The Willingness to Pay for a Certification Label and a Tribal Art Design of Native American Wooden Gift Products

Daisuke Sasatani

University of Washington

CINTRAFOR

Center for International Trade in Forest Products

Modeling for Marketing

- **Multivariable Techniques**

  To reduce the dimension of the similar variables

  Unsupervised learning

  (i.e., Discriminant Analysis)

  vs

- **Trade-Off Model**

  Focusing the relationship between the variables

  Supervised learning

  (i.e., Regression, Conjoint Analysis)

Agenda

- Background of the study
- Experimental Design
- Multivariate Technique Results
- Incorrect Results
- Simulation & Conjoint Analysis
- Conclusion

This material is based upon work that is supported by the National Institute of Food and Agriculture, USDA through the National Needs Fellowship program under award number 2012-38920-30196. We gratefully acknowledge the support of the USDA Federal State Marketing Improvement Program, award no. 14-FSMIP-WA-0015 for providing financial support to this study.

Warm Spring Sawmill in OR, Apr 11, 2016

PRESS RELEASE

THE CONFEDERATED TRIBES OF THE WARM SPRINGS RESERVATION OF OREGON

Warm Springs, Oregon 97761 / 541 553-1161

FOR IMMEDIATE RELEASE

WARM SPRINGS FOREST PRODUCTS INDUSTRIES WINDING UP OPERATIONS

WARM SPRINGS, OREGON, April 11, 2016 – Tribal Council, by unanimous motion on April 5, 2016 and Tribal Resolution 12,155, dated April 11, 2016, has authorized Tribal staff to take actions that will result in judicial appointment of a third-party receiver to take possession and control of the assets of Warm Springs Forest Products Industries ("WSFPI") assets for the purpose of an orderly wind up its operations.

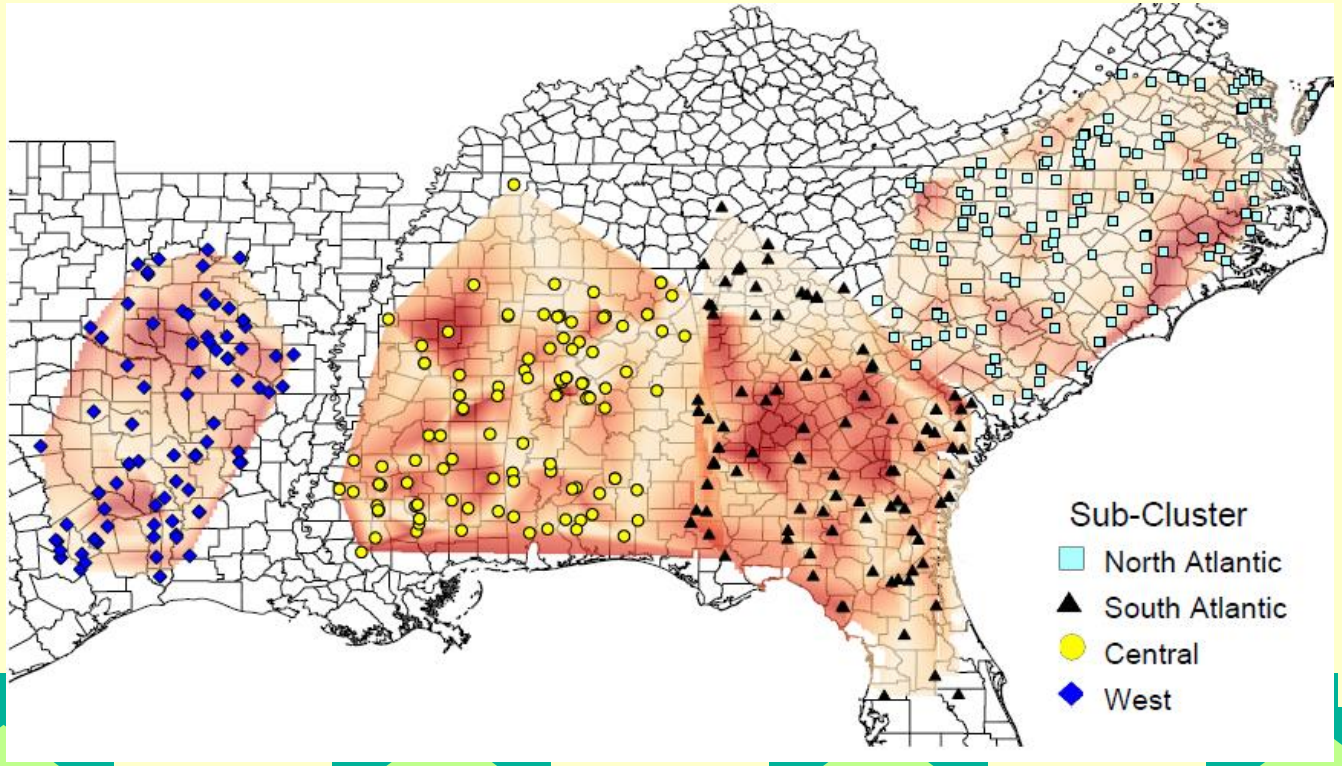
Softwood Sawmill Industry in N. America

- 1,258 (1995) → 891 (2009) ↓ 29.2%
- Productivity per plant increased

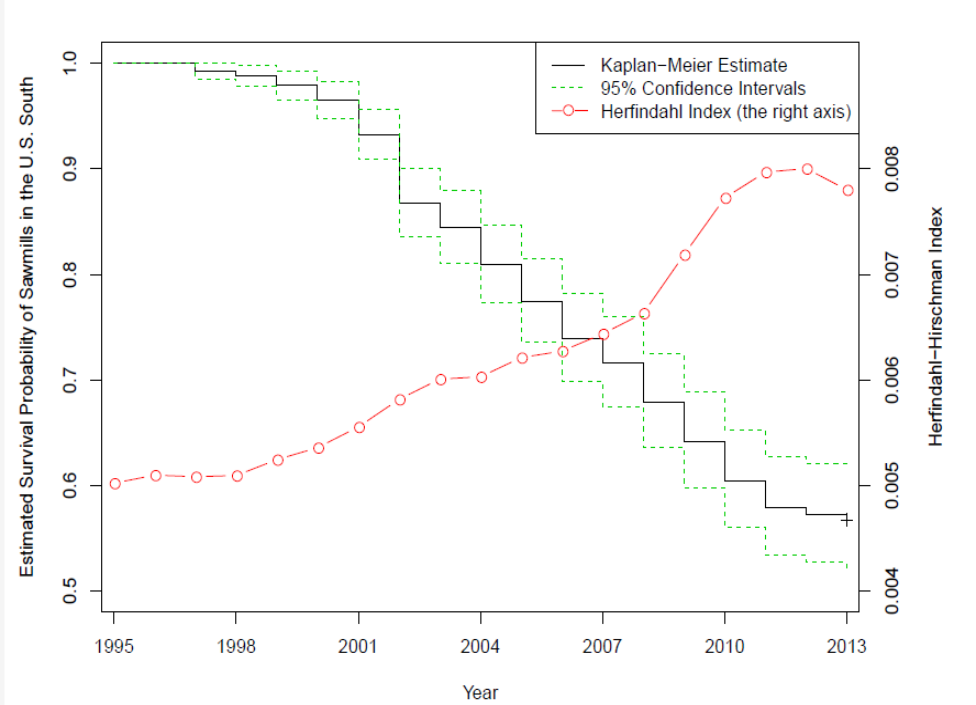
- Consolidation trend continues regardless the economic situation.

Sasatani and Zhang (2015) *For. Sci.*

- Investigated the factors that impact the sawmill plant closures in the US South.
- Applied survival analysis (duration model)



Sasatani and Zhang (2015) *For. Sci.*



- Competition
- Production Capacity

→Economies of Scale

- Types of products
- Ownership

Business environment for SMEs is ***extremely*** tough.

How can a sawmill survive?

Either

- Become larger and more productive.

  or

- Target niche markets.

This is exactly what Michael Porter says about the

Generic Strategies.

Tribally owned sawmills

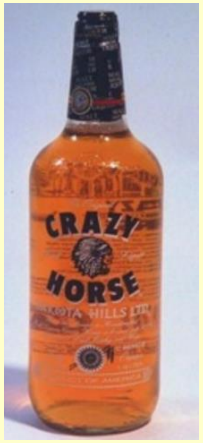
- **10 sawmills (2001) → 4 sawmills (2016)**

(San Carlos Apache, White Mountain Apache, Yakama, and Menominee)

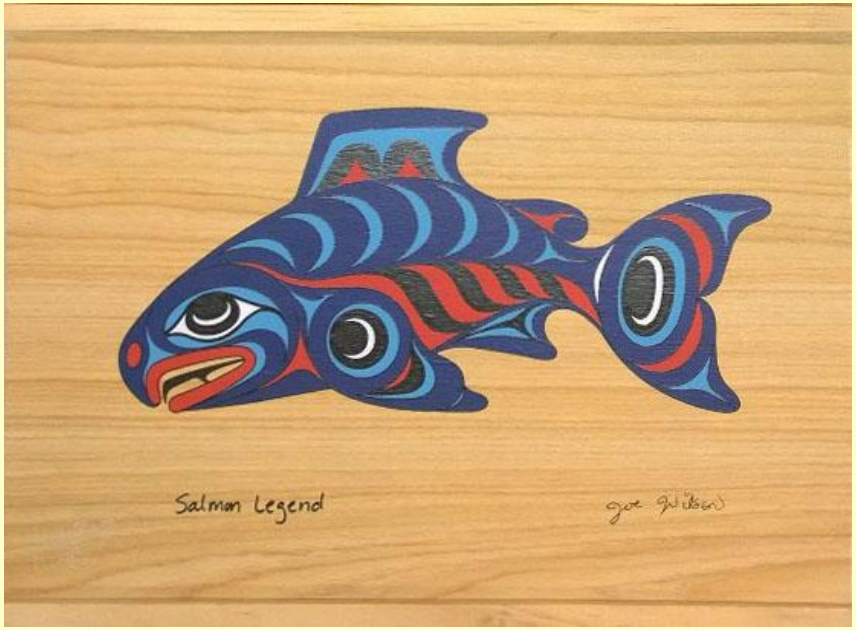
- Tribal resource management is often based on a unique integration of cultural, environmental, and economic values that contribute many public benefits and ecosystem services.
- Tribal forest products are often sold as a commodity, and these distinct tribal values are generally not recognized or rewarded in the marketplace (Morishima 2014).

Tribal Image and Branding

- Use of Native American imagery and names in advertising and branding especially by non-native affiliation.
- Native American Male = *brave*, *wild*, … (sports, car, etc)
- Native American = *Nature* (especially for food products)

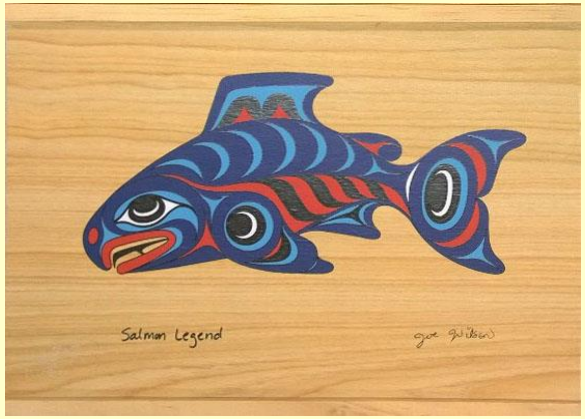


Smoked Salmon Box



Tribal Wooden Gift Box Project

- Design vs Plain wooden box
- Hypothetical Certification Logo
- Three different price ($10, $15, $20)



Factorial Combinations

Survey

- Ask respondents' demographic information.
- Show three boxes to survey respondents (the attributes are as balanced and as orthogonal as possible).
- Ask to rate the perceptual values of each box.

(beauty, tribal appeal, environmental sustainability, good forest management, supports local craftsman, good value, good gift, likelihood to purchase)

Survey

Native American Gift Box Survey

Please rate the following attributes for each box (A, B, & C).

1. **Aesthetic Appeal (Beauty).**

	Not at all		Slightly		To a high degree
Box A	1	2	3	4	5
Box B	1	2	3	4	5
Box C	1	2	3	4	5

2. **Native American Appeal.**

	Not at all		Slightly		To a high degree
Box A	1	2	3	4	5
Box B	1	2	3	4	5
Box C	1	2	3	4	5

3. **Environmentally Sustainable Product.**

	Not at all		Slightly		To a high degree
Box A	1	2	3	4	5
Box B	1	2	3	4	5
Box C	1	2	3	4	5

4. **Supports Local Craftsman.**

	Not at all		Slightly		To a high degree
Box A	1	2	3	4	5
Box B	1	2	3	4	5
Box C	1	2	3	4	5

Pros and Cons of the Study Design

Pros

→ It was easy to conduct the survey.

→ We collected 603 surveys.

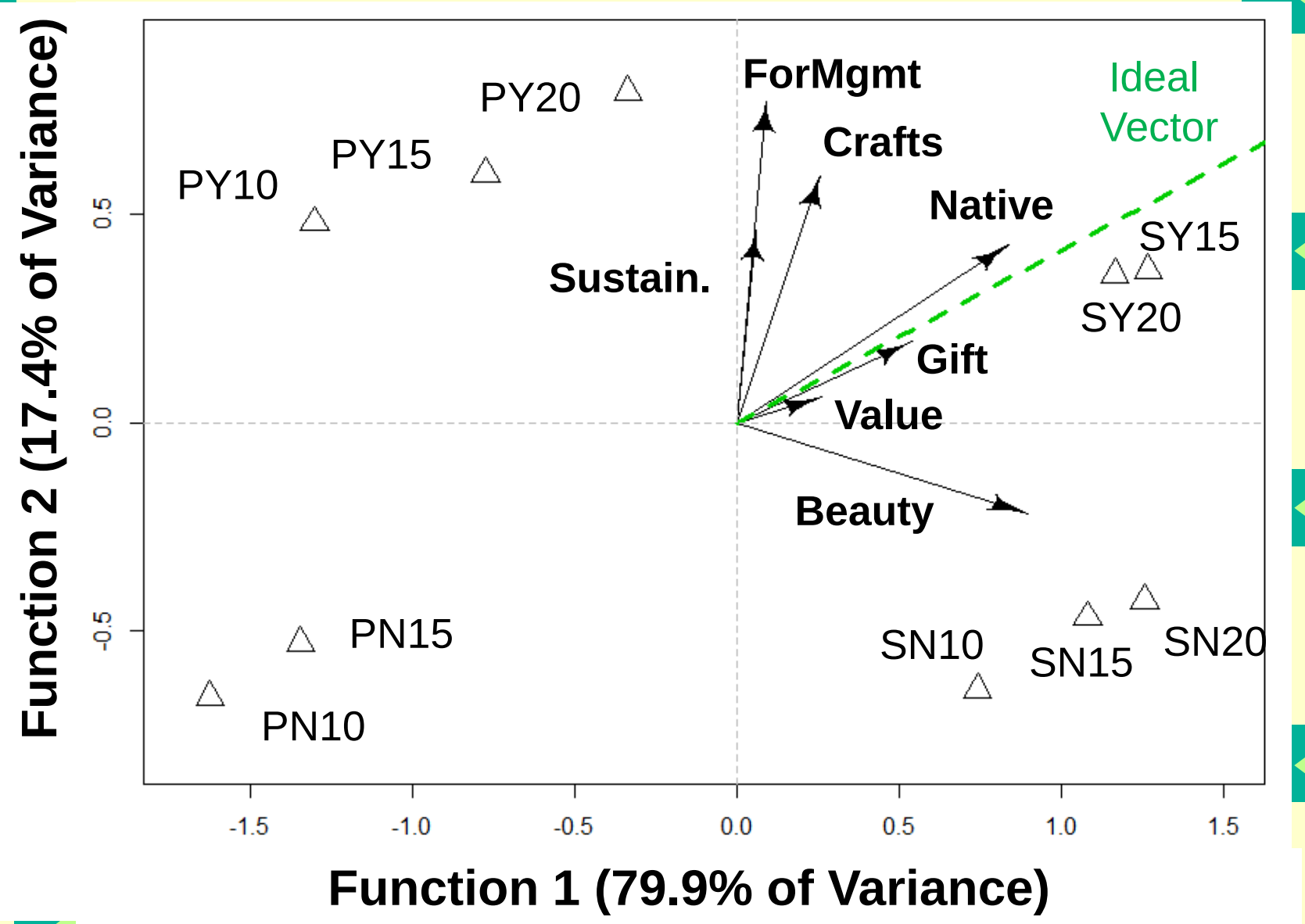
Cons

→ Respondents saw only 3 boxes out of 12 full-combinations.

Perceptual Mapping

- Visualization technique to display the perceptions of customers.
- Show the position of a product relative to the perceptual attributes.
- Many perceptual attributes are strongly correlated → Dimension reduction (e.g., factor analysis, discriminant analysis …)

Discriminant Analysis



pros and cons of perceptual mapping

- Can identify the “ideal” attribute levels
- Cannot discernible the impact of the each product attributes
- More correlated attributes get more weight
- Consumer use perception as final decision, so perceptual mapping can be more useful to determine the marketing strategy.

Trade off model is also needed

- How about the regression analysis?

Dependent Variable

Likelihood to purchase the box

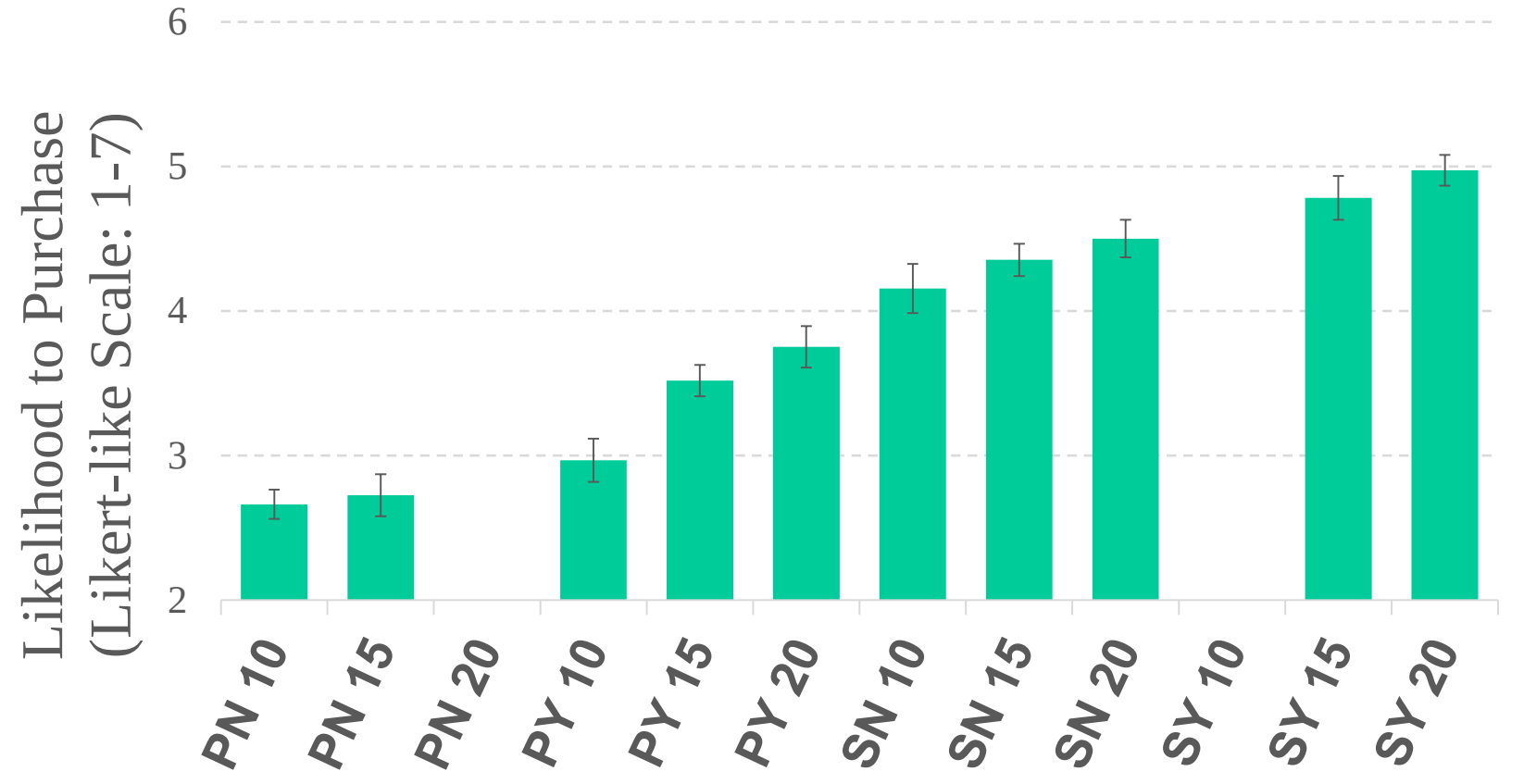
Independent Variables

Certification Logo

Design (Salmon)

Price

DV: Likelihood to Purchase



P: Plane Box S: Salmon Designed Box

Y: Logo Yes N: Logo No

Regression Analysis

	p.e.	std. e	t-stats	
Constant	2.14	.1	12.90	***
Salmon Design	.39		15.07	***
Certification Logo		.089	5.64	***
Price	.0	.012	4.10	***

- Dependent va e: kelihood of purchase th x (1-7)
- R^2=.187

DV: Likelihood to Purchase

P: Box S: Salmon Desig Box

Y ogo Yes N: Logo No

Problems in Dependent Variables

- Ys are dependent by each respondent
  - → Need to standardize the scale
  - → Partial Profile does not work

Solution:
Simulate full ranking of likelihood of purchase of each respondent, and then apply regression (conjoint) analysis.

Assume the ranking of the stated likelihood to purchase of the box *j* by respondent *i* (O_{ij}) is equal to the respondent *i*'s utility of each box *j* (U_{ij}).

$$R\left(O_{ij}\right) = R(U_{ij})$$

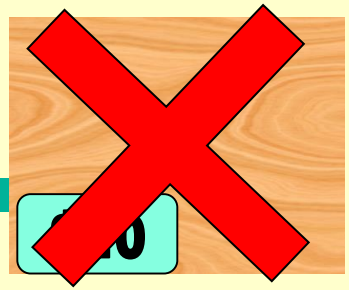
And

$$U_{ij} = V_{ij} + e_{ij} = \beta x_{ij} + e_{ij}$$

$$R(O_{ij}) = R(\beta x_{ij} + e_{ij}) = \gamma_i x_{ij} + \delta_{ij}$$

The ranking of the stated likelihood to purchase is explained by 3 product attributes; design, logo and price.

Full Combinations



Full Combinations

Stated Score

Ranking

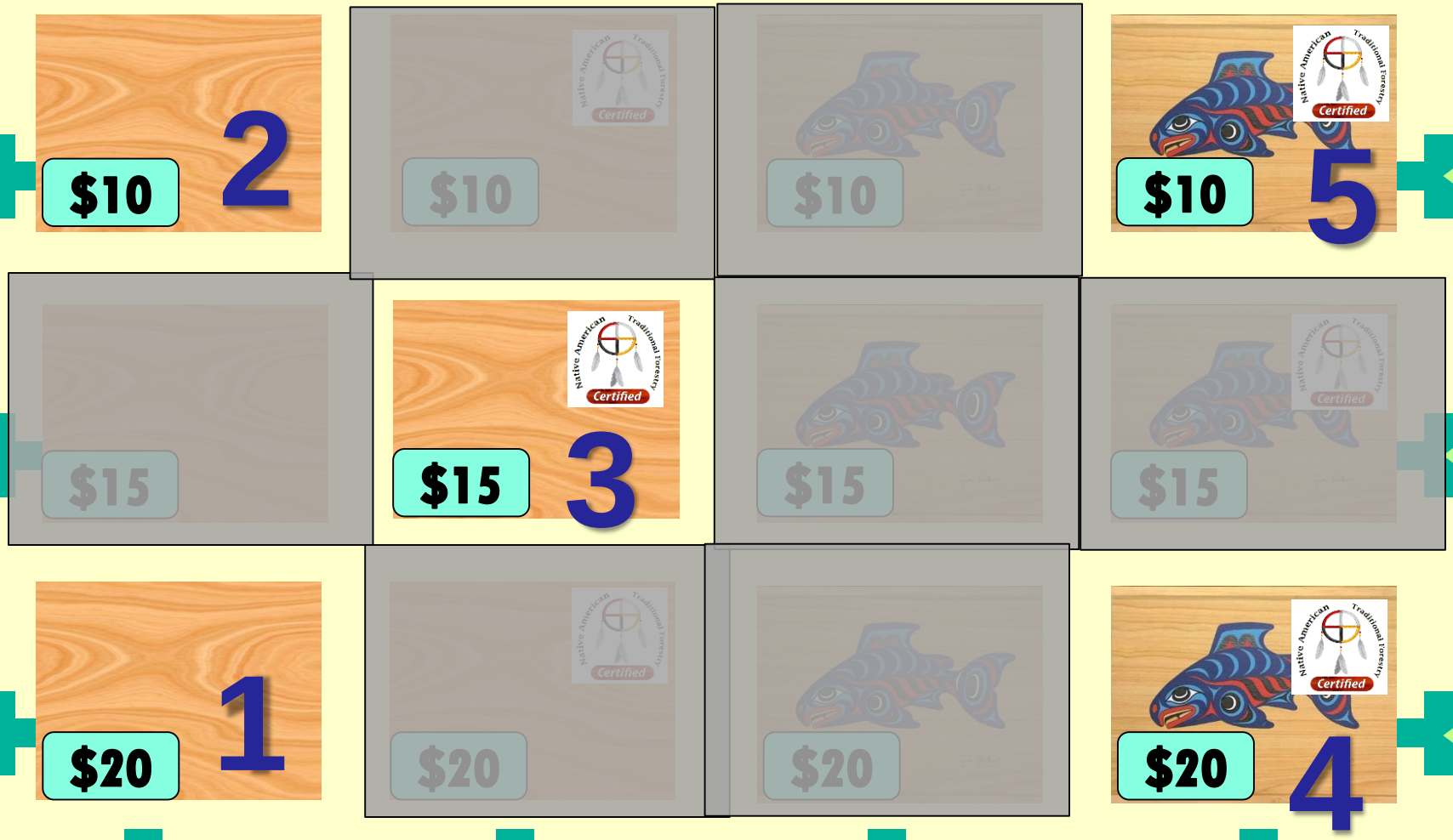
Individual ranking simulation

$$R(O_{ij}) = \gamma_i x_{ij} + \delta_{ij}$$

$$R(O_{ij}) = \gamma_{0\,i} + \gamma_{1\,i}\, Design_{ij} + \gamma_{2\,i} Logo_{ij} + \gamma_{3\,i} Price_{ij} + \delta_{ij}$$

Ranking

Ranking for Simulation



γ_0=xx, γ_1=xx, γ_2=xx, γ_3=xx

γ_0=xx, γ_1=xx, γ_2=xx, γ_3=xx

2.3 $10	3.8 $10	5.3 $10	5.6 $10
1.2 $15	3.4 $15	4.2 $15	5.4 $15
0.9 $20	2.5 $20	3.7 $20	5.2 $20

Full Ranking Estimated

3 2.3 $10	7 3.8 $10	10 5.3 $10
12 5.6 $10	2 1.2 $15	5 3.4 $15
8 4.2 $15	11 5.4 $15	1 0.9 $20
4 2.5 $20	6 3.7 $20	9 5.2 $20

Probit Ordinal Regression

- After obtaining the simulated full-ranking, simply taking (probit) ordinal regression can lead to the impact of product attributes.
- Interaction terms are not included because of the assumption of the first simulation.

	P.E.	Std. Err.	t-test
Design	**2.27**	0.048	47.4
Logo	**1.55**	0.045	34.9
Price	**-0.18**	0.006	-32.4
taus			
1|2	-4.03	0.100	-40.2
2|3	-3.03	0.093	-32.5
3|4	-2.34	0.091	-25.8
4|5	-1.76	0.089	-19.8
5|6	-1.25	0.088	-14.2
6|7	-0.77	0.088	-8.7
7|8	-0.28	0.088	-3.2
8|9	0.24	0.088	2.7
9|10	0.81	0.089	9.2
10|11	1.51	0.090	16.7
11|12	2.49	0.095	26.3

Results

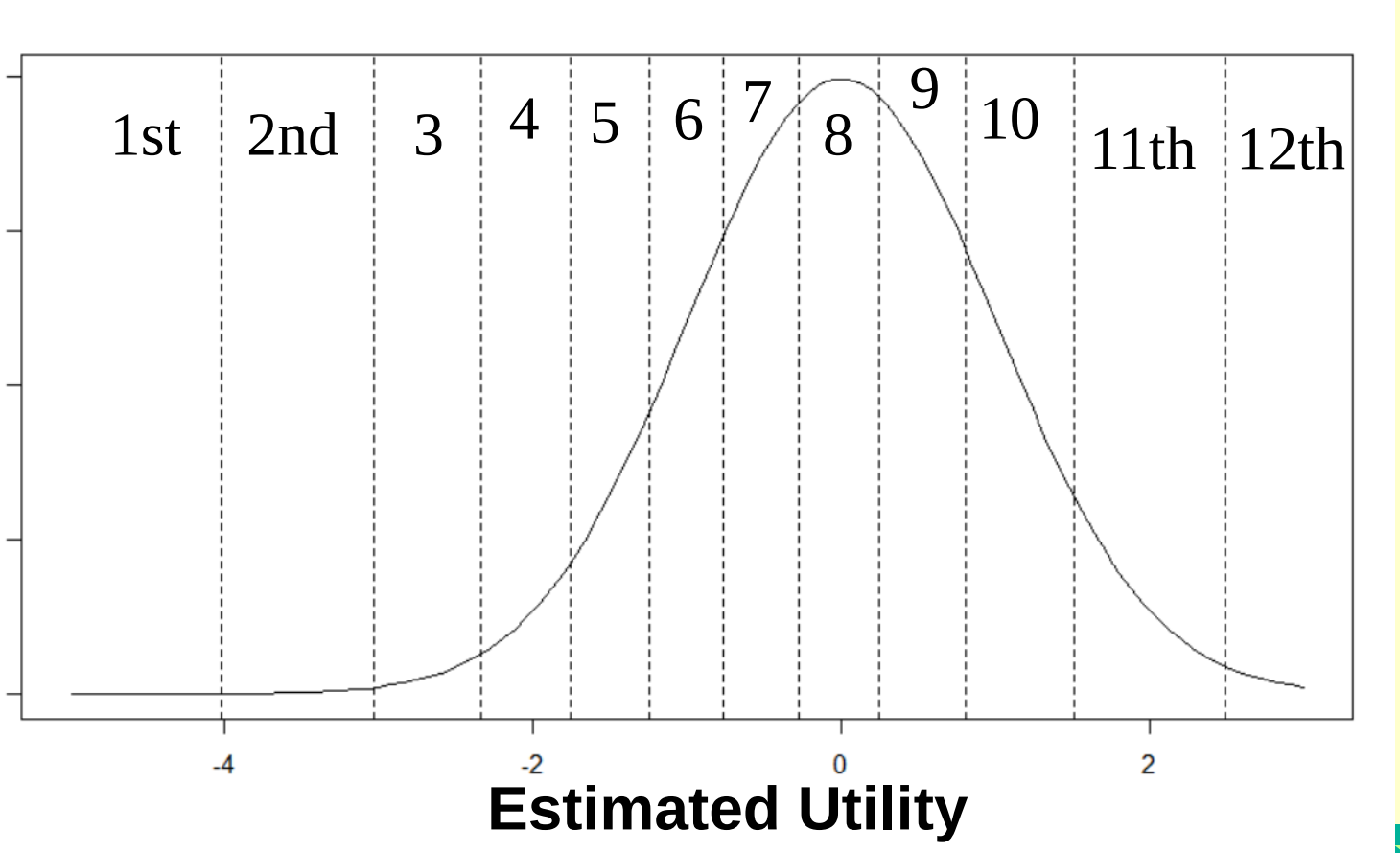
Design increases 2.27 utility. Logo increases 1.55 utility.
Price increment by $1 decrease 0.18 utility.

WTP
Design → $12.71
Logo → $8.70

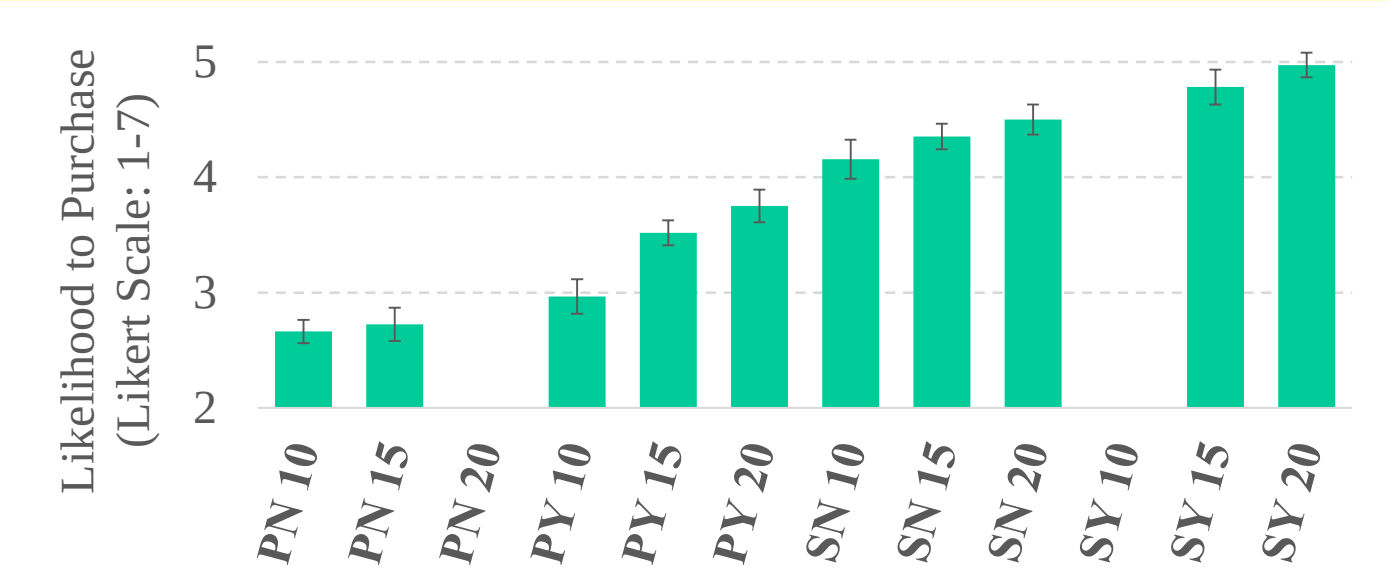
Native American Traditional Forestry
Certified

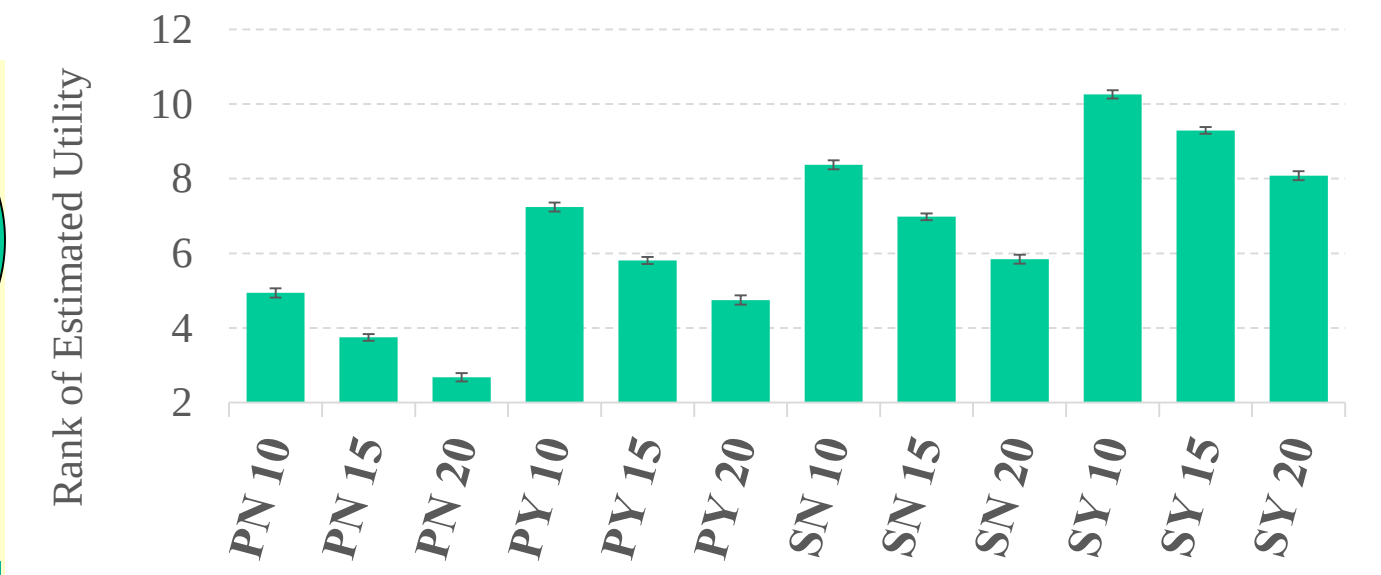
Representation

Utility = 2.27 Design + 1.55 Logo -0.18 Price



Compared two graphs





Conclusion

- Need to use both trade-off models and dimension reduction techniques.
  - → Trade-offs: Impacts of attributes
  - → Multivariate: Direction and trend of attributes
- Need to understand the limitations of the models.
- Need to learn experimental design.
- There are some innovative ways to overcome the limitations.

CINTRAFOR
Center for International Trade in Forest Products

W