U.S. Consumer Willingness to Pay Price Premiums for Certified Wood Products

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Introduction

- Certification was first introduced in the early 1990s to address concerns of tropical deforestation and forest degradation.

- Overarching objective of certification: address public concerns about perceived negative impacts of forest production activities on the natural environment.

- Certification *may* offer increased profits *if* consumers are willing to pay a premium for certified products.

Are consumers really willing to pay a premium for certified wood products?

- Anderson and Hansen (2004) report that actual consumer purchase behavior does not indicate WTP premiums.

- Limitation of hypothetical response studies: inability to *definitively discern* whether consumers will actually act upon their stated intentions.

- Nevertheless, past research suggests concern and interest on the part of consumers.

- U.S. wood products supply chain members as well as home builders have been shown to pay premiums for certified products (Humphries, Vlosky & Carter 2001, Duery 2006).

Previous research

- Ozanne and Vlosky (1997, 2003) report that U.S. consumers stated they would be willing to pay an average premium of 12% for certified products over non-certified alternatives.

- Teisl et al. (2002) found consumers are more inclined to consider certification for low-priced frequently purchased items.

Research Methods

- A 2005 survey replicated methods followed by Ozanne and Vlosky (1997, 2001).

- Tailored Design Method - Dillman (1978, 2000).

- Ozanne and Vlosky provided data for 1995.

Empirical model

Let *U* be an ordered response eliciting consumer level of utility derived from purchasing a wood product. The ordered probit model for *U* can be derived from a latent variable model where *U** is determined by:

$$U_i^* = \boldsymbol{X}\beta + \varepsilon_i \qquad \qquad \varepsilon / \boldsymbol{X} \sim Normal\ (0,1)$$

Where *β* is a row of vector of effects associated with selected variables, *X* is an information matrix and *ε* is a random error term.

Empirical model

The order response model for this study assumes the following relationship.

Premium levels:

0%	$U=0$	if $U^*_i \leq 0$;
10%	$U=1$	if $0 < U^*_i \leq \mu_1$;
25%	$U=2$	if $\mu_1 < U^*_i \leq \mu_2$;
50%	$U=3$	if $\mu_2 < U^*_i \leq \mu_3$;
>50%	$U=4$	if $\mu_3 \leq U^*_i$

Where U is the ith respondent's rating for a particular product and the μ_s are unknown thresholds parameters. The parameters in the model can be estimated by using maximum likelihood.

Model Constructs

Willingness to pay a premium was modeled as a function of:

- Actual purchasing behavior for certified products

- Belief that certification can reduce tropical deforestation,

- Level of trust to the entities issuing certification certificates and

- Socio-economic and demographic variables: Education, income, gender, age.

Variables included in the Model

Variable	Type
Dependent variable	
PREMIUM	Ordered rank (0-4)
Explanatory variables	
SEEK	5-point Likert scale
TROPDEFO	5-point Likert scale
FEDS*	Binary
INDUSTRY	Binary
ENGO	Binary
THIRDPARTY	Binary
INCOME1*	Binary
INCOME2	Binary
INCOME3	Binary
INCOME4	Binary
EDU1*	Binary
EDU2	Binary
EDU3	Binary
EDU4	Binary
EDU5	Binary
GENDER	Binary
AGE	Continuous
YEAR05	Binary

* Indicates base group in the model.

Ordered Probit Estimates for WTP a Premium for a Certified Ready-to-Assemble Chair (base price $100)

Variable	Coef.	Robust Std. Err.	z	P>z
SEEK	.3971891	.0589159	6.74	0.000**
TROPDEFO	.1867369	.0654381	2.85	0.004**
INDUSTRY	-.1351899	.206664	-0.65	0.513
PRIVATE	.1390633	.1260801	1.10	0.270
ENGO	.0246022	.1244517	0.20	0.843
INCOME2	.4611793	.1584596	2.91	0.004**
INCOME3	.5217238	.1713671	3.04	0.002**
INCOME4	.5419056	.1849767	2.93	0.003**
AGE	.0035996	.0046214	0.78	0.436
EDU2	.1334273	1.053259	0.13	0.899
EDU3	.3003954	1.044131	0.29	0.774
EDU4	.1937215	1.045806	0.19	0.853
EDU5	.3713827	1.044793	0.36	0.722
GENDER	.3342143	.114683	2.91	0.004**
YEAR05	.104703	.1211009	0.86	0.387

Obs: 439, Log pseudolikelihood = -541.50139 Wald χ^2 (15) = 98.02, Prob > χ^2 = 0.0000.

Ordered Probit Estimates for WTP a Premium for a Certified Dining Room Set (base price $1,000)

Variable	Coef.	Robust Std. Err.	z	P>z
SEEK	.3468432	.057865	5.99	0.000**
TROPDEFO	.1859352	.0639493	2.91	0.004**
INDUSTRY	.1924016	.2112176	0.91	0.362
PRIVATE	.2237412	.1290553	1.73	0.083*
ENGO	.3157552	.128076	2.47	0.014**
INCOME2	.4207895	.1462774	2.88	0.004**
INCOME3	.5597467	.1676944	3.34	0.001**
INCOME4	.4102885	.1818632	2.26	0.024**
AGE	-.0007261	.004563	-0.16	0.874
EDU2	-.5086032	.6921813	-0.73	0.462
EDU3	-.249709	.6874155	-0.36	0.716
EDU4	-.3339287	.689314	-0.48	0.628
EDU5	-.2820312	.6877351	-0.41	0.682
GENDER	.2735201	.1113153	2.46	0.014**
YEAR05	.3256594	.1205988	2.70	0.007**

Obs= 439, Log pseudolikelihood = -544.27014   Wald $\chi2$ (15) = 100.66, Prob > $\chi2$ = 0.0000

Ordered Probit Estimates for Willingness to pay for an Environmentally Certified for Kitchen Remodeling Job

(base price $5,000)

Variable	Coef.	Robust Std. Err.	z	P>z
SEEK	.3461218	.071526	4.84	0.000**
TROPDEFO	.1197697	.0694323	1.72	0.085*
INDUSTRY	.1541488	.2076511	0.74	0.458
PRIVATE	.2340384	.1363107	1.72	0.086*
ENGO	.2266769	.1306974	1.73	0.083*
INCOME2	.4060236	.1553293	2.61	0.009**
INCOME3	.5886515	.1730934	3.40	0.001**
INCOME4	.4919313	.1874525	2.62	0.009**
AGE	-.001858	.0047486	-0.39	0.696
EDU2	-.5122144	.6838529	-0.75	0.454
EDU3	-.3923357	.676019	-0.58	0.562
EDU4	-.5744606	.6781387	-0.85	0.397
EDU5	-.5957172	.6767819	-0.88	0.379
GENDER	.2637248	.118814	2.22	0.026**
YEAR05	.3129667	.1261016	2.48	0.013*

Obs= 439, Log pseudolikelihood = -511.51515 Wald χ^2 (15) = 60.05, Prob > χ^2 = 0.0000

Ordered Probit Estimates for WTP a Premium for a new home (base price $100,000)

Variable	Coef.	Robust Std. Err.	z	P>z
SEEK	.3278837	.0636618	5.15	0.000**
TROPDEFO	.1954444	.0668133	2.93	0.003**
INDUSTRY	.424703	.2073801	2.05	0.041**
PRIVATE	.1444981	.1275722	1.13	0.257
ENGO	.1910975	.1216329	1.57	0.116
INCOME2	.3594377	.1393059	2.58	0.010**
INCOME3	.5836336	.165929	3.52	0.000**
INCOME4	.5076663	.1716172	2.96	0.003**
AGE	.0016005	.0043583	0.37	0.713
EDU2	.6459739	.8309825	0.78	0.437
EDU3	.5906909	.8250839	0.72	0.474
EDU4	.5856886	.825755	0.71	0.478
EDU5	.6403277	.8259831	0.78	0.438
GENDER	.1916525	.1132773	1.69	0.091
YEAR05	.2478831	.1197803	2.07	0.039**

Obs= 439, Log pseudolikelihood = -636.91278 Wald χ^2 (15) = 87.43, Prob > χ^2 = 0.0000

Marginal Effects

Marginal probability effect for and individual who agrees with the statement "I believe certification can reduce tropical deforestation" against an individual who does not agree with the statement.

Product	Coef.	Std. Err.	z	P>z
Ready-to-assemble chair	.1411521	.0525316	2.69	0.007 **
Dining room set	.1718376	.0581553	2.95	0.003 **
Kitchen job	.1127987	.0619657	1.82	0.069 *
New home	.1917689	.0665712	2.88	0.004 **

Age=35, Gender=Male, INCOME=3,EDUC=3, YEAR=2005

Marginal Effects

Marginal probability effect for an individual with INCOME1 (total annual household income < $39,999) against INCOME3 (total annual household income $80,000 - $119,999)

Product	Coef.	Std. Err.	z	P>z
Ready-to-assemble chair	-.1279649	.0513776	-2.49	0.013 **
Dining room set	-.184859	.06088	-3.04	0.002 **
Kitchen job	-.1761047	.0596144	-2.95	0.003 **
New home	-.1944421	.0622225	-3.12	0.002 **

Age=35, Gender=Male, EDUC=3, YEAR=2005, TROPDEFO=4.11

Marginal Effects

Marginal probability effects of moving from WTP=0 to WTP=10%

Product	Coef.	Std. Err.	z	P>z
Ready-to-assemble chair	.1537057	.0640227	2.40	0.016 **
Dining room set	.2239503	.0701363	3.19	0.001 **
Kitchen job	.2278482	.0778888	2.93	0.003 **
New home	.1984898	.036229	5.48	0.000 **

Age=35, income=3, Gender=Male, ENGO=1,=1,EDU3=1, YEAR05=1, TROPDEFO=4.11

Conclusions

- Results suggest higher probabilities of paying a premium for certified wood products are associated with affluent (higher income) consumers who seek out certified products.

- Potential premiums are more likely to be paid by consumers who are concerned about tropical forests and believe that certification can help reduce tropical deforestation.

Questions and Comments?

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