comparisons were made on over twenty explanatory variables, this difference

could have occurred by chance. Therefore, data from both locations were combined into a single data set.

Nearly 62% of respondents had never heard of the concept of forest certification prior to completing the questionnaire. Of those that had heard of certification, the majority were familiar with the concept because they were employed in the forest products industry. The mean self-reported knowledge level of forest certification was 2.74 (SD = 1.57) on a scale where 1 = know nothing about and 7 = know a great deal about. Table 6 provides a summary of the demographic characteristics of the respondents.

Table 6. Summary of the sample's demographic characteristics.

Characteristic	Frequency (n = 303)	% of sample
Type of Respondent		
DIY	278	91.7
PRO	25	8.3
Gender		
Male	214	70.6
Female	83	27.4
Not specified	6	2.0
Household Income		
Less than \$20,000	25	8.3
\$20,000 to \$40,000	47	15.5
\$40,001 to \$60,000	89	29.4
\$60,001 to \$80,000	62	20.5
\$80,001 to \$100,000	40	13.2
Greater than \$100,000	33	10.9
Not specified	7	2.3
Education		
High school	35	11.6
Some college	106	35.0
College graduate	99	32.7
Graduate degree	59	19.5
Other	4	1.3

Methods of Data Analysis

Conjoint Analysis

We followed the customary, disaggregate approach to interpreting conjoint analysis, or in other words, a preference structure was modeled for each respondent (Hair et al. 1995). We also assumed that the overall utility for each of the hypothetical plywood products was an additive function of the four product attributes that we defined, and that these evaluations are interval level data (Louviere, 1988). Thus, from the ranking data provided by respondents, part-worth values were estimated by ordinary least squares regression. Given the assumption of additivity, it was necessary to assess the fit of the model for each respondent. This was accomplished by eliminating those respondents whose R^2 value was lower than 0.80. In other words, for the individuals with an R^2 value less than 0.80, the specified factors and levels did not sufficiently explain the preference structure. This model assessment procedure resulted in the elimination of 6.6 percent (25) of the questionnaires from the analysis. Next, the part-worth estimates were used to calculate the relative importance for each attribute. The interested reader should see (Hair et al. 1995) for further explanation of these procedures.

Binary Logistic Regression

Our objective in this phase of the analysis was to identify a parsimonious set of variables useful for predicting which respondents rated environmental

certification as a highly important product attribute and those that rated it not important. To meet this objective we followed the logistic regression model building strategy suggested by Hosmer and Lemeshow (2000), in which they state that the decision to begin the model with all possible variables depends on the overall sample size and the number in each outcome group relative to the total number of candidate variables. Each of these factors were not issues for this data set because the sample size was large relative to the number of explanatory variables and the number of respondents in each group was also large. Therefore, we used maximum likelihood, backwards-stepwise (likelihood ratio) binary logistic regression to identify which explanatory variables were significantly associated with group membership.

Binary logistic regression is a multivariate statistical procedure used to predict a dichotomous dependent variable from a set of dichotomous or polytomous independent variables (Hosmer and Lemeshow 2000, Hair et al. 1995). An alpha-to-enter value of .01 and an alpha-to-exit value of 0.05 were used. These procedures identified general patterns within the entire set of observations. However, several issues for this type of data analysis must be addressed. First, respondents that did not provide data for all of the explanatory variables were excluded from the analysis. Thus, the regression was adjusted on only 270 of the 303 respondents in the estimation group. Second, the data was univariately examined for cases where an explanatory variable completely separates the outcome group. In other words, if we know the value of such an explanatory variable then we know the group membership. Second, the data was assessed for

the presence of “influential” observations. This was accomplished by adjusting an initial regression, and then using studentized residuals to identify outliers greater than three standard deviations from the mean. No potentially influential observations were found. Finally, multicollinearity, which is correlation among explanatory variables, was assessed through an examination of a correlation matrix. Hair et al. (1995) suggest that correlations greater than 0.90 indicate multicollinearity. None of the correlations was greater than 0.65. SPSS statistical software version 11.0 was used for the analysis.

Results

The Relative Importance of Environmental Certification

Table 7 indicates the part-worth estimates from our sample. We performed these calculations in aggregate, e.g. all respondents as one group, and on four subgroups. Each subgroup was comprised of the respondents that rated a particular product attribute as their most important. The part-worth scores indicate the preferred levels of each attribute, e.g. a negative value indicates the level is not preferred and a positive value indicates the level is preferred. Table 7 shows that the aggregate and subgroups all preferred the following levels of each attribute: the lower price, environmentally certified, six plies, and Roseburg.

Table 7. Part worth & relative importance estimates from overall group, price, certification, core, and manufacturer groups.

Attribute	Levels	All Respondents n = 287		Price Group n = 35		Certification Group n = 177		Core Group n = 58		Manufacturer Group n = 17	
		Part worths	Relative Importance	Part worths	Relative Importance	Part worths	Relative Importance	Part worths	Relative Importance	Part worths	Relative Importance
Price	\$22.10	0.49	20.8%	1.57	73.0%	0.34	13.6%	0.45	17.0%	0.15	8.7%
	\$22.59	-0.49		-1.57		-0.34		-0.45		-0.15	
Certification	certified	1.04	43.8%	0.22	10.2%	1.54	61.6%	0.44	16.6%	0.44	24.6%
	non-certified	-1.04		-0.22		-1.54		-0.44		-0.44	
Core	5 plys	-0.70	29.5%	-0.34	15.8%	-0.46	18.4%	-1.69	63.8%	-0.30	17.0%
	6 plys	0.70		0.34		0.46		1.69		0.30	
Manufacturer	Roseburg	0.14	5.9%	0.02	1.0%	0.16	6.4%	0.07	2.6%	0.88	49.7%
	Boise	-0.14		-0.02		-0.16		-0.07		-0.88	
		100.0%		100.0%		100.0%		100.0%		100.0%	

Since part-worths indicate an attribute's preferred level, but do not directly indicate the importance of the attribute, further insight to respondents' preference structure can be gained by examining the relative importance scores displayed in Table 7. Relative importance is an indicator of the weight a respondent places on an attribute relative to the other attributes as he or she forms preferences. One can infer from a comparison of two attribute's relative importance scores how much more important one is than the other. For the typical respondent, environmental certification was rated the most important plywood attribute, accounting for 43.8 percent of the importance. This value was about 1.5 times that of the attribute number of plies (29.5 percent of the importance) and just over two times that of price (20.8 percent of the importance). The attribute manufacturer (5.9 percent) was relatively unimportant.

These results show that the respondents do not place equal weight on product attributes when forming their preferences. For example, we can infer that the typical respondent prefers an environmentally certified piece of plywood to a non-certified piece and that this product attribute is about two times more

important than price. Thus, these results suggest that the typical respondent is willing to pay a slightly higher price in order to purchase a product that is environmentally certified. One can also infer from **Table 7** that the importance of a given attribute varies greatly from individual to individual. In other words, at the aggregate level environmental certification appears to be a preferred attribute and highly important, but when looking at the importance ratings among the four subgroups, nearly 40 percent of the respondents rated some other product attribute more important than environmental certification.

Segmenting Respondents

We used each respondent's relative importance estimate for the attribute environmental certification as a criterion for classifying respondents into one of two categories: 1) those that rated environmental certification as important and therefore likely to buy EFP's; and 2) those that rated the attribute unimportant, and therefore, not likely to buy EFP's. The cut-off value for this classification criterion was 0.57. Respondents whose scores were greater than or equal to 0.57 were put into the likely to buy EFP's group; those whose relative importance estimate was less than 0.57 were put into the not likely to buy EFP's group. We arrived at the 0.57 cut-off figure from a graphical assessment of the data, which clearly suggested a natural break in the distribution of this variable at 0.57. **Table 8** shows the results of this classification procedure. Note that this segmentation scheme suggested that just over 50 percent of the respondents were likely to purchase EFP's. This result is consistent with that of the *Green Gauge Report*, which

identified 46 percent of population that were likely to buy green products (Roper 2002). With respect to EFP's, the size of the likely to buy segment is consistent with those identified by Bigsby and Ozanne (2002) for New Zealand consumers and Forsyth et al. (1999) for Canadian consumers.

Table 8. Market Segments for Ecolabeled Forest Products

	Likely to Buy Group	Not Likely to Buy Group
Number of Respondents	136	134

Predicting Segment Membership

Backwards-stepwise logistic regression was used to identify five explanatory variables from the original set that were significantly associated with segment membership (Table 9).

Table 9. Parameter Estimates for the Binary Logistic Regression Model

Variable	B	S.E.	Wald	Sig	Exp(B)
willingness-to-pay	0.329	0.157	4.413	0.036	1.390
past environmental purchase behavior	0.094	0.033	8.283	0.004	1.099
political affiliation	-0.286	0.106	7.208	0.007	0.752
age	-0.260	0.114	5.212	0.022	0.771
important to display environmental info on product packaging	0.381	0.102	14.088	0.000	1.464
constant	-2.166	0.942	5.288	0.021	0.115

Nagelkerke R square = .359

dependent variable = likely to buy EFP's, or not likely to buy EFP's

Table 10 shows that the model correctly predicted which segment a respondent belonged to 72.6 percent of the time (note that any cell in the table where the 0 and 1 column and row headers don't match contain miscategorized respondents). This compared to correctly classifying respondents 50.4 percent

(136/270) that one could expect by chance. Breaking down predictive accuracy further, the model correctly predicted those who rate environmental certification highly important 73.5 percent of the time and correctly predicted those who do not rate environmental certification highly important 71.6 percent of the time.

Table 10. Classification table for predicting segment membership

	0	1	% correct
0	96	38	71.6
1	36	100	73.5
overall percent correct			72.6

total cases = 270

Since the dependent variable in binary logistic regression can only take one of two values (e.g. group 1 or group 2), one can infer the effect the explanatory variables have on the likelihood of group membership. These results show that after accounting for the effects of the other variables in the model:

- A one unit increase in the measurement of willingness to pay more for EFP's (e.g. willing to pay a higher percentage more for EFP's) is associated with a 1.39 (95% CI = 1.02 to 1.89) times increased chance of membership in the likely to purchase group. In other words, those willing to pay a premium are more likely to buy EFP's.
- A one unit increase in the measurement of past environmental purchase behavior (e.g. demonstrating greater levels of past environmental purchase behavior) is associated with a 1.10 (95% CI = 1.03 to 1.17) times increased chance of membership in the likely to purchase group. This means that those exhibiting greater levels of past environmental purchase behavior are more likely to buy EFP's.
- A one unit decrease in the measurement of political affiliation (e.g. more conservative) is associated with 1.33 (95% CI = 1.08 to 1.64) times chance of membership in the likely to purchase group.

This means that more politically liberal respondents are more likely to buy EFP's.

- A one unit increase in our measurement of age is associated with a 1.30 (95% CI = 1.04 to 1.62) times chance of membership in the not likely to purchase group. Thus, younger respondents were more likely to buy EFP's.
- A one unit increase in the measurement of strength of belief in environmental information on packaging is associated with a 1.46(CI = 1.20 to 1.79) times chance of membership in the likely to purchase group. In other words, those that believe environmental packaging information are more likely to purchase EFP's.

Discussion

Methodological Implications

The conjoint analysis results revealed that for the typical respondent, an environmentally certified product was preferred to a non-certified product. This result is consistent with all other conjoint studies addressing EFP's (Anderson and Hansen 2003b, Bigsby and Ozanne 2002, and Cooper et al. 1996). However, in this study the typical respondent rated environmental certification as the most important product attribute. This was not the case in any of the other studies just mentioned. Related to the observed high importance of environmental certification is the low relative importance of price. We believe price was rated relatively unimportant because the price levels specified in the conjoint design were not very far apart, e.g. \$22.10/piece and \$22.59/piece. Therefore, respondents viewed it as unimportant. However, Anderson and Hansen (2003a) found that the same price difference did significantly impact actual consumer

behavior. This comparison of results obtained from conjoint analysis with those from actual behavior, suggest that conclusions drawn from efforts to understand consumer response to EFP's will vary with the methods used to estimate consumer response. Therefore, new methodologies for assessing consumer response to EFP's need to be developed and applied. In addition, a further level of complexity in understanding consumer response to EFP's is the different responses that can be expected across different products, i.e. commodity plywood and lumber compared to custom built furniture.

Marketing and Managerial Implications

Considering the six criteria for market segmentation offered by Wedel and Kamakura (1999), we suggest the segmentation approach offered in this study would be effective for the following reasons: First, segment members would be relatively easy to identify because three of the five variables we found to be significantly associated with group membership – age, political affiliation, and past environmental purchase behavior are easily measurable. Second, the size of the likely to buy EFP segment was about 50 percent of the respondents, a substantial proportion, which justifies the pursuit of such a segment. Third, the likely to buy EFP segment would be easily accessible for promotion and distribution efforts because they could be targeted based on factors such as age, political affiliation, and past environmental purchase behavior. For example, assuming for a moment our results are representative of broader populations, EFP manufacturers may discover through market research that young, politically liberal consumers, that

have engaged in past environmentally friendly purchase behavior tend to shop at local lumberyards as opposed to big box type retailers. Such information could be used to target distribution and promotion efforts for EFP's through such outlets. Fourth, it would seem the segment is stable since it is based on steady factors such as age, past behavior, beliefs, and political affiliation. Fifth, without actually implementing marketing strategies based on the segmentation it is impossible to determine whether the segments are responsive. Finally, it seems the segmentation is actionable because their identification provides guidance in manipulating marketing factors such as price, promotion, distribution, and product specifications.

Building further on this concept of actionability, or in other words product positioning, we offer the following suggestions for EFP manufacturers and promoters:

First, similar to the findings of Anderson and Hansen (2003b), respondents that reported a willingness to pay more for a EFP were associated with the segment most likely to buy EFP's. The same can be said of those that think it is important to display environmental information on product packaging. We suggest both of these variables are characteristic of a core group of EFP consumers that is strongly committed to purchasing environmentally friendly products. However, EFP manufacturers may not be able to effectively target this core group in mainstream distribution channels because most consumers base purchase decisions on price and quality (Forsyth et al. 1999). Therefore, it seems that manufacturers can best target this core group of EFP consumers through

distribution channels that sell exclusively EFP's, e.g. green building supply retailers. It is important to note however, that the exclusive pursuit of such a distribution strategy would likely unnecessarily restrict the size of the target market. For example, the recent growth of the organic food offerings in mainstream food supermarkets is attributed to the fact that organic food marketers have expanded their target market from the "true blue green", those who buy organic for the environment's health, to include those that buy organic foods for their own health (Pollan 2001). Although the comparison isn't ideal, because personal health considerations do not play a role in EFP purchase decisions, it seems that EFP's do have appeal to a broader range of consumers than just the 10 percent or so that are "true blue greens".

Second, respondents that reported they frequently purchase other types of environmentally friendly products were associated with the more likely to buy EFP's segment. This result suggests that EFP manufacturers and promoters could capitalize on the cognitive dissonance principle. This could be accomplished through promotional campaigns targeting current consumers of organic food, bio friendly detergents, recycled paper products, etc. The implicit message in promotional materials would be that in order for such consumers to be consistent in their purchase patterns, they should purchase EFP's.

Finally, it is important to mention explanatory variables that were not significantly associated with group membership. According to theory, values can cause attitudes (Homer and Kahle 1988), yet none of the values we measured were significantly associated with group membership. One explanation of this result is

that we measured the wrong values. However, we discount this argument because we used the well-established LOV scale to measure nine values, which have been shown to be useful for consumer behavior research (Kahle and Kennedy 1988). In addition, altruism, the other value that we measured, has been shown to be significantly related to environmentally conscious consumer behavior (Straughan and Roberts 1999). Therefore, another possible explanation is that at the time the data was collected, respondents did not associate any values with their attitude toward this product attribute. Given Kahle and Kennedy's (1988) assertion that consumers buy products, in part, to reflect their values and enact their lifestyle, this possibility is significant for those marketing EFP's, because it implies that at the present time forest certification ecolabels are not recognized by consumers as representing any of their values. This concept is called the principle of abstraction, which states that tying a value to a product may imbue the product with some of the positive affect associated with the value (Kahle and Kennedy 1988).

If it is true that consumers currently associate none of their personal values with forest certification ecolabels, then clearly the purpose of the ecolabel is difficult to realize. Therefore, it is important for forest certification proponents to begin building a brand. A fundamental concept associated with branding is that a brand effectively extends a consumers attention away from the core physical product to include intangible product features, i.e. personal values associated with the product or its use. In order to accomplish this companies or certification systems should begin explicitly linking personal values with forest certification ecolabels in their promotional messages. For example, the personal value altruism

could be linked to ecolabels using a phrase such as, “because you care about others”. The implied message in the phrase is that the purchase of EFP’s supports healthy forests and a healthy environment, both of which help assure the continued existence of humans. Therefore, an altruistic person should purchase EFP’s because they care about the continued welfare of others. Indeed such promotional strategies may be evolving. For example, according to the Forest Stewardship Council (2003) the development of the FSC forest certification scheme up to this point has focused on establishing forest management standards. In the future, the focus will shift to the establishment of an overarching marketing plan, which will include the identification of key audiences and appropriate branding building strategies.

Limitations

Throughout this paper, we have assumed that respondents with strongly held positive attitudes for EFP’s, are likely to buy EFP’s, and therefore represent a target market. However, researchers have long questioned the strength of the link between attitude and behavior (LaPiere 1934, Wicker 1969, Smith and Swinyard 1983, Sheppard et al.1988). Thus, one must remember that we measured attitudes rather than behavior. However, the variables we have identified as significant predictors of a consumer’s attitude toward the product attribute environmental certification could be measured for individuals observed in a future study, which does measure actual behavior.

Although we did survey actual consumers, we only surveyed a convenience sample of consumers from two stores in one state. Thus, these results are not generalizable to broader populations of consumers.

Conclusions

Similar to a number of other studies, we found that environmental certification is a preferred product attribute. Thus, it seems firmly established that the majority of consumers would rather purchase an environmentally certified forest product than a non-certified forest product. However, it remains unclear how important the environmental certification attribute is relative to other product attributes, such as price and quality. We found that environmental certification was the most important product attribute relative to price, number of plies in the panel, and manufacturer. This finding contradicts previous studies, which have shown that environmental certification is unimportant relative to attributes such as price and quality. Further research is needed that measures both consumer attitudes and purchase behavior across a range of certified forest products and ecolabeled price premiums.

We also identified a segment of consumers that is most likely to purchase ecolabeled plywood. Finally, we suggested several product positioning strategies that are likely to be effective because they are based on demographic, psychographic, and behavioral variables found to be significantly associated with the segment.

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The Impact of Environmental Certification on Preferences for Wooden Furniture: A Conjoint Analysis Approach

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Abstract

The objectives of this exploratory study were to: 1) determine the relative importance of five wood CD rack product attributes; and 2) identify demographic and psychographic variables associated with the respondents who rated environmental certification as the most important attribute in forming their product preferences. To meet these objectives, we surveyed a convenience sample of 265 Oregon State University undergraduate students enrolled in an international business class during the 2001/2002 academic year. The results indicated that respondents viewed environmental certification as a favorable product attribute. However, for the typical respondent, the importance of other product attributes outweighed environmental certification. Despite environmental certification's limited importance for the typical respondent, it was the most important attribute for 20.8 percent of the respondents. Backwards-stepwise binary logistic regression was used to identify four variables useful for predicting which respondents would place the highest importance on the attribute environmental certification. A key finding was that willingness to pay more for certified forest products (CFP's) was highest among those who placed the greatest importance on environmental certification. Although, our sample was not representative of the general population, these results provide insights about possible marketing implications. First, since environmental certification was a relatively unimportant purchase decision criterion for the average respondent, CFP's marketed in mainstream distribution channels, i.e. big box retailers, are not likely to realize significant price

premiums. However, since willingness to pay was greatest among those who placed the highest importance on environmental certification, CFP price premiums may be possible through market segmentation.

Introduction

The *Green Gauge Report*, published annually by the market research firm Roper ASW, documents public attitudes towards the state of the natural environment. Roper ASW (2003) results showed that increasing numbers of American consumers demonstrate their environmental concern through environmentally conscious purchase behavior (ECPB) - the practice of buying products on the basis of their environmental attributes. Similarly, in the mid-1990's The Hartman Group, another market research firm, conducted a nationwide study of US food consumers (Hartman 1999,1997,1996). According to results published in *The Hartman Report*, price, quality, and availability/convenience were the most important purchase decision criteria. However, they also found that: 1) about 50 percent of food consumers were influenced by environmental considerations. 2) About half of food consumers viewed ecolabels (on product symbols, which differentiate a product from similar products based on environmental impacts associated with production, distribution, use, or disposal) as a key source of information about a product's environmental attributes and they would like to see more detailed information on ecolabels. And 3) 63 percent reported they would be willing to pay more for a product that has a positive environmental impact (Hartman 1999, 1997, 1996). Results from the Hartman and Roper reports as well as a variety of other sources (e.g. Nimon and Beghin 1999, Bhat 1996, Ottman 1993, Schwepker and Cornwell 1991) caused many companies to believe that consumers would buy a product based on its

environmental attributes. In reality, most environmentally friendly products face apathy and price resistance from the majority of consumers. For example, twenty years of opinion polling by the National Renewable Energy Lab concluded that 56-80 percent of American voters were willing to pay more for environmental protection or renewable electricity. However, as of May 1998, only 1-2 percent or 45,000 electric customers across the country had signed up for “green” electricity (Holt and Wiser, 1999). Apparently, Fowler (2002) correctly asserts, “after a decade of attempting to appeal to shopper’s environmental sensibilities, many companies have concluded that shoppers seem far more willing to pay for convenience than for ideology.”

What causes the disconnect between expressed environmental concern and subsequent ECPB? The *Green Gauge Report* suggests that some consumers perceive environmentally friendly products as inferior. For example, 41 percent of respondents reported not buying green products because they feared the products wouldn’t work as well. Thus, the disconnect may be an artifact of green marketing’s early days when inferior, overpriced earth-friendly products sought to replace readily available, trusted, high-quality brands (Ottman, 1993). Dunlap (1989) offers several explanations for the discrepancy between environmental concern and ECPB. First, increasing government attention to environmental problems causes the media and public to assume the problem is being addressed, thus, they turn their attention to other issues. Second, the public perceives institutions rather than individuals as the culprit. This common perception causes individuals to believe environmental responsibility lies with organizations. Third,

people may be willing to change some, but not all, aspects of their lives for the sake of the environment, i.e. willing to recycle but not carpool. Fourth, the public may be uneducated in methods of environmentally responsible behavior. Finally, the absence of strong leadership regarding environmental protection may cause some to feel lifestyle changes are unimportant.

Forest Certification

In this context of heightened environmental concern, but lagging ECPB, the concept of *forest certification* - third-party verification that forest management practices are consistent with predetermined criteria - has emerged. Certification was introduced in the early-to-mid 1990's and is based on the notion that consumers are concerned about the state of the world's forests and would therefore prefer purchasing forest products that are certified to originate from well-managed forests. Thus, forest certification is conceived as a market-based approach for sustainable forest management. Some CFP's display ecolabels, which indicate that an independent third-party inspected and approved the forest management practices in the forest from which the product originated. The movement by the global forest products industry toward forest certification is clear. The number of forest acres under certified management has grown to 306 million acres worldwide (Rametsteiner, 2002). Additionally, major lumber products retailers in the United States and Europe including The Home Depot, IKEA, B&Q, and The Body Shop have made commitments to source their lumber products from environmentally certified vendors (Anderson, et al. 2002). Despite

these trends, consumer demand for certified, ecolabeled forest products has been slow to develop.

Previous Studies of Consumer Demand for CFP's

Because the process of forest certification can be a costly investment, many forest landowners and forest products manufacturers want evidence confirming the assumption that consumers will discriminate purchases in favor of CFP's. Numerous studies have addressed the issue, although none have produced empirical evidence supporting the notion of consumer preference for CFP's. Teisl et al. (2002) found that environmental labeling of forest products could influence consumer decision-making, but price and quality would likely continue to be the most important considerations. Their study was unique because they used focus groups. Smith (1999) conducted a review of published studies about consumer attitudes relative to forest products marketed with emphasis on social, environmental, or sustainable attributes. He identified 184 publications and classified 25 of them as major research efforts. Results from those studies are mixed. Several indicated that marketing a forest product's environmental attributes would have a positive effect on consumer behavior (Ozanne and Vlosky 1997, Bigsby et. al. 1997, Winterhalter and Cassens 1994). Others indicated that a forest product's environmental attributes were relatively unimportant in consumer purchase decisions (Groonros and Bowyer 1999, Forsyth et al. 1999, Rametsteiner 1999, Ozanne and Smith 1996). Several studies identified a consumer segment, which placed high value on environmental certification (Forsyth et al. 1999,

Groonros and Bowyer 1999, Ozanne and Smith 1998, Ozanne and Vlosky 1997, Ozanne and Smith 1996).

Smith's review concluded that the dominant methodology used was mail questionnaires and personal interviews. The format typically involved direct questions about attitudes and intended behavior with respect to purchasing CFP's. There are two drawbacks associated with this methodology. First, the respondent considers the importance of any given attribute individually rather than in the context of other product attributes. Therefore, the researcher can determine whether or not environmental certification, for example, is an important attribute, but he or she cannot determine its importance relative to other product attributes. A second drawback is an apparent weak link between expressed attitude and actual behavior. Attitude is defined as a learned predisposition to consistently respond positively or negatively toward an object. It is an extremely popular concept because it is generally believed that attitudes are predictors of behavior. However, there are many examples of attitude/behavior inconsistency (e.g. Oskamp et al. 1991, Wicker 1969). In the case of CFP's, we believe that respondents tend to answer questions in a 'socially desirable' manner, thereby, overstating the importance placed on a product's environmental attributes and their willingness to pay a premium for an environmentally certified product. Because of these drawbacks, Smith (1999) urged for further research, which observed actual consumer purchases of CFP's.

The observation of actual purchase behavior is a logical next step for research on this topic since it bypasses the weak link between expressed attitude

and actual behavior. However, such a methodology has limitations as well. From a practical perspective, our experience has shown that a study of actual consumer behavior is exceedingly difficult. Gaining full cooperation from a CFP supplier and CFP retailer while maintaining an adequate level of academic and scientific rigor is challenging at best. From an external validity perspective, we submit that the researcher must use great care in designing such a study because it is questionable whether the observation of purchase behavior can be interpreted as consumer preferences. For example, given our busy lives, it can be argued that a consumer chooses the best *available* product, rather than taking the time to find the product that perfectly satisfies his or her needs. In other words, a consumer with low involvement in a purchase, may buy a product simply because it is convenient and not because it is their preferred product. If such a scenario were true a researcher would incorrectly interpret purchases, as preferences for a product, rather than purchases made because they were most convenient.

Conjoint analysis is a multivariate statistical technique first introduced in 1964, which has evolved into a family of techniques that has received extensive use since the mid 1970's (Green and Srinivasan, 1990). Briefly described, it is a method by which researchers can realistically model which product attributes matter most to consumers. We do not offer a full explanation of the technique; for more information the interested reader should see (McCullough 2002, Reddy et. al. 1996 Hair, et. al. 1995, Green and Srinivasan 1990). We chose to use conjoint analysis in this study as a tool for modeling consumer response to CFP's because it allowed us to determine the importance of environmental certification

relative to other product attributes. Despite its widespread use in other disciplines, a review of the forest products literature revealed that few studies used the technique. Reddy and Bush (1998) and Reddy et. al. (1996) used conjoint analysis to evaluate consumer perceptions of softwood lumber quality. Bigsby and Ozanne (2002) and Cooper et. al. (1996) used this technique to model consumer preferences for CFP's. In both of those studies, which used wood furniture as a hypothetical product, environmental certification was relatively unimportant.

Objectives

The two main objectives of this study were to: 1) Assess respondent preferences among selected wood furniture attributes with special attention on the relative importance placed on environmental certification. 2) Identify a set of explanatory variables useful for predicting which respondents rated environmental certification as the most important product attribute. Such a model is useful since we believe that respondents who place the highest importance on environmental certification constitute a target market for CFP's.

Methods

Theoretical Framework

A fundamental concept underlying this research is that all humans possess needs and desires, some of which can be satisfied through the purchase of goods and services. Consumer behavior is the study of individuals, groups, or organizations and the processes they use to select, secure, use, and dispose of products and services to satisfy their needs and the impacts these processes have on the consumer and society (Hawkins et al. 2001). To frame our study theoretically, we adapted Hawkins' et al. (2001) model of consumer behavior (**Figure 4**). According to the model, needs and desires drive an individual's purchase behavior. Needs and desires are influenced by each person's self-concept, which in turn, is formed by influences in that person's life, i.e. values, beliefs, and attitudes. As we gain life experiences our self-concept and lifestyle change based on what we have learned.

Survey instrument

To operationalize the theoretical constructs depicted in Figure 3, we created a questionnaire that was divided into two sections – a *dependent* measure and several *explanatory* measures.

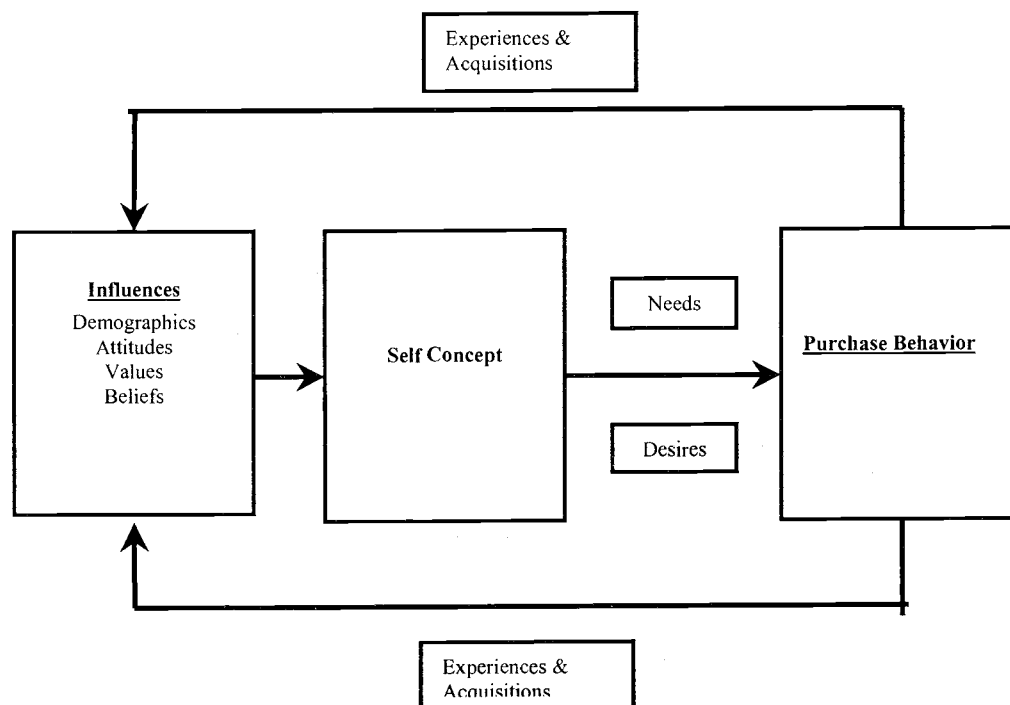


Figure 3. *Theoretical Framework of Consumer Behavior - Adapted from Hawkins, Best & Coney 2001.*

Dependent measure

In the first section of the survey, respondents were asked to imagine they were purchasing a wood CD rack while considering the following attributes - price, wood type, environmental certification, adjustability of shelves, and storage

capacity. Several levels were defined, within each attribute i.e. price = \$75, \$100, or \$125. Each level of each attribute was clearly defined on the survey instrument. Eight versions of a wood CD rack were created using a fractional, orthogonal conjoint design. The conjoint design was presented to the respondents as shown in Figure 4. The task of each respondent was to rank the 8 versions of a wood CD rack in order from most to least desirable. This scenario of comparing different versions of similar products is thought to realistically recreate the purchase process a consumer encounters in real life (McCullough, 2002). Statistical analysis of each respondent's rankings yields the relative importance for each of the five product attributes. We used each respondent's importance ranking for the attribute environmental certification as a criterion for classifying respondents into one of two categories: 1) those that rated environmental certification as the most important product attribute, and 2) all others, thereby, creating a binary dependent variable.

Selection of the product attributes

The first step in creating a conjoint analysis study is deciding what product attributes need to be included in the model. The environmental certification attribute was chosen on the basis of its relevance to the objectives of the study. The four remaining attributes – price, wood type, adjustability of shelves, and storage capacity were selected from an original list of sixteen wood CD rack attributes consistently mentioned in promotional material. The basis of attribute selection was their importance rankings in a survey of fifteen students enrolled in a

wood science class at Oregon State University. During this process, size and color of the rack also emerged as very important considerations. We felt that those two attributes were indeed important, but that they were not determinant. Therefore, we stated on the questionnaire that the respondent should assume the size and color of the wood CD rack perfectly matched their needs. The levels for the attribute price (\$75, \$100, and \$125) were selected because they were within the range of published prices for wood CD racks.

Card 1 Rank _____ Price: \$125 Wood type: solid wood Wood Origin: environmentally certified Shelves: not adjustable Storage Capacity: 200	Card 2 Rank _____ Price: \$100 Wood type: solid wood Wood Origin: not environmentally certified Shelves: not adjustable Storage Capacity: 100
Card 3 Rank _____ Price: \$75 Wood type: solid wood Wood Origin: environmentally certified Shelves: not adjustable Storage Capacity: 100	Card 4 Rank _____ Price: \$100 Wood type: solid wood Wood Origin: not environmentally certified Shelves: adjustable Storage Capacity: 200
Card 5 Rank _____ Price: \$100 Wood type: composite Wood Origin: environmentally certified Shelves: not adjustable Storage Capacity: 200	Card 6 Rank _____ Price: \$75 Wood type: composite Wood Origin: not environmentally certified Shelves: adjustable Storage Capacity: 200
Card 7 Rank _____ Price: \$125 Wood type: composite Wood Origin: not environmentally certified Shelves: adjustable Storage Capacity: 100	Card 8 Rank _____ Price: \$100 Wood type: composite Wood Origin: environmentally certified Shelves: not adjustable Storage Capacity: 100

Figure 4. Set of 8 Wood CD Racks with systematically varied attribute levels.

Explanatory measures

The second part of the questionnaire was exploratory in nature in that we identified fourteen constructs that we hypothesized to be correlated to ECPB.

They were:

1. *Demographic* – Respondents reported their age, gender, personal income, parental income.
2. *Willingness-to-pay* – we asked each respondent to assume that they were going to purchase a wood CD rack that cost \$100. We then asked them how much more they would be willing-to-pay for the rack if it were environmentally certified. Their response choices were: 0, 5, 10, 25, 50, and more than 50 percent. Adapted from Ozanne and Vlosky (1997).
3. *Awareness of Certification* – Respondents reported whether they had heard of forest certification prior to completing the questionnaire. The response categories were 1 = yes and 2 = no. Single item scale, developed for this study.
4. *Knowledge of Forest Certification* – Respondents reported their personal level of knowledge about forest certification on a scale from 1 = know nothing about and 7 = know a great deal about. Single item scale, developed for this study.
5. *Understanding of Environmental Certification* – Respondents reported whether or not they understood why products were environmentally certified. The scale used for this item was 1 = agree and 7 = disagree. Single item scale, from Ozanne and Vlosky (1997).
6. *Importance of Environmental Packaging* – Respondents reported their attitude about the importance of displaying environmental information on product packaging. The scale used for this item was 1 = agree and 7 = disagree. Single item scale, developed for this study.
7. *Credibility of Environmental Packaging* – Respondents reported their attitude about the credibility of environmental claims made on product packaging. The scale used for this item was 1 = agree and 7 = disagree. A composite score for this variable was computed by summing the items in the construct. Developed for this study. Cronbach's Alpha = .781.

8. *Knowledge of Environmental Issues* – Respondents reported their knowledge of five general environmental issues - acid rain, world population growth, global warming, pollution from pesticides, and destruction of the rain forest. The scale used for each item was 1 = know nothing about and 7 = know a great deal about. A composite score for this variable was computed by summing the items in the construct. Cronbach's Alpha = .915. Developed for this study.
9. *Engagement in Environmentally Friendly Behavior* – Respondents reported their engagement in three environmentally friendly behaviors including – recycling, joining/supporting an environmental organization, and boycotting purchases from specific companies whose products damage the environment. The scale used for each item was 1 = never and 7 = always. A composite score for this variable was computed by summing the items in the construct. Cronbach's Alpha = .686. Developed for this study.
10. *Engagement in Environmentally Conscious Purchase Behavior* – Respondents reported how often they intentionally purchased organic fruits and vegetables, recycled paper products, environmentally friendly detergents, and products not tested on animals. The scale used for each item was 1 = never and 7 = always. A composite score for this variable was computed by summing the items in the construct. Cronbach's Alpha = .822. Developed for this study.
11. *Altruism* – Respondents reported how likely they would be to engage in six specific behaviors that can generally be described as helping someone in need. The scale used for each item was 1 = I wouldn't do this and 7 = I would do this. A composite score for this variable was computed by summing the items in the construct. Cronbach's Alpha = .723. Adapted from Rushton, Chrisjohn, and Fekken (1981).
12. *LOV (List of Values)* – Respondents reported how important 9 values are in their daily life and then selected on value from the list of nine that was most important. Cronbach's Alpha = .900. From Kahle and Kennedy (1989).
13. *Environmental Concern* – Respondents answered four questions regarding their level of concern for the state of the natural environment. The scale used for each item was 1 = agree and 7 = disagree. A composite score for this variable was computed by summing the items in the construct. Cronbach's Alpha = .867. Adapted Dunlap and Van Liere (1978).

14. *Perceived Consumer Effectiveness* – Respondents reported the degree to which they believe their individual actions as consumers affect the state of the natural environment. The scale used for each item was 1 = agree and 7 = disagree. A composite score for this variable was computed by summing the items in the construct. Cronbach's Alpha = .552. From Straughan and Roberts (1999).

The Cronbach's Alpha scores indicate the reliability of a scale. The Cronbach's Alpha values for constructs 9, 11, and 14 suggest that these scales are less reliable than optimal. However, these scales were adapted from other studies, in which they were shown to be reliable. Therefore, we elected to retain them as potential explanatory variables.

Sample

We sampled undergraduate students enrolled in an international business class at Oregon State University during the winter and spring terms of the 2001/2002 academic year. A self-administered questionnaire was used to collect data. Respondents were given approximately twenty minutes to complete the questionnaire at the beginning of a regularly scheduled class session. Respondents were clearly informed that participation was voluntary and not related to their grade in any way.

A total of 293 questionnaires were received of which 265 were used in the analysis because 28 (9.5 percent) were unusable due to incomplete answers (10 questionnaires) or response patterns that didn't meet the assumptions required by conjoint analysis (18 questionnaires).

The majority of respondents (78.7 percent) reported that they had never heard of forest certification prior to completing the questionnaire. Of those that

were familiar with forest certification, they generally learned of it in other classes, rather than having bought CFP's in the past. The mean self-reported knowledge level about the forest certification issue was 2.02 (SD 1.19) on a scale where 1 = know nothing about and 7 = know a great deal about.

Nearly 55 percent of respondents were female and the average respondent age was 22 years. The median personal income range was less than \$20,000. The median parental income range was \$60,001-\$80,000. Table 11 provides a complete summary of the demographic characteristics of the respondents.

Table 11. Demographics of sample respondents (% respondents)

Gender (*n* = 263, with 2 missing)

Male	45.3
Female	54.7
Total	100.0

Age (*n* = 262, with 3 missing)

19	1.9
20	19.8
21	32.4
22	21.8
23	11.8
24	2.3
25	2.7
>25	7.3
Total	100.0

Personal Income Range (*n* = 258 with 7 missing)

Less than \$20,000	86.4
\$20,000 to \$40,000	8.4
\$40,001 to \$60,000	1.6
\$60,001 to \$80,000	1.6
\$80,001 to \$100,000	.8
More than \$100,000	1.2
Total	100.0

Parental Income Range (*n* = 241 with 24 missing)

Less than \$20,000	2.5
\$20,000 to \$40,000	10.0
\$40,001 to \$60,000	19.9
\$60,001 to \$80,000	21.2
\$80,001 to \$100,000	16.6
More than \$100,000	29.9
Total	100.0

Method of Analysis

Conjoint Analysis

First, we analyzed the conjoint results for each individual. We assumed that the wood CD rack evaluations were an additive function of the five product attributes we defined and that these evaluations were interval level data (Louviere, 1988). These are common assumptions in conjoint analysis and they allow use of ordinary least squares regression to estimate the parameters of our wood CD rack attribute importance model. Additivity implies that a respondent's utility for a whole product is simply the sum of the utilities for each attribute. Several questionnaires (6.1 percent) were eliminated from the data set because the conjoint responses were non-additive. In other words, their ranking scores showed either no consistent pattern of preference for any product attribute, or an interaction effect between two or more attributes. An R^2 value less than 0.90 was used to eliminate non-additive responses. Thus, with the data 'cleaned' of respondents whose rankings were not consistent with the assumptions of conjoint, we next determined the preferred levels for each attribute for each respondent. This was accomplished by computing the part-worth for each level of each attribute. The part-worths were then used to determine the relative importance of each attribute for each respondent. We also used each respondent's importance scores to divide the respondents into five subgroups based on which attribute they rated most important. Up to this point, all analysis was done at the individual respondent level. In the next step, we

adjusted a regression that yielded the part-worths for respondents at the aggregate level. The aggregate part-worth values were then used to calculate the relative importance of the attributes for the ‘typical’ respondent. Finally, we performed the same aggregate part-worth calculations within each of the five subgroups to determine the relative importance of the product attributes for the ‘typical’ respondent in each subgroup.

Binary logistic regression analysis

Our objective in this phase of the analysis was to identify a parsimonious set of variables useful for 1) predicting which respondents placed the highest importance on environmental certification, and 2) examine the effect of the selected variables on respondent preferences for environmental certification. Therefore, we used backwards-stepwise (likelihood ratio) binary logistic regression to identify which explanatory variables were useful in predicting membership in the group of interest. Binary logistic regression is a multivariate statistical procedure used to predict a dichotomous dependent variable from a set of dichotomous or polytomous independent variables (Hair et al. 1995). An alpha-to-enter value of 0.05 and an alpha-to-exit value of 0.10 were used. These procedures resulted in a “best” model containing four explanatory variables. Note we use “best” in quotes because according to Ramsey and Schafer (1997), the variable selection process should be sensitive to the objectives of the study, and the particular subset chosen is relatively unimportant. Thus, we arrived at the final model through a combination of

The relative importance of environmental certification

Table 12. Part worth & relative importance estimates from overall group, wood origin group, wood type group, price group, adjustable group, & storage group.

[illegible]

The part-worth scores indicated the preferred levels of each attribute, the greater the positive value of the part worth estimate the higher the preference for that level. **Table 12** shows that the aggregate and subgroups all preferred the following level of each wood attribute: the lowest price, solid wood, environmentally certified, adjustable shelves, and greater storage capacity. These results indicate that environmental certification is a preferred product attribute to non-environmentally certified. Given this result, the question becomes, in the context of other product attributes how important is environmentally certified? The importance scores indicate this.

The importance scores were calculated by: 1) determining the range of part-worths for each attribute, 2) summing the ranges, and 3) dividing the range for each attribute by the sum of ranges. Relative importance is an indicator of the weight a respondent places on an attribute relative to the others as he or she forms preferences. One can infer from a comparison of two attribute's relative importance scores how much more important one is than the other. For the aggregate, price was clearly the most important attribute, about 1.5 times as important as wood type, wood origin, and adjustability and about 2.5 times as important as storage capacity. The importance scores change quite dramatically between subgroups. For example, note the reversal of the aggregate results in the environmental certification subgroup where the importance of the attribute wood origin is about 2.5 times that of price.

Note the consistently high importance of price across all subgroups. It is either the first or second most important attribute. Our aggregate results were consistent with those of Ozanne and Smith (1996) who found that consumers considered the factors: quality (in terms of both construction and materials used) and price highly important in the purchase decision. Environmental impact, on the other hand, was not a primary purchase decision criterion in their study. On the other hand, our results were not consistent with Ozanne and Bigsby (2002) who found that price was relatively unimportant in New Zealand consumers purchase decisions for outdoor wood furniture.

These results showed that the respondents did not place equal weight on product attributes when forming their preferences. For example, we know from the part-worth values reported in **Table 12** that the typical respondent preferred an environmentally certified wood CD rack to a non-certified rack. However, we also know that compared to price, wood origin was relatively unimportant. Thus, when forming preferences, the typical respondent was willing to sacrifice environmental certification for the sake of a lower price. We also know from **Table 12** that the importance of a given attribute varied greatly from individual to individual. In other words, at the aggregate level wood origin appeared relatively unimportant, but when looking at the importance ratings among the five subgroups, 55 respondents or 20.8 percent rated it their most important attribute.

Predicting Respondent's Utility for Wood Origin

Table 13. Parameter Estimates for the Binary Logistic Regression Model

Variable	B	S.E.	Wald	Sig	Exp(B)
gender	-0.514	0.363	2.000	0.157	0.598
willingness-to-pay	0.447	0.140	10.159	0.001	1.563
environmental concern	0.150	0.050	8.877	0.003	1.162
altruism	-0.073	0.032	5.156	0.023	0.93
constant	-2.690	1.428	3.551	0.060	0.068

Nagelkerke R square = .216

This exploratory part of the analysis attempted to identify which explanatory variables were significant in predicting respondents that placed the highest importance on environmental certification. Backwards-stepwise logistic regression was used to reduce the number of explanatory variables to the four displayed in **Table 13**. Note from **Table 14** that the model correctly predicted which group a respondent belonged to 82.3 percent of the time. Breaking down predictive accuracy further, the model correctly predicted those who did not place highest importance on environmental certification 97.1 percent of the time, but was only able to correctly predict the respondents that were most likely to place the highest importance on environmental certification 26.1 percent of the time.

Table 14. Classification Table for predicting group membership

	0	1	% correct
0	169	5	97.1
1	34	12	26.1
overall percentage correct			82.3

0 = environmental certification not most important

1 = environmental certification most important

total cases = 220

It was also of interest to interpret the regression coefficients in terms of the effect they have on group membership. The parameter estimates are displayed in **Table 13**. These results showed that after accounting for the effects of the other variables in the model: 1) females were 1.67 (95 % CI = .82 to 3.40) times as likely to rate environmental certification as the most important attribute, 2) those respondents willing-to-pay at least a 5 percent premium for a CFP were 1.56 (95% CI = 1.18 to 2.06) times as likely to rate environmental certification as the most important attribute, 3) those respondents who expressed increased levels of environmental concern were 1.16 (95 % CI = 1.05 to 1.28) times as likely rate environmental certification as the most important attribute, and 4) surprisingly, those respondents who expressed *lower* levels of altruism were 1.08 (95 % CI = 1.01 to 1.15) times as likely to rate environmental certification as the most important attribute.

Marketing and Managerial Implications

Although these data were from a convenience sample of undergraduate students and were therefore not generalizable, the data does provide insights about possible marketing and managerial implications. Further research will be required to verify the following points.

These results suggest that environmental certification has a positive effect for the typical respondent on their preferences for a wood CD rack. However, more influential competing effects often outweigh environmental certification's positive effect. For example, the typical respondent was willing to sacrifice

environmental certification for the sake of a lower price. Should such a finding hold true for the general population, it would suggest that CFP's cannot command premium prices when marketed in mainstream distribution channels, i.e. big box retail stores, because for the typical respondent the utility of a lower price outweighs the value of environmental certification. However, it may be possible to market CFP's in a separate distribution channel. The target market for this channel would be the respondents who placed the highest value on the attribute environmental certification. The recent emergence of green building supply retailers are an example of an alternate distribution channel. Two such stores exist in the Pacific Northwest - *Environmental Building Supply* (EBS) in Portland, OR and *The Environmental Home Center* in Seattle, WA.

This study identified several characteristics associated with respondents who value environmental certification more than the other attributes. Again, should these findings hold true for the general population, knowledge of those characteristics could be used by marketers to tailor CFP promotional efforts to maximize their impact on the target market. This includes explicitly stating the benefits that buying CFP's will have on the state of the natural environment. Such a message should resonate strongly with this group, given their higher levels of environmental concern. Second, promotional communications should be targeted to reach audiences that are more likely to be female. Third, not only is environmental certification very important to this group, they reported that they were more likely to be willing-to-pay at least a 5 percent premium for CFP's. This

finding suggests that a premium for certified products may be obtainable in this distribution channel.

Limitations

Straughan and Roberts (1999) found evidence that altruistic people, i.e. those concerned for the welfare of others, also tend to exhibit ECPB. Presumably this is because the welfare of others is linked to the state of the natural environment. We have no explanation for the results of this study, which found that those who reported themselves as less altruistic were also more likely to rate environmental certification as the most important product attribute.

Our conjoint analysis may be limited by the fact that there is an effect for the number of levels associated with an attribute. An attribute with *significantly* more levels than the other attributes in a model will be more important than the other attributes. In this study price was the only attribute with 3 levels while the others all had 2 levels. Thus, it is possible that some of the importance in price can be ascribed to the fact that it had one more level than all other attributes.

Perhaps the biggest limitation of this study is that since the population sampled was undergraduate students, definitive inferences from the results cannot be drawn to broader populations of consumers.

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Conclusions

The purpose of this dissertation was to better understand consumer behavior with respect to ecolabeled forest products. Thus, two objectives of the study were to: 1) evaluate whether forest product ecolabels have any effect on consumer behavior, and 2) if so, were some consumers willing to pay more for them. To meet these objectives, I measured the effect of an ecolabel in two ways.

First, the results of the quasi-experiment conducted at two of The Home Depot stores clearly show that ecolabels do have a positive effect on consumer behavior, as long as the ecolabeled product does not carry a price premium. However, when a price premium is introduced, the effect of the ecolabel is minimized. These results suggest that most consumers prefer to purchase ecolabeled forest products. However, for most consumers, the environmental certification product attribute is less compelling than other product attributes such as price.

Second, I surveyed Oregon State University undergraduate students and The Home Depot consumers using conjoint analysis. Although conjoint analysis is not as direct a method as the observation of actual behavior, the survey results also show that for most consumers, forest product ecolabels would have a positive impact on consumer behavior. The undergraduate survey results show that other product attributes are more important than environmental certification in forming product preferences. This result is consistent with the quasi experiment results. The consumer survey, on the other hand, suggested that environmental

certification was the most important product attribute. This would cause one to infer that consumers would be willing to pay extra for EFP's. Clearly, this is inconsistent with the quasi experiment results. What makes this inconsistency especially intriguing is that the conjoint design used in the consumer survey was developed to exactly replicate the features of the products in the quasi experiment. This suggests that significantly different conclusions could be drawn about consumer preferences for ecolabeled forest products depending on the method used to evaluate those preferences. Obviously, this has important implications for those using the information. The methodological inconsistency of the results about consumer preference for EFP's has long been suspected, but this is the first study that demonstrates differing results based on methodology.

A final objective, of this study was to identify demographic, psychographic, and behavioral variables associated with those consumers most likely to buy EFP's. Such information can be used to effectively position EFP's. The key findings from this portion of the study were that those reporting the strongest preferences for environmentally certified forest products: were also most likely to be: environmentally concerned, younger, politically liberal, willing to pay more for EFP's, and most likely to have exhibited previous environmentally conscious purchase behavior. Another key finding was that no personal values were found to be significantly associated with those reporting the strongest preferences for environmentally certified forest products. This is important because it is believed that tying specific personal values to a product will cause some consumers to purchase that product, because doing so allows them to express their social values

to others. Creating an explicit association between personal values and environmentally certified forest products would be vital to their success in the marketplace.

In summary, this study was the first to empirically demonstrate that forest certification ecolabels could have a positive effect on consumer purchase behavior. It was also determined that the effect of the ecolabel varies among individuals, which suggests the need for consumer segmentation strategies. Therefore, this study also identified demographic, psychographic, and behavioral factors associated with those most likely to purchase ecolabeled forest products. Not only can information about such associations be used for segmentation, it is also useful for developing brand building strategies that link a forest certification ecolabel with attitudes, beliefs, and values held by those most likely to purchase ecolabels. Despite these findings, it is likely that the effect of the ecolabel varies not only from person to person, but also between different forest products and when different price premiums are placed on the ecolabeled product. Therefore, further research is needed to: 1) evaluate consumer price sensitivity to a range of ecolabeled price premiums. For example, in this study a 2 percent price premium was used. The results would have likely been different, had we used a 20 percent ecolabeled price premium. And, 2) evaluate the effect of forest certification ecolabels across a range of forest products. It is likely that the effect of an ecolabel would differ if it were placed on a 2 x 4 stud versus a wooden coffee table because of the way in which the products will be used. The stud will most likely be used in a wall. Thus, it will not be visible in its final application, because it is

covered by plywood, sheetrock, etc. The coffee table, on the other hand, is an appearance product, which carries elements of style and prestige and is displayed in the home. Therefore, its owner would be more likely to want to express his or her social values through the display of a “environmentally friendly” coffee table.

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Appendices

Appendix A - Questionnaire used during the student survey.

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Thank you for taking the time to complete this survey.

The Department of Wood Science and Engineering at Oregon State University is researching consumer preferences for forest products. A variety of interested parties will use information from this study. They include: forest product manufacturers, environmental groups, government agencies, forest landowners, and forest product retailers.

Your participation is voluntary and is not related to your grade in any way! However, your participation is essential to the success of this study. Therefore, please help us by taking a few minutes to **thoughtfully** answer the following questions. You may choose to skip any question you do not wish to answer. Your responses along with those of many other OSU students will be combined and used for statistical summaries. Your responses are anonymous and confidential.

Sincerely,

Roy C. Anderson, PhD Candidate
 Eric N. Hansen, Associate Professor
 Oregon State University
 Department of Wood Science and Engineering
 541-737-4257

Please answer the following questions (fill in blanks or check boxes where appropriate):

1. What is your age? _____ YEARS OLD
2. What is your gender? ☐ MALE ☐ FEMALE
3. What is your annual household income level?
 - ☐ Less than \$20,000
 - ☐ \$20,000 to \$40,000
 - ☐ \$40,001 to \$60,000
 - ☐ \$60,001 to \$80,000
 - ☐ \$80,001 to \$100,000
 - ☐ More than \$100,000
4. What is your parent's annual household income level?
 - ☐ Less than \$20,000
 - ☐ \$20,000 to \$40,000
 - ☐ \$40,001 to \$60,000
 - ☐ \$60,001 to \$80,000
 - ☐ \$80,001 to \$100,000
 - ☐ More than \$100,000

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Directions (please read carefully):

For the purposes of this survey, imagine that you are going to purchase a wooden CD rack. The options available for purchase are given in the 8 cards presented below. Each card is a different combination of five product features that a person would be likely to consider before making a purchase decision. *Your task is to rank the 8 cards in your order of preference considering only the product features listed.* For example, if the CD rack features presented in Card 1 best satisfy your personal preferences you would rank it 1, and if Card 8 least satisfies your preferences you would rank it 8. Assume that product features not listed on the cards such as size and color perfectly match your preferences needs.

Features:

Price

Wood type:

Wood Origin

Shelves

Storage capacity

Levels:

\$125, \$100, \$75

solid wood – the unit is constructed from solid pieces of wood

composite – the unit is constructed from small particles of wood, which are glued together, examples include particleboard and fiberboard

environmentally certified – a product with a label that informs the consumer that it originated from a well-managed forest, and that an independent third party verified forest management and harvest practices meet ecological, social and economic values.

not environmentally certified – no information about the origin of the wood used to make the product.

adjustable – shelves can be adjusted so that other media like VHS tapes, DVD's, and books could also be stored.

not adjustable – the shelves are designed to only hold CD's

100 – the unit can store 100 CD's

200 – the unit can store 200 CD's

Card 1	Rank _____
Price:	\$125
Wood type:	solid wood
Wood Origin:	environmentally certified
Shelves:	not adjustable
Storage Capacity:	200

Card 3	Rank _____
Price:	\$75
Wood type:	solid wood
Wood Origin:	environmentally certified
Shelves:	adjustable
Storage Capacity:	100

Card 5	Rank _____
Price:	\$100
Wood type:	composite
Wood Origin:	environmentally certified
Shelves:	adjustable
Storage Capacity:	200

Card 7	Rank _____
Price:	\$125
Wood type:	composite
Wood Origin:	not environmentally certified
Shelves:	adjustable
Storage Capacity:	100

Card 2	Rank _____
Price:	\$100
Wood type:	solid wood
Wood Origin:	not environmentally certified
Shelves:	not adjustable
Storage Capacity:	100

Card 4	Rank _____
Price:	\$100
Wood type:	solid wood
Wood Origin:	not environmentally certified
Shelves:	adjustable
Storage Capacity:	200

Card 6	Rank _____
Price:	\$75
Wood type:	composite
Wood Origin:	not environmentally certified
Shelves:	not adjustable
Storage Capacity:	200

Card 8	Rank _____
Price:	\$100
Wood type:	composite
Wood Origin:	environmentally certified
Shelves:	not adjustable
Storage Capacity:	100

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Please answer the following questions:

5. Some forest products feature an on-product logo placed there by a neutral third party. The logo assures the consumer that the wood used to make the CD rack comes from a sustainably managed forest and was harvested in an environmentally sound manner. Assume the wooden CD rack described in the previous section cost \$100 and featured a logo. Please circle what you would do if you were going to purchase this wooden CD rack.

I would not pay a premium (\$100)	I would pay 5% more (\$105)	I would pay 10% more (\$110)
I would pay 25% more (\$125)	I would pay 50% more (\$150)	I would pay more than 50%

6. Before today, had you ever heard of an environmentally certified forest product?
- NO YES
If yes, where? ▼

6. Compared to the average person, please rate your knowledge level of forest certification (circle your answer):

KNOW NOTHING ABOUT						KNOW A GREAT DEAL ABOUT
1	2	3	4	5	6	7

7. Rate your knowledge level of the following environmental issues:

	KNOW NOTHING ABOUT					KNOW A GREAT DEAL ABOUT	
	1	2	3	4	5	6	7
Acid rain	1	2	3	4	5	6	7
World Population Growth	1	2	3	4	5	6	7
Global Warming	1	2	3	4	5	6	7
Pollution from Pesticides	1	2	3	4	5	6	7
Destruction of the rain forest	1	2	3	4	5	6	7

8. Rate how often you engage in the following environmentally friendly behaviors:

	NEVER						ALWAYS
	1	2	3	4	5	6	7
Recycling	1	2	3	4	5	6	7
Join/support an environmental organization	1	2	3	4	5	6	7
Boycott purchases from environment damaging products/companies	1	2	3	4	5	6	7

9. Rate how often you intentionally purchase the following environmentally friendly products:

	NEVER						ALWAYS
	1	2	3	4	5	6	7
Organically grown fruit and vegetables	1	2	3	4	5	6	7
Recycled Paper Products	1	2	3	4	5	6	7
Environmentally friendly detergents	1	2	3	4	5	6	7
Products not tested on animals	1	2	3	4	5	6	7

10. If you found yourself in such a situation, circle the number that best describes how likely it would be for you to engage in the following behaviors:

	1	2	3	4	5	6	7
	1	2	3	4	5	6	7
Push a stranger's car out of the snow.	1	2	3	4	5	6	7
Give directions to a stranger.	1	2	3	4	5	6	7
Delay an elevator and hold the door open for a stranger.	1	2	3	4	5	6	7
Point out a clerk's error in undercharging for an item.	1	2	3	4	5	6	7
Offer to help a handicapped or elderly stranger across a street.	1	2	3	4	5	6	7
Carry a stranger's belongings (books, parcels, etc.)	1	2	3	4	5	6	7

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11. The following is a list of things that some people look for or want out of life. Please study the list carefully and then rate each thing on how important it is in your daily life (1 – very unimportant, and 7 – very important).

	VERY UNIMPORTANT						VERY IMPORTANT
Self Respect	1	2	3	4	5	6	7
Sense of belonging	1	2	3	4	5	6	7
Excitement	1	2	3	4	5	6	7
Warm relationships with others	1	2	3	4	5	6	7
Self-fulfillment	1	2	3	4	5	6	7
Being well respected	1	2	3	4	5	6	7
Fun and enjoyment in life	1	2	3	4	5	6	7
Security	1	2	3	4	5	6	7
A sense of accomplishment	1	2	3	4	5	6	7

12. From the following list, check the ONE thing that is most important to you in your daily life.

Self Respect	Being well respected	Warm relationships with others
Sense of Belonging	Fun and enjoyment in life	A sense of accomplishment
Excitement	Security	Self-fulfillment

13. For each statement, please circle the number that best describes your level of agreement with the statement:

	DISAGREE						AGREE
I am concerned about the natural environment.	1	2	3	4	5	6	7
The condition of the natural environment affects the quality of my life.	1	2	3	4	5	6	7
I am willing to make sacrifices to protect the natural environment.	1	2	3	4	5	6	7
My actions impact the natural environment.	1	2	3	4	5	6	7
When I buy products I try to consider how my use of them will affect the environment and other consumers.	1	2	3	4	5	6	7
It is worthless for the individual consumer to do anything about environmental problems.	1	2	3	4	5	6	7
Since one person cannot have any effect upon pollution and natural resource problems, it doesn't make any difference what I do.	1	2	3	4	5	6	7
Each consumer's behavior can have a positive effect on society by purchasing products sold by socially responsible companies.	1	2	3	4	5	6	7
It is important to display environmental information on product packaging.	1	2	3	4	5	6	7
I generally believe environmental information on product packaging.	1	2	3	4	5	6	7
I understand the concept of environmental certification.	1	2	3	4	5	6	7
I feel there is a need to certify tropical forests for environmental health.	1	2	3	4	5	6	7
I feel forest certification can reduce tropical deforestation.	1	2	3	4	5	6	7
I feel forest certification can help sustain the health of U.S. forests.	1	2	3	4	5	6	7
I feel there is a need to certify U.S. forests for environmental health.	1	2	3	4	5	6	7

Appendix B - Questionnaire used during the Home Depot consumer survey

Page 1 of 4



OREGON STATE UNIVERSITY
WOOD SCIENCE & ENGINEERING

Thank you for taking the time to complete this survey.

The Home Depot and the Department of Wood Science and Engineering at Oregon State University are researching consumer preferences for plywood. A variety of interested parties will use information from this study. They include: forest product manufacturers, government agencies, environmental groups, forest landowners, and forest product retailers.

Your participation is voluntary! However, your participation is essential to the success of this study. Therefore, please help us by taking a few minutes to answer the following questions. You may choose to skip any question you do not wish to answer. Your responses along with those of many other Home Depot shoppers will be combined and used for statistical summaries. Your responses are anonymous and confidential.

Sincerely,

Roy C. Anderson, PhD Candidate
Eric N. Hansen, Associate Professor
Oregon State University
Department of Wood Science and Engineering
541-737-4257

Please answer the following questions by checking the appropriate box:

1. I would describe myself as a:

☐ DO-IT-YOURSELF
☐ PROFESSIONAL CONTRACTOR
2. What is your age?

☐ 18-25
☐ 26-35
☐ 36-45

☐ 46-55
☐ 56-65
☐ 65+
3. What is your gender?

☐ MALE

☐ FEMALE
4. What is your annual household income level?

☐ LESS THAN \$20,000
☐ \$20,000 to \$40,000
☐ \$40,001 to \$60,000
☐ \$60,001 to \$80,000
☐ \$80,001 to \$100,000
☐ MORE THAN \$100,000
5. What is the highest education level you have completed?

☐ HIGH SCHOOL GRADUATE
☐ SOME COLLEGE COURSEWORK
☐ COLLEGE GRADUATE
☐ GRADUATE DEGREE
☐ OTHER _____

Directions:

Imagine that you need to purchase a sheet of $\frac{3}{4}$ " x 4' x 8' BC grade, exterior, sanded plywood. In the scenario below you are faced with 8 hypothetical plywood sheets – each containing a different combination of the following four plywood features:

<u>Features:</u>	<u>Levels:</u>
Price	\$22.59 per sheet \$22.10 per sheet
Certification	<i>environmentally certified</i> – the plywood displays a label informing the consumer that the wood used to make the panel comes from a well-managed forest in which an independent third party verified forest management and harvest practices meet ecological, social and economic values. <i>not environmentally certified</i> – the plywood displays no information about the origin of the wood used to make the plywood panel.
Core	<i>5 ply</i> – panel is made of 5 plies of veneer <i>6 ply</i> – panel is made of 6 plies of veneer
Manufacturer	<i>Roseburg</i> – plywood panel manufactured by Roseburg Forest Products <i>Boise Cascade</i> – Plywood panel manufactured by Boise Cascade Corporation

Your task is to consider the features listed for each piece of hypothetical piece of plywood (A-H) and then rank them from 1 – the one you most prefer, to 8 – the one you least prefer.

Plywood A Rank _____ Price: \$22.59 sheet Certification: environmentally certified Core: 5 ply Manufacturer: Roseburg Forest Products	Plywood E Rank _____ Price: \$22.10 sheet Certification: environmentally certified Core: 5 ply Manufacturer: Boise Cascade Corporation
Plywood B Rank _____ Price: \$22.10 sheet Certification: not environmentally certified Core: 6 ply Manufacturer: Boise Cascade Corporation	Plywood F Rank _____ Price: \$22.59 sheet Certification: not environmentally certified Core: 6 ply Manufacturer: Roseburg Forest Products
Plywood C Rank _____ Price: \$22.59 sheet Certification: not environmentally certified Core: 5 ply Manufacturer: Boise Cascade Corporation	Plywood G Rank _____ Price: \$22.10 sheet Certification: not environmentally certified Core: 5 ply Manufacturer: Roseburg Forest Products
Plywood D Rank _____ Price: \$22.10 sheet Certification: environmentally certified Core: 6 ply Manufacturer: Roseburg Forest Products	Plywood H Rank _____ Price: \$22.59 sheet Certification: environmentally certified Core: 6 ply Manufacturer: Boise Cascade Corporation

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Please answer the following questions:

6. Some plywood features a logo on the packaging, which indicates that a neutral third-party has certified that the wood in the panel comes from a sustainably managed forest and was harvested in an environmentally sound manner. Assume the plywood panel described in the previous section cost \$20 and featured such a logo. Please check the box next to what you would do if you were going to purchase this plywood panel:

☐ I WOULD NOT PAY A PREMIUM (\$20)
 ☐ I WOULD PAY 5% MORE (\$21)
 ☐ I WOULD PAY 10% MORE (\$22)
 ☐ I WOULD PAY 25% MORE (\$24)
 ☐ I WOULD PAY 50% MORE (\$30)
 ☐ I WOULD PAY MORE THAN 50%

7. Before today, had you ever heard of an environmentally certified forest product? ☐ NO ☐ YES

If yes, where? ▼

8. Compared to the average person, please rate your knowledge level of forest certification (circle your answer):

KNOW NOTHING ABOUT 1 2 3 4 5 6 7 KNOW A GREAT DEAL ABOUT

9. Rate your knowledge level of the following environmental issues:

	KNOW NOTHING ABOUT					KNOW A GREAT DEAL ABOUT	
	1	2	3	4	5	6	7
Acid rain	1	2	3	4	5	6	7
World Population Growth	1	2	3	4	5	6	7
Global Warming	1	2	3	4	5	6	7
Pollution from Pesticides	1	2	3	4	5	6	7
Destruction of the rain forest	1	2	3	4	5	6	7

10. Rate how often you engage in the following environmentally friendly behaviors:

	NEVER					ALWAYS	
	1	2	3	4	5	6	7
Recycling	1	2	3	4	5	6	7
Join/support an environmental organization	1	2	3	4	5	6	7
Boycott purchases from environment damaging products/companies	1	2	3	4	5	6	7

11. Rate how often you intentionally purchase the following environmentally friendly products:

	NEVER					ALWAYS	
	1	2	3	4	5	6	7
Organically grown fruit and vegetables	1	2	3	4	5	6	7
Recycled Paper Products	1	2	3	4	5	6	7
Environmentally friendly detergents	1	2	3	4	5	6	7
Products not tested on animals	1	2	3	4	5	6	7

12. If you found yourself in the following situations, circle the number that best describes how likely it would be for you to engage in the following behaviors:

	I WOULDN'T DO THIS					I WOULD DO THIS	
	1	2	3	4	5	6	7
Push a stranger's car out of the snow.	1	2	3	4	5	6	7
Give directions to a stranger.	1	2	3	4	5	6	7
Delay an elevator and hold the door open for a stranger.	1	2	3	4	5	6	7
Point out a clerk's error in undercharging for an item.	1	2	3	4	5	6	7
Offer to help a handicapped or elderly stranger across a street.	1	2	3	4	5	6	7
Carry a stranger's belongings (books, parcels, etc.)	1	2	3	4	5	6	7

13. The following is a list of things that some people look for or want out of life. Please study the list carefully and then rate each thing on how important it is in your daily life (1 = very unimportant, and 7 = very important).

	VERY UNIMPORTANT						VERY IMPORTANT
	1	2	3	4	5	6	7
Self-Respect	1	2	3	4	5	6	7
Sense of belonging	1	2	3	4	5	6	7
Excitement	1	2	3	4	5	6	7
Warm relationships with others	1	2	3	4	5	6	7
Self-fulfillment	1	2	3	4	5	6	7
Being well respected	1	2	3	4	5	6	7
Fun and enjoyment in life	1	2	3	4	5	6	7
Security	1	2	3	4	5	6	7
A sense of accomplishment	1	2	3	4	5	6	7

14. From the following list, check the **ONE** box next the thing that is most important to you in your daily life.

- | | | |
|---|--|---|
| <input type="checkbox"/> Self-Respect | <input type="checkbox"/> Being well respected | <input type="checkbox"/> Warm relationships with others |
| <input type="checkbox"/> Sense of belonging | <input type="checkbox"/> Fun and enjoyment in life | <input type="checkbox"/> A sense of accomplishment |
| <input type="checkbox"/> Excitement | <input type="checkbox"/> Security | <input type="checkbox"/> Self-fulfillment |

15. I would describe my political affiliation as (circle a number):

EXTREMELY LIBERAL				EXTREMELY CONSERVATIVE		
1	2	3	4	5	6	7

16. For each statement, please circle the number that best describes your level of agreement with the statement:

	DISAGREE						AGREE
	1	2	3	4	5	6	7
I am concerned about the natural environment.	1	2	3	4	5	6	7
The condition of the natural environment affects the quality of my life.	1	2	3	4	5	6	7
I am willing to make sacrifices to protect the natural environment.	1	2	3	4	5	6	7
My actions impact the natural environment.	1	2	3	4	5	6	7
When I buy products I try to consider how my use of them will affect the environment and other consumers.	1	2	3	4	5	6	7
It is worthless for the individual consumer to do anything about environmental problems.	1	2	3	4	5	6	7
Since one person cannot have any effect upon pollution and natural resource problems, it doesn't make any difference what I do.	1	2	3	4	5	6	7
Each consumer's behavior can have a positive effect on society by purchasing products sold by socially responsible companies.	1	2	3	4	5	6	7
It is important to display environmental information on product packaging.	1	2	3	4	5	6	7
I generally believe environmental information on product packaging.	1	2	3	4	5	6	7
I understand the concept of environmental certification.	1	2	3	4	5	6	7

THANK YOU!