Genie in a Bottle

Understanding the Effects of Information and Social Influence on Product Choice

Manisha Anantharaman Rebecca Sanders Karthikgeyan Sivakumaran



Outline

- Background
- Hypotheses
- Survey Design
 - Limitations
- Summary Statistics
- Model Specifications
- Lessons Learned

Motivation

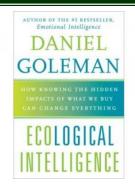
- Changing consumer behavior,
 so that consumers buy products that are better for:
 - themselves,
 - the environment, and
 - society.

"Voting with your dollars",

"Shopping your way to sustainability"

- Consumers as "point of leverage"
- Sustainable and ethical consumption

Green consumption is everywhere

















But how do you change consumers?

- Thankfully consumers are not always 'rational'!
- Determinants of consumption behavior
 - Individual
 - Attitudes and values
 - Habit
 - Personal ability
 - Structural
 - Social norms
 - Infrastructure
 - Cultural practices

But how do you change consumers?

- Information and consumer behavior
 - Increasing awareness general
 - Impact information specific actions
 - Procedural information specific actions
- But information is not always enough
 - Necessary but not sufficient
 - Complex information can be misunderstood
 - Needs to be supported by social norms and infrastructure

But how do you change consumers?

- Social influence
 - Cialdini's Focus Theory of Normative
 Education
- Degrees of separation
 - Provincial norms
 - Social norms

Cialdini, R.B., Kallgren, C.A., & Reno, R.R. (1991). A focus theory of normative conduct. Advances in Experimental Social Psychology, 24, 201–234

Goldstein, N. J., Cialdini, R. B., & Griskevicius, V. (2006). A room with a viewpoint: Using social norms to motivate environmental conservation in hotels. Journal of Consumer Research

Griskevicius, V., Tybur, J. M., & Van den Bergh, B. (2010). Going green to be seen: Status, reputation, and conspicuous consumption. Journal of Personality and Social Psychology, 98, 392–404

Our experiment

- Reusable Water Bottle Choice
- Information
 - Environmental rating
 - Health rating
 - Social rating
- Social influence
 - Provincial norm "your colleagues"
 - Social norm "Americans"

Why Water Bottles?

- Public, observable
- More susceptible to status concerns
- More susceptible to influence
- But not as 'complicated' as choosing a car or jeans
- Drawback: Reusable water bottles already considered 'green'.
 - Might be less sensitive to environmental ratings
- Price sensitivity might be limited due to low costs

Hypotheses

- High environment, social and health ratings will increase utility. Low ratings will decrease utility.
- 'Rational' consumers will be more sensitive to health ratings than social or environmental ratings
- Provincial norms will have a stronger effect on choice than Social norms
- Influence will have a greater effect on choice than information

Survey Design: Characteristics

- Age
- Gender
- Department
- Income
- US Citizen
- Family structure
- Self-assessed environmental rating (two versions)
- Self-assessed health rating
- Objective social rating

Survey Design: Attributes

- Brand
- Price
- Material
- Mouth size
- Bottle size
- Color availability
- Social responsibility rating
- Environmental rating
- Health rating

- -- Near social cue
- -- Far social cue
 - -- "Green" label

Survey Design: Stated Preference

Each attribute * number of levels...

```
3^4x4^4x5^2 = 518,400 \text{ profiles}

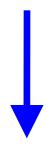
\rightarrow (518,400)^2 \text{ choice sets}
```

Survey Design: Stated Preference

Each attribute * number of levels...

$$3^4x4^4x5^2 = 518,400 \text{ profiles}$$

 $\rightarrow (518,400)^2 \text{ choice sets}$

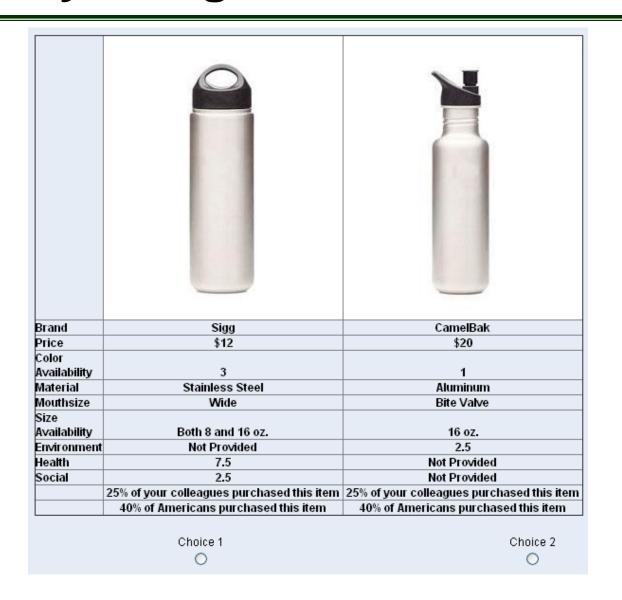


90 choice sets

Survey Design: Qualtrics

- 90 question blocks, 2 choices
- Each respondent given 5 blocks
- Blocks randomly selected
- 137 responses → ~ 680 choices

Survey Design: Question Block

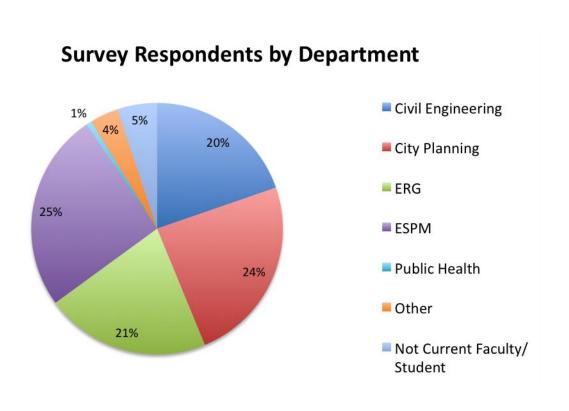


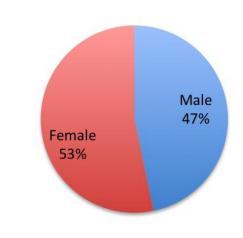
Survey Design: Limitations

Stated preference does not occur in a bubble!

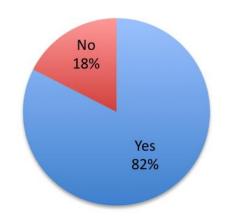
- Did not ask about current beliefs, preferences, or habits
- Some combinations unrealistic
- Respondents could "fact check" near social cue
- Lack of information about social cues
 - Scale
 - Source, e.g., Good Guide
- Homogeneity within sample characteristics

Respondent Breakdown by Gender

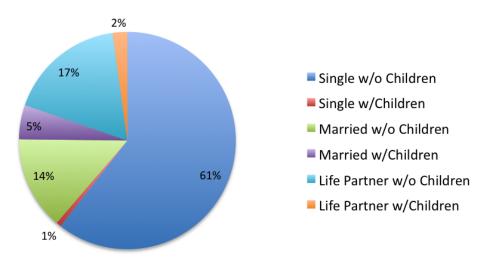




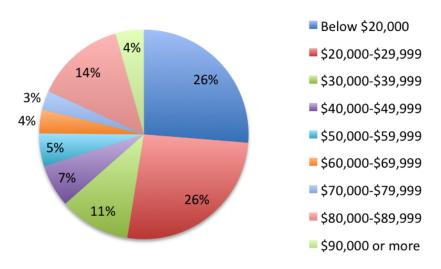




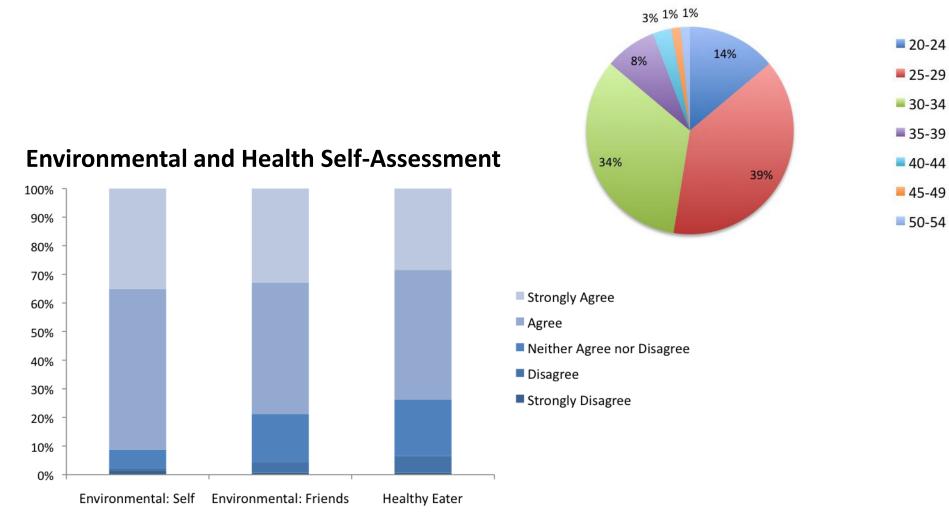
Family Demographics of Survey Sample



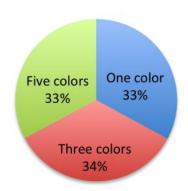
Annual HH Incomes of Survey Sample



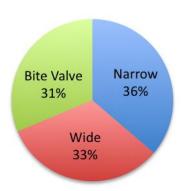
Survey Respondents by Age Group



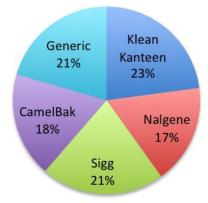
Respondents' Preferences by Color Availability



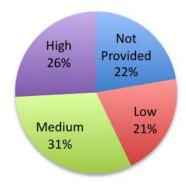
Respondents' Preferences by Mouth Size



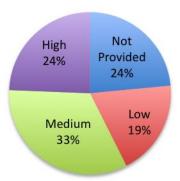
Respondents' Preferences by Brand



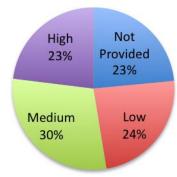
Respondents' Preferences by Environmental Rating



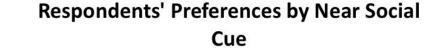
Respondents' Preferences by Health Rating

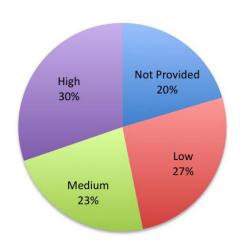


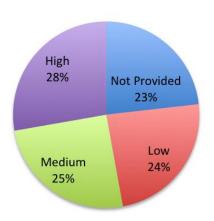
Respondents' Preferences by Social Responsibility Rating



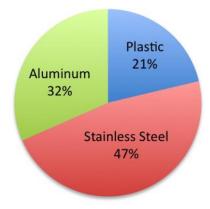
Respondents' Preferences by Far Social Cue







Respondents' Prerences by Material



Binary Logit Model 1: Linear Specification

$$\begin{aligned} & \mathsf{V_i} = & \mathsf{ASC} + \beta_{price} \mathsf{X}_{price} \\ & + \beta_{EnvH} \mathsf{X}_{EnvH} + \beta_{EnvM} \mathsf{X}_{EnvM} + \beta_{EnvL} \mathsf{X}_{EnvL} \\ & + \beta_{steel} \mathsf{X}_{steel} + \beta_{plastic} \mathsf{X}_{plastic} + \dots \\ & \mathsf{i} = 1,2 \end{aligned}$$

Note: Choice between the "same" product

→no alternative-specific coefficients

Results

Parameter for:	Exp. Sign	Estimated Value	t-statistic
Env. High	+		
Health High	+		
Social High	+		
Far Social Cue High	+		
Near Social Cue High	+		
Steel	+		
Plastic	-		
Price	-		

^{*}Other parameters, e.g. those for color, size, etc., were consistently found insignificant.

Results

Parameter for:	Exp. Sign	Estimated Value	t-statistic
Env. High	+	+0.606	3.84
Health High		+0.646	4.15
Social High	+	+0.587	3.68
Far Social Cue High		+0.560	3.42
Near Social Cue High	+	+0.285	1.75
Steel	+	+0.828	6.12
Plastic	-	-0.610	-4.63
Price	-	-0.0285	-1.29*

Results

Parameter for:	Exp. Sign	Estimated Value	t-statistic
Env. High	+	+0.606	3.84
Health High	+	+0.646	4.15
Social High	+	+0.587	3.68
Far Social Cue High	+	+0.560	3.42

Plastic

Near Social Cue H Hypothesis 1:

High environmental, social, and health ratings will increase utility.

Results

Parameter for:	Exp. Sign	Estimated Value	t-statistic
Env. High	+	+0.606	3.84
Health High	+	+0.646	4.15
Social High	+	+0.587	3.68
Far Social Cue High	+	+0.560	3.42

Near Social Cue F

Steel

Plastic

Price

Hypothesis 2:

"Rational", self-interested consumers will gain more utility from high health ratings than from high social or environmental ratings.

✓ 0.646 > 0.606 & 0.646 > 0.587 using two-sample t-test

Results

Parameter for:	Exp. Sign	Estimated Value	t-statistic
Env. High	+	+0.606	3.84
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Far Social Cue High	+	+0.560	3.42
Near Social Cue High	+	+0.285	1.75
Steel		0.000	0.10

Plastic

Hypothesis 3:

"Provincial" norms will have a stronger effect on choice than social norms.

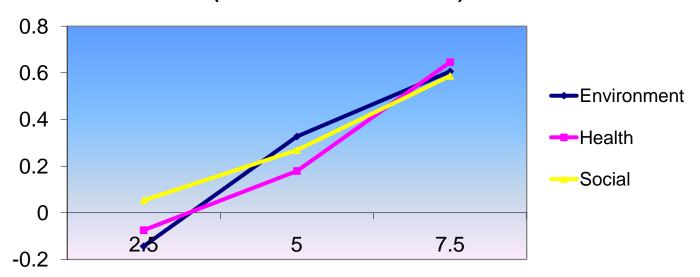
× 0.285 < 0.560

Results

Parameter for:	Exp. Sign	Estimated Value	t-statistic
Env. High	+	+0.606	3.84
Health High	+	+0.646	Information
Social High	+	+0.587	3.68
Far Social Cue High	+	+0.560	2.42
Near Social Cue High	+	+0.285	Influence
Hypothesis 4: Influence more important than Information. *			

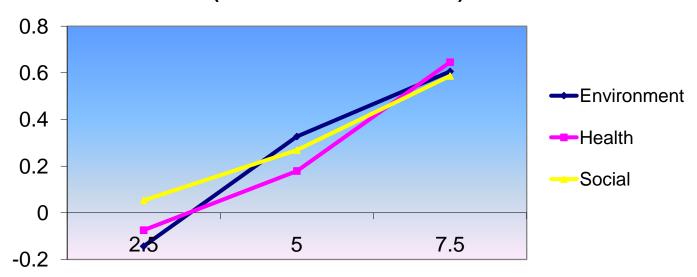
Results

Marginal Utilities for Different Ratings (relative to Not Provided)



Results

Marginal Utilities for Different Ratings (relative to Not Provided)



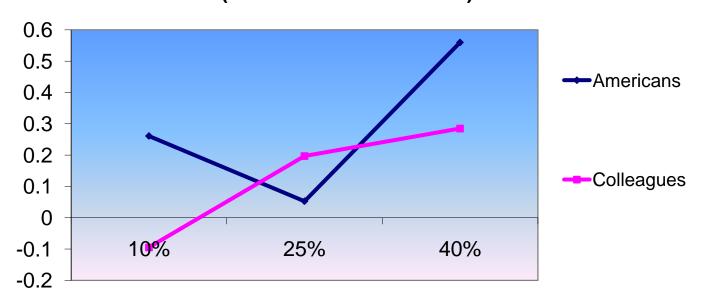
Parameter 1	Parameter 2	t-stat
Env. Hi	Env. Low	4.65
Env. Hi	Env. Med	1.69
Env. Med	Env. Low	2.88

Parameter 1	Parameter 2	t-stat
Health Hi	Health Low	4.55
Health Hi	Health Med	2.88
Health Med	Health Low	1.49

Parameter 1	Parameter 2	t-stat
Soc. Hi	Soc. Low	3.28
Soc. Hi	Soc. Med	1.92
Soc. Med	Soc. Low	1.3

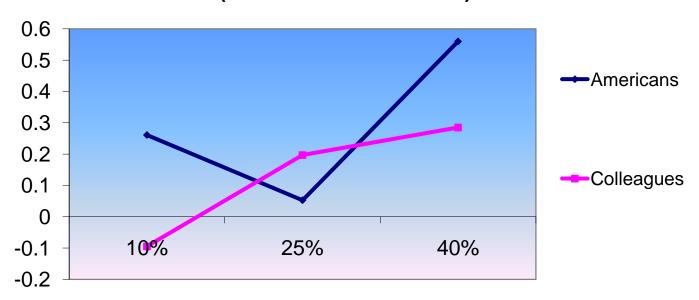
Binary Logit Model 1: Results

Marginal Utilities for Different Social Cues (relative to Not Provided)



Results

Marginal Utilities for Different Social Cues (relative to Not Provided)



Parameter 1	Parameter 2	t-stat
Far Cue Hi	Far Cue Low	1.96
Far Cue Hi	Far Cue Med	3.27
Far Cue Med	Far Cue Low	1.29

Parameter 1	Parameter 2	t-stat
Near Cue Hi	Near Cue Low	2.43
Near Cue Hi	Near Cue Med	0.55
Near Cue Med	Near Cue Low	1.77

Binary Logit Model 2: Interaction Terms

Attributes

Characteristics

Age

Gender

Department

US Citizen

Income

Socially Responsible Rating

Environmental Rating

Health Rating

Near Social Cue

Far Social Cue

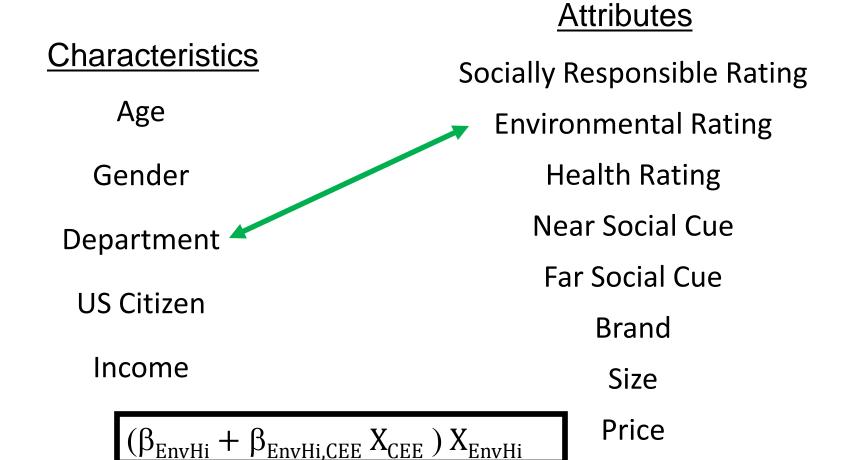
Brand

Size

Price

Interact to capture systematic heterogeneity

Binary Logit Model 2: Interaction Terms



Binary Logit Model 2: Interaction Terms

Characteristics

Age

Gender

Department

US Citizen

Income

 $\beta_{\text{PriceIncome}} (X_{\text{Price}}/X_{\text{Income}})$

Attributes

Socially Responsible Rating

Environmental Rating

Health Rating

Near Social Cue

Far Social Cue

Brand

Size

Price

Binary Logit Model 2:

Results

Parameter for:	Estimated Value	t-statistic
Env. High	0.642	3.95
Env. Med	0.354	2.03
Health High	0.684	4.27
Social High	0.618	3.78
Plastic	-0.623	-4.55
Steel	0.876	6.21
Price/Income	-0.920	-1.71

^{*}The specification above specifically permuted Near and Far Social Cues with Age, Gender, and Citizenship

Binary Logit Model 2:

Results

Parameter for:	Estimated Value	t-statistic
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Binary Logit Model 3: Random Coefficients

Specify a distribution for coefficients $\beta \sim f(\beta)$

→ Capture *unobserved* heterogeneity

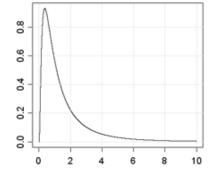
Binary Logit Model 3: Random Coefficients

Specify a distribution for coefficients $\beta \sim f(\beta)$

→ Capture *unobserved* heterogeneity

We specify the following distributed parameters:

 $\beta_{\text{Price/Income}} \sim \ln N(\mu, \sigma^2)$



Enters Biogeme as:

```
[GeneralizedUtilities]
1 - exp( B_priceI [ sigma_priceI ] ) * PRICEBYINCOME_1
```

Binary Logit Model 3: Random Coefficients

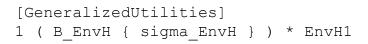
Specify a distribution for coefficients $\beta \sim f(\beta)$

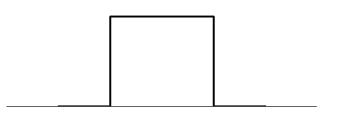
→ Capture *unobserved* heterogeneity

We specify the following distributed parameters:

$$\beta_{\text{Price/Income}} \sim \ln N(\mu, \sigma^2)$$

$$\beta_{EnvHi} \sim U(\mu, \sigma^2)$$
 Enters Biogeme as:





Binary Logit Model 3:

Random Coefficients

Note: Panel Data

ID	RESPONSE_NUM	AGE	GENDER	FAMILY	INCOME	CITIZEN	ENV_1	НІТН_1	SOC_1	PRICE_1	
1	1	27	1	1	15	1	4	1	4	12	
1	2	27	1	1	15	1	4	4	1	14	
1	3	27	1	1	15	1	4	2	2	20	
1	4	27	1	1	15	1	4	1	5	16	
1	5	27	1	1	15	1	5	2	5	14	
2	6	22	1	1	15	1	2	4	5	14	
2	7	22	1	1	15	1	2	2	4	20	
2	8	22	1	1	15	1	4	4	4	12	
2	9	22	1	1	15	1	4	4	1	14	
2	10	22	1	1	15	1	1	2	4	12	
3	11	32	2	1	45	1	4	2	1	14	
3	12	32	2	1	45	1	1	2	5	14	

Binary Logit Model 3:

Random Coefficients

Note: Panel Data

ID	RESPONSE_NUM	AGE	GENDER	FAMILY	INCOME	CITIZEN	ENV_1	HLTH_1	SOC_1	PRICE_1		
1	1	27	1	1	15	1	4	1	4	12		
1	2	27	1	1	15	1	4	4	1	14		
1	3	27	Coeffic	ients th	nat enter	utility f	functio	n:				
1	4	27	- v	ary ove	er respo	ndents	BUT					
1	5	27	- r	emain (constant	t across	respo	onses fo	or give	n respo	nder	nt
2	6	22	Indicat	ad in R	iogeme	hv:	•		J	•		
2	7	22		Indicated in Biogeme by:								
2	8	22	_	[PanelData]								
2	9	22	ID 	_								
2	10	22	B_priceI_sigma_priceI									
3	11	32	2	1	45	1	4	2	1	14		
3	12	32	2	1	45	1	1	2	5	14		

Binary Logit Model 3: Results

Parameter	Estimated Value	t-statistic
B_Env. High (mean)	0.587	4.14
sigma_Env.High (s.d.)	0.805	1.50*
B_priceI (location)	-0.992	-0.77*
sigma_priceI (scale)	1.80	2.02
B_HealthHigh	0.619	4.69
B_SocialHigh	0.464	3.58

Binary Logit Model 3:

Results

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B_HealthHigh	0.619	4.69
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$$E[\beta_{Price/Income}] = e^{\mu + 0.5\sigma^2} = 1.87$$

Binary Logit Model 3: Results

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We perform a Log-Likelihood Ratio Test w.r.t. Basic Model:

→ test-statistic = -2*(-384+382) = 4

Binary Logit Model 3: Results

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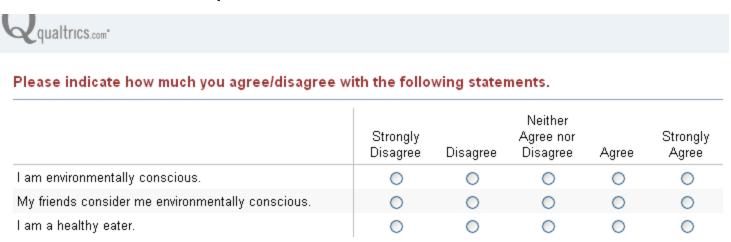
Fail to reject, and keep basic model at 95% confidence level.

What might we have done differently?

- Provide greater variation in price, other parameters
- Distribute survey more widely
- Presentation of information
 - Validity of rating?

What might we have done differently?

Likert Scale Questions:



- Not well developed
- Little response variation (~90% agreed w/ "env. conscious"
- Given more time, pursue a latent class model

Closing Thoughts

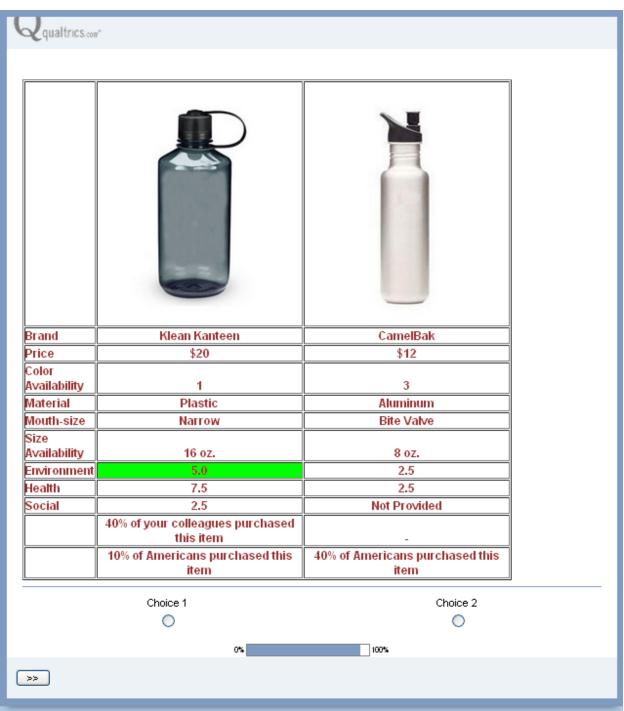
- Many limitations
 - Survey design
 - Sample design
- Lessons learned
 - Stated preference
 - Logit modeling

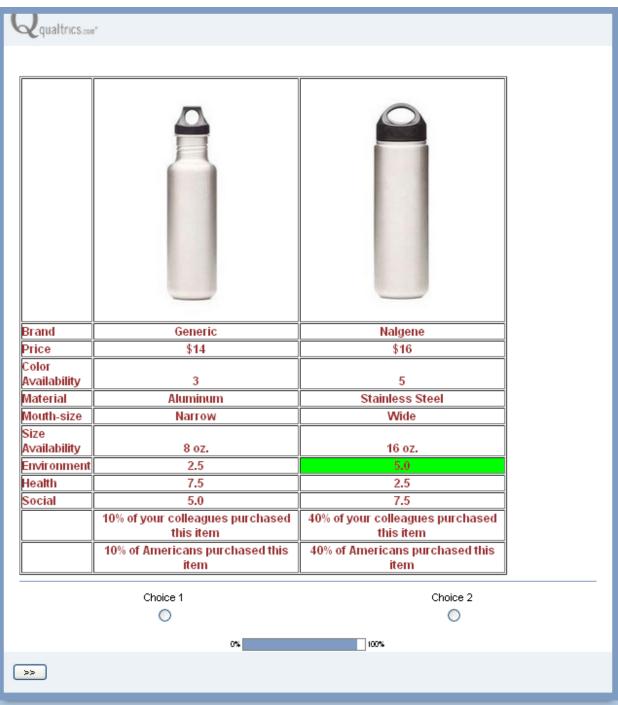
Thank you!

Thank you so much for agreeing to take our survey on product choice! This survey should take approximately 3 minutes to complete. We will not ask you for any personally identifiable informationall responses will remain anonymous and be kept confidential. Your participation is important to the success of this survey, so thank you again for your time!If you are currently a student or faculty member, what is your home department?

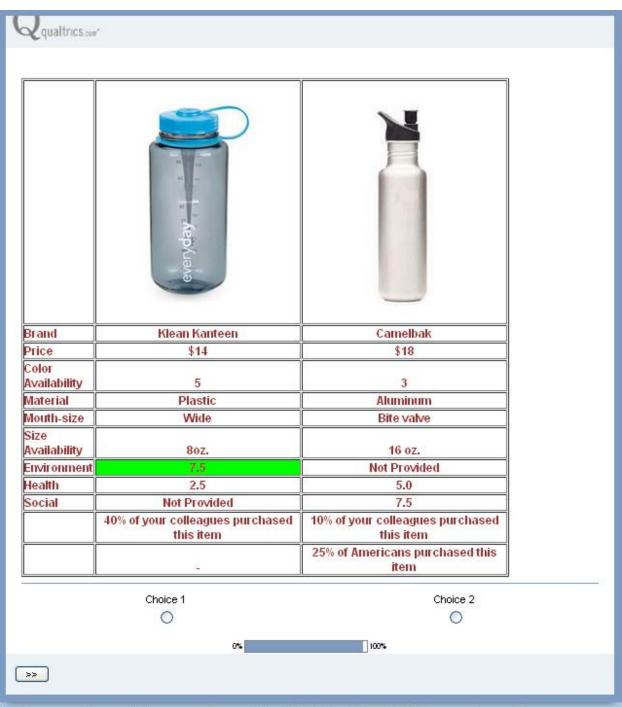
\mathbf{O}	Civil Engineering
O	City Planning
O	ERG
O	ESPM
O	Public Policy
O	Public Health
O	Other
O	Not currently faculty or student
Wh	nat is your age?
•••	
O	Under 5 years
O	5 to 9 years
O	10 to 14 years
O	15 to 19 years
O	20 to 24 years
O	25 to 29 years
O	30 to 34 years
O	35 to 39 years
O	40 to 44 years
O	45 to 49 years
O	50 to 54 years
O	55 to 59 years
O	60 to 64 years
O	65 to 69 years
O	70 to 74 years
0	75 to 79 years
0	80 to 84 years
O	85 to 89 years
O	90 years or over

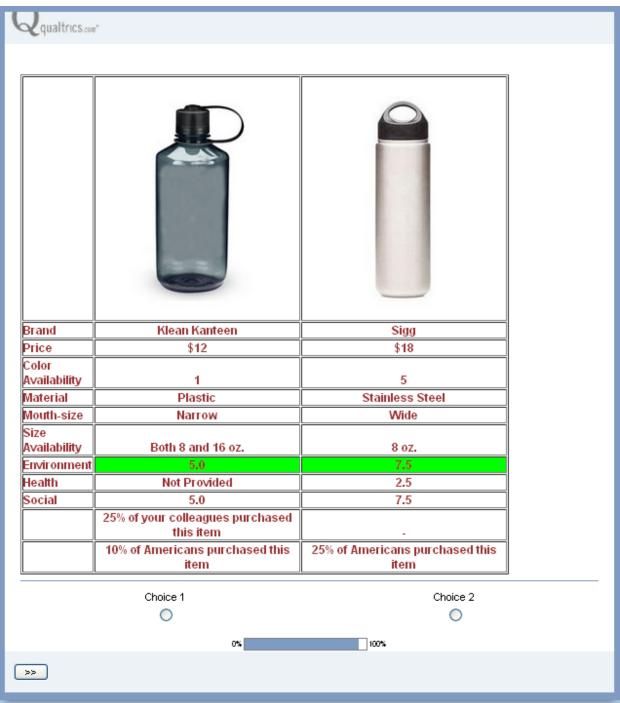
What is your gender?						
0	Male					
0	Female					
Ple	ase indicate your current family structure.					
O	Single without children					
O	Single with children					
0	Married without children					
0	Married with children					
	Life partner without children					
0	Life partner with children					
Wh	at is your annual household income range?					
	Below \$20,000					
	\$20,000 - \$29,999					
	\$30,000 - \$39,999					
	\$40,000 - \$49,999 \$50,000 - \$59,999					
	\$60,000 - \$69,999					
	\$80,000 - \$89,999					
	\$90,000 or more					
	\$70,000 - \$79,999					
	<i>ϕ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,</i>					
Are	you a citizen of the United States?					
0	Yes					
O	No					











Please indicate how much you agree/disagree with the following statements.

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
I am environmentally conscious.	•	•	0	0	•
My friends consider me environmentally conscious.	•	•	•	•	•
I am a healthy eater.	•	•	•	•	•

In the last year, have you volunteered and/or donated money to a charity?

- O Yes
- O No