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An Analysis of Consumer Support for Environmental Certification of Hardwood Products

Pornpat Wiwattarangkul
University of Tennessee - Knoxville

To the Graduate Council:

I am submitting herewith a thesis written by Pornpat Wiwattarangkul entitled "An Analysis of Consumer Support for Environmental Certification of 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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Accepted for the Council:

Anne Mayhew
Vice Provost and
Dean of Graduate Studies

(Original signatures are on file in the Graduate Student Services Office.)

AN ANALYSIS OF CONSUMER SUPPORT FOR ENVIRONMENTAL CERTIFICATION OF HARDWOOD PRODUCTS

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

Pornpat Wiwattarangkul
August 2002

DEDICATION

This thesis is dedicated to my beloved parents

Mr.Visan and Mrs.Tassanee Wiwattarangkul

My brothers, Pheerasak - Oak, Pattarachai - Unn, and Napat – Nut Wiwattarangkul who always have endless love and support for all that I have done.

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ABSTRACT

Environmental wood certification programs could play an important role in conserving forests across countries such that several studies on the feasibility of certification programs have been conducted. The main focus areas of this study are in the state of Pennsylvania and Tennessee. The first objective of this study is to assess consumers' support and willingness to pay a premium for certified hardwood products. The second objective is to examine how income, demographics and attitudes about the environment, and scope of certification may influence support and willingness to pay a premium for certified hardwood products. Next, the study wants to examine reasons for not supporting certification or supporting certification but not willing to pay. Last, this study examines how income, demographics and attitudes about the environment, and scope of certification may influence reasons for lack of support and not being willing to pay more.

A telephone survey was conducted in March/April of 2001 for the primary used in the study by Jensen, Jakus, and English (2002). Analysis is based on an ordered logistics model, multinomial logistics models, chi-square statistics and t-tests. Logistics models are employed to examine the effects of demographics, attitudes toward environment, and scope of certification on support level and also on reasons for lack of willingness to pay and support cited. Frequencies and mean are used to assess consumer support and willingness to pay.

Results suggest that demand for certified hardwood products in the studied regions exists. About 44 percent of consumers supported and would pay a premium for certified hardwood products. Segment of consumers most likely to support and pay more

are female, live in an urban area, contributed to environmental group, recycled in past month, is a frequent forest user, have income less than $50,000, and is not a homeowner. This consumer segment has about 77 chance of supporting and pay more for certification.

Reasons for lack of willingness to pay cited were cannot afford to pay more, company should pay even if it costs more, certification does not add to cost, certification is not worth paying more, and other. Male, contributed to environmental group, recycles, and income $50,000 or greater were the variable with significant influence on the reason cannot afford to pay more. Male, contributed to environmental group, and contributed to hunting/fishing group were significant influenced on the reason wood company should pay even if it costs more. Male, contributed to environmental group, and income $50,000 or greater were significant influenced on the reason certification is not worth paying more.

Primary reasons for not supporting certification indicated by survey participants are environmental certification will not work to improve the environment, certification could lead to regulation, environmental organizations are too powerful, other causes are of higher priority than the environmental certification, wood companies should be regulated rather than certification, and other. Male, contributed to environmental group, and contributed to hunting/fishing group were significant influenced on the reason environmental organizations are too powerful. No variables had significant influence on other reasons.

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CHAPTER I

INTRODUCTION AND OBJECTIVES

Emerging Markets for Environmentally Certified Wood Products

With growing environmental concerns and pressures, international standards of forestry practices have been developed to regulate forestry management practices and to help preserve the conditions of forests. Voluntary forest certification programs have been initiated in many developed countries, particularly in European countries and the United States, as market-based tools to promote sustainable forest management.

Environmental certification is defined 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" by the Natural Resources Defense Council. The Forest Stewardship Council (FSC) gives the meaning of forest certification as "the process by which the performance of on-the-ground forestry operations are passed against a predetermined set of standards.

Several environmental certification programs provide new environmental information that helps consumers to understand certification issues and to build consumers' confidence in certification programs. "In general, third-party certification provides information on six distinct environmental areas: raw materials consumption; energy consumption; air emissions; water emissions; solid-waste generation; and indirect resource consumption or impact e.g. destruction of wildlife habitat, species preservation" (Coddinton, 1993).

An environmental label or eco-label, given after passing certification processes, is used to convey information from producers to consumers that certified wood products were produced in an environmentally sustainable way." "An environmental label is an assurance that an environmental claim on a product or management system meets specified criteria" (Cabarle *et al*., 1995).

Eco-labeling provides consumers with the opportunity to support good forestry management practices through their purchase of the certified forest-related products. Green consumerism has increased the market viability of forest certification products. Certification programs are potentially successful market-based incentives, which could take the place of government regulation to promote sustainable forest management.

Sustainable forest management by forest certification programs are recognized as more viable than government regulations in the era of green consumerism. Certification programs are potentially successful market-based incentives. An evidence of one widely known ecolabel program in the United States is the dolphin-safe label on canned tuna. Once consumers were convinced that tuna-fishing practices killed a great number of dolphins, they boycotted tuna (Mitchell, ERS, 2001). The dolphin-safe label program was developed to insure consumers that tuna was caught in a way that dolphins are safe. Another example of an environmental program that happened from environmental consciousness is Home Depot's Environmental Program. Accounting for 10 percent of the home building improvement industry[1], Home Depot recognized their potential power to impact the environment and set several environmental principles in the early 1990's (Lober and Eisen, 1995). Because of the program, all the products having any

[1] In 1997, Sales of Home Depot reached $ 24 billion.

environmental claims sold in Home Depot must be evaluated by independent certification organizations.

Scope of Environmental Certification Programs

Environmental certification programs may use life cycle analysis, where the product's life cycle is evaluated for its overall environmental effect, from the extraction of its raw materials, through the production process and associated wastes, transportation, retail distribution, consumer application, useful life, and disposal (Cabarle *et al*., 1995). Another method of forest certification is called chain-of-custody certification. Chain-of-custody certification traces a product back to its source of origin and assures customers that wood products are from well-managed forests and kept separate from noncertified wood products.

In 1992, at the United Nations Conference on Environment and Development (UNCED) -the Earth Summit- the goal of sustainable management of the world's forests was accepted by its members. In June of 1993, the United States declared at the Ministerial conference on the Protection of Forests in Europe (Helsinki Process) its commitment to a national goal of achieving sustainable management of US forests by the year 2000. The awareness of the need for sustainably managed forests and the growth of environmental activism in the United States provided an incentive to search for environmental certification programs.

Several programs and organizations related to forest certification were founded during the last decade in the United States. The US-based Rainforest Alliance's "Smart Wood" Program, which attempts to independently certify the environmental attributes of

wood products, was created in 1990. In October 1993, a movement to support socially beneficial and economically viable management of the world's forests was institutionalized when the Forest Stewardship Council (FSC) was formed. "The FSC provides structure to the certification process by determining principles and criteria of certification, and functioning as an overseer of certifying agents themselves" [2] (Merry and Carter, 1997). Forest products that passed criteria of FSC certifiers are allowed to carry the FSC registered trademark. The International Standards Organization released the standard to measure company's practices regarding environmental management systems called ISO 14001 series in 1997. The ISO 14001 series offers a framework for certification of environmental management systems rather than specifying forest management standards as FSC does.

All of the forest certification movements share similar primary objectives of certification programs. They generally include one or more of the following: to increase 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, to improve the earth's environmental quality, to increase market share, to provide product differentiation, or to provide an objective audit of forest asset management.

[2] At the present time, FSC has accredited only two wood products certification programs in the US which are the Smart Wood Program of the Rainforest Alliance and the Green Cross Program of Scientific Certification Systems.

Considerations with Environmental Certification

Certified forest products only about 0.5 percent of international forest trade is (Berg and Olszewski, 1995). In order for certification programs to have substantial effects on sustainable forest management, a much larger share of the products will likely need to be certified. At its current levels, the use of certified wood products has limited effect on sustainable forest management.

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. While Mater (1995) noted that certified wood products are not widely available for consumers. Difficulties in maintaining the chain of custody and resistance from retailers to keep wood supplies from certified forests separate become problems perceived by forest owners and manager in this study.

Cost of certification is another consideration. There are two primary costs associated with obtaining certification. The first is the cost of inspection and initial registration. The second is management cost associated with using practices that meet certification requirements. 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 from higher prices of certified products or “green premiums”.

Forest management certification can be provided in different ways. Examples include self-certification, government agency certification, or certification by an independent third-party organization (Ozanne and Vlosky, 1997). A study by Ozanne and Vlosky found that only the third-party certification, which is done by an independent certifier, is credible from consumers' perspectives. However, wood product producers may fear that participating in a certification program will allow the outsiders to have control over their business.

The purpose of this study is to assess consumers' support and willingness to pay a premium for certified hardwood products and develop consumer profiles for certified hardwood products. The study also examines how income, demographics, attitudes about the environment, and scope of certification may influence support and the willingness to pay a green premium for the certified hardwood products. The reasons for not supporting certification or for supporting certification, but not being willing to pay more are also examined. Also, this study examines how income, demographics, attitudes about the environment, and scope of certification may influence reasons for lack of support and not being willing to pay more for certified hardwood products. Lastly, this study measures the effects of income, demographics, attitudes toward the environment, and scope of certification on reasons cited.

The information and analysis results obtained from this study will be helpful to the wood products industry developing consumer profiles of those who have the most potential to seek out and purchase certified hardwood products. The information is also helpful in projecting market potential for certified hardwood products and for identifying reasons why consumers may not support or be willing to pay more for certified products.

CHAPTER II

REVIEW OF LITERATURE

A number of studies have been conducted regarding consumer's willingness to pay for and their perception of environmentally certified wood products. 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.

Methods of Analysis

To develop and profile consumer segments for environmentally certified wood products in terms of demographic, socioeconomic, and attitudinal variables, cluster analysis was employed by Ozanne and Vlosky (1997), Gronroos and Bowyer (1999), Forsyth *et al*. (1999), and Spinazze and Kant (1999). Logistic models that are used in this study were not employed in other earlier studies of consumers' willingness to pay for certified wood products. Descriptive statistics such as percent and mean value were used to assess consumers' support and willingness to pay by Ozanne and Vlosky (1997), Gronroos and Bowyer (1999), Forsyth *et al*. (1999), and Spinazze and Kant (1999). Chi-squares tests were employed by Gronroos and Bowyer (1999) as an analysis tool to test

the association between two variables[3]. In addition in their study, t-tests were used to test whether a variable in the model is statistically significant. All of the studies mentioned tested for non-response bias to ascertain whether or not respondents who responded are different from those who did not respond. If non-bias exists, the results obtained are not representative of the population surveyed.

Willingness to Pay Studies

A study by the World Wide Fund for Nature (WWF) found that 66 percent of respondents would be willing to pay green premium for certified wood products. These consumers would pay up to 13 percent more for wood originating from certified sustainable sources.

According to Winterhalter and Cassens (1993), their study reported the willingness to pay of households with incomes of $50,000 or higher. The sample population in this study was affluent consumers across the country as it is believed that consumers with high enough incomes would seek and purchase wood products with a premium in significant amount.[4] Of these respondents, 81 percent would pay a premium for certified sustainable wood products. Of those, fifty six percent would pay 1 to 10 percent more, 19 percent would pay 11 to 20 percent more, and 3 percent would pay more than 20 percent for green premium.

In addition, a study from Ozanne and Smith (1995) found that 34 percent of the

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[3] Hypothesis of the Chi-square test is
Ho : There is an association between the row and the column variables
H1 : Otherwise

[4] An affluent consumer is defined by The American demographic Association as having an annual income of $50,000 or greater.

respondents in the U.S. would be willing to pay more for certified wood products. Lastly, a study of Ozanne and Vlosky (1995) noted that 57-64 percent of the consumers surveyed indicated a willingness to pay for environmentally certified wood and lumber products.

The sample used in Ozanne and Vlosky (1995) was homeowners with incomes over $30,000 who would be in the market for a range of environmentally certified wood products. The studies by Winterhalter and Cassens limited their sample to households with higher than national median income and, therefore, the results have limited capability to be generalized to the population as a whole.[5] Their sample was restricted to adult homeowners who earn certain amount of incomes that usually are upper medium and high incomes. People in these income groups are generally accounted less than half of population in the U.S.

The studies by the WWF and Winterhalter and Cassens also did not vary wood product types to examine how the level of price may influence the green premium amount consumers would be willing to pay. Hence, the results were limited because it is likely that the degree of willingness to pay differs from products with a relatively low price to products with a relatively high price.

As opposed to the above studies, the study of Ozanne and Vlosky (1995) tried to investigate whether the willingness to pay for premium varies over a range of wood products. Certified wood items used in this study were 1) a 2 by 4-8'stud at a price of $1, 2) a ready-to-assemble chair at a price of $100, 3) a dining room set at a price of $1000, 4) a kitchen remodeling job at a price of $5000, and 5) a new home that is built of

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[5] U.S. median household money income, 1996 model-based estimate equals to $37,005 (www.census.gov)

certified wood products at a price of $100,000. On average, 37 percent of respondents were not willing to pay a premium for environmentally certified products cited in the study. The percentage of respondents who were not willing to pay higher prices for certified forest products listed in ordered above were 29 percent, 38 percent, 39 percent, 43 percent, and 36 percent. For respondents who would pay a green premium, average premiums ranged from 4.4 percent for a new home with a value of $100,000 to 18.7 percent for a 2 by 4-8' stud at a price of $1. The study indicated that consumers would pay the highest percent premium for a certified stud, the cheapest item, and the lowest percent premium for a new home, the most expensive item.

Another study of the willingness to pay of respondents across various products (a 2 by 4 by 8'stud, hardwood flooring, a ready-to-assemble chair, a dining room set and a new home) at different premiums is by Ozanne and Vlosky (1997). Survey participants in this study were business wood consumers that are involved with wood products purchases (architects, building contractors, and home center retailers). Results of this study were similar to those of Ozanne and Vlosky (1995) that low-price products received higher premium percent than high-price products and fewer respondents would be willing to pay a premium as the premium increases. Mater (1995) indicated about 54 percent of businesses (a study covered three U.S. states – Washington, Oregon, and California) are willing to pay a 10 percent premium if that premium could be passed on to consumers.

Other studies have found the majority of consumers unwilling to pay more. In a study by Gronroos and Bowyer (1997), 50 and 40 percent of respondents in Chicago and Minneapolis/St. Paul are aware of the importance of environmental certification.

However, only about 40 and 25 percent of those consumers indicated that they would be more likely to purchase certified lumber and wood products. Winterhalter and cassens and Ozanne and Vlosky (1997) found that 22 and 36 percent of their participants would not want to pay more for certified wood products. In addition, Gronroos and Bowyer (1999) reported that 64 and 77 percent (for Minneapolis/St. Paul and Chicago area respectively) indicated would not pay more. For business wood purchasers in Ozanne and Vlosky (1997), 31 percent of architects, 42 percent of building contractors, and 75 percent of home center retailers expressed an unwillingness to pay for any kind of certified products.

Market Participant for Environmental Certification Wood Products

Several studies have evaluated the effect of socio-economic factors on preferences for environmentally certified wood products. Characteristics of a person who are most likely to purchase certified wood products found in previous studies are presented in Table 2-1. Cluster analyses were conducted in several studies to help identify the market segments of potential buyers who would most likely purchase certified wood products.[6] Ozanne and Smith (1995) noted that 18 percent of respondents realized the importance of environmental certification of forest practices. Consumers in this group are characterized as "politically liberal, democratic, female, a member of an environmental organization, and fairly well educated" (Ozanne and Smith, 1995). A study of Ozanne and Vlosky (1997) which attempted to confirm the consumer profile developed by Ozanne and Smith

[6] 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).

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)	• Adult • Homeowner • Income > $30,000	• Politically liberal • Democratic • Female • Member of an environmental organization • Well educated
Ozanne and Vlosky (1997)	• Adult • Homeowner • Income > $30,000	• Politically liberal • Democratic • Female • Member of an environmental organization
Forsyth, *et al*. (1999)	• Adult • Customers of home improvement retail stores • Live in British Columbia, Canada	• Relatively young, low income, urban setting Or • Relatively old and high income
Spinazze and Kant (1999)	• Active buyers of wood products • No specific socioeconomic or demographic characteristics	• Consumer profile depends only on environmental awareness. • Gender and education correlate with willingness to pay

(1995) reported the same characteristics except that well educated characteristic was insignificant.

However, the study by Spinazze and Kant (1997), a study that measured 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. Its correlation analysis, however, revealed that only gender and education were correlated with premium (females and more educated were willing to pay more).

In much the same way, a study of Forsyth, *et al*. (1999) found no clear evidence on characteristics of customers who would most likely buy certified wood products. The most likely buyers of certified wood products in the sample were classified into two clusters. The first cluster can be described as relatively young, having the lowest average income of any cluster and being urban residents. The other cluster included urban residents who are relatively old with high average income.

Consumer Perspectives About Environmental Certification Wood Products

The term environmental certification may be well understood among the wood industry people or member of environmental organizations, but Spinazze and Kant indicated that only about 19 percent of their respondents express familiarity with 'forest management certification'. While respondents in previous studies acknowledged the importance of certification and agreed that sustainable forest management is crucial, their purchasing and preferences behaviors do not necessarily reflect these concerns. When

respondents in the Forsyth, *et al*. (1999) study were asked to rank factors that they would consider most in buying wood products to learn the relative importance of environmental attributes, quality and price were the qualifications they placed on the highest rank. Environmental attributes, which are environmental impact, certification, and retailer's environmental image were ranked at eighth, ninth and tenth from eleven features. Eleven products features are grain pattern, location and size of knots, species, quality, appearance, strength, brand name, price, retailer's environmental image, environmental impact, and certification. The last three can be considered environmental attributes of wood products.

Similarly, respondents in Gronroos 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 in the second least importance, 13^{th} out of 14^{th}. Home buying factors in this study are 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 and impact of building materials production on environment. That is, several studies suggested that wood products consumers would indicate their willingness to pay more for certified hardwood products in the studies, but they may be reluctant to do it practically.

CHAPTER III

DATA SOURCES AND METHODOLOGY

Survey Data

All the collected data used in this study were taken from a previous published study by Jensen, Jakus, and English (2002). A copy of the survey is presented in Appendix A. Telephone surveys were conducted by the Human Dimensions Lab, University of Tennessee Department of Forestry, Wildlife, and Fisheries in March/April 2001. Names and telephone numbers of survey participants were drawn by a private listing service. The survey was designed using information gathered in the pretest survey sent out randomly to Tennessee residents listed in telephone directories.[7]

A total of 1,614 telephone surveys were obtained from consumers in two eastern hardwood-producing states, Tennessee and Pennsylvania.[8] Respondents in this study were randomly selected from residents in each area that were at least 18 years of age and were the person primary responsible for wood products purchases in their household.

Two areas of each state were surveyed, one in an urban area with low levels of forestry activity, the other in more a rural area with high levels of forestry activity. About four hundred surveys from each state area were to obtain for a total of 1,614 responses. The counties in Tennessee and Pennsylvania were chosen on the basis of low urbanization/high concentrations of wood products industries or hardwood removals and from counties with high urbanization/low hardwood removals (Table 3-1). In each case,

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[7] The pretest mail surveys were primarily designed to develop a price range for certified version of hardwood products. However, this study focuses mainly on level of support, not a premium willing to be paid by respondents. Therefore, details of the pretest mail surveys will not be delineated here.

[8] The state of Pennsylvania by far has more certified hardwood forest land than any other state in the United States and is home of eleven companies with chain of custody certification. (Source:WWF)

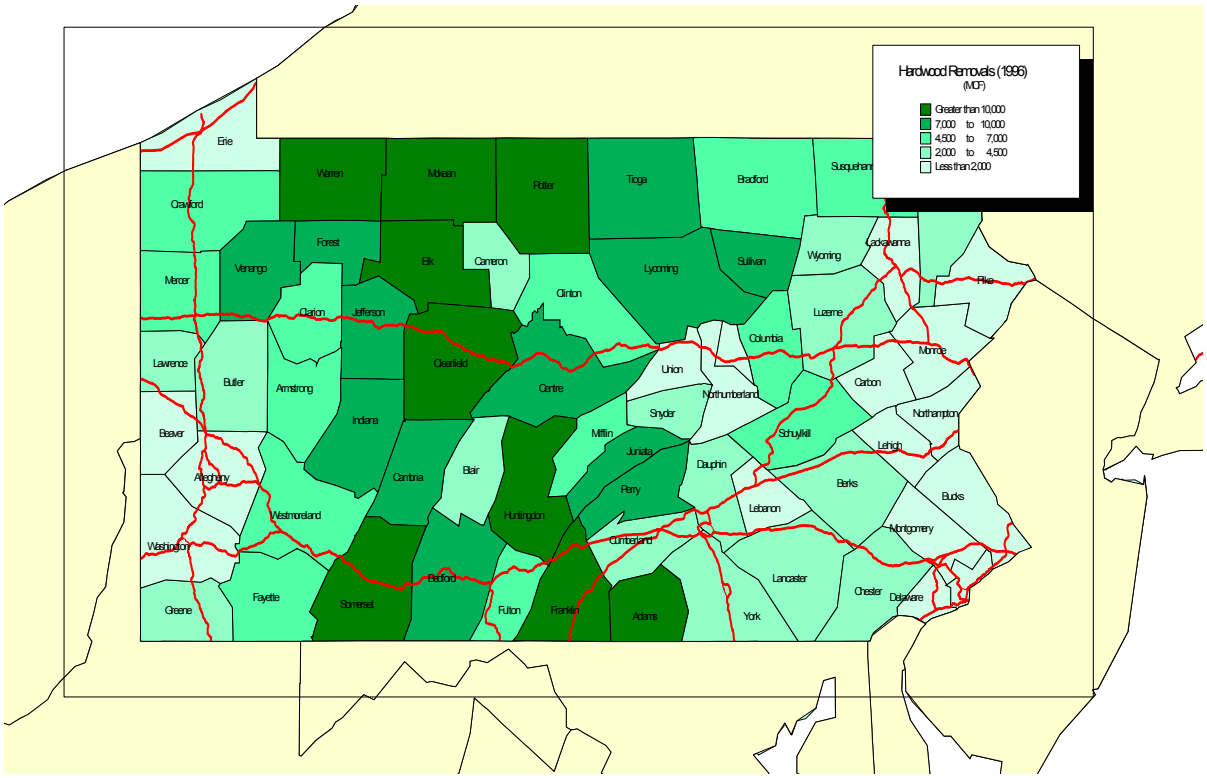
the urban counties had population densities of greater than 500 people per square mile (Figure 3-1 and 3-2). These counties also had hardwood removals of less than 2 million cubic feet per year (Figure 3-1 and 3-2). The rural counties had population densities of less than 75 persons per square mile. These counties also had hardwood removals of 10 million cubic feet per year or greater.[9]

Each sample area was also divided into two groups according to the certification protocol. One group was presented certification of the product throughout the supply chain or "full certification". The other group was presented with certification at the

Table 3-1. Study 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

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



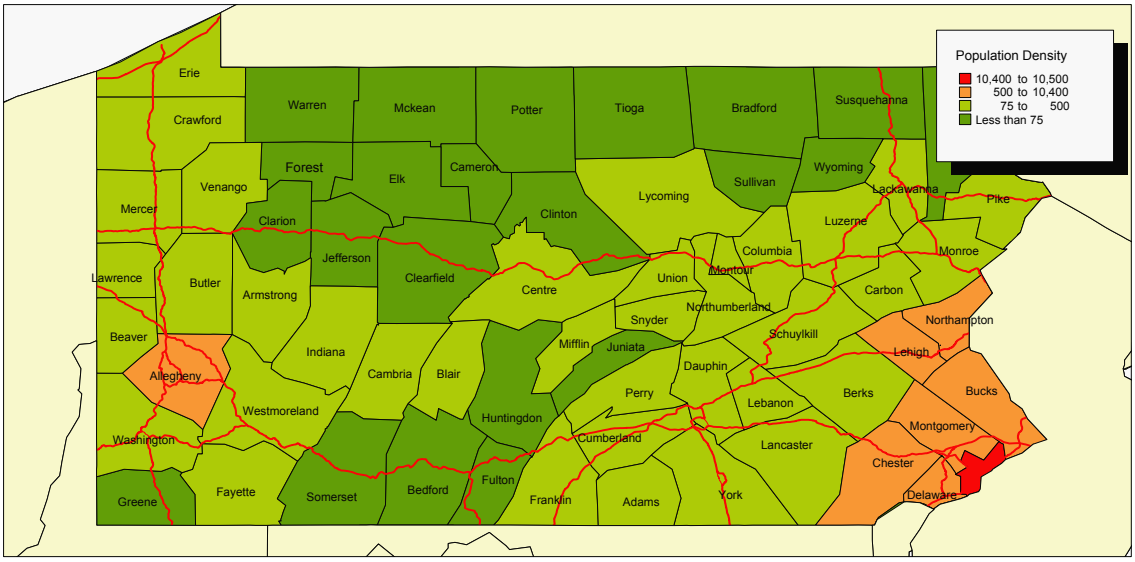


Figure 3-1. Pennsylvania: Hardwood Removals and Population Density, By County

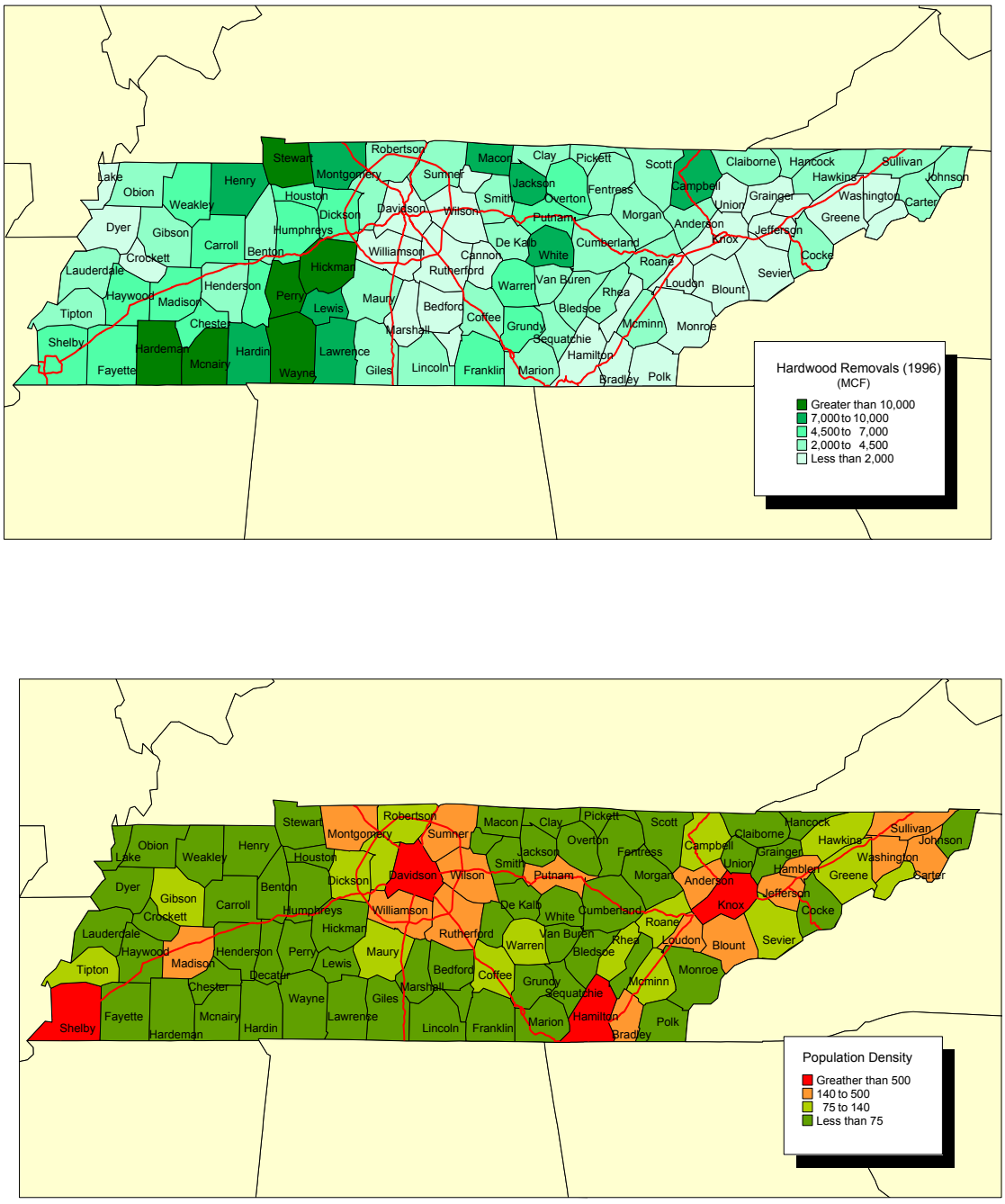


Figure 3-2. Tennessee: Hardwood Removals and Population Density, By County

harvest level of the product's life cycle or "partial certification" text. In full certification, all aspects of production, including timber growing and harvesting, product manufacturing, and handling methods, are monitored. Only timber growing and harvesting are monitored in partial certification. For both types, a product label assuring certification would appear on or nearby the product. For the two certification protocols, the text read as:

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 caller read the certification text to the respondent, they were asked to indicate which statement most closely reflected their opinions about environmental certification of hardwoods. The respondents were offered three statements. The first statement said, "I support environmental certification and would pay a higher price for hardwood products if they were certified". The second statement was, "I support environmental certification but not if it requires paying a higher price for hardwood

products". The third statement was "I do not support environmental certification regardless of whether it costs me anything". By allowing respondents to express support for environmental certification without being willing to pay higher prices, bias associated with "yea saying" may be minimized (Blamey, Bennett, and Morrison 1999). In other words, any pressure to provide a "socially responsible" response of support for the environment may be decreased, providing a more realistic estimate of consumers' behavior in the marketplace.

In the telephone interviews, respondents were asked whether or not they support environmental certification. The respondents who indicated support of environmental certification were further asked would they be willing to pay more for certified hardwood products. If the respondents indicated that they did not support certification, they were also asked to indicate reasons why. If the respondents stated that they supported certification, but would not pay more for certified products, they were asked to provide reasons why.

When respondents were asked why they might not be willing to pay a higher price or might not support certification, they were reminded that there are many reasons why one might not support or be willing to pay more for certification. Respondents' attitudes toward the environment, household income, education level, age, and type of residence were also solicited as part of the interview survey. Other information collected included participation in environmental organizations and frequency of recreational use of forests. The information collected would help to assess how demographics, attitudes toward the environment, and involvement in a wood products related industry might influence the willingness to pay for and support of environmental certification hardwood products.

The questions asked would provide more insight to understand how each characteristics influence support and willingness to pay for certification, and also what characteristics might influence reasons for not paying more and not supporting.

Methods of Analysis

The analysis of data included several methods. Descriptive statistics, such as mean values and percent, are employed to assess support and willingness to pay. The (Pearson) chi-square test is used to measure association between two discrete variables (for example 'yes/no'), so:

$$\text{Chi-squared} = \frac{\sum_i \sum_j (F_{ij} N_{ij})^2}{N_{ij}}$$

where

$$F_{ij} = \frac{N_{i\cdot} * N_{\cdot j}}{N} \quad .$$

The degree of freedom is (R-1) * (C-1) where R = rows, C = columns. The chi-square statistic formula is taken from Stephen E. Fienberg: The Analysis of Cross-Classified Categorical Data (1977). This study uses the chi-square statistic to test the association between respondents' characteristics and support, between respondents' characteristics and reasons for not willing to pay and not support.

An ordered logistic model is used to estimate factors influence support and willingness to pay. The statistical analysis system (SAS software program) is employed in order to obtain an ordered logistic model. Unordered multinomial logistic models are used to examine factors influencing lack of support or willingness to pay. In this case, a

Limdep program is utilized as SAS has limited capability in analyzing a model with multiple categorical variables (Greene, 1999).

This study chooses to use logistic models over regression models because values of dependent variables in the model are discrete, not continuous as required in regression models. In other words, dependent variables in the model are limited to be only certain numbers within a specific range. Examples include 'yes/no' or 'male/female'. Noted that all tests of significance are conducted at the 90% confidence level or higher.

Model of Support for Certification

An ordered logistic model will be used to estimate the effects of demographics, attitudes toward the environment, and scope of certification on the level of support for certification. Letting the qualitative responses take on the following values:

Support=0	I do not support environmental certification of hardwood products regardless of whether it costs me anything.
Support=1	I support environmental certification, but not if it requires paying a higher price for hardwood products.
Support =2	I support environmental certification and would pay a higher price for hardwood products if they were certified.

The model, for the probability that the respondent will hold the jth level of support can be expressed as follows.

$$\Pr(Support = j): \quad \begin{cases} 1 - F(\beta' X) & j = 0, \\ F(\mu - \beta' X) - F(-\beta' X) & j = 1, \\ 1 - F(\mu - \beta' X) & j = 2, \end{cases}$$

where :

F is the logistic distribution, so

$$F = \frac{e^{\beta' X}}{1 + e^{\beta' X}} \ ,$$

and μ is a threshold parameter to be estimated. The β is a vector of parameters to be estimated. The matrix X includes demographics, income, attitudes toward the environment, and scope of certification. Variables included in the models and their definition are presented in Table 3-2.

Since in the logistic model, the estimated coefficients cannot be interpreted directly as slopes, marginal effects need to be calculated separately. The marginal effects or change in probability of a response given a change in X are

$$\partial \Pr[Support=0]/\partial X = -\phi(\beta' X)\beta,$$

$$\partial \Pr[Support=1]/\partial X = -\phi(\beta' X)\beta - \phi(\mu - \beta' X)\beta,$$

$$\partial \Pr[Support=2]/\partial X = \phi(\mu - \beta' X)\beta,$$

where:

ϕ is the logistic density function, so

$$\phi = \frac{e^{\beta' X}}{(1 + e^{\beta' X})^2} .$$

The marginal effects are calculated at the sample means.

While the magnitudes on coefficients from the logistic model cannot be interpreted directly, the sign of each coefficient can. The significance of the overall model is evaluated with a chi-square likelihood ratio test (LLR). The Log-Likelihood Ratio Test (LLR) compares the log-likelihood function of the model if only the intercept

Table 3-2. Variable Definitions

Variable Name	Definition
Full certification	1 if received survey with full scope of certification, 0 with partial scope of certification
Urban	1 if a respondent live in an urban area, 0 otherwise
Male	1 if a respondent is male, 0 otherwise
Age	Age in years
Recycled in past month	1 if recycled in past month, 0 otherwise
Contribution to environmental group	1 if have ever contributed to a conservation organization, 0 otherwise
Contribution to hunting/fishing group	1 if have ever contributed to a hunting/fishing organization, 0 otherwise
Forest user	1 if use forests for recreation at least 7 times per year, 0 otherwise
Homeowner	1 if reside in home or condo they own, 0 otherwise
Income greater than $50,000	1 if income is greater than $50,000, 0 otherwise
College	1 if complete college or higher, 0 otherwise

was included with the log-likelihood of the model and is calculated as 2*(LL(Restricted to Intercept)-LL(Not Restricted)). The model will also be evaluated according to the percent of responses that are correctly classified by the model. The significance of the coefficients is evaluated with t-tests.

Models for Reasons for Lack of Support or Willingness to Pay a Premium

Because several reasons for not supporting certification or for not being willing to pay more for certification were cited, unordered multinomial logistic models will be used to estimate the effects of demographics, attitudes toward the environment, and scope of certification on different reasons cited. The variables *Reason-No Support* and *Reason-No Pay* take on values representing the differing reasons, and are 0, 1, 2, …, J. Therefore, the respondent faces J reasons for not being willing to pay more or for not supporting certification.

If the J disturbances are independent and identically distributed, then

$$\Pr(Reason_i = j) = \frac{\exp(\beta' X_{ij})}{\sum_{j=1}^{J} \exp(\beta' X_{ij})}.$$

Normalizing the data to assume that $\beta_0 = 0$, the probability that a respondent selected reason j is written as:

$$\Pr(Reason = j) = \frac{\exp(\beta_j' X_i)}{1 + \sum_{k=1}^{J} \exp(\beta_k' X_i)} \quad for\ j = 1,2,\ldots, J,$$

$$\Pr(Reason = 0) = \frac{1}{1 + \sum_{k=1}^{J} \exp(\beta_k' X_i)} \quad .$$

The marginal effects of the characteristics on the probabilities are:

$$\frac{\partial P_j}{\partial X_i} = P_j\left[\beta_j - \sum_{k=0}^{J} P_k \beta_k\right] = P_j[\beta_j - \bar{\beta}].$$

As with the ordered logistic model, the overall model significance is evaluated with the Log Likelihood Ratio Test. The model will also be evaluated according to the percent of responses that are correctly classified by the model. The significance of the coefficients is evaluated with t-tests.

The reasons for not supporting certification include that it could lead to regulation, that the management practices should be regulated (not voluntary), that the respondent did not believe certification would work to improve the environment, that environmentalists had too much power, other issues are more important, and other reasons. The reasons for supporting, but not being willing to pay more were that the respondent didn't believe it would cost any more to make a certified product, the company should pay for certification if it costs more, the respondent could not afford to pay more, the respondent didn't believe certification would work to improve the environment, and other reasons.

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 five parts: (1) Opinions about certification and reasons for lack of support and willingness to pay and characteristics of respondents, (2) Opinion across characteristics, (3) Ordered logistic model of support level, (4) Multinomial logistic models of reasons for lack of willingness to pay/support, and (5) Market potential for certified hardwood products.

Opinion about Certification and Reasons for Lack of Support and Willingness to Pay and Characteristics of Respondents

As displayed in Table 4-1, of 1,614 respondents, 1,474 provided an opinion about environmental certification. Of those with an opinion, 43.8 percent or 645 participants supported environmental certification and would pay more, 46 percent or 679 respondents supported environmental certification but would not being willing to pay

Table 4-1. Opinions of Respondents about Environmental Certification

Opinions	Percent of responses (N = 1,474)
I support certification and would pay more	43.8
I support certification, but not willing to pay more	46.0
I do not support certification regardless of how much it costs	10.2

more. About 150 respondents or 10.2 percent did not support certification regardless of its cost.

Of the 679 respondents who supported certification but were not being willing to pay more, 577 respondents disclosed their reason, while 102 respondents either didn't know about environmental certification or refused to reveal their reason (Table 4-2). 'Cannot afford to pay more for certified wood products' was the most commonly stated reason at 48.3 percent. 'Wood company should pay even if it costs more', 'Certification does not add to cost' and 'Certification is not worth paying more' were the other three most commonly cited reasons. Percentages of responses for those three remaining reasons are 19.4, 14.4 and 8.2 respectively. About 10 percent of responses represents variety of other reasons.

Of the 150 respondents who did not support the environmental certification, 119 respondents provided their reason, whereas 31 respondents were either didn't know why or refused to disclose their reason (Table 4-3). There were five primary reasons for not supporting environmental certification; 'Environmental certification will not work to improve the environment', 'Certification could lead to regulation', 'Environmental organizations are too powerful', 'Other causes are of higher priority than the environmental certification', and 'Wood companies should be regulated rather than certification'. The most common response, 29.4 percent, was 'Environmental certification will not work to improve the environment'. 'Certification leads to regulation' was ranked second with 21.9 percent. Just over 12.6 percent said

Table 4-2. Reasons Supporting but Not Being Willing to Pay More

Reasons	Percent of responses (N = 577)
I cannot afford to pay more	48.3
Wood company should pay even if it costs more	19.4
Certification does not add to cost	14.4
Certification is not worth paying more	8.2
Other	9.7

Table 4-3. Reasons for Not Supporting Environmental Certification

Reasons	Percent of responses (N = 119)
Environmental certification will not work to improve the environment	29.4
Certification could lead to regulation	21.9
Environmental organizations are too powerful	12.6
Other causes are of higher priority than the environmental certification	9.2
Wood companies should be regulated rather than certification	7.6
Other	19.3

'Environmental organizations are too powerful'. 'Other causes are of higher priority than the environmental certification', and 'Wood companies should be regulated rather than certification' were cited with 9.2 and 7.6 percent of the time, respectively. A variety of reasons accounted for the remaining 19.3 percent of the responses.

Table 4-4 presents characteristics of all respondents. An average age for all respondents in the survey is about 50. About 84 percent of respondents were home/condo owners. Respondents are almost evenly divided between male and female and also between those who live in an urban area and in a rural area (approximately equal number of surveys were conducted from respondents in each area, i.e. rural and urban areas of Tennessee and Pennsylvania). More than 76 percent of all respondents recycled in past month. Less than 40 percent of the respondents had contributed time or money to an environmental conservation group. Similarly, less than 30 percent had contributed to a hunting/fishing group. About 33 percent regularly used forests for recreation purposes. About 34 percent of respondents had completed at least a college degree.

Opinions across Characteristics

The information in Table 4-5 compares opinions across support for variables used in the ordered logistic model of support. Note that college, contribution to hunting/fishing group, and age were not significant in the model and are not presented in this table. As can be seen in Table 4-5, while 54.95 percent of those supporting and willing to pay were urban, 32.89 percent of non-supporters were urban. The chi- square test of association showed significant association between support and urbanization.

Table 4-4. Variable Names and Characteristics of All Respondents

Variable Name	N	Mean
Full certification	1,614	.5056
Urban	1,614	.4988
Male	1,605	.5321
Age	1,580	50.1354
Recycled in past month	1,609	.7657
Contributed to environmental group	1,590	.3836
Contributed to hunting/fishing group	1,603	.2876
Forest user	1,614	.3259
Homeowner	1,603	.8434
Income greater than $50,000	1,024	.4634
College	1,596	.3352

Table 4-5. Percents of Characteristics across Support

Characteristics	Do not support	Support but not pay	Support and pay	Chi-square	
Urban	.3289	.5152	.5495	12.5560	***
Male	.6974	.5804	.5142	10.1621	***
Contributed to environmental group	.2895	.3380	.4835	23.0465	***
Recycled in past month	.7763	.7343	.8231	9.7560	***
Forest user	.3553	.3427	.4104	4.3064	*
Income $50,000 or greater	.5658	.4732	.4623	2.7908	
Homeowner	.5385	.8462	.7948	8.9231	**

*** indicates significance at 99 percent confidence level,
** indicates significance at 95 percent confidence level,
* indicates significance at 90 percent confidence level

About 69.74 percent of respondents not supporting certification were male, 58.04 percent of supporters unwilling to pay were male, and 51.42 percent of those supporting and willing to pay were male. There was a significant association between support and male as indicated by the chi-square test of association. While 48.35 percent of participants supporting and willing to pay had contributed to an environmental group, 28.95 percent of those not supporting had contributed. The chi-square test of association indicated significant association between support and contribution to environmental group. As high as 82.31 percent of respondents who supported and would pay more recycled while 77.63 percent of non-supporters recycled. The chi-square test of association showed significant association between support and recycling. About 41.04 percent of those who supported and would pay more were frequent forest users, and 35.53 percent of non-supporters were frequent forest users. There was a significant association (at 90 percent confidence level) between support and forest user. Income $50,000 or greater had no statistical association with support as can be seen from the chi-square test value. While 79.48 percent of those supporting and willing to pay a premium were homeowner, only 53.85 percent of those not supporting were. The chi-square test of association suggested statistical association between support and homeownership at the 95 percent confidence level.

Ordered Logistic Model of Support Level

Results from an ordered logistic model for support and willingness to pay are presented in Table 4-6. The model is highly significant (LLR = 52.4663) and correctly predicts about 53 percent of the responses. There are 919 observations in the model.

Table 4-6. Ordered Logistic Model of Support and Willingness to Pay

Variable Name	Coefficient	Standard Error	t-ratio	P-value	
Intercept	2.4765	.2630	9.4155	.0000	***
Mu	2.6876	.1261	21.3116	.0000	***
Urban	.2906	.1433	2.0279	.0426	**
Male	-.3639	.1332	-2.7325	.0063	***
Contributed to environmental group	.5513	.1372	4.0196	.0001	***
Recycled in past month	.2571	.1618	1.5889	.1121	*
Forest user	.3168	.1421	2.2305	.0257	**
Income $50,000 or greater	-.2069	.1364	-1.5163	.1294	*
Homeowner	-.4364	.1885	-2.3153	.0206	**
LLR				52.4663	***
Percent Correctly Classified				.5307	
N				919	

*** indicates significance at 99 percent confidence level
** indicates significance at 95 percent confidence level
* indicates significance at 90 percent confidence level

Full certification, contributed to hunting/fishing group, age, and college are not significant and are not reported here. The significance of the intercept and mu indicate thresholds between the three levels of support. If either the intercept or mu was not significantly different from zero then "do not support" and "support but not pay" could be grouped together or "support but not pay" and "support and pay" could have been grouped together. The coefficients on all variables included in the model were significant at the 90 percent confidence level or greater level. The intercept, mu, male, and contribution to environmental organizations are significant at 99 percent confidence level, while urban, forest user and homeowner are significant at 95 percent confidence level, and recycled in past month and income $50,000 or greater are significant at 90 percent confidence level. The results showed that urban, contribution to environmental organizations, recycling, and forest user all positively (negatively) influenced the probability of support and willingness to pay (not supporting). Male, income $50,000 or greater and homeowner negatively (positively) influenced the probability of support and willingness to pay (not supporting). In a logistic model, only signs of coefficients can be utilized directly. Also, with an ordered logistic model, only the direction of influence on probability of support and pay or not supporting can be ascertained. In order to measure the effects of the variables on probability of support, but not willing to pay more, the marginal effects are calculated.

The marginal effects of each of the variables on support and willingness to pay are presented in Table 4-7. Marginal effects in this table report a change in the probability of support given a change in characteristics. While urban had a negative

Table 4-7. Marginal Effects from Model of Support and Willingness to Pay

Variable Name	Do not Support	Support but not pay	Support and pay
Urban	-.0203	-.0517	.0720
Male	.0255	.0647	-.0902
Contributed to environmental group	-.0386	-.0981	.1367
Recycled in past month	-.0181	-.0457	.0637
Forest user	-.0222	-.0564	.0785
Income $50,000 or greater	.0145	.0368	-.0513
Homeowner	.0305	.0776	-.1082

influence on the probability of not supporting or not willing to pay, it positively influenced the probability of support and willing to pay. Male positively influenced the probability of not supporting or not willing to pay, but negatively influenced the probability of supporting and being willing to pay. While contribution to environmental organizations had a negative influence on the probability of not supporting or not willing to pay, it had a positive influence on the probability of support and willingness to pay. Recycled in past month negatively influenced the probability of not supporting or not willing to pay, but it positively influenced the probability of support and willingness to pay. Forest user negatively influenced the probability of not supporting or not willing to pay, but positively influenced the probability of support and willingness to pay. While income$50,000 or greater and homeowner had a positive influence on the probability of not supporting or not willing to pay, they negatively influenced the probability of

support and willing to pay. A considered amount of change in the probability of support when characteristics of survey participants change happened with contributed to environmental group. The probability of support and willingness to pay more increased as much as 14 percent by having contributed to environmental group.

Two profiles were developed using the signs on the estimated coefficients from the model. Variables with a positive influence on support and willingness to pay are used to develop profile 1, while a negative influence on willingness to pay is used to develop profile 2. The profile data were multiplied by their estimated coefficients and then the probabilities of support =0, support =1, and support =2 were calculated. As can be seen in Table 4-8, profile 1 had a 2 percent chance of not supporting, a 21 percent chance of supporting, but not willing to pay, and a 77 percent chance of supporting and pay. Profile 2 had a 19 percent chance of not supporting, a 58 percent chance of supporting but not being willing to pay, and a 23 percent chance of supporting and pay.

Multinomial Logistic Model of Reasons for Lack of Willingness to Pay and Support

Results of reasons why respondents supported, but were not willing to pay more for certified hardwood products are presented in Table 4-9. Chi-square tests of association measure association between characteristics and reasons for lack of willingness to pay. From the total of 679 responses, 577 were received with reasons for support but not being willing to pay more for certified hardwood products. They were ‘Cannot afford to pay more’, ‘‘Wood company should pay’, Certification does not add to cost’, ‘Certification is not worth paying more’, and ‘Other’.

Table 4-8. Predicted Probability of Support and Willingness to Pay for Two Profiles

Profiles	Predicted Probability of Support Level		
	0 (Do Not Support)	1 (Support But Not Pay)	2 (Support and Pay)
Urban, female, contributed to environmental group, recycled, forest user, income less than $50,000, not a homeowner	.0200	.2106	.7694
Rural, male, did not contribute, did not recycle, not a forest user, income $50,000 or greater, homeowner	.1871	.5847	.2282

Table 4-9. Percents of Characteristics across Reasons for Not Willing to Pay

Percent With Characteristics	Can't Afford to Pay (N=227)	Company Should Pay (N=91)	Certification Does not Add to Cost (N=67)	Certification Is Not Worth Paying More (N=41)	Other (N=42)	Chi-Square	
Full Certification	.4571	.5000	.4912	.5714	.6923	7.744	*
Urban	.4743	.6000	.4737	.5429	.5897	4.2643	
Male	.4857	.6500	.7719	.6000	.6410	16.8869	***
Contributed to environmental group	.3086	.3333	.4737	.2857	.2308	7.7542	*
Contributed to hunting/fishing group	.2286	.3833	.2632	.2286	.4103	9.3191	**
Recycles	.7600	.7667	.6667	.6571	.7949	4.0421	
Forest User	.3257	.3000	.2982	.2571	.4872	5.7282	
Income $50,000 or greater	.3543	.6667	.5965	.4000	.4359	23.0719	***

*** indicates significance at 99 percent confidence level
** indicates significance at 95 percent confidence level
* indicates significance at 90 percent confidence level

From the chi-square test of association, only male and income $50,000 or greater were highly associated with reasons for not willing to pay more. Among those who said they could not afford to pay more, 45.71 percent received full certification, 47.43 percent were urban, 48.57 percent were male, 30.86 percent contributed to environmental group, 22.86 percent, contributed to hunting/fishing group, 76 percent recycles, 32.57 percent were forest users, and 35.43 percent had income $50,000 or greater. While 50 percent of those saying company should pay even if it costs more received full certification, 60 percent were urban, 65 percent were male, 33 percent contributed to environmental group, 38 percent contributed to hunting/fishing group, 76.67 percent recycles, 30 percent were forest users, 66.67 percent had income $50,000 or higher. Among those who indicate that certification does not add to cost, 49.12 percent received full certification, 47.37 percent were urban, 77.19 percent were male, 47.37 percent contributed to environmental group, 26.32 percent contributed to hunting/fishing group, 66.67 percent recycles, 29.82 percent were forest users, and 59.65 percent had income $50,000 or greater. For those who mentioned certification is not worth paying more, 57.14 percent received full certification, 54.29 percent were urban, 60 percent were male, 28.57 percent contributed to environmental group, 22.86 percent, contributed to hunting/fishing group, 65.71 percent recycles, 25.71 percent were forest users, and 40 percent had income $50,000 or greater. While 69.23 percent those who cited other reasons received full certification, 58.97 percent were urban, 64.10 percent were male, 23.08 percent contributed to environmental group, 41.03 percent, contributed to hunting/fishing group, 79.49 percent recycles, 48.72 percent were forest users, and 43.59 percent had income $50,000 or greater.

Results from the multinomial logistic model of reasons for not paying more are shown in Table 4-10. The model is highly significant with LLR = 88.64403 and correctly classified about 51 percent of the response. There are 366 observations in the model. Note that the reason 'Certification does not add to cost' was the omitted category in the analysis. Homeowner, age, and college were not significant and not presented here. Male, contributed to environmental organization, recycles and income $50,000 or greater were significant influences on 'Cannot afford to pay more' as a reason for not paying more. Male, contributed to environmental organizations, and contributed to hunting/fishing group were significant influences on the reason 'Wood Company should pay'. 'Certification is not worth paying more' was significantly influenced by male, contribution to environmental organization, and income $50,000 or greater. All variables significantly influenced 'Other' as a reason for not paying more.

The marginal effects of each of the variables on reasons for not willing to pay can be seen in Table 4-11. Obtaining full certification text lessened the chance of saying 'Cannot afford to pay more' or 'Certification does not add to cost'; however, it increased the chance of suggesting 'Wood company should pay', 'Certification is not worth paying more', or 'Other'. While living in an urban area decreased the probability of stating the reason 'Cannot afford to pay more', 'Certification does not add to cost', or 'Other', it increased the chance of claiming 'Wood company should pay' and 'Certification is not worth paying more'. While males were less likely to indicate that they cannot afford to pay more or other reason, they were more likely to say that the wood company should

Table 4-10. Multinomial Logistic Model of Reasons for Not Paying More

Variable Name	Coefficient	Standard Error	t-ratio	P-value	
		Cannot Afford to Pay More			
Intercept	1.9973	0.4933	4.0489	.0001	***
Full Certification	-.0457	.3263	-.1399	.8887	
Urban	.2549	.3649	.6987	.4847	
Male	-1.5029	.3810	-3.9447	.0001	***
Contributed to environmental group	-.8871	.3477	-2.5511	.0107	***
Contributed to hunting/fishing group	.3680	.4078	.9023	.3669	
Recycles	.6650	.3612	1.8413	.0656	*
Forest User	.6267	.3917	1.6000	.1096	
Income $50,000 or greater	-.9353	.3428	-2.7289	.0064	***
		Wood Company Should Pay Even If It Costs More			
Intercept	-.4413	.6233	-.7081	.4789	
Full Certification	.2038	.3854	.5288	.5970	
Urban	.6985	.4351	1.6055	.1084	
Male	-.9187	.4479	-2.0511	.0403	**
Contributed to environmental group	-.9337	.4097	-2.2791	.0227	**
Contributed to hunting/fishing group	1.0849	.4631	2.3427	.0191	**
Recycles	.6723	.4363	1.5411	.1233	
Forest User	.2939	.4678	.6281	.5299	

Table 4-10. Multinomial Logistic Model of Reasons for Not Paying More (continued)

Variable Name	Coefficient	Standard Error	t-ratio	P-value	
Income $50,000 or greater	.1928	.4133	.4663	.6410	
Certification Is Not Worth Paying More					
Intercept	.1553	.6548	.2371	.8126	
Full Certification	.3644	.4453	.8182	.4132	
Urban	.5719	.4970	1.1508	.2498	
Male	-.8946	.5005	-1.7872	.0739	*
Contributed to environmental group	-.8748	.4907	-1.7827	.0746	*
Contributed to hunting/fishing group	.3559	.5668	.6280	.5300	
Recycles	.1114	.4773	.2335	.8154	
Forest User	.2178	.5463	.3987	.6901	
Income $50,000 or greater	-.8210	.4682	-1.7536	.0795	*
Other					
Intercept	-1.7225	.7745	-2.2241	.0261	**
Full Certification	1.0971	.4630	2.3699	.0178	**
Urban	1.4413	.5227	2.7575	.0058	***
Male	-1.2377	.5144	-2.4063	.0161	**
Contributed to environmental group	-1.6682	.5102	-3.2694	.0011	***

Table 4-10. Multinomial Logistic Model of Reasons for Not Paying More (continued)

Variable Name	Coefficient	Standard Error	t-ratio	P-value	
Contributed to hunting/fishing group	1.4281	.5385	2.6520	.0080	***
Forest User	1.4634	.5189	2.8204	.0048	***
Income $50,000 or greater	-.8591	.4692	-1.8308	.0671	*
LLR				86.64403	***
Percent Correctly Classified				.5109	
N				366	

*** indicates significance at 99 percent confidence level
** indicates significance at 95 percent confidence level
* indicates significance at 90 percent confidence level

Table 4-11. Marginal Effects for Reasons for Not Willing to Pay

Variable Name	Cannot Afford To Pay More	Wood Company Should Pay	Certification Does Not Add To Cost	Certification Is Not Worth Paying More	Other
Full Certification	-.0963	.0098	-.1971	.0226	.0835
Urban	-.0883	.0438	-.0590	.0147	-.0887
Male	-.1976	.0319	.1538	.0226	-.0168
Contributed to environmental group	-.0543	-.0153	.1157	-.0036	-.0725
Contributed to hunting/fishing group	-.8012	.0907	-.0724	-.0713	.0791
Recycles	.0590	.0199	-.0757	-.0448	.0416
Forest User	.0556	.0363	-.0714	-.3069	.0828
Income $50,000 or greater	-.1684	.1293	.0834	-.0221	-.0222

pay, certification does not add to cost, or certification is not worth paying more. Participants who contributed to environmental organizations were more likely to indicate certification does not add to cost as their reason for not being willing to pay, and less likely to cite other reasons. A person who contributed to hunting/fishing group had a higher chance to state 'Wood company should pay' or 'Other', and had a smaller chance to indicate that cannot to afford to pay more, certification does not add to cost, or certification is not worth paying more as a reason for not paying more. Respondents who recycle in past month were more likely to cite 'Cannot afford to pay more', 'Wood company should pay', or 'Other', and were less likely to state that certification does not add to cost or certification is not worth paying more. Forest users were more likely to say that they cannot afford to pay, the wood company should pay, or other, but were less likely to say certification does not add to cost or certification is not worth paying more. Having income $50,000 or greater decreased the chance of suggesting 'Cannot afford to pay more', 'Certification is not worth paying more', or 'Other' as reasons for not being willing to pay. However, it increased the probability the respondents would say that the wood company should pay or that certification does not add to cost.

Percents of characteristics across reasons for not supporting certification are presented Table 4-12. Chi-square tests suggest that no variable is really significant to influence the probability of reasons for not supporting. Among those who mentioned certification will not work to improve the environment, 62.86 percent were male, 25.71 percent contributed to environmental group, and 34.29 percent contributed to hunting/fishing group. For those who said certification may lead to regulation, 61.54

Table 4-12. Percents of Characteristics across Reasons for Not Supporting

Percent With Characteristics[a]	Certification Will Not Work to Improve The Environment (N = 31)	Certification May Lead to Regulation (N = 18)	Environmental Organizations Are Too Powerful (N = 10)	Other[b] (N = 35)	Chi-Square
Male	.6286	.6154	.8667	.5714	4.2579
Contributed to environmental group	.2571	.2308	.6667	.3571	5.0526
Contributed to hunting/fishing group	.3429	.3846	.6000	.3095	4.1801

[a] Table 4-12 included only 3 variables because other variables were not close enough to the 90 percent confidence level

[b] Observation of "Wood companies should be regulated rather than certification" and "Other causes are of higher priority" reason were included in "Other" because each of those reasons have only few observations.

percent were male, 23.08 percent contributed to environmental group, and 38.46 percent contributed to hunting/fishing group. While 86.67 percent of those who said environmental organizations are too powerful were male, 66.67 percent contributed to environmental group, and 60 percent contributed to hunting/fishing group.

Results from multinomial logistic model of reasons for lack of support are presented in Table 4-13. The model is significant (LLR=15.93656) and correctly classified about 39 percent of the response. There are 118 observations in the model.

Table 4-13. Multinomial Logistic Model of Reasons for Lack of Support

Variable	Coefficient	Standard Error	t-ratio	P-value	
		Certification May Lead to Regulation			
Intercept	-.2959	.4596	-.6439	.5197	
Male	-.5823	.5419	-.1075	.9144	
Contributed to environmental group	-.1580	.6142	-.2573	.7970	
Contributed to hunting/fishing group	.2019	.5439	.3714	.7104	
		Environmental Organizations Are Too Powerful			
Intercept	-2.2004	.8417	-2.6141	.0089	***
Male	1.4454	.8543	1.6919	.0907	*
Contributed to environmental group	-1.9529	1.1306	-1.7273	.0841	*
Contributed to hunting/fishing group	1.1399	.6601	1.7268	.0842	*
		Other			
Intercept	.2451	.3998	.6129	.5399	
Male	-.2855	.4794	-.5955	.5515	
Contributed to environmental group	.5317	.5120	1.0386	.2990	
Contributed to hunting/fishing group	-.1649	.4971	-.3318	.7400	
LLR				15.93656	*
Percent Correctly Classified				.3898	
N				118	

*** indicates significance at 99 percent confidence level
** indicates significance at 95 percent confidence level
* indicates significance at 90 percent confidence level

Only male, contributed to environmental group, and contributed to hunting/fishing group were significant in the model and presented here. 'Certification will not work to improve the environment' was the omitted category. None of the variables had significant influence on 'Certification may lead to Regulation' and 'Other' as a reason for not supporting the certification of hardwood products. However, all variables significantly influenced on the reason 'Environmental Organization are too powerful'. Male and contributed to hunting/fishing group were more likely to indicate that this was the reason for lack of support. Respondents who contributed to environmental organization were less likely to indicate that environmental organizations are too powerful.

The marginal effects of the variables on reasons for not supporting are presented in Table 4-14. While, being male increased the chance of suggesting that certification will not work to improve the environment or environmental organizations are too powerful, it decreased the chance of stating that certification may lead to regulation or other reason. While a person who contributed to environmental organizations is more likely to indicate that certification will not work to improve the environment or other reason, he/she is less likely to state that environmental organizations are too powerful and other. Respondents who contributed to a hunting/fishing group are more likely to indicate that certification may lead to regulation or environmental organizations are too powerful. However, they are less likely to say that certification will not work to improve the environment or other reason.

Table 4-14. Marginal Effects for Reasons For Not Supporting

Variable Name	Certification Will Not Work to Improve The Environment	Certification May Lead to Regulation	Environmental Organizations Are Too Powerful	Other
Male	.4833	-.1336	.1168	-.1040
Contributed to environmental group	.8253	-.3715	-.1577	.1947
Contributed to hunting/fishing group	-.2516	.2889	.8564	-.8937

Market Potential for Certified Hardwood Products

Of those who supported certification and would pay more, 43.72 percent purchased wood products last year and planned to purchase them this year, while 56.28 percent did not purchase wood products last year and/or have no plan for this year (Table 4-15). Among those supporting certification, but not willing to pay more, 52.14 percent were more frequent wood purchasers, while 47.86 percent were less frequent wood purchasers. Of those not supporting certification, 42 percent were more frequent wood purchasers and 58 percent were less frequent wood purchasers. The results suggest that

Table 4-15. Level of Support by Wood Products Buyers

Support Level	Purchased Wood Products Last Year and Planned to This Year (Percent)	Did not Purchase Wood Products Last Year and Had No Plan for This Year (Percent)	Total Number
Support certification and would pay more (N=645)	43.72	56.28	645
Support but would would not pay More (N=679)	52.14	47.86	679
Do not support (N=150)	42.00	58.00	150
Total Number	699	775	1474
Chi-square = 11.3623***			

*** indicates significance at 99 percent confidence level

those who were supporters of certification, but not willing to pay more, were more likely to be frequent purchasers of wood than those who would pay more or those who did not support certification. The chi-square test of association revealed a significant association between support level and wood purchases.

Most wood buyers participants in the survey purchased wood products for in home/residential purposes. Demand for certified wood products for residential wood buyers would have greater influence on effectiveness of certification than business wood buyers since 91.54percent of those who support certification purchased wood products for in home/residential purposes. Among those supporting certification, about 8.46 percent purchased wood for commercial purposes (table 4-16). Of those supporting, but not willing to pay, 12.43 percent were commercial wood purchasers. Of those not supporting certification, nearly 15 percent were commercial wood purchasers. The chi-squared test of association revealed a signification association between support level and purpose of wood purchases. These results suggest that certified products may sell better to residential purchasers than to commercial purchasers.

Table 4-16. Purposes of Wood Products Usage by Level of Support

Support Level	Purchase Wood Products for Commercial Purposes (Percent)	Purchase Wood Products for Residential Purposes (Percent)	Total Number
Support certification and would pay more (N=473)	8.46	91.54	473
Support but would not pay more (N=515)	12.43	87.57	515
Do not support (N=103)	14.56	85.44	103
Total Number	119	972	1091
Chi-square = 5.5640*			

* indicates significance at 90 percent confidence level

CHAPTER V

CONCLUSIONS

The purpose of this study is to assess consumers' support and willingness to pay a premium for certified hardwood products. The study also examines how income, demographics, attitudes about the environment, and scope of certification may influence support and the willingness to pay a green premium for the certified hardwood products. The reasons for not supporting certification or for supporting certification, but not being willing to pay more are also examined. Also, this study examines how income, demographics, attitudes about the environment, and scope of certification may influence reasons for lack of support and not being willing to pay more for certified hardwood products.

Summary of Findings and Discussion

The results of this study suggest that there is a demand for certified hardwood products from residents in the states of Pennsylvania and Tennessee. A person who lives in an urban area, is female, contributes to environmental organization, recycled in past month, is a frequent forest user, earns income less than $50,000, and is not a homeowner is the profile of a person most likely to support and pay a premium for certified hardwood products. This profile of prospective certified hardwood purchasers is similar to consumer profiles developed by Ozanne and Smith (1995), Ozanne and Vlosky (1997), and Forsyth, et al. (1999) that urban, female, low income, and environmentally involved respondents have high chance to be purchasers for certified wood products.

Reasons for not being willing to pay more revealed in this study are 'Cannot afford to pay more', 'Company should pay even if it costs more', 'Certification does not add to cost', 'Certification is not worth paying more', and 'Other'. The fact that the highest percentage of individuals who support but would not pay more for certification cites reason cannot afford to pay more suggests that consumers may not have the ability to pay a premium for certified hardwood products, given the prevailing market prices of noncertified wood products. Noteworthy, individuals who were frequent forest users are less likely to state that they cannot afford to pay more. This suggests that forest users in particular see the importance of forest certification and would sacrifice money from other activities to support certification of hardwood products. Males who contributed to environmental organization and had income $50,000 or higher are most likely to indicate that certification does not add to cost. This suggests that the industry will need to clearly communicate, especially to these consumers why certified products may cost more. Males who were urban and received full certification are more likely to suggest that certification is not worth paying more. This finding could reflect that there are a large number of social issues to be funded facing consumers, particularly to these consumers, in addition to environmental conditions. In addition, environmental awareness among these consumers are low. Clear understanding about potential benefit of certification could induce consumers to accept that certified hardwood products have added value and then be more willing to pay a premium.

Primary reasons for not supporting certification indicated by survey participants are 'Environmental certification will not work to improve the environment', 'Certification could lead to regulation', 'Environmental organizations are too powerful',

'Other causes are of higher priority than the environmental certification', and 'Wood companies should be regulated rather than certification'. The fact that the highest percentage of non-supporters cites reason certification will not work to improve the environment sends a message that more information on how certification can work to improve the condition of the environment should be provided to consumers. Interestingly, those who contributed to environmental organization were more likely to state that certification will not work to improve the environment. This result could reflect that these individuals believe means other than voluntary certification would work better. The fact that individuals who were members of hunting/fishing groups believed environmental organizations are too powerful may reflect the conflict between forest resource users and environmental organizations.

From a market potential view, the findings from this study suggest that residential wood purchasers have greater chance than commercial wood purchasers to support and willing to pay a premium for certified hardwood products. In other words, certified hardwood products may sell better to residential wood purchasers than to commercial purchasers. Initial marketing efforts might be toward residential users rather than commercial users. Furthermore, while most frequent wood purchasers would support but not pay more, most of those who are less frequent wood purchasers would support and be willing to pay more. This study suggests that at least initially certified products may comprise a niche market for less frequently purchased goods.

Interestingly, findings indicate that a person with relatively lower income is more likely to support and pay more for certified wood products than those with relatively high income. However, this finding is similar to the results of Forsyth, et al. (1999). In the

study of Ozanne and Smith (1995), Ozanne and Vlosky (1997), and Spinazze and Kant (1999), income variable had no influence on the willingness to pay. This study also found that full certification has no effect on support. This indicates that participants may not realize that full certification as opposed to partial certification can have broader effects in improving environmental conditions. Therefore, educational programs about certification would need to convey that full certification has greater potential benefit to the environment than partial certification and how it would be of greater benefit.

In order to better understand purchasing behaviors of consumers with high income, college degree and who receive full certification (who are less likely to support and pay more for certified hardwood products), further research should explore more on these consumers. Also, it is noteworthy to not overlook another profile of consumers. This consumer has a relatively high chance of support but not being willing to pay. At least this group of consumers supports certification. Given the choice between certified and uncertified wood products at the same price, they would likely choose certified products.

Limitations of the study

Because the concept of certification wood products is relatively new to general public and certified hardwood products are not widely available, survey participants may not fully understand the concept of certification. Therefore, a study may not accurately reveal the actual purchase behavior of respondents. In addition, respondents might not truthfully indicate their opinion about certification as the questions asked in the

willingness to pay study were hypothetical. Therefore, actual purchasing behavior could differ greatly from the results presented.

Only about 47 percent of survey participants who provided opinion about environmental certification are active wood purchasers. Hence, number of those who support and would pay a premium may not represent actual demand for certified hardwood products and the number of wood buyers who would actually support and pay more for certified hardwood products would be lesser than what is reported in this study. In the study of Spinazze and Kant, survey participants were actively participating in the wood product's market. Their sample respondents were randomly selected from consumers visiting home improvement stores such as, IKEA, Home Depot, and Office Depot to purchase wood products. Across all products investigated in this study, an average of 22.86 percent of respondents would not pay a premium.[10] This number is smaller than percent of those who support but not pay found in this study.

The survey that this study has taken from included residents from all range of income. However, while as high as 46 percent of respondents household in this study earn income greater than $50,000, less than 40 percent of household of respondents in Tennessee and Pennsylvania have income higher than $50,000. As well, while the average age of participants in this study is 50, the median age in Tennessee and Pennsylvania is only about 36 and 38 respectively. This means that survey participants in this study does not represent the general population of the state of Tennessee and

[10] The study of Spinazze and Kant did not separate support into 3 levels as in this study. Therefore, it is assumed that percentage of respondents who would not pay a premium in that study is similar to support but not being willing to pay in this study.

Pennsylvania. However, these characteristics may reflect those who are most likely to be residential wood products purchasers.

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APPENDIX

APPENDIX

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

VITA

Pornpat “Jing” Wiwattarangkul was born in Samutprakarn, Thailand, on December 20, 1976. She attended and graduated from Assumption High School in Bangkok, Thailand. Later on, She received her Bachelor of Arts in Economics from Thammasat University, one of the most prestigious universities in Thailand. She received a scholarship from Tokyo-Mitsubishi Bank in the junior and senior year. While studying at Thammasat University, she participated several extra curricular activities; the one program that had inspired her interest in agriculture was Summer Volunteer Camp.

Upon graduation, she started working with Maersk Bangkok Branch, a biggest Danish shipping company, as a management trainee. After 15 months of working, she entered the Master’s program in Agricultural Economics at the University of Tennessee, Knoxville. The Master of Science degree was received August 2002.