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An Analysis of Consumer's Willingness to Pay for Environmental Certified Hardwood Products

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To the Graduate Council:

I am submitting herewith a thesis written by Meng Li entitled "An Analysis of Consumer's Willingness to Pay for Environmental Certified Hardwood Products." I have examined the final electronic copy of this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Science, with a major in Agricultural Economics.

Kim L. Jensen, Major Professor

We have read this thesis and recommend its acceptance:

Burton C. English, John R. Brooker

Accepted for the Council:

Carolyn R. Hodges

Vice Provost and Dean of the Graduate School

(Original signatures are on file with official student records.)

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and recommend its acceptance:

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John R. Brooker

Accepted for the Council:

Anne Mayhew

Vice Provost and
Dean of Graduate Studies

(Original signatures are on file with official student records.)

**AN ANALYSIS OF CONSUMERS' WILLINGNESS TO PAY
FOR ENVIRONMENTAL CERTIFIED
HARDWOOD PRODUCTS**

A Thesis
Presented for the
Master of Science Degree
The University of Tennessee, Knoxville

Meng Li
May 2003

Dedication

This thesis is dedicated to my beloved parents and husband

Mr. Yuheng Li, Mrs. Shuna Wang and Mr. Baofu Lu

who have been giving me tremendous love and support.

Acknowledgement

The completion of this thesis was due in large part to invaluable guidance and support of my major professor, Dr. Kim Jensen. Without her patience and guidance to all the revisions, I would not complete this thesis. I would also like to express my gratitude to my thesis committee, Dr. Burton English and Dr. John. Brooker, for their precious comments on my research and study.

I would like to thank all faculty, staff, and graduate students in the Department of Agriculture Economics for being very friendly and supportive. Especially, I would like to thank Mary Gage, Pornpat Wiwattarakul (Jing) and Tammara Cole for their support and encouragement. Without love and help from all my friends and families, I would not have done this far.

Abstract

This study examines Tennessee and Pennsylvania consumers' market participation for environmentally certified hardwood products (oak table, oak shelving board, oak chair), obtains potential premiums paid for selected hardwood products, determines the effects of scope of certification and demographics on premium amounts, and builds profiles of consumers who are willingness to pay the premium for certified hardwood products.

A pretest survey taken in Tennessee was used to construct premium ranges for the main field survey. Analysis of the main field survey conducted in rural and urban areas of Tennessee and Pennsylvania is based on the results of the logistic model, descriptive statistics, t-tests and chi-square tests. Logistic models are applied to evaluate the effects of demographics, attitudes toward environment, and scope of certification on market participation for specified certified wood products and to estimate the probabilities and amounts of willingness to pay.

Results from the study suggest that about 44 percent of respondents in each state would support environmental certification of hardwood products and would pay a premium. The logistic models for each product in both states were significant except the model for the certified table at the specified premium in Tennessee. The premium level had negative influence on willingness to pay while the scope of the certification did not appear to have effect on it. The residency, education level, and interest in environmental issues and consumer awareness, as demonstrated by rural/urban, college/less than college, recycling experience, contribution to environmental organizations and forest use, played inconsistent roles in willingness to pay. However, young, female and low-income consumers had consistently positive influence on willingness to pay. Consumers who indicated they would pay more for a certified hardwood product were willing to pay \$172.80 more on a \$799 table, \$11.49 more on a \$28.80 shelving board, and \$43.42 more

on a \$199 chair in Tennessee. In Pennsylvania, consumers would like to pay \$140.09, \$11.34 and \$49.81 more on a table, shelving board and chair, respectively. Among those profiled as most likely to pay premiums would pay as high as \$611.88 on a table, \$46.99 on a shelving board, and \$129.68 on a chair. Among those profiled as least likely to be willing to pay, most were not willing to pay anything more.

Contents

CHAPTER I.....	1
INTRODUCTION AND OBJECTIVES.....	1
Emergence of the Certification Movement	1
Scope of Environmental Certification Programs	2
Concerns Associated with Environmental Certification	4
CHAPTER II.....	7
LITERATURE REVIEW	7
Consumer’s Preference and Willingness to Pay Study.....	7
Premiums for Certified Wood Products.....	8
Market Participants for Environmentally Certified Wood Products	10
Adopted Methodology	13
CHAPTER III.....	15
DATA SOURCES AND METHODOLOGY	15
Survey Data.....	15
Pretest Survey.....	15
Main Field Survey	18
Methods of Analysis	27
CHAPTER IV.....	32
RESULTS.....	32
Descriptive Statistics	32
Logistic Model of Willingness to Pay.....	41
Logistic Model for Estimating the Coefficients of Willingness to Pay for Certified Hardwood Products	43
Logistic Model for Estimating the Probabilities, WTP and Related Profiles of Consumers Willin gness to Pay a Premium for Certified Hardwood Products	49
CHAPTER V	57
Conclusions	57
Summary of Findings and Implications	57
Recommendations for Future Work.....	60
References	62
Appendices.....	67
Appendix A.....	68
Phase I. Pre-Test Survey	68
Appendix B	76
Phase II. Field Survey.....	76

Appendix C	84
Information Booklet Sent to Those Agreeing to Participate	84
In the Second Telephone Survey.....	84
Appendix D.....	91
Follow-up Survey of Individuals Willing to Pay for.....	91
Environmental Certification	91
VITA.....	99

List of Tables

Table 2-1. Profiles Summary of Respondents Who Would Most Likely Be Buyers for Certification Wood Products from Previous Studies.....	11
Table 3-1. Selected Counties in Pennsylvania and Tennessee.....	20
Table 3-2. Prices for Uncertified Table, Shelving Board, and Chair and Premium Levels for Certified Table, Shelving Board, and Chair	27
Table 3-3. Variable Definitions	29
Table 4-1. Variable Names and Characteristics of the Respondents in TN	33
Table 4-2. Variable Names and Characteristics of the Respondents in PA.....	34
Table 4-3. Percent of Willingness to Buy Product at the Specified Premium in TN.....	36
Table 4-4. Percent of Willingness to Buy Product at the Specified Premium in PA	37
Table 4-5. Percent of Certified Table Purchase at Different Premium Level in TN (N= 107).....	38
Table 4-6. Percent of Certified Table Purchase at Different Premium Level in PA (N=121)	38
Table 4-7. Percent of Certified Shelving Board Purchase at Different Premium Level in TN (N=101)	39
Table 4-8. Percent of Certified Shelving Board Purchase at Different Premium Level in PA (N=111)	40
Table 4-9. Percent of Certified Chair Purchase at Different Premium Level in TN (N=104)	42
Table 4-10. Percent of Certified Chair Purchase at Different Premium Level in PA (N=111)	43
Table 4-11. Estimated Logistic Model for Willingness to Purchase the Certified Table at the Specified Premium in Tennessee.....	44
Table 4-12. Estimated Logistic Model for Willingness to Purchase the Certified Table at the Specified Premium in Pennsylvania	45
Table 4-13. Estimated Logistic Model for Willingness to Purchase the Certified Shelving Board at the Specified Premium in Tennessee.....	47
Table 4-14. Estimated Logistic Model for Willingness to Purchase the Certified Shelving Board at the Specified Premium in Pennsylvania	48
Table 4-15. Estimated Logistic Model for Willingness to Purchase the Certified Chair at the Specified Premium in Tennessee.....	50
Table 4-16. Estimated Logistic Model for Willingness to Purchase the Certified Chair at the Specified Premium in Pennsylvania	51
Table 4-17. Probabilities of Those Willing to Pay the Premiums Offered and Conditional Willingness to Pay for Certified Table over a \$799 Uncertified Table in Tennessee and Pennsylvania	53
Table 4-18. Probabilities of Those Willing to Pay the Premiums Offered and	

Conditional Willingness to Pay Premiums for Certified Shelving Board over a \$28.80 Uncertified Shelving Board in Tennessee and Pennsylvania	54
Table 4-19. Probabilities of Those Willing to Pay the Premiums Offered and Conditional Willingness to Pay Premiums for Certified Chair over a \$199 Uncertified Chair in Tennessee and Pennsylvania	56

List of Figures

Figure 3-1. Pictorial Depiction of Scope of Environmental Certification.....	17
Figure 3-2. Examples of Product Pictures and Descriptions	19
Figure 3-3. Pennsylvania: Hardwood Removals and Population Density, By County	21
Figure 3-4. Tennessee: Hardwood Removals and Population Density, By County	22
Figure 4-1. Support and Willingness to Pay For Certified Hardwood Products in Pennsylvania.	36
Figure 4-2. Support and Willingness to Pay for Certified Hardwood Products in Tennessee.....	36
Figure 4-3. Percent Change of Purchasing Certified Table at Different Premium Level in TN and PA	39
Figure 4-4. Percent Change of Purchasing Certified Shelving Board At Different Premium Level in TN and PA.....	40
Figure 4-5. Percent Change of Purchasing Certified Chair At Different Premium Level in TN and PA	42

CHAPTER I

INTRODUCTION AND OBJECTIVES

Emergence of the Certification Movement

Forest management practices first gained worldwide attention in the late 1980s when reports of deforestation and forest degradation in the world's tropical regions raised public concern over the state of tropical forests. Views regarding deforestation ranged from protecting the livelihood of native peoples to preserving natures. The watershed event for environmental movement is the 1992 United Nations Conference on Environmental and Development (UNCED). From that time forward, forestry issues such as sustainable forestry management and forest products certification became part of the international political scene.

One tool that emerged from the new environmental paradigm was eco-labeling: "labels applied to consumer and industrial products certifying that they met environmental standards". The goal of eco-labeling programs was to promote environmental improvement by encouraging end-consumers to choose products and services that were environmentally preferable. An environmental label or eco-label is used to convey information from producers to consumers that certified wood products are produced in an environmentally sustainable way. By providing consumers with reliable information on products' impact on the environment, eco-labeling programs strive to harness consumers' demand to influence business' behavior. Examples of eco-labels included dolphin-safe tuna, the Forest Stewardship Council label, the EPA's Energy Star program and the Rainforest Alliance's ECO-OK certification.

Due to the increased awareness and public support for environmentally friendly

products, some retailers in the US have begun to question the origins of their products and their suppliers. A recent example of a corporation's response to pressure from customers, shareholders, environmental groups, employees and competitors is the case of Home Depot. In the early 1990s, Home Depot, accounted for about 10 percent of the home building and improvement industry, established the most extensive environmental program in its industry. In 1999, the company was adopting a forest products policy incorporating a preference for wood originating in certified forests (Ford, 2000). All the products having any environmental claims sold in Home Depot must be evaluated by independent certification organizations.

Scope of Environmental Certification Programs

The Natural Resources Defense Council gives the definition of environmental certification as “a means of protecting forests by promoting environmentally responsible forestry practices by which forests are evaluated according to international standards and certified as well managed by a qualified independent certifier”. The Forest Stewardship Council (FSC) describes forest certification as “the process by which the performance of on-the-ground forestry operations is passed against a predetermined set of standards.” Ruddell (1997) noted that certification process provides consumers with a way to select products based on the environmental management of the forests from which these products originated.

As a response to increasing concern on the part of consumers over deforestation and forest-management practices, international efforts have been initiated to establish guidelines for sustainable forest management covering virtually all forest types (Bowyer and Grönroos, 1999). Some of these guidelines originated from initiatives by environmental organizations. There are two major international voluntary certification approaches carried out by Forest Stewardship Council and International Organization for Standard.

The Forest Stewardship Council (FSC), an international non-profit founded in 1993, ran the largest single-product labeling program in the world. FSC has positioned itself as the all-encompassing body for accrediting third-party certifiers. “The FSC supports environmentally appropriate, socially beneficial, and economically viable management of the world’s forests, by evaluating and accrediting forest management certifiers, and by strengthening certification and forest management capacity worldwide” (Hansen, 1997).

The FSC developed ten broad-based principles and criteria designed to apply to a variety of different forest types and regions and to assure that consistent performance-based standards are utilized in evaluating forest management practices by accredited certifiers. So far, the FSC has accredited two independent organizations as certifiers in US, the Smart Wood Program of the Rainforest Alliance and the Green Cross Program of Scientific Certification Systems. Accredited certification organizations were responsible for monitoring the on-the-ground management of individual forests. The certification organization had to audit the chain of custody¹ from the forest, through the manufacturer to the retailer and finally, the consumer.

As of April 1999, the FSC had certified over 16 million hectares of forest, eighty-eight percent of which was in the United States, United Kingdom, and Poland. In 1999, less than one percent of internationally traded wood products were certified by the FSC (Masserang and Tinter, 1999).

The International Organization for Standardization (ISO) has published two major voluntary international management systems for the forest: the ISO 9000 Quality

¹ Chain of custody was the process by which the source of a timber product was verified. In order for products originating from certified sources to be eligible to carry the FSC Trademark, the timber had to be tracked from the forest through all the steps of the production process until it reached the end user. Only when this tracking was independently verified could the product carry the FSC logo.

Management System (QMS) series standards and the ISO 14001 Environmental Management System (EMS) standards. “ISO 9000 QMS assures an effective quality management system within an organizational framework, while ISO 14001 EMS does not certify the quality or environmental performance of a product but it does certify a management process that an organization is committed to and that will improve its chances of accomplishing its quality and environmental goals” (Ruddell and Stevens, 1998). In fact, the ISO 14001 EMS standard is likely to be adopted quicker than the ISO 9000 QMS series standards in the United States and the ISO 14001 series offers a framework for certification of environmental management systems rather than specifying forest management standards as FSC does.

The primary objectives of all the certification programs were identified in the study conducted by the Society of American Foresters Council in 1994. Those objectives include: “increasing general consumer awareness of the relationship of the forest industry to the environment, increasing consumer acceptance and confidence in certified products, modifying consumer behavior to select certified products, modifying manufacturer behavior to more sustainable management practices, improving the earth’s environmental quality, increasing market share, providing product differentiation and an objective audit of the management of the forest asset, promoting sustainable forest management and demonstrating that forest management provides sustainable economic, ecological, and social benefits.”

Concerns Associated with Environmental Certification

Although a growing segment of the public is sufficiently concerned about the environmental effects of the wood product and markets using wood from certified sustainable forests are developing, a mass market has not yet emerged. Cost of certification is a very important issue which not only influences the producers manufacturing behavior but also affects the consumers purchasing behavior. There are

two primary costs associated with obtaining certification status. The first is the cost of inspection and initial registration. The second relates to management costs associated with meeting certification requirements or standards (Merry and Carter, 1996). The cost also includes time and money for employee and consumer education, increased storage space, and improvements to product tracking systems (Humphries, Vlosky and Carter, 2001). Costs of certification may vary greatly, depending on the scope of certification. A program that certifies a product throughout its life cycle would likely be much more costly than a program that only certifies the product at timber growing and harvesting. These higher costs may be covered through higher prices of certified products or also called “green premiums”.

Regarding to the producers’ aspect, only a small number of wood products manufacturers are currently manufacturing or purchasing certified wood products. Only 0.5 percent of internationally traded wood products are certified. Without the certainty of willingness to purchase certified products by consumers, manufacturers are reluctant to certify their products due to the additional costs associated with certification. While a number of studies have suggested that consumers are willing to pay more for eco-labeled wood products, industry concerns remain due to lack of available information for decision-making, and about whether added supply chain costs would be offset. Initial certification can cost tens of thousands of dollars plus small amounts for annual renewals. Also the manufacturers are concerned that their products will be at a cost disadvantage to uncertified wood products or other substitute materials. To some extent, not sufficient volumes of certified wood products are available to meet customer demands. The Woodworkers Alliance for Rainforest Protection (WARP) list before 1995 included just 13 certified sources and only 6 of these are US producers and of these only three produce substantial volumes.

The growth of human population and industrialization and their potential

impacts on natural resources have become sources of concern for consumers. It is becoming clear that consumers' worry about the environment, and consumers who espouse a concern for the environment, or have what has come to be labeled a "green orientation", are growing in number (Donaton and Fitzgerald, 1992). Although environmental awareness and concern appear to be widespread, consumers are highly fragmented in their willingness to act by choosing higher-priced products. Another issue is whether or not there is sufficient demand for certified wood products. Heyward and Vertinsky (1999), and Hansen (1997) proposed that the demand for certified wood products is limited. This is partly because there is not enough public awareness and a relatively small number of consumers realize the value of forest certification.

The fragmentation of certifying business is another consideration. Mater (1995) noted that the sheer number of certification organization, the diversity of their programs, the complexity of certification symbols and the social/technical merging of values confuse many consumers, which may deter the consumers who wish to purchase such products.

The purpose of this paper is to assess the willingness to pay a premium for environmentally certified wood products by Tennessee and Pennsylvania consumers over a range of products (table, chair, shelving board) and to obtain an estimate of the premium that consumers would be willing to pay for selected hardwood products. The study also determines how scope of certification and demographics may influence willingness to pay for certified products and to build profiles of consumers who are most willing to pay the premium for certified wood products.

The information from this specific research will provide some general insight into how much consumers as a whole are willing to pay and provide a general indication of their commitment to environmental issues. The analysis results will be helpful to the wood products industry seeking out a potential market for certified hardwood products.

CHAPTER II

LITERATURE REVIEW

A number of studies have been conducted regarding consumer's willingness to pay for environmentally certified wood products and their perception. Studies of environmentally certified forest products have encompassed not only analyses of willingness to pay, but also assessments of consumer perspectives about environmental certified wood products and certification programs. Additionally, information about market potential and market participants for sustainably managed certified forest products has been derived. Due to the differences in characteristics and demographics of sample populations and methods used in each study, the results suggested by the studies described below vary.

Consumer's Preference and Willingness to Pay Study

Around the world consumers have expressed a willingness to include environmental criteria in purchase decision. Several studies have examined consumers' willingness to pay for environmentally certified products. A 1991 Gallup Poll (Masserang and Tinter, 1999) found that more than 90 percent of consumers looked for environmentally safe products and were willing to pay more for them. A 1996 study by The Hartman Group, a market research firm specializing in the natural products industry, found that 71 percent of consumers were interested in purchasing "earth sustainable" products.

An early 1990s World Wide Fund for Nature (WWF) study found that 66 percent of respondents would be willing to pay higher prices, up to 13.6 percent more, for wood originating from sustainable sources.

A study conducted by Winterhalter and Cassens (1993) in Purdue University, which focused on affluent customers with incomes of more than \$50,000, found that 81 percent of consumers polled were willing to pay more for assurances of sustainability. Fifty-six percent of the respondents would pay 1-10 percent more for sustainable wood products. Almost 25 percent expressed a willingness to pay a premium of more than 10 percent. The limitation of this study was the survey targeted relatively affluent, well-educated consumers.

Ozanne and Smith (1995) noted that 34 percent of the respondents in their survey were willing to pay a premium for certified lumber and wood products. Ozanne and Vlosky (1997) reported that approximately 63 percent of consumers would pay up to 12 percent more for certified wood products. The later study was restricted to adult homeowners with a household income of \$30,000 or more. As with Winterhalter and Cassens study, this study was targeted to higher income consumers. Therefore, the results have limited capability to be generalized to the population as a whole.

Bowyer and Grönroos (1999) assessed the market potential for environmentally certified wood products in new homes in Minneapolis/St. Paul and Chicago. Only 36 percent of respondents in Chicago and 24 percent in Minneapolis/St. Paul were willing to pay a premium.

Premiums for Certified Wood Products

Willingness to pay a premium for environmentally certified wood products might vary for different types of consumer products and product costs. Ozanne and Vlosky (1997) tried to investigate whether the willingness to pay for premium varies over a range of wood products. The certified wood products in the study were: 1) a stud; 2) a ready- to- assemble chair; 3) a wood dining set; 4) a kitchen remodeling job; and 5) a new home. The result indicated that consumers would pay the highest percent premium

for a certified stud at \$1 base price, the cheapest item, and the lowest percent premium for a new home at \$100,000 base price, the most expensive item. In other words, the percent premium consumers will pay declines with the value of the product. Consumers are willing to pay a relatively high premium for an inexpensive certified wood item, vice versa. Rametsteiner, *et al.* (1999) also found the inverse relationship between willingness to buy and price in a study of European consumers willingness to buy certified forest products.

From the previous studies, the percent of consumers who will pay a specified premium declines with the level of the premium too. Rametsteiner, *et al.* (1999) found if the price of the certified product was 150 percent of the original price, willingness to pay was decreased by 20 percent. Although Forsyth (1999) did not examine willingness to pay across a range of consumer products with a range of price points in their study, they indicated that about 94.3 percent of the interviewees would choose the certified wood products if its price was as the same as the non-certified wood products. About 67.3 percent would pay a 5 percent premium, 28.3 percent would pay a 10 percent premium, and only 13 percent would pay more than ten percent premium.

Several willingness-to-pay studies indicate that consumers may not actually pay even if they state that they are willing to pay when faced with the purchase decision. Based on the research by Wicher whose study was on relationship between attitude and behavioral responses, Ozanne and Vlosky (1997) found that the idea that attitudes may not predict behavior. As cited in Forsyth *et al.* (1999), the study by Gleason *et al.* (1996) supports this argument either. Seventy-five percent of survey respondents are willing to pay more but in fact less than five percent of customers could actually be expected to pay a premium.

The report from ECE/FAO (ECE/FAO Forest Products Annual Market Review, 1998-1999) noted that the intention to pay premiums is naturally influenced by such

factors as price and quality. Masserang and Tinter (1999) also found that even for customers interested in purchasing environmentally friendly products, environmental considerations were not the primary factors in purchase decisions. Customers were only willing to consider environmental goods if all other factors – quality, convenience, price, etc.— were equal. In the research of the Hartman Group, past experience took 47% share, which is the number one factor in product purchase decision for consumers. Price, brand recognition, recommendation of other people, convenience and environmental impact of product are the other primary factors that affect consumers' decision with 37 percent, 15 percent, 13 percent, 12 percent, and 6percent, respectively. Similarly, respondents in Grönroos and Bowyer (1997) were asked to rank the important of 14 features when buying a home. The impact of building materials production on environment, the only environmental attribute, was placed thirteenth. Factors ranked higher than the environmental impact of building materials were location, price, investment value, quality of workmanship, quality of bulking materials, affordable property taxes, style/appearance, size and number of rooms, energy efficiency, low maintenance requirements, lot size, impact of building materials on personal health. The respondents in the study of Forsyth *et al.* (1999) ranked quality and price first and second respectively among eleven product attributes. Three environmental attributes, environmental impact, whether the product is certified and retailer's environmental image were ranked eighth, ninth and tenth, respectively. Only the product's brand name ranked lower.

Market Participants for Environmentally Certified Wood Products

Several studies have attempted to identify profiles of those most likely to buy certified wood products by using demographic, socioeconomic, culture, and personality variables, as well as attitudes. Characteristics of a person who are most likely to purchase certified wood products found in previous studies are presented in Table 2-1.

Table 2-1. Profiles Summary of Respondents Who Would Most Likely Be Buyers for Certification Wood Products from Previous Studies

Study	Respondents Characteristics	Profiles
Ozanne and Smith (1995)	<ul style="list-style-type: none"> • Adult • Homeowner • Income > \$30,000 	<ul style="list-style-type: none"> • Politically liberal • Democratic • Female • Member of an environmental organization • Well educated
Ozanne and Vlosky (1997)	<ul style="list-style-type: none"> • Adult • Homeowner • Income > \$30,000 	<ul style="list-style-type: none"> • Politically liberal • Democratic • Female • Member of an environmental organization
Forsyth, <i>et al.</i> (1999)	<ul style="list-style-type: none"> • Adult • Customers of home improvement retail stores • Live in British Columbia, Canada 	<ul style="list-style-type: none"> • Relatively young, low income, urban setting <p>Or</p> <ul style="list-style-type: none"> • Relatively old and high income
Spinazze and Kant (1999)	<ul style="list-style-type: none"> • Active buyers of wood products • No specific socioeconomic or demographic characteristics 	<ul style="list-style-type: none"> • Consumer profile depends only on environmental awareness. • Gender and education correlate with willingness to pay

The Hartman Group in the study of Masserang and Tinter (1999) identified six distinct customer segments by differentiating the demographics – Household Income, Education, Head of Household Age, Household Size and Marital Status. These six segments are “ True Naturals”, “New Green Mainstream”, “Young Recyclers”, “Affluent Healers”, “Overwhelmed”, and “Unconcerned”. The first two segments represented the primary target segments for environmentally friendly products. The two in the middle comprised the secondary target market for environmentally friendly products. The remaining two segments remained unconcerned about the environment.

Ozanne and Smith (1998) found that 18 percent of respondents believed the importance of environmental certification of forest practices and this group of the consumers is more likely to purchase these products at a premium. This segment of consumers are described as “politically liberal, democratic, female, a member of an environmental organization, and fairly well educated.” Ozanne and Vlosky (1997) found a similar profile with the exception of education level. Cornwell and Schwepker (1995) concluded that environmentally concerned consumer tends to be white, urban, better educated, higher in income and occupational status, and thus higher in socioeconomic status. However, the study of Spinaze and Kant (1997) that aimed at measuring the willingness to pay for certified wood products in Ontario, Canada suggested that the consumer segment that would pay highest premium for certified wood products is independent of demographic and socioeconomic variables. Instead, it depends on environmental awareness. They examined the correlation between gender, education and premiums and found that there were significant differences in premium between men and women. Women were more concerned about the environment than men. The level of education seemed no significant influence on premiums. Forsyth, *et al.* (1999) focused on five demographic characteristics to examine differences in willingness to pay for certified wood products: sex, place of residence (urban or rural), age, income, and market segment

(consumer or professional). They profiled the consumers who are most likely to buy certified products as female, urban, young, and low income. Because the data do not provide statistically significant different, no firm and clear conclusions on the characteristics and the likelihood of buying certified wood products could be drawn.

Adopted Methodology

While some studies of willingness-to-pay for the certified wood products have been undertaken in the past, the market for environmentally certified wood products has quickly evolved in recent years. Increased awareness of environment status necessitates new research to document the current dynamics of the forest products market.

Cluster analyses were conducted in several studies to help identify the market segments of potential buyers who would most likely purchase certified wood products.² Ozanne and Smith (1998) utilized cluster analysis and multiple discriminant analysis to develop and describe consumer segments for environmentally certified wood products. Forsyth, Haley and Kozak (1999) also undertook cluster analysis to identify the market segments consisting of the most likely buyers of certified wood products. Ozanne and Vlosky (1997) not only used descriptive statistics such as frequencies and mean responses to analyze the data on willingness to pay but cluster analysis and analysis of variance techniques to profile the consumer segments most willing to incur a premium for certified wood products. Bowyer and Grönroos (1999) did not use cluster analysis but means and distributions with Chi-squares and t-tests. Logistic models that are used in this study were not employed in other earlier studies of consumers' willingness to pay for

² Cluster analysis is a technique used for classification of objects without prior assumptions about the population. Objects within clusters would exhibit high internal homogeneity and high external heterogeneity with those outside their cluster (Punj and Stewart, 1983).

certified wood products. Logistic models enable a causal relationship between premium, demographics, and attitude and likelihood of willingness to pay to be estimated.

CHAPTER III

DATA SOURCES AND METHODOLOGY

Survey Data

The data for this research were collected from surveys conducted in 2000-2001 by the Human Dimensions Lab, University of Tennessee Department of Forestry, Wildlife, and Fisheries (Jensen, Jakus, and English, 2002). Two phases of the survey were required for this data collection. The first phase was a pretest mail survey of Tennessee residents. The second phase was the main field survey to the residents of Tennessee and Pennsylvania based on the information from the pretest. A detailed description of each phase is presented below.

Pretest Survey

A total of 500 residents randomly selected from telephone listings were sent a full-color mail survey. The sample was stratified with no more than 200 residents coming from the four major urban counties in the state (Davidson, Hamilton, Knox and Shelby). In order to increase the response rate of the survey, a reminder postcard was sent to residents who had not responded one week after the initial mailing of the survey and two weeks later another follow-up survey was sent out to those who had not yet replied. Of the 500 surveys mailed to Tennessee residents, 78 addresses were undeliverable. Of the 422 deliverable surveys, 78 completed surveys were returned by mail, yielding a response rate of 18 percent.

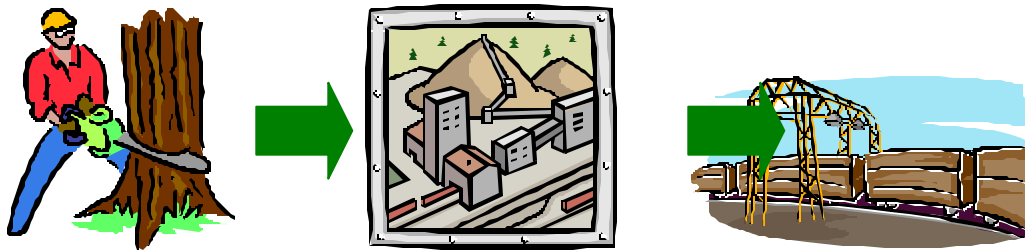
The pretest survey included opinions about environmental certification, amounts of willingness to pay for certain hardwood products, and demographic information such as age, education, household income and homeownership (See Appendix A). The price

premium that consumers would be willing to pay for specific certified wood product was a primary focus of the pretest survey. The pretest survey of Tennessee residents was used to establish a preliminary distribution of residents' willingness to pay (WTP) for eco-labeled wood products. The WTP distribution estimated from this pretest was then used to choose an optimal experimental design for the second phase of full field survey. Analysis of preliminary survey data yielded the price vectors needed for the second survey.

Two versions of the pretest survey were mailed. The versions differed in the scope of the certification. One version included a full scope certification and the other contained a partial certification. Each respondent was randomly assigned to either of them. In full certification, all aspects of production, including timber growing and harvesting, product manufacturing, and handling methods, are monitored. Partial certification is only responsible for timber growing and harvesting. To indicate whether the product had partial certification or full certification, respondents were shown an environmental certification label that would appear on or near certified wood products.

The environmental certification was described at the beginning of the survey, which was worded as "Environmental certification means a product has passed a voluntary environmental screening process by an independent third party organization (not the wood products company, the wood products industry, or the government)". According to the different scope of the certification the residents would receive, the explanation of certain certification and pictorial depiction of the certification processes was presented followed (Figure 3-1). Respondents were then asked whether they had ever purchased environmentally certified wood products. Information of opinions of environmental certification and willingness to pay for certified hardwood products was collected in this pretest of Tennessee residents. Respondents could answer that they "support environmental certification and would pay a higher price for hardwood products

Timber growing and harvesting methods, product manufacturing, and product handling would be monitored to ensure that practices are used that help sustain our environment for current and future generations.



Timber Growing & Harvesting is Environmentally Certified

Product Manufacturing is Environmentally Certified

Product Handling is Environmentally Certified

Figure 3-1. Pictorial Depiction of Scope of Environmental Certification

if they were certified”, “support environmental certification but not if it requires paying a higher price for hardwood products”, or “do not support environmental certification of hardwood products regardless of whether it costs me anything”. Those who would pay more for certified wood products were then asked how much more they would pay for each of the three wood products (an oak table, an oak chair, and an oak shelving board) (Figure 3-2). Two identical pictures of each product were presented to the respondents. Two products in two pictures are identical in all attributes except for certification. The certification label was placed adjacent to the certified product. Respondents could fill in the blank with the price that they were willing to pay for the certified product based on the given price for the uncertified product. The price of uncertified table was given at \$799, the uncertified chair at \$199, and the uncertified shelving board at \$28.80. These preliminary data regarding the premium range for the certified table, shelf and chair in Tennessee area would help to do the further analysis in the second phase survey.

Main Field Survey

A total of 1,614 telephone surveys were obtained from consumers in two eastern hardwood-producing states, Tennessee and Pennsylvania. The sampled residents were randomly selected in each state, at least 18 years old, and the person primary responsible for wood products purchases in their household.

Six selected counties in each state were surveyed on the basis of high urbanization with low hardwood removals and low urbanization with high concentrations of wood products industries and hardwood removals (Table 3-1). Residents in urban areas of Tennessee (403) and in rural areas (400) were contacted in the survey. In Pennsylvania, 402 surveys were collected from urban areas and 409 from rural areas. In total, 1614 responses were completed. In each case, the urban counties had population densities of greater than 500 people per square mile (Figure 3-3 and 3-4). These counties also had hardwood removals of less than 2 million cubic feet per year (Figure 3-3 and 3-4).

Oak Dining Table
40 inches wide by 72 inches long
Environmentally Certified



Oak Chair
39" tall, Seat 19"w x 20"d
Environmentally Certified



Oak Shelving Board
1" x 10", 6 feet long
Environmentally Certified



Figure 3-2. Examples of Product Pictures and Descriptions

Table 3-1. Selected Counties in Pennsylvania and Tennessee

State	High Urbanization/Low Hardwood Removals County	Low Urbanization/High Hardwood Removals County
Pennsylvania	Allegheny, Montgomery, Northampton	Clearfield, Elk, McKean
Tennessee	Davidson, Hamilton, Knox	Hardeman, McNairy, Wayne

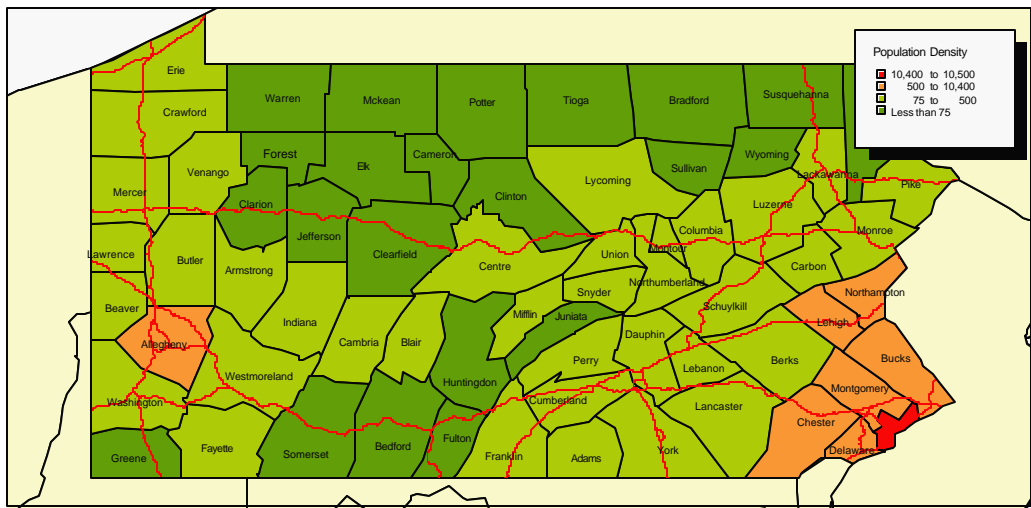
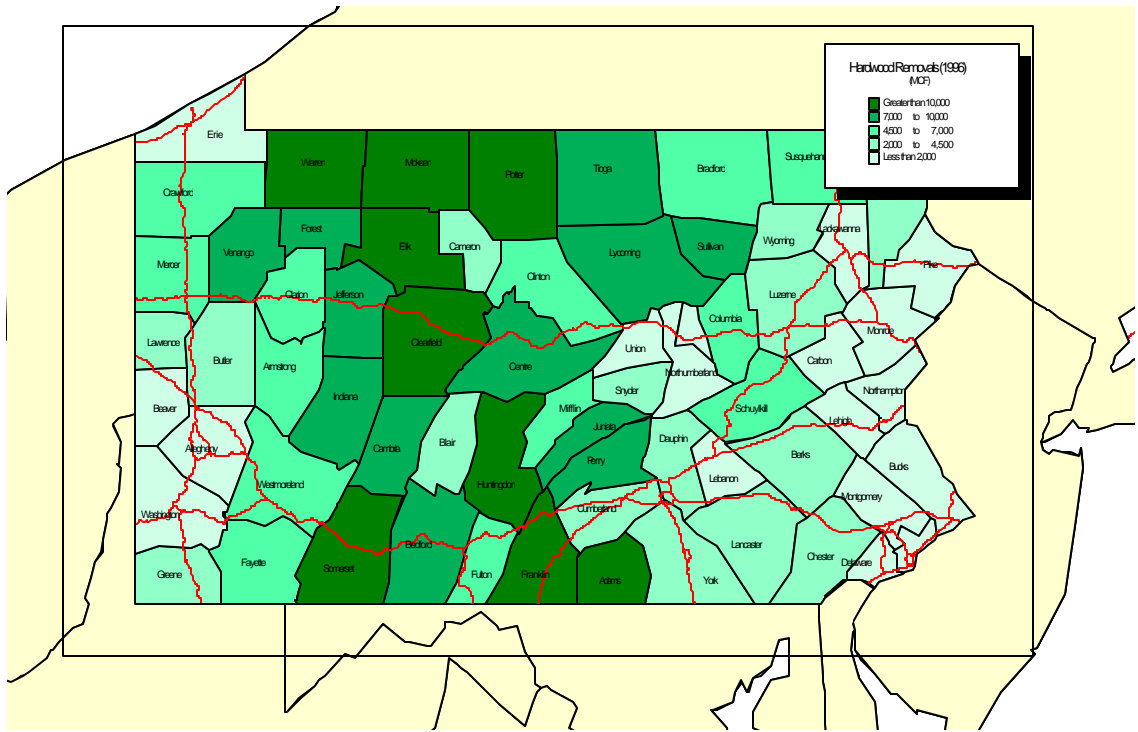


Figure 3-3. Pennsylvania: Hardwood Removals and Population Density, By County

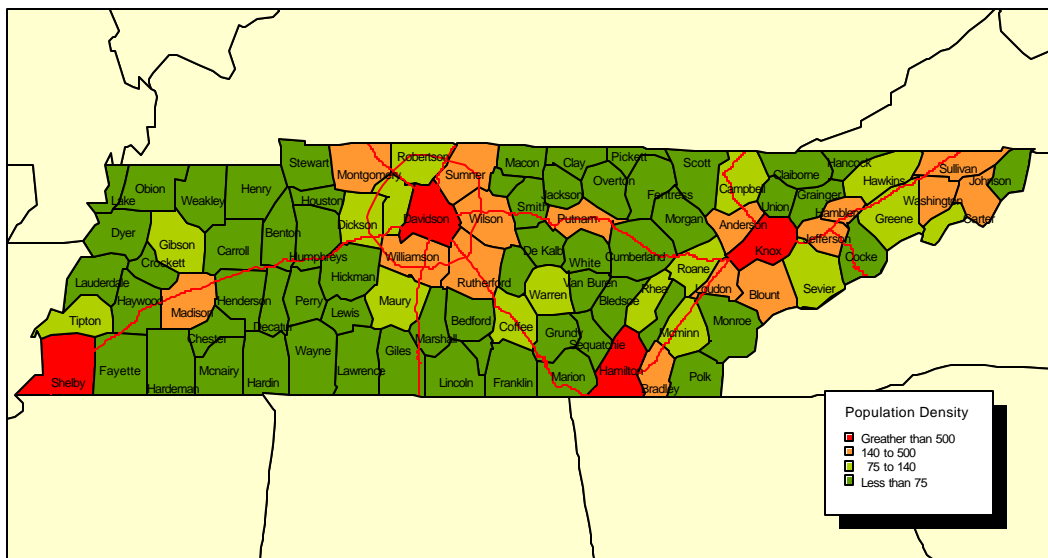
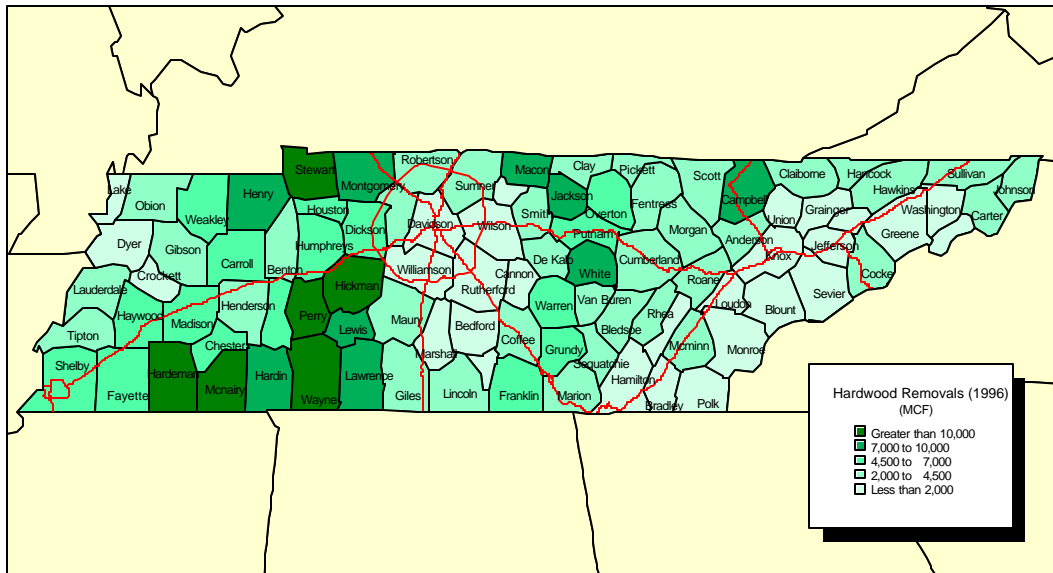


Figure 3-4. Tennessee: Hardwood Removals and Population Density, By County

The rural counties had population densities of less than 75 persons per square mile. These counties also had hardwood removals of 10 million cubic feet per year or greater.³

As with the pretest, two versions of the survey were used “full” and “partial” certification (See Appendix B). The respondents were randomly assigned to either one of the versions. The text for the certification processes was as follows:

Full Certification Text

Environmental certification means a product has passed a voluntary environmental screening process by an independent third party organization, not the wood products company, the wood products industry, or the government. All aspects of production, including timber growing and harvesting, product manufacturing, and handling methods, are monitored to ensure that practices are used that help sustain our environment for current and future generations. A product label assuring certification appears on or nearby the product.

Partial Certification Text

Environmental certification means a product has passed a voluntary environmental screening process by an independent third party organization, not the wood products company, the wood products industry, or the government. Timber growing and harvesting methods are monitored to ensure that practices are used that help sustain our environment for current and future generations. A product label assuring certification appears on or nearby the product.

After the certification text was read to the respondent, they were asked their opinions about environmental certified wood products as in the pretest survey. They were asked to indicate whether they support certification and would pay more or support but not pay more or not support regardless of paying more or not.

Demographic information, socioeconomic, attitudes toward the environment

³ Source: Census Bureau. County Population Estimates as of July 1, 1999. <http://www.census.gov>, and Timber Product Output (TPO) Database Retrieval System as of 1996, <http://srsfia.usfs.msstate.edu/rpa/tpol/>.

and environmental experience were collected in this survey in order to examine whether these factors would influence the decision of willingness to pay for certified hardwood products and how much consumers are willing to pay for each products. The information was useful in building consumer profiles for certified hardwood products. The information included in the survey was age, gender, income, education, type of residence, household income; recycle experience, participation in environmental groups, frequency of recreational use of forest, purchases of environmentally labeled non-wood products, label read for the first time purchasing, homeownership, and whether any immediate family member was employed in a wood products related industry.

Previous studies have produced mixed findings regarding the effects of demographics and income on willingness to pay for certification of forest products. According to the previous studies cited in Chapter 2, different age groups and gender may have different standpoints toward environmentally certified wood products. Younger age was hypothesized to have a positive influence. Female respondents were more concerned about the environment than men, so male was hypothesized to have a negative influence on purchasing certified wood products. In general, at any given price, those with higher incomes could afford to pay higher prices. Past economic theory has proven that price and income variables are directly tied into consumer purchasing decisions. Therefore, the higher income group, the income greater than \$50,000 in this study, will probably be the participants who are willing to purchase the products and will have positive influence on willingness to pay. The premium amount is postulated to have a negative effect on willingness to buy the certified products, so as the premium level increases, the willingness to buy the product at the specified premium should decline. Education Level is another important demographic variable, which was indicated by the former studies that well-educated consumers are willing to purchase certified wood products. People with college education or beyond are postulated be more likely to buy the certified wood

products and have positive influence on purchasing. The studies by Cornwell and Schwegker (1995) and Forsyth, et al. (1999) noted that urban residence would like to purchase certified wood products and have positive influence on market participation. Therefore, the urban residence is hypothesized to have positive influences on willingness to pay in this study. Several previous studies mainly focused on homeowner and indicated that homeowners are willing to purchase the products. Therefore, homeownership is hypothesized to be positive.

The questions such as participation in recycling, environmental groups and frequent use of forests for recreation may reflect values the respondents place on the environment and forest resources. They would be hypothesized to have a positive influence on willingness to pay. Purchasing environmentally labeled non-wood products is hypothesized to have a positive influence since this measure may reflect consumers' awareness of eco-labeling. Respondents who purchased environmentally labeled non-wood products before may easily become the consumers of environmentally certified wood products. Label readership is hypothesized to have a positive influence on willingness to pay because label readers will tend to be more aware of the products specifications and how the products are manufactured. Any immediate family member was employed in a wood products related industry may hypothesized to have a positive or negative influence since the employers may give their positive point of view toward the environment to their family members or share their concerns about job losses if applied certification with their families, which is negative opinion. The full certification process is hypothesized to have a positive influence on willingness to purchase certified products relative to the partial process. This is anticipated because the potential positive environmental effects of the full certification would be throughout the market channel, versus only at growing and harvesting level, as with the partial certification program.

Respondents who indicated some positive willingness to pay a higher price for

certified wood products and those who were willing to participate in a second round telephone survey were sent a product information booklet (See Appendix C) which gave the definition of environmental certification, scope of the certification process and an environmental certification label for hardwood products. Pictures of sample products were shown in the booklet.

The respondents receiving the booklet were asked to read a section in the booklet on making hypothetical choices. The booklet's text reassured respondents that some people might be willing to pay more for environmentally certified products, while others might not. The section contained a page of text describing hypothetical bias and the problems it may cause when providing market information to the wood products industry. Respondents were also reminded of their budget constraint in the booklet. The purpose of these statements was to mitigate the potential effects of hypothetical bias (Kotchen and Reiling 1999; Cummings and Taylor 1999). As part of the follow-up phone call, the respondents were again reminded to carefully consider their budget constraint and to make as realistic a choice as possible in a hypothetical situation.

In the follow-up telephone survey (See Appendix D), respondents were reminded that certified and uncertified items were identical in quality except the certification and the price of each non-certified product was given (Table 3-2). Respondents were asked to indicate which of the products (certified, uncertified, or neither) they would be willing to purchase at a given premium. The prices of the products were based on results of the preliminary survey in the first phase. Finally, the respondents were asked to indicate the reasons why they purchased certified products, supported certification but would not pay the premium, or did not support certification.

Table 3-2. Prices for Uncertified Table, Shelving Board, and Chair and Premium Levels for Certified Table, Shelving Board, and Chair

Product	Uncertified Price	Premiums
Table	\$799	\$25, \$45, \$50, \$55, \$60
Shelving Board	\$28.80	\$1.50, \$4, \$5, \$6, \$10
Chair	\$199	\$10, \$15, \$20, \$25, \$40

Methods of Analysis

The analysis of data included several methods. Each state's data (Tennessee and Pennsylvania) will be analyzed respectively. Descriptive statistics, such as frequencies and mean responses, are used to analyze the data on willingness to pay. The t-statistics is utilized in this study to examine the significance of each variable. The chi-square test is employed also to measure association between two discrete variables.

Logit models will be selected as the regression method in this study to evaluate how certification scope, demographics, attitudes toward the environment, and location may influence market participation for environmentally certified oak table (PayTable), chair (PayChair), and shelving board (PayShelf), to predict the probability of willingness to pay for certified hardwood products and to estimate the amount of willingness to pay for a given hardwood product. The logit model is commonly used in settings where the dependent variable is binary such as 'yes/no' or 'male/female'. In other words, dependent variables are discrete and limited to only certain numbers within a specific range which is usually from 0 to 1 for predicted probabilities. In this study (See Equation 1a. – 1c.), the dependent variables are expressed as PayTable=1, PayChair=1 and PayShelf=1 if the respondents were willing to pay a nonzero premium for certified hardwood products, 0 otherwise. As to the independent variables, the logit technique is a better procedure for capturing the magnitude of the independent variable effects for qualitative dependent variables (Amemiya 1983). In logit modeling, the likelihood of purchasing each of the

products is a function of a set of predetermined variables (Z, R), which are defined in Variable Definition (Table 3-3). The conditional willingness to pay (WTP) estimates will be obtained on the respondents stating they would be willing to pay some premium for certified hardwood products.

Equation 1a. – 1c.

$$a. \Pr(\text{PayTable}=1) = F(d + \delta Z + \gamma R_T)$$

$$b. \Pr(\text{PayChair}=1) = F(d + \delta Z + \gamma R_C)$$

$$c. \Pr(\text{PayShelf}=1) = F(d + \delta Z + \gamma R_S)$$

where $\delta, \gamma,$ and f are parameters to be estimated, and F is the logistic distribution (Greene, 2000). The matrix Z includes demographics and several other factors. In addition to the other explanatory variables used in the model described above, a premium variable, R , is included in the estimated equation for each product (Table 3-3). While the magnitudes on coefficients from each logit model cannot be interpreted directly, the sign of each coefficient can. The significance of overall model is evaluated with a chi-square Log-Likelihood Ratio Test (LLR).⁴ The significance of the coefficients is evaluated with t-tests. The estimate of the conditional willingness to pay for the product can be obtained by the following:

Equation 2.

$$WTP|WTP>0 = (d + \delta Z) / -\gamma$$

where the parameters $\delta, \gamma,$ and ϕ are estimated via Equations 1a. - 1c. The value of willingness to pay for the product in Equation 2 is a conditional WTP estimate, because it is conditional on the respondent indicating willingness to participate in the market for

⁴ The Log-Likelihood Ratio Test (LLR) compares the log-likelihood function of the model if only the intercept was included with the log-likelihood of the model and is calculated as $-2 \times (\text{LLR (Restricted to Intercept)} - \text{LLR (Not Restricted)})$.

Table 3-3. Variable Definitions

Variable	Definition
Included in Willingness to Buy Products Equation (Z variables):	
Full	1 if received survey with full scope of certification, 0 with partial scope of certification
Urban	1 if a respondent live in an urban county, 0 otherwise
Recycled	1 if recycled in past month, 0 otherwise
Consergr	1 if have ever contributed to a conservation organization, 0 otherwise
Hfgr	1 if have ever contributed to a hunting/fishing organization, 0 otherwise
Forestuse	1= Less than once per year, 2= 1-3 times/year 3= 4-6 times/year, 4= 7-11 times/year 5= At least once per month
Nonwood	1 if purchased non-wood products, 0 otherwise
Label Read First Time Purchasing	1= Never, 2= Almost never, 3= Sometimes, 4= Often, 5= Always
Homeown	1 if reside in home or condo they own, 0 otherwise
Age	Age in years
Scollege	1 if highest grade of school completed is some college, 0 otherwise
College	1 if complete college or higher, 0 otherwise
Employ	1 if employed in forest industry, 0 otherwise
Inc2535	1 if income \$25,000-\$34,999, 0 otherwise
Inc3550	1 if income \$35,000-\$49,999, 0 otherwise
Inc5075	1 if income \$50,000-\$74,999, 0 otherwise

Table 3-3. continued

Variable	Definition
Incgt75	1 if income \$75,000 or greater, 0 otherwise
Male	1 if a respondent is male, 0 otherwise
Included Positive Willingness to Pay Equation (R variables):	
Tblmore	Premium levels for table \$25, \$45, \$50, \$55, \$60
Shlvmore	Premium levels for shelf \$1.50, \$4, \$5, \$6, \$10
Chrmore	Premium levels for chair \$10, \$15, \$20, \$25, \$40
Dependent Variables:	
PayTable	1 if willing to pay the specific premium for the table, 0 otherwise
PayShelf	1 if willing to pay the specific premium for the shelf, 0 otherwise
PayChair	1 if willing to pay the specific premium for the chair, 0 otherwise

certified products. The estimates of WTP are obtained for the three products (Table, Shelving Board, and Chair) and for the two states (Tennessee and Pennsylvania) for a total of six equations estimated.

The WTP is calculated at the sample means of the demographic variables. The WTP is also calculated for profiles of those most and least likely to pay the premiums to demonstrate how demographics may affect WTP. Using variables with estimated positive signs creates the profiles of the most likely to pay the premiums by setting them equal to 1. The variables with estimated negative signs set to 0 will be used to form the profiles of the least likely to pay the premiums.

For estimation purpose, one classification was eliminated from each group of variables to prevent perfect collinearity. The base group of individuals consists of those who satisfy the following description: those who received partial scope of certification; those who live in rural areas; those who did not recycle in the past month; those who have never contributed to a conservation organization; those who have never contributed to a hunting/fishing organization; those who have never purchased environmentally labeled non-wood products; those who do not live in own their home and condo; those whose education level are less than some college; those who or whose relatives are not employed in the wood products related industry; those whose income are less than \$25,000, and those who are female.

The Statistical Analysis System (SAS) software program is employed in this study in order to obtain the ordered logit model. Limdep is used as an assistant program to make up the limited capability of SAS in analyzing the model with multiple categorical variables (Greene, 1999).

CHAPTER IV

RESULTS

The purpose of this chapter is to present the results of the analysis of data collected from the survey. The study results are divided into two parts and in each part, the results for Tennessee and Pennsylvania are presented respectively. (1) Descriptive statistics, (2) Logistic Model of Willingness to Pay, which has another two sub-parts: (a) Logistic Model for Estimating the Coefficients of Willingness to Pay for Certified Hardwood Products, (b) Logistic Model for Estimating the Probabilities, WTP and Related Profiles of Consumers Willingness to Pay a Premium for Certified Hardwood Products.

The results from t-statistics indicated that some variables were not significantly different from zero in any of the models. The variables were dropped from the models. The eliminated variables are “contribution to hunting or fishing group”, “purchasing environmentally labeled non-wood products”, “label reading before purchasing products”, “homeownership”, and people whose highest grade of school is “some college”. The above variables will not be shown in the following results.

Descriptive Statistics

Table 4-1 and Table 4-2 present characteristics of the responses in Tennessee and Pennsylvania. A total of 803 responses were obtained in Tennessee and 811 responses in Pennsylvania. The average age for all respondents in the survey is about 50. In both states, the responses were almost evenly split between the partial and full-certification processes and also between those who live in an urban area and in a rural area.

Table 4-1. Variable Names and Characteristics of the Respondents in TN

Variable Name	N	Mean
Full	803	.5131
Urban	803	.5019
Recycled	798	.6541
Consergr	792	.3472
Forestuse	785	2.9210
Age	782	49.4578
College	783	.3178
Employ	795	.2302
Inc2535	803	.0922
Inc3550	803	.1233
Inc5075	803	.1357
Incgt75	803	.1370
Male	801	.4994

Table 4-2. Variable Names and Characteristics of the Respondents in PA

Variable Name	N	Mean
Full	811	.4982
Urban	811	.4957
Recycled	811	.8755
Consergr	798	.4198
Forestuse	798	3.2043
Age	798	50.7995
College	803	.3524
Employ	809	.2200
Inc2535	811	.1060
Inc3550	811	.0999
Inc5075	811	.1776
Incgt75	811	.1381
Male	804	.5647

Responses in both states use forests for recreation purposes approximately four to six times per year. The respondents are almost evenly divided between male and female in Tennessee. However, more than 56 percent of respondents were male in Pennsylvania. More than 30 percent of the respondents in each state had completely at least a college degree. About 22 percent had immediate family employed in a wood products industry. About 10 percent in each state had income between \$25,000 and \$35,000. Similarly, about 10 percent of the respondents had income between \$35,000 and \$50,000. At the income level between \$50,000 and \$75,000, Tennessee had about 13 percent respondents and Pennsylvania had about 18 percent. The collected data indicated that more than 87 percent of respondents recycled in the past month in Pennsylvania, which is more than those in Tennessee (about 65 percent). About 35 percent of respondents in Tennessee contributed time or money to an environmental conservation group. However, more than 40 percent was found in Pennsylvania.

About 44 percent respondents in each state supported environmental certified wood products and would pay a higher price (Figure 4-1 and 4-2). However, about 46 percent respondents supported but would not pay a higher price. Around 10 percent did not support.

A total of 645 respondents, 321 in Tennessee and 324 in Pennsylvania, would be willing to pay more. Of these, a total of 376 responded to the follow-up survey (190 in Pennsylvania and 186 in Tennessee) (See Table 4-3 and 4-4), which was used to estimate the probability and the amount of premiums of the willingness to pay for the certified hardwood products. About 74 percent, 69 percent and 72 percent of respondents in Tennessee would like to purchase environmentally certified table, shelving board and chair respectively. In Pennsylvania, about 77 percent, 71 percent and 71 percent of respondents are willing to buy each certified product.

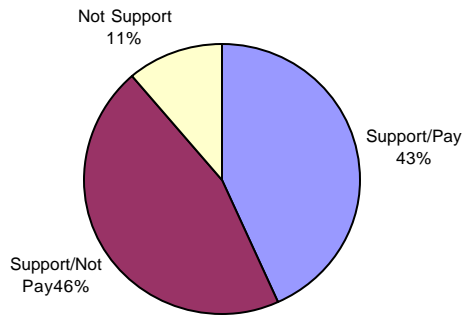


Figure 4-1. Support and Willingness to Pay For Certified Hardwood Products in Pennsylvania.

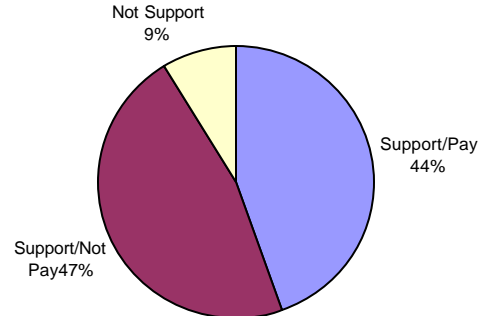


Figure 4-2. Support and Willingness to Pay for Certified Hardwood Products in Tennessee.

Table 4-3. Percent of Willingness to Buy Product at the Specified Premium in TN

	Percent		
	Table N(184)	Shelving Board N(185)	Chair N(186)
Environmentally Certified Product	73.91	68.65	71.51
Not Environmentally Certified Product	20.11	27.57	22.58
Neither	4.89	2.70	4.30
Don't Know	1.09	1.08	1.61

Table 4-4. Percent of Willingness to Buy Product at the Specified Premium in PA

	Percent		
	Table N(190)	Shelving Board N(190)	Chair N(190)
Environmentally Certified Product	77.37	70.53	70.53
Not Environmentally Certified Product	18.95	26.32	26.32
Neither	3.16	0.53	2.63
Don't Know	0.53	2.63	0.53

Tables 4-5 and 4-6 were summarized in the Figure 4-3. The percent that would purchase the certified table at a \$25 premium was 87.5 and 92.59 in TN and PA, respectively, compared with 83.88 and 82.86 at \$60 premium level. However, shown in the Figure 4-3, the percent of purchasing certified table in Tennessee increased from premium level \$45 and in Pennsylvania, the change was not simply decrease but increase as well. Previous studies indicated that there was a negative correlation between premium and percent of consumers' willingness to pay a specified premium. Obviously, this was not the case. The chi-square tests did not reveal that there was a significant correlation between the premium level and percent of willingness to purchase the certified table.

The percent of willingness to purchase the certified shelving board decreased from 78 at the \$1.5 premium to 56 at \$10 premium in Tennessee (Table 4-7) and from 96 to 63 in Pennsylvania (Table 4-8). The general trend for two states declined as the premium levels increased (Figure 4-4). However, the percentages of respondents willing to purchase the certified shelving board did not decline continuously. The chi-square tests and associated p-values indicated that there was not a significant degree of correlation in

Table 4-5. Percent of Certified Table Purchase at Different Premium Level in TN (N= 107)

Premium Level	Percent of Willing to Pay for Certified Table \$799+premium	N (number of respondents)	Chi-Square	P-Value
\$25	87.50%	21	1.92	0.74
\$45	73.33%	22		
\$50	77.78%	21		
\$55	79.31%	23		
\$60	83.88%	20		

Table 4-6. Percent of Certified Table Purchase at Different Premium Level in PA (N=121)

Premium Level	Percent of Willing to Pay for Certified Table \$799+premium	N (number of respondents)	Chi-Square	P-Value
\$25	92.59%	25	6.37	0.17
\$45	67.74%	21		
\$50	80.77%	21		
\$55	73.53%	25		
\$60	82.86%	29		

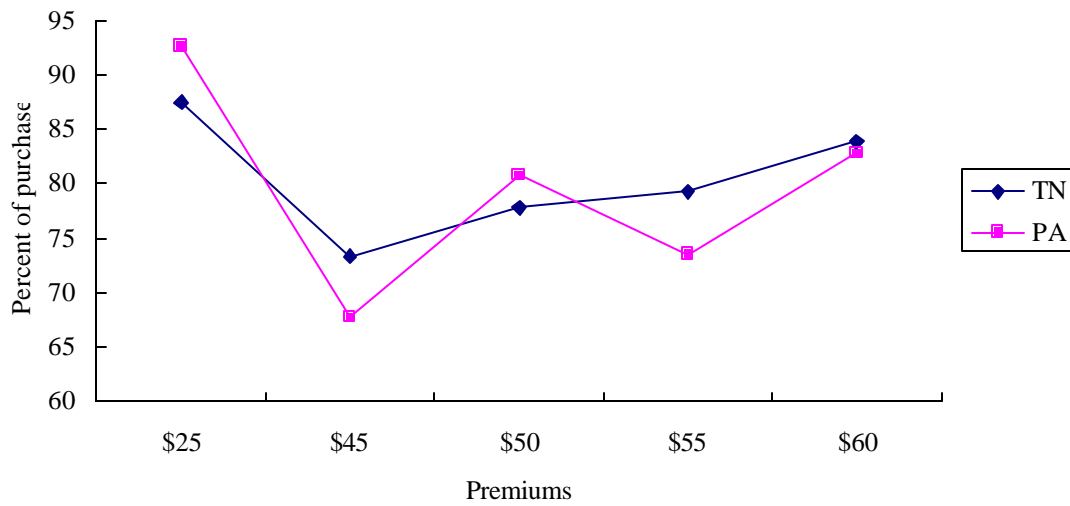


Figure 4-3. Percent Change of Purchasing Certified Table at Different Premium Level in TN and PA

Table 4-7. Percent of Certified Shelving Board Purchase at Different Premium Level in TN (N=101)

Premium Level	Percent of Willing to		Chi-Square	P-Value
	Pay for Certified Shelving Board \$28.80+premium	N (number of respondents)		
\$1.50	78.26%	18	5.05	0.28
\$4.00	81.25%	26		
\$5.00	72.41%	21		
\$6.00	73.33%	22		
\$10.0	56.00%	14		

Table 4-8. Percent of Certified Shelving Board Purchase at Different Premium Level in PA (N=111)

Premium Level	Percent of Willing to		Chi-Square	P-Value
	Pay for Certified Shelving Board \$28.80+premium	N (number of respondents)		
\$1.50	96.30%	26	22.27	0.0002
\$4.00	71.88%	23		
\$5.00	88.89%	24		
\$6.00	48.48%	16		
\$10.0	62.86%	22		

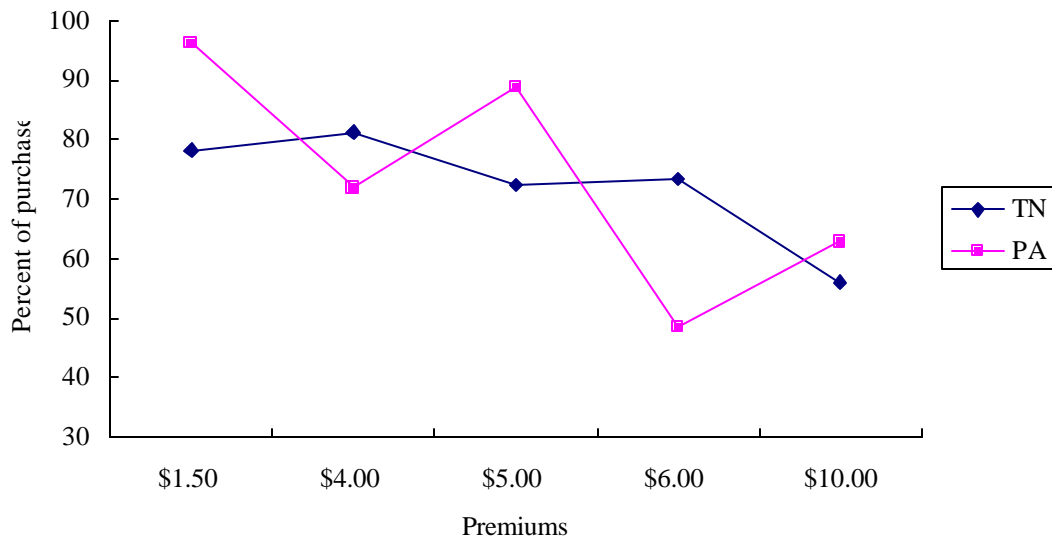


Figure 4-4. Percent Change of Purchasing Certified Shelving Board At Different Premium Level in TN and PA

Tennessee between the shelving board which respondents would be willing to purchase and the premium level. On the contrary, a significant association was found in Pennsylvania.

The data for the certified chair follows the expected pattern. As the price premium for the chair increases, the percentage of respondents willing to purchase the chair declines (Figure 4-5). The percent who would choose the certified chair over the uncertified chair dropped from 86 percent at the \$10 premium to 61 percent at the \$40 premium in Tennessee (Table 4-9) and from 92 percent to 61 percent in Pennsylvania (Table 4-10). A significant association between respondents' willingness to purchase environmentally certified chair and premium level was found in Pennsylvania, however Tennessee was not found having such a significant relationship.

Regarding to the inverse relationship between the percent premium consumers will pay and the value of the product, examined by the previous studies, the result of this study did not find the same conclusion.

Logistic Model of Willingness to Pay

The logit model was used to evaluate how certification scope, demographics, attitudes toward the environment and location may influence market participation for environmentally certified hardwood products. The logit model was also used to estimate conditional WTP for each certified product to identify how much the respondents are willing to pay, given they are a participant in the market for the certified hardwood products. Finally, this logit model was utilized to profile the consumers who is most likely to be in the market for certified hardwood products and who is less likely to be in the environmental market.

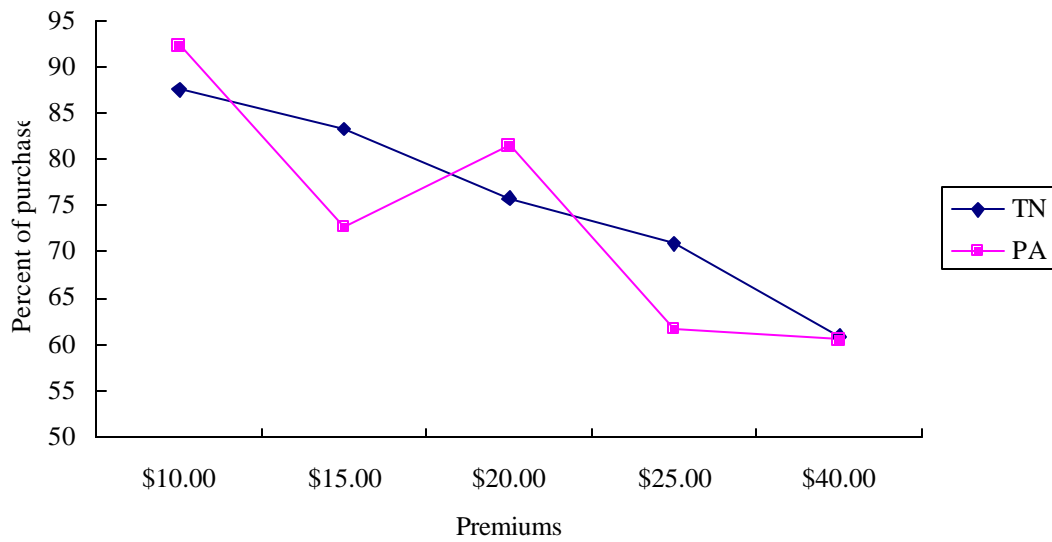


Figure 4-5. Percent Change of Purchasing Certified Chair At Different Premium Level in TN and PA

Table 4-9. Percent of Certified Chair Purchase at Different Premium Level in TN (N=104)

Premium Level	Percent of Willing to Pay for Certified Chair \$199+premium	N (number of respondents)	Chi-Square	P-Value
\$10.00	87.50%	21	5.93	0.20
\$15.00	83.33%	25		
\$20.00	75.86%	22		
\$25.00	70.97%	22		
\$40.00	60.87%	14		

Table 4-10. Percent of Certified Chair Purchase at Different Premium Level in PA (N=111)

Premium Level	Percent of Willing to Pay for Certified Chair \$199+premium	N (number of respondents)	Chi-Square	P-Value
\$10.00	92.31%	24	10.53	0.03
\$15.00	72.73%	24		
\$20.00	81.48%	22		
\$25.00	61.76%	21		
\$40.00	60.61%	20		

Logistic Model for Estimating the Coefficients of Willingness to Pay for Certified Hardwood Products

The estimated logistic models for willingness to purchase the certified table in Tennessee and Pennsylvania, equation 1a, are displayed in Table 4-11 and Table 4-12, respectively. As indicated by log-likelihood ratio, the model for the table in Tennessee was not significant overall ($\chi^2=15.97$), the correct prediction was about 72 percent of the responses though, while the model for Pennsylvania was significant ($\chi^2=29.13$) at 90 percent confidence level and correctly predicted about 79.6 percent.

Since the table equation for Tennessee was not statistically significant, the model has very little predictive capability. Only age, income level between \$50,000-\$75,000 and intercept are significant at 90 percent confidence level. The other income variables, the scope of certification, and the premium had insignificant effects on

Table 4-11. Estimated Logistic Model for Willingness to Purchase the Certified Table at the Specified Premium in Tennessee

Variable Name	Coefficient	Means	Standard error	t-ratio	P-value
Intercept	3.136		1.7214	3.3188	0.0685 *
Full	0.3239	0.4851	0.4757	0.4637	0.4959
Tblmore	-0.0131	47.2761	0.021	0.3849	0.535
Urban	-0.2099	0.6269	0.5694	0.1359	0.7124
Recycled in past month	-0.4189	0.7836	0.6717	0.3889	0.5329
Consergr	0.7134	0.5373	0.5221	1.8669	0.1718
Forest use	0.042	3.5224	0.1673	0.0629	0.8019
Age	-0.0288	49.2164	0.0166	3.0052	0.083 *
College	0.2011	0.3657	0.5654	0.1265	0.722
Employ	0.2011	0.2463	0.6081	0.1094	0.7408
Inc2535	0.5521	0.0970	0.9117	0.3667	0.5448
Inc3550	1.2518	0.1045	0.9136	1.8774	0.1706
Inc5075	2.1462	0.1567	1.1412	3.5367	0.06 *
Incgt75	-0.0162	0.2239	0.6394	0.0006	0.9797
Male	-0.6881	0.4702	0.5115	1.8098	0.1785
LLR			15.9748		
Percent Correctly Classified		72			
N		134			

*** indicates significance at 99 percent confidence level

** indicates significance at 95 percent confidence level

* indicates significance at 90 percent confidence level

Table 4-12. Estimated Logistic Model for Willingness to Purchase the Certified Table at the Specified Premium in Pennsylvania

Variable Name	Coefficient	Means	Standard error	t-ratio	P-value	
Intercept	2.2522		1.9086	1.3924	0.238	
Full	0.4312	0.5425	0.4665	0.8544	0.3553	
Tblmore	-0.0184	47.9739	0.021	0.7703	0.3801	
Urban	-0.3083	0.5163	0.529	0.3397	0.56	
Recycled in past month	1.8942	0.9542	0.9726	3.7929	0.0515	*
Consergr	-0.4337	0.5490	0.4765	0.8285	0.3627	
Forest use	-0.0209	3.5556	0.1698	0.0151	0.9021	
Age	-0.018	50.8954	0.0175	1.0545	0.3045	
College	1.1768	0.4379	0.5571	4.4621	0.0347	**
Employ	-1.5984	0.2484	0.5186	9.5001	0.0021	***
Inc2535	0.5315	0.1176	0.9268	0.3288	0.5664	
Inc3550	0.6511	0.1307	0.8981	0.5255	0.4685	
Inc5075	-1.1636	0.2810	0.6122	3.6123	0.0574	*
Incgt75	-0.6396	0.1634	0.7584	0.7112	0.399	
Male	-0.3038	0.5359	0.4924	0.3806	0.5373	
LLR			29.1337*			
Percent Correctly Classified			79.6			
N			153			

*** indicates significance at 99 percent confidence level

** indicates significance at 95 percent confidence level

* indicates significance at 90 percent confidence level

the respondents' willingness to buy the table.

Those in Pennsylvania who had recycled in the past month and education level in college were more likely to purchase certified table in higher prices, while people whose family member employed in wood industry and income between \$50,000- \$75,000 were less likely to pay premium for the environmental table. The influence of employment was significant at 99 percent confidence level. College was significantly different from zero at 95 percent confidence level. Recycled in the past month and income between \$50,000-\$75,000 were significant at 90 confidence level. The scope of certification and premium level still did not affect the probability of willingness to purchase the product. Although age and male had negative sign, they were not significant enough in the model to influence the purchase decision, which was different from the result of Tennessee.

The models for shelving board have more predictive capability than those for table. Overall, the equations for both states were significant ($\chi^2=42.23$ in TN, $\chi^2=28.88$ in PA) and correctly predicts over 83 percent of the responses in TN and over 77 percent in PA.

Table 4-13 presents the model of willingness to pay for the certified hardwood shelving board in Tennessee. The model is consistent with previous expectations in that the price effect was negative and statistically significant. As expected, recycled in the past month, family member employed in the forest industry were positively significant. Age and male had negative influence on willingness to buy shelving at the specified premium. Contrary to expectations, however, full certification and college had negative effect. There were no income effects on likelihood of willingness to pay the premium.

The price effect in Pennsylvania (Table 4-14) was also negative and highly significant on willingness to buy the certified shelving board. Different from Tennessee, only college had positive influence in the model. Males still were less likely to pay the

Table 4-13. Estimated Logistic Model for Willingness to Purchase the Certified Shelving Board at the Specified Premium in Tennessee

Variable Name	Coefficient	Means	Standard error	t-ratio	P-value	
Intercept	4.4011		1.4143	9.6841	0.0019	***
Full	-1.0468	0.4820	0.4676	5.0122	0.0252	**
Shlvmore	-0.233	5.3058	0.0919	6.4292	0.0112	**
Urban	0.9044	0.6115	0.5735	2.4868	0.1148	
Recycled in past month	1.2073	0.7986	0.6104	3.9116	0.048	**
Consergr	0.8474	0.5108	0.525	2.606	0.1065	
Forest use	-0.2649	3.4173	0.1728	2.3486	0.1254	
Age	-0.0352	49.1799	0.0167	4.4287	0.0353	**
College	-0.9945	0.3453	0.5962	2.782	0.0953	*
Employ	1.2846	0.2374	0.6683	3.6941	0.0546	*
Inc2535	1.8756	0.1079	1.2261	2.34	0.1261	
Inc3550	1.5076	0.1007	0.9384	2.5811	0.1081	
Inc5075	0.0661	0.1439	0.7447	0.0079	0.9293	
Incgt75	-0.8743	0.2158	0.6481	1.8198	0.1773	
Male	-1.4315	0.4676	0.5349	7.1632	0.0074	***
LLR			42.2273***			
Percent Correctly Classified			83.2			
N			139			

*** indicates significance at 99 percent confidence level

** indicates significance at 95 percent confidence level

* indicates significance at 90 percent confidence level

Table 4-14. Estimated Logistic Model for Willingness to Purchase the Certified Shelving Board at the Specified Premium in Pennsylvania

Variable Name	Coefficient	Means	Standard error	t-ratio	P-value	
Intercept	5.6256		1.7751	10.0439	0.0015	***
Full	-0.5243	0.5390	0.4169	1.5817	0.2085	
Shlvmore	-0.2024	5.5292	0.076	7.0925	0.0077	***
Urban	-0.7416	0.5260	0.4949	2.2453	0.134	
Recycled in past month	-0.7945	0.9545	1.1822	0.4517	0.5015	
Consergr	0.3127	0.5584	0.4269	0.5364	0.4639	
Forest use	0.0665	3.5649	0.4802	0.1391	0.7092	
Age	-2.66E-02	50.7597	0.1555	0.1831	0.6687	
College	0.1791	0.4286	0.0155	2.9321	0.0868	*
Employ	-1.1123	0.2468	0.4844	5.2719	0.0217	**
Inc2535	-0.2174	0.1169	0.8113	0.0718	0.7887	
Inc3550	0.1918	0.1234	0.7266	0.0697	0.7918	
Inc5075	-0.9407	0.2857	0.5559	2.8637	0.0906	*
Incgt75	-0.5449	0.1688	0.6535	0.6952	0.4044	
Male	-0.7612	0.5260	0.4345	3.0687	0.0798	*
LLR			28.879**			
Percent Correctly Classified			77.1			
N			154			

*** indicates significance at 99 percent confidence level

** indicates significance at 95 percent confidence level

* indicates significance at 90 percent confidence level

premium. Family member employed in the forest industry and income \$50,000-\$75,000 had negative influence on paying more. The negative effect of high income was not consistent with expectations.

The model for WTP for the certified chair is presented in Table 4-15 and Table 4-16. As indicated by the LLR statistics, the models in both states were significant overall at 90 percent confidence level ($\chi^2=22.12$ for TN and $\chi^2=21.72$ for PA). The models correctly classified 76.3 percent and 73.8 percent for Tennessee and Pennsylvania, respectively.

The model shows that the premium amount had a significant negative effect on willingness to buy the product in Tennessee. Besides the premium having effect in the model, male also had negative influence on the likelihood for the chair. Contribution to environmental organization and income \$35,000-\$50,000 positively influenced the probability of WTP.

Same as the model for Tennessee, the premium amount also had negative effect on the willingness to buy the certified chair in Pennsylvania. Premium was the only significant effect in this model. Age, gender, income and other environmental behavior had no effects on likelihood of being willing to pay the premium.

Logistic Model for Estimating the Probabilities, WTP and Related Profiles of Consumers Willingness to Pay a Premium for Certified Hardwood Products

Since the profiles of market participations are formed based on the signs of the coefficients (included every variables) in each model, the profile of market participants and the profile of market-non-participants would be drawn directly from the logistic model result. According to two different types of profiles, the probability of willingness to pay and estimated WTP for each product would be calculated. Based on the sample

Table 4-15. Estimated Logistic Model for Willingness to Purchase the Certified Chair at the Specified Premium in Tennessee

Variable Name	Coefficient	Means	Standard error	t-ratio	P-value	
Intercept	2.5468		1.3385	3.6203	0.0571	*
Full	-0.2911	0.4891	0.4459	0.4262	0.5139	
Chrmore	-0.064	21.6423	0.0234	7.4424	0.0064	***
Urban	0.4298	0.6204	0.5112	0.7069	0.4005	
Recycled in past month	-0.1359	0.7810	0.5757	0.0557	0.8134	
Consergr	0.9164	0.5255	0.4919	3.4712	0.0624	*
Forest use	0.0672	3.4672	0.1582	0.1802	0.6712	
Age	-0.0128	49.1971	0.0155	0.6874	0.407	
College	-0.1019	0.3577	0.5518	0.0341	0.8535	
Employ	0.351	0.2482	0.5574	0.3965	0.5289	
Inc2535	0.2942	0.1168	0.7163	0.1687	0.6812	
Inc3550	2.2446	0.1022	1.1479	3.8238	0.0505	*
Inc5075	1.1216	0.1460	0.8005	1.9628	0.1612	
Incgt75	0.2029	0.2190	0.6249	0.1054	0.7454	
Male	-0.8289	0.4745	0.4809	2.9713	0.0848	*

LLR			22.1159*			
Percent Correctly Classified			76.3			
N			137			

*** indicates significance at 99 percent confidence level

** indicates significance at 95 percent confidence level

* indicates significance at 90 percent confidence level

Table 4-16. Estimated Logistic Model for Willingness to Purchase the Certified Chair at the Specified Premium in Pennsylvania

Variable Name	Coefficient	Means	Standard error	t-ratio	P-value
Intercept	2.5011		1.5543	2.5895	0.1076
Full	0.2061	0.5359	0.4031	0.2615	0.6091
Chrmore	-0.0422	22.6471	0.0193	4.7681	0.029 **
Urban	-0.3673	0.5163	0.4614	0.6337	0.426
Recycled in past month	0.8535	0.9542	0.8987	0.9019	0.3423
Consergr	0.3926	0.5621	0.4162	0.89	0.3455
Forest use	-0.0505	3.5686	0.1497	0.1139	0.7357
Age	-0.0169	51.0261	0.0154	1.208	0.2717
College	0.2979	0.4248	0.4655	0.4094	0.5223
Employ	-0.7238	0.2549	0.4556	2.5242	0.1121
Inc2535	0.9765	0.1176	0.8696	1.2609	0.2615
Inc3550	0.5031	0.1307	0.688	0.5348	0.4646
Inc5075	-0.5758	0.2745	0.5196	1.2279	0.2678
Incgt75	0.2145	0.1699	0.6605	0.1055	0.7454
Male	-0.592	0.5294	0.4274	1.9189	0.166
LLR			21.7245*		
Percent Correctly Classified			73.8		
N			153		

*** indicates significance at 99 percent confidence level

** indicates significance at 95 percent confidence level

* indicates significance at 90 percent confidence level

means, there would be another probability and WTP. Probability1 and WTP1 in the following tables were calculated by using the estimates from the model and the actual values (sample means) for the explanatory variables. Probability2 and WTP2 were based on profile of those who are most likely to purchase at premiums. Probability3 and WTP3 were based on the profile of those who are least likely to buy with higher prices.

Table 4-17 shows the comparison among probabilities of willingness to pay the certified table and the estimated WTP. Based on sample means, the probability of willingness to pay was about 84 percent in both states. The estimate of the conditional willingness to pay in Tennessee was about \$173, which is that consumers would pay about \$173 more for a certified table. However, respondents in Pennsylvania would pay \$140 more for the product less than the WTP in Tennessee. If the probabilities of willingness to pay were based on the profile of market participant, the probabilities would be almost 100 percent. Participants would pay as high as \$612 more for the table in Tennessee and \$351 more in Pennsylvania. The probability of willingness to pay with respondents who were least likely to pay more was about 34 percent in Tennessee. Only about 1 percent in Pennsylvania would buy the table at the specific premium. The negative WTP indicated that respondents would pay as low price as possible for the certified table. In other words, consumers would pay as high as several times of basic price to buy a certified table if they were identified as those most likely to pay. On the contrary, those who were identified as least likely to pay would pay nothing more.

It is not accurate to make a profile of a market participant in Tennessee, since the model for the table was insignificant. In Pennsylvania (Table 4-12), the profile of willingness to pay more for certified table would be rural residence with a full certification, recycled in the past month, not contributed to environmental group, frequency of forest use less than once per year, age at 25, college education, no family members in forest industry, income between \$35,000 and \$50,000 and female.

Table 4-17. Probabilities of Those Willing to Pay the Premiums Offered and Conditional Willingness to Pay for Certified Table over a \$799 Uncertified Table in Tennessee and Pennsylvania

	Tennessee (N=134)	Pennsylvania (N=153)
Probability1 (at sample means)	83.81%	84.49%
WTP1	\$172.80	\$140.09
Probability2 (most likely to say yes)	99.94%	99.63%
WTP2	\$611.88	\$351.42
Probability3 (most likely to say no)	34.38%	1.27%
WTP3	\$-2.07	\$-188.57

The market non-participant would be urban residence with partial certification, not recycled in the past month, person who contributed to environmental group, forest use at least once per month, age at 65, education less than college, family member in forest industry, high income level between \$50,000 and \$75,000 and male.

About 81 percent and 76 percent chances of being a market participant for certified shelving board were found in Tennessee and Pennsylvania respectively, based on the sample means (Table 4-18). Respondents in both states would like to pay about \$11 more for the product. Under the profile of market participant, the probabilities in both states were nearly 100 percent. The premium that willing to pay was about \$47 in Tennessee and about \$30 in Pennsylvania. Only 0.82 percent and a little bit higher 5.77 percent were found if market non-participant were considered. Still negative numbers of

Table 4-18. Probabilities of Those Willing to Pay the Premiums Offered and Conditional Willingness to Pay Premiums for Certified Shelving Board over a \$28.80 Uncertified Shelving Board in Tennessee and Pennsylvania

	Tennessee (N=139)	Pennsylvania (N=154)
Probability1 (at sample means)	80.85%	76.43%
WTP1	\$11.49	\$11.34
Probability2 (most likely to say yes)	99.99%	99.23%
WTP2	\$46.99	\$29.53
Probability3 (most likely to say no)	0.82%	5.77%
WTP3	-\$15.27	-\$8.27

WTP were found which indicated that respondents who were least likely to pay higher prices for the certified shelving board would pay nothing more for the premiums.

The profile of market participants for the certified shelving board in Tennessee (Table 4-13) would be urban residence with a partial certification, recycled in the past month, contributed to environmental organization, forest use less than once per year, young at 25, education less than college, family members employed in forest industry, low income between \$25,000 and \$35,000, and female. However, those who would not purchase the product with the premiums would be rural residences with full certifications, not recycled in the past month, not contributed to environmental group, forest use at least once per month, old at 65, college education, no family members worked in forest industry, high income greater than \$75,000 and male.

The profile of market participants in Pennsylvania (Table 4-14) were rural residences with partial certification, not recycled in the past month, contributed to

environmental group, forest use at least once per month, young at 25, college education, no family member employed in forest industry, respondents with income between \$35,000 and \$50,000, and female. Respondents with the characteristics of urban residence, recycled recently, not contributed to environmental group, forest use less than once per year, age at 65, education less than college, family member employed in forest industry, income greater than \$50,000 and male would not be the market participants who would pay the premiums for the certified shelving board.

Regarding to the certified chair (Table 4-19), about 80 percent and 76 percent probabilities of being a market participant. Respondents would pay more than \$43 more for the chair in Tennessee, while people in Pennsylvania would pay about \$50 premium. Still almost 100 percent probabilities of paying more for the certified chair were found if only potential market participants were considered. More than \$127 would be paid. Respondents of profile 3 in Tennessee had an about 28 percent chance of willingness to paying more for the product and they would pay only \$6.63 more, relative to the high value with the profile 2. Only 11.26 percent probability was found in Pennsylvania and people with this profile would not pay anything for the certified chair.

The potential market participants in Tennessee (Table 4-15) would be urban residence with partial certification, not recycled in the past month, contributed to environmental group, forest use at least once per month, young at 25, education less than college, family members employed in forest industry, income between \$35,000 and \$50,000, and female. People were not willing to purchase certified chair with higher prices if they were rural residence with full certification, recycled in the past month, not contributed to environmental group, forest use less than once per year, old at 65, college, no family members in forest industry, higher income greater than \$75,000 and male.

Pennsylvania market participants (Table 4-16) for the certified chair would be rural residence with full certification, recycled recently, contributed to environmental

Table 4-19. Probabilities of Those Willing to Pay the Premiums Offered and Conditional Willingness to Pay Premiums for Certified Chair over a \$199 Uncertified Chair in Tennessee and Pennsylvania

	Tennessee (N=137)	Pennsylvania (N=153)
Probability1 (at sample means)	80.13%	75.88%
WTP1	\$43.42	\$49.81
Probability2 (most likely to say yes)	99.88%	98.92%
WTP2	\$126.93	\$129.68
Probability3 (most likely to say no)	27.67%	11.26%
WTP3	\$6.63	\$-26.27

group, forest use less than once per year, young at 25, college education, no family member employed in forest industry, low income between \$25,000 and \$35,000, and female. Those who were urban residence with partial certification, who had not recycled in the past month, not contributed to environmental group, forest use at least once per month, age at 65, education less than college, family member employed in forest industry, high income greater than \$50,000 and male were not willing to purchase certified chair at specific premiums.

CHAPTER V

Conclusions

The purpose of this study is to assess consumers' willingness to pay a premium for certified hardwood products and how income, demographics, attitudes about the environment, and scope of certification may influence the probability and willingness-to-pay a green premium for the certified hardwood products. The study also profiles the market participants for the environmental certified products.

Summary of Findings and Implications

The results from this study suggest that there is a demand for environmentally certified hardwood products since market participation rates in Tennessee and Pennsylvania of about 44 percent of consumers. Since the model of willingness to buy a certified table in Tennessee was not significant, only results of shelving board and chair were used to make the profile of those who most likely to pay a premium for certified hardwood products in Tennessee. They are who were distributed a partial certification, who are urban residents, who has contributed to environmental organization, who is young and female, whose education level is less than college, and whose family member is employed in forest industry. Consumers with income less than \$50,000 would be potential purchasers. About 0.75 percent of respondents have these characteristics in Tennessee willing to pay premiums for certified hardwood products. According to the U.S. Census Bureau⁵, the estimated populations in Tennessee were 5,797,289 by July 1,

⁵ Source: U.S. Census Bureau. Annual Population Estimates by State as of July 1, 2002.
<http://www.census.gov>.

2002, among which 76.2 percent of the state population was adult (above 18 years old). Therefore, about 32,784 customers in Tennessee could be the potential market for environmental certified hardwood products. In Pennsylvania, market participants are those who are rural residents, young, female, who have college education, whose family members are employed in forest industry, and income less than \$50,000. This segment of consumers takes about 1.36 percent of the respondents in Pennsylvania. By July 1, 2002, 12,335,091 populations were estimated in Pennsylvania and about 75.4 percent of the populations were adults. The potential adult market size could be 127,831. To sum up the profiles in both states, the profiles of prospective certified hardwood participants indicate that female, younger age and lower income have higher chance to be purchasers for certified wood products. This is similar to the conclusions of the study by Forsyth, et al (1999). However, the type of residence, education level, and employment in forest industry gave inconsistent results in two states. Consumers who indicated they would pay more for a certified hardwood product were willing to pay \$172.80 more on a \$799 table, \$11.49 more on a \$28.80 shelving board, and \$43.42 more on a \$199 chair in Tennessee. In Pennsylvania, consumers would like to pay \$140.09, \$11.34 and \$49.81 more on a table, shelving board and chair, respectively. Among those profiled as most likely to pay premiums would pay as high as \$611.88 on a table, \$46.99 on a shelving board, and \$129.68 on a chair. Among those profiled as least likely to be willing to pay, most were not willing to pay anything more.

Consistent with expectations and previous studies, the premium has a negative influence on willingness to purchase the product in both states based on the signs of the premiums in each model. As the price goes up, the amount of willingness to buy should go down. However, according to the results of the logistic model, there was not a significantly inverse relationship between the premium of table and the percent of consumers who will pay more. The expected relations were found in the model of

shelving board and chair.

The studies by Cornwell and Schwepker (1995) and by Forsyth, *et al.* (1999) concluded that urban residents would be the most likely participants. However, the type of residence in this research did not appear to have a consistent influence on market participation or the willingness to pay. Urban residents in Tennessee were profiled as market participants of certified hardwood products, while the rural residents in Pennsylvania were identified as potential market participants. The interest in environmental issues and consumer awareness, as demonstrated by recycle experience, contribution to environmental organizations, and forest use, played inconsistent roles in willingness to pay. This finding indicates that it is not enough to develop the market for the certified hardwood products only depending on the consumers' limited awareness toward environment. Effective education programs regarding certification programs would be important and necessary. Educational programs or marketing might focus on magazines, websites and publications that are of an environmental or outdoor recreation focus. Family members employed in the forest industry might be concerned about job losses and other issues if their companies applied certification system. Therefore, negative point of views would be delivered to their family members. This might be the case for Pennsylvania, in which respondents who have family member employed in forest industry have negative influence on willingness to purchase the products. Educational efforts might include information about potential job opportunities and impacts in the forest industry. Pennsylvania residents who had college education would like to purchase certified wood products, while this character did not show up in Tennessee. Spinaze and Kant (1997) found the level of education had no significant influence on premiums. Well-educated people may have broader knowledge and perceptibility on environment, which probably lead them to think more about practical application of the certification and its procedure.

It was surprising to find that a person with relatively lower income is more likely to purchase certified wood products at higher premium than that with relatively high income. However, this finding is similar to the results of Forsyth, *et al.* (1999). This study also found that full certification had no effect on the willingness to pay. The scope of the certification, partial or full certification did not appear to consistently influence the willingness to pay. This indicates that consumers did not believe the broader screening process beyond the timber growing and harvesting level in environmental management practices for wood products had additional effect in improving environmental conditions. Therefore, further education programs and marketing regarding certification programs might need to fully explain potential environmental impacts of supply chain vs. a harvesting level.

Recommendations for Future Work

Since the concept of certified wood products is relatively new to general public and such products are not widely available in the market, the survey respondents might not fully understand the concept of the certification. Therefore, the results may not accurately reveal the actual purchase behavior of respondents. In order to get more accurate results of consumers' willingness to pay for the certified hardwood products in the future, the interviewees should be informed by more knowledge of certification, detailed procedure of certification system and the potential impact to the environment. The initial educational efforts might focus on growing and harvesting level. When the products and related information become prevailing in the market, further education effort throughout the market channel need to be made.

Modeling might be used that does not allow negative WTP. However, in this study, the values of WTP based on the profiles of least likely to purchase the certified hardwood products appeared negative mostly. The results could be explained that the respondents who were least likely to purchase products would pay nothing more for the

certified wood products or they would buy if they were subsidized for certain money. In future study, alternative formula of WTP should be tried to avoid the negative WTP values. All variables were used to estimate WTPs in this research, no matter whether the variable was significant or not. In later work, only significant variables will be utilized to estimate WTP values to check whether the negative values still exist.

Future research and surveys should include information of expenditures on wood product by respondents. The information would help to know whether the respondents are high spenders or not on wood product purchasing.

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Appendices

Appendix A

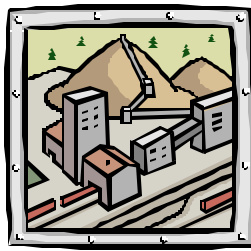
Phase I. Pre-Test Survey

Environmental Certification of Hardwood Products

We would like to ask you a few questions about your views of environmental certification of hardwood products (such as oak or cherry furniture, poplar trim, hickory for wood crafts, or oak lumber).

Environmental certification means a product has passed a voluntary environmental screening process by an independent third party organization (not the wood products company, the wood products industry, or the government).

Timber growing and harvesting methods, product manufacturing, and product handling would be monitored to ensure that practices are used that help sustain our environment for current and future generations.



Timber Growing & Harvesting is Environmentally Certified

Product Manufacturing is Environmentally Certified

Product Handling is Environmentally Certified

1. Have you ever purchased wood products that were labeled as environmentally certified?

YES

NO

DON'T KNOW

Please examine this environmental certification label that might appear on or nearby hardwood products.



2. Please circle the response that most closely reflects your opinions about environmental certification.
 - a. I support environmental certification and would pay a higher price for hardwood products if they were certified
 - b. I support environmental certification but not if it requires paying a higher price for hardwood products
 - c. I do not support environmental certification of hardwood products regardless of whether it costs me anything

If you chose answer “b” or “c”, please go to question 6. If you chose “a” continue on.

Purchasing Hardwood Products

The next set of questions are about purchasing different hardwood products. In each case, we ask you to think about two products that are similar in all ways, except that one has been environmentally certified and the other has not. While you might wish to choose a product with a different color of wood or type of wood, please consider products of similar quality, and your ability to pay for these products.

The choices we are asking you to make are, of course, hypothetical. No one will force you to actually buy the product you choose and no one will collect a cash payment from you. This is a problem in studies such as this.

When people don't actually pay for the product they choose, they might not make the same decision as they would if they did have to pay. This is called "hypothetical bias". Hypothetical bias can cause our results to be biased, so that people in the hardwood products industry will get incorrect market information.

How can we get people to act the same way in both hypothetical and actual choices?

The only way is to ask you to carefully consider the choices. Ask yourself if you would ever buy this product and, if so, to think about the product choices and which product you would truly be willing to buy and how much you would pay.

There are no "correct" answers. Some people may be willing to pay more for an environmentally certified product, while others may not.

DINING TABLE

3. Please look at the picture of an oak dining table. Please indicate in the space provided, how much more you would pay for the table that is environmentally certified.

a.

Price: \$799

Oak Dining Table

40 inches wide by 72 inches long
NOT Environmentally Certified



A photograph of a wooden dining table with a rectangular top and a central pedestal base with four legs.

b.

I would pay
\$ _____
more for the
certified table.

Oak Dining Table

40 inches wide by 72 inches long
Environmentally Certified



A photograph of the same wooden dining table as in part a, but with a circular logo to its right. The logo is green and white, featuring a tree and the text "FSC" and "Environmentally Certified".

CHAIR

4. Please look at the picture of an oak chair. Please indicate in the space provided, how much more you would pay for the chair that is environmentally certified.

a.

Price: \$199

Oak Chair
39" tall, Seat 19"w x 20"d
NOT Environmentally Certified



b.

**I would pay \$ _____
more for the certified chair.**

Oak Chair
39" tall, Seat 19"w x 20"d
Environmentally Certified



SHELVING BOARD

3. Please look at the picture of an oak shelving board. Please indicate in the space provided, how much more you would pay for the board that is environmentally certified.

a.

Price: \$28.80



b.

I would pay
\$ _____
more for the
certified
board.



About You...

This section contains a few questions about you and your household. Please keep in mind, all individual responses will be held confidential.

4. For your primary residence, are you a (Please circle the best answer)
- | | |
|----------------|---------------------|
| a. Home owner | d. Condo Renter |
| b. Home Renter | e. Apartment Renter |
| c. Condo Owner | f. Other: _____ |
7. What is your age? _____
8. What was the highest level of schooling you completed?
- | | |
|------------------------------|---------------------|
| a. No formal schooling | e. Some college |
| b. Grade school (Grades 1-8) | f. College graduate |
| c. Some high school | g. Post graduate |
| d. High school graduate | |
9. Please circle the category that best represents your **household** income from all sources before taxes in the year 2000.
- | | |
|-----------------------|---------------------------|
| a. Less than \$15,000 | f. \$60,001-\$75,000 |
| b. \$15,001-\$25,000 | g. \$75,001-\$100,000 |
| c. \$25,001-\$35,000 | h. \$100,001-\$125,000 |
| d. \$35,001-\$45,000 | i. greater than \$125,000 |
| e. \$45,001-\$60,000 | |

THANK YOU FOR PARTICIPATING IN THIS STUDY!! PLEASE PLACE THE COMPLETED QUESTIONNAIRE IN THE ENVELOPE WITH THE POSTAGE PROVIDED AND RETURN IT TO US.

Appendix B

Phase II. Field Survey

Part A. Initial Telephone Survey

OBS ID: _____

Hardwood Products and the Environment Survey
March/April 2001

Hello, my name is _____ and I am calling as part of a research project for the University of Tennessee. We are contacting people to ask questions about their views of the environment. This call will not take much of your time, we are not selling anything, and all answers will be kept strictly confidential.

For this survey to provide the best information, I need to speak to the person who would most likely be the one to purchase wood products, such as furniture or lumber, for your household.

IF IT'S THE PERSON: CONTINUE

WHEN THE CORRECT PERSON ANSWERS REPEAT THE FIRST PARAGRAPH AND CONTINUE BELOW.

[IF THE PERSON IS NOT THERE, FIND OUT WHEN TO CALL BACK . CALL BACK: _____]

What is your first name? _____

[SAY THEIR NAME] Is there a good time to ask you some questions or would another time be better for you? When would be a good time ?

Call back: _____

PHONE NUMBER: _____

ID #	CODES			FOR CALLBACKS	
	DATE	TIME	RESULTS	DATE	TIME
#1				#1	
#2				#2	
#3				#3	
#4				#4	
#5				#5	

This survey is strictly confidential. Your responses will not be associated with your name. You also have the right to refuse to answer any of the questions. Our research study concerns the different ways in which wood products can be produced, and how that might affect your purchases of wood products. First, I am going to ask you a few questions about your wood products purchases.

Q1. Did you purchase any wood products during the past year (examples include wood furniture, lumber, shelving).

1=YES, 2 =NO, 8=DON'T KNOW, 9=REFUSED

Q2 Do you plan to purchase wood products during the next year?

1=YES, 2 =NO, 8=DON'T KNOW, 9=REFUSED

[IF ANSWERED 'NO' or 'DON'T KNOW' TO QUESTIONS 1 AND 2, SKIP TO QUESTION 4.]

Q3. Are the wood products your purchased or plan to purchase for...

1=Commercial Purposes
2=Use in your home/residence
3=Both
8=DON'T KNOW
9=REFUSED

Now, I'd like to ask a few questions about your views of environmental certification of hardwood products. These products might include oak or cherry furniture, poplar trim, hickory for wood crafts, or oak lumber.

RANDOMIZE whether the respondent gets the "Full" or "Partial" certification text.

FULL CERTIFICATION TEXT

Environmental certification means a product has passed a voluntary environmental screening process by an independent third party organization, not the wood products company, the wood products industry, or the government. All aspects of production, including timber growing and harvesting, product manufacturing, and handling methods, are monitored to ensure that practices are used that help sustain our environment for current and future generations. A product label assuring certification appears on or

nearby the product.

PARTIAL CERTIFICATION TEXT

Environmental certification means a product has passed a voluntary environmental screening process by an independent third party organization, not the wood products company, the wood products industry, or the government. Timber growing and harvesting methods are monitored to ensure that practices are used that help sustain our environment for current and future generations. Product manufacturing and handling would not be monitored or certified. A product label assuring certification appears on or nearby the product.

Q4. Have you ever purchased wood products that were labeled as environmentally certified?

1=YES, 2 =NO, 8 =DON'T KNOW, 9=REFUSED

Q5. Please tell me which statement most closely reflects your opinions about environmental certification of hardwood products.

RANDOMIZE ORDER and READ ALL

1=I support environmental certification and would pay a higher price for hardwood products if they were certified.

2=I support environmental certification, but not if it requires paying a higher price for hardwood products.

3=I do not support environmental certification of hardwood products regardless of whether it costs me anything,

8 =DON'T KNOW

9=REFUSED

[IF THEY CHOOSE ANSWER # 1 ON QUESTION 5, READ THE FOLLOWING AND THEN GO TO QUESTION 8

The next stage of our study will focus on how much people might be willing to pay for certified wood products. I would like to send you brief booklet containing information about environmental certification of hardwood products and then call you again for a very short interview after you have read it. Would you be willing to help us in understanding how people feel about paying more for certified wood products?.

[IF THEY CHOOSE 2, GO TO QUESTION Q6]

[IF THEY CHOOSE 3, GO TO QUESTION Q7]

Q6. There are many reasons why a person might support environmental certification of hardwood products, but not if it requires paying a higher price. Why do you feel this way?

DON'T READ

1=can NOT afford to pay higher prices

2= do not believe it costs any more to make a certified product

3=believe the manufacturers should not charge higher prices even if it costs more to make certified products

4=other

8 =DON'T KNOW, 9=REFUSED

Q7. There are many reasons why a person might not support environmental certification of hardwood products. Why do you feel this way?

DON'T READ

1=do NOT believe environmental certification will work to improve the environment

2=you believe other causes are of higher priority than the environment

3=you believe the companies should be regulated rather than using voluntary certification

4=other

8 =DON'T KNOW, 9=REFUSED

We would like to conclude our survey by asking you a few questions about yourself and your household. Remember, all responses will be held confidential.

Q8. In the past month, have you recycled paper, plastic, newspapers, or aluminum?

[1=YES, 2=NO, 8=DON'T KNOW, 9=REFUSED]

Q9. Have you ever contributed time or money to a conservation or environmental advocacy group? (Examples include Nature Conservancy, National Wildlife Federation, or Sierra Club).

[1=YES, 2=NO, 8=DON'T KNOW, 9=REFUSED]

Q10. Have you ever contributed time or money to a hunting or fishing group, such as Ducks Unlimited or Trout Unlimited?

[1=YES, 2=NO, 8=DON'T KNOW, 9=REFUSED]

Q11. How frequently do you use forests for recreation purposes (examples include picnics, hiking, hunting, leaf-viewing)?

1=Less than once per year

2=One to three times per year

3=Four to six times per year

4=Seven to eleven times per year

5=At least once per month

8=DON'T KNOW

9=REFUSED

Q12. Have you ever purchased environmentally labeled NON-WOOD products (for example, dolphin safe tuna or pesticide free produce)?

[1=YES, 2=NO, 8=DON'T KNOW, 9=REFUSED]

Q13. How often do you read labels on products when purchasing them for the first time?

[1=Never, 2=Almost Never, 3=Sometimes, 4=Often, 5=Always, 8=DON'T KNOW,

9=REFUSED]

Q14. Is your primary residence a?

1=Home you own

2=Home you rent

3= Condo you own

4= Condo you rent

5=Apartment you rent

- 6=Other [If they answer "other" ask them to please describe: Q14A
- 8=DON'T KNOW
- 9=REFUSED

Q15. What is your age?

Q16. What is the highest grade of school you completed? _____

- 1=No formal schooling
- 2=Grade school (1-8)
- 3=Some high school
- 4=High school graduate
- 5=Some college
- 6=College graduate
- 7=Post graduate
- 8=DON'T KNOW
- 9=REFUSED

Q17. Are you or any member of your immediate family employed in a wood products related industry (for example, construction, furniture manufacturing, sawmilling, logging, or woodworking)?

- 1=YES
- 2=NO
- 8=DON'T KNOW
- 9=REFUSED

Q18. I am going to read a list of income categories for household income from all sources before taxes for the year 2000. Please stop me when I get to yours.

- 1 = \$4,999 or less
- 2 = \$5,000 - \$9,999
- 3 = \$10,000 - \$14,999
- 4 = \$15,000 - \$19,999
- 5 = \$20,000 - \$24,999
- 6 = \$25,000 - \$34,999
- 7 = \$35,000 - \$49,999
- 8 = \$50,000 - \$74,999
- 9 = \$75,000 - \$99,999
- 10 = \$100,000 - \$149,999
- 11 = \$150,000 or more
- 12 = Don't know

13 = Refused

You may also provide your actual income INCA=
GENDER [DON'T ASK] 1=Male, 2=Female
Thank you for participating in this study.

Interviewer _____

Time Finished Survey _____

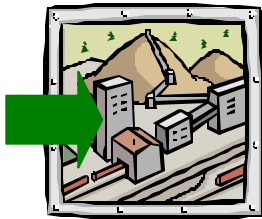
***NAME AND ADDRESS OF EACH PERSON WHO AGREES TO SECOND
SURVEY***

Appendix C

Information Booklet Sent to Those Agreeing to Participate In the Second Telephone Survey

Environmental certification means the product has passed a voluntary environmental screening process by an independent third party organization (not the wood products company, the wood products industry, or the government).

Timber growing and harvesting methods, product manufacturing, and product handling would be monitored to ensure that practices are used that help sustain our environment for current and future generations.



Timber Growing & Harvesting is Environmentally Certified

Product Manufacturing is Environmentally Certified

Product Handling is Environmentally Certified

Please examine this example of an environmental certification label for hardwood products. This label might be located on or nearby the examples of hardwood products you will see in the next few pages of this booklet.



Product voluntarily monitored to certify that timber growing and harvesting, product manufacturing, and handling methods were used that help sustain our environment for current and future generations

The interviewer will ask you questions about purchasing different hardwood products. In each case, she/he will ask you to think about two products that are similar in all ways, except that one has been environmentally certified and the other has not. Pictures of these products are provided in this booklet.

While you might wish to choose a product with a different color of wood, style, or type of wood, please consider products of similar quality, and your ability to pay for these products.

The choices we will be asking you to make are, of course, hypothetical. No one will force you to actually buy the product you choose and no one will collect a cash payment from you.

This is a problem in studies such as this.

When people don't actually pay for the product they choose, they might not make the same decision as they would if they did have to pay. This is called "hypothetical bias". Hypothetical bias can cause our results to be biased, so that people in the hardwood products industry will get incorrect market information.

How can we get people to act the same way in both hypothetical and actual choices?

The only way is to ask you to carefully consider the choices. Ask yourself if you would ever buy this product and, if you would, to think about the product choices and those for which you truly would be willing to buy and pay.

DINING TABLE

Please look at these pictures of an oak dining table and read the information about the products. The two tables are identical in quality, except one table has not been environmentally certified, while the other has.

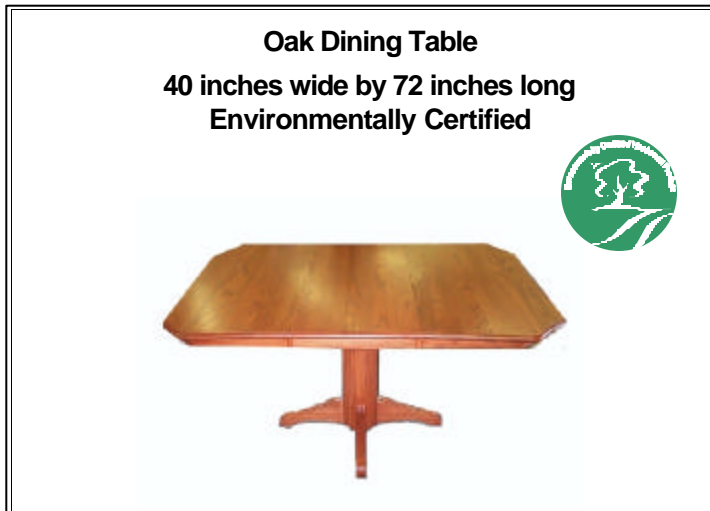
a.

Price \$799



b.

Price: \$ _____



SHELVING BOARD

Please look at these pictures of an oak shelving board and read the information about the products. The two boards are identical in quality, except one board has not been environmentally certified, while the other has.

a.

Price:
\$28.80



b.

Price:
\$ _____



CHAIR

Please look at these pictures of an oak chair and read the information about the products. The two chairs are identical in quality, except one chair has not been environmentally certified, while the other has.

a.

Price: \$ 199

Oak Chair
39" tall, Seat 19"w x 20"d
NOT Environmentally Certified



b.

Price: \$ _____

Oak Chair
39" tall, Seat 19"w x 20"d
Environmentally Certified



When our interviewer calls she/he will ask you about which products you would be willing to purchase at certain prices. She/he will provide you with the prices during the phone call. Please try to read through the information about environmental certification and look at the various products presented in this booklet. It will assure a more accurate record is available for our research and probably allow the phone call to take only about 5 minutes of your time.

Thank you for agreeing to help us with this study. Your responses will provide the hardwood products industry and forestry managers with helpful information about consumers' views on hardwood products and the environment.

Appendix D

Follow-up Survey of Individuals Willing to Pay for Environmental Certification

OBS ID: _____

CERTIFICATION: CIRCLE: 1=TOTAL 2=HARVEST

Hardwood Products and the Environment Survey-Followup April 2001

Hello, my name is _____ and I am calling for the University of Tennessee –Knoxville. Could I speak with _____ [NAME OF PERSON CONTACTED IN FIRST CALL]

IF IT'S THE PERSON: CONTINUE

[IF THE PERSON IS NOT THERE, FIND OUT WHEN TO CALL BACK .
_____ call back.]

Hello, my name is _____ and I am calling for the University of Tennessee –Knoxville. We recently called you about environmental certification of hardwood products and sent you a booklet with information about some certified hardwood products. I am following up to ask you a few brief questions about the information contained in the booklet. Did you receive the booklet?

[IF SO, THEN CONTINUE ON....IF NOT, PLEASE TELL THEM YOU WILL SEND THEM ANOTHER and CONTACT THEM LATER...CONFIRM ADDRESS]

[SAY THEIR NAME] Is there a good time to ask you some questions or would another time be better for you? When would be a good time?

Call back: _____

PHONE NUMBER: _____

ID #		CODES				FOR CALLBACKS	
		DATE	TIME	RESULTS		DATE	TIME
	#1				#1		
	#2				#2		
	#3				#3		
	#4				#4		
	#5				#5		

Just to remind you, this survey is strictly confidential. Your responses will not be associated with your name. You also have the right to refuse to answer any of the questions. This interview should only take about 5 minutes to complete.

1. Have you had a chance to read the booklet?

1=YES 2=NO **[Schedule callback when they've read it.]**

2. Based on what you read in the booklet, please tell me how much you agree or disagree with the following statements:

[Randomize Order]

2a. The booklet was not very understandable

1=Strongly Agree
2=Agree
3=Don't Agree
4=Strongly Disagree
5=Other
8=DON'T KNOW
9=REFUSED

2b. The booklet did a good job of informing me about environmental certification.

1=Strongly Agree
2=Agree
3=Don't Agree
4=Strongly Disagree
5=Other
8=DON'T KNOW
9=REFUSED

3. Do you have the booklet with you right now?

1=YES 2=NO, Went to get it 3=NO-remembers pictures

I will now ask you a few questions about each of the three hardwood products featured in the booklet. The pictures in the booklet are just examples.

While you might wish to choose a product with a different color of wood, style, or type of wood, please consider products of similar quality, and your ability to pay for these products.

As stated in the booklet, all of these questions are hypothetical and no one will collect any money from you, but we need you to treat this as if you were faced with an actual purchase decision.

As you answer the questions, ask yourself if you would ever buy this product and, if you would, to think about the product choices and those for which you truly would be willing to buy and pay.

[RANDOMIZE ORDER OF WOOD PRODUCTS]

Product #1: DINING TABLE

Please open the booklet and look at the pictures of the oak dining table. The two tables are identical in quality, except that one table has been environmentally certified, while the other one has not. The non-certified table sells for \$799. If the environmentally certified table sold for:

[Randomize prices as usual making sure we match the type of certification.]

Partial Certification	[\$810	\$825	\$850	\$875	\$900	\$950]
Full Certification	[\$825	\$850	\$875	\$900	\$950	\$1000]

Which table would you purchase? _____

1= Environmentally Certified Table [GO TO FQ2]

2=NOT Environmentally Certified Table [GO TO FQ3]

3=Neither [GO TO FQ4]

8=DON'T KNOW

9=REFUSED

- 4a. There are many reasons why a person might choose the certified table over the uncertified table. Why did you choose to purchase the certified table?

[DON'T READ]

- 1=can afford to pay the higher price
- 2=believe the added costs of certification are worth it.
- 3=believe protection of the environment is "priceless"
- 4=other
- 8=DON'T KNOW
- 9=REFUSED

- 4b. There are many reasons why a person might choose the uncertified table over the certified table. Why did you choose to purchase the uncertified table?

[DON'T READ]

- 1=I can NOT afford to pay the higher price
- 2=I do not believe the added costs of certification are worth it
- 3=other
- 8=DON'T KNOW
- 9=REFUSED

- 4c. There are many reasons why a person might not choose either table. Why did you choose neither table?

[DON'T READ]

- 1=can NOT afford to purchase either table
- 2=would never purchase a product like this no matter what the price
- 3=other
- 8=DON'T KNOW
- 9=REFUSED

Product #2: SHELVING BOARD

5. Now turn to the pictures of the oak shelving boards. The two boards are identical in quality, except that one board has been environmentally certified, while the other on has not. The non-certified board sells for \$28.80. If the environmentally certified board sold for:

[Randomize prices as usual making sure we match the type of certification.]

Partial Certification	[\$30	\$32.50	\$35	\$40	\$45	\$50]
Full Certification	[\$32.50	\$35	\$40	\$45	\$50	\$60]

Which Shelving Board would you purchase? _____

- 1= Environmentally Certified Shelving Board [GO TO FQ6]
- 2=NOT Environmentally Certified Shelving Board [GO TO FQ7]
- 3=Neither [GO TO FQ8]
- 8=DON'T KNOW
- 9=REFUSED

5a. There are many reasons why a person might choose the certified Shelving Board over the uncertified Shelving Board. Why did you choose to purchase the certified Shelving Board?

[DON'T READ]

- 1=can afford to pay the higher price
- 2=believe the added costs of certification are worth it.
- 3=believe protection of the environment is "priceless"
- 4=other
- 8=DON'T KNOW
- 9=REFUSED

5b. There are many reasons why a person might choose the uncertified Shelving Board over the certified Shelving Board. Why did you choose to purchase the uncertified Shelving Board?

[DON'T READ]

- 1=I can NOT afford to pay the higher price

- 2=I do not believe the added costs of certification are worth it
- 3=other
- 8=DON'T KNOW
- 9=REFUSED

5c. There are many reasons why a person might not choose either Shelving Board. Why did you choose neither Shelving Board?

[DON'T READ]

- 1=can NOT afford to purchase either table
- 2=would never purchase a product like this no matter what the price
- 3=other
- 8=DON'T KNOW
- 9=REFUSED

Product #3: CHAIR

6. Now turn to the pictures of the oak chairs. The two chairs are identical in quality, except that one chair has been environmentally certified, while the other on has not. The non-certified chair sells for \$199. If the environmentally certified chair sold for:

[Randomize prices as usual making sure we match the type of certification.]

Partial Certification	[\$205	\$210	\$225	\$250	\$275	\$300]
Full Certification	[\$210	\$225	\$250	\$275	\$300	\$350]

Which Chair would you purchase?

- 1= Environmentally Certified Chair [GO TO FQ10]
- 2=NOT Environmentally Certified Chair [GO TO FQ11]
- 3=Neither [GO TO FQ12]
- 8=DON'T KNOW
- 9=REFUSED

6a. There are many reasons why a person might choose the certified Chair over the uncertified Chair. Why did you choose to purchase the certified Chair?

[DON'T READ]

- 1=can afford to pay the higher price
- 2=believe the added costs of certification are worth it.
- 3=believe protection of the environment is "priceless"
- 4=other
- 8=DON'T KNOW
- 9=REFUSED

6b. There are many reasons why a person might choose the uncertified Chair over the certified Chair. Why did you choose to purchase the uncertified Chair?

[DON'T READ]

- 1=I can NOT afford to pay the higher price
- 2=I do not believe the added costs of certification are worth it
- 3=other
- 8=DON'T KNOW
- 9=REFUSED

6c. There are many reasons why a person might not choose either Chair. Why did you choose neither Chair?

- 1=can NOT afford to purchase either table
- 2=would never purchase a product like this no matter what the price
- 3=other
- 8=DON'T KNOW
- 9=REFUSED

Thank you for agreeing to help us with this study. Your responses will provide the hardwood products industry and forestry managers with helpful information about how consumers views on hardwood products and the environment.

Interviewer _____

Time Finished Survey _____

VITA

Meng Li was born in Beijing, China. She graduated from Chongde High school in Beijing in 1993. Thereafter, she entered into the Department of International Trade and Economics in Beijing Polytechnic University. She got her Bachelor of Art degree in July 1997. She received a scholarship for Outstanding Undergraduate Student in her second and junior year. Then she started working In Beijing Automobile Industry Import & Export Corporation as European Market Sales Representative for 3 years. In January 2001, he entered the Master of Science program in the Department of Agriculture Economics at the University of Tennessee, Knoxville. She is presently a research assistant and going to get her M.S. in May 2003.