Lecture 8: Stated Preferences and Hypothetical Markets

Prof. Parthum

Environmental Economics

Econ 475

$$\log(price)_{ijt} = \beta_0 + \beta_1 Age_{it} + \beta_2 \log(WQ)_{it} + \beta_3 \widehat{ECS}_{jt} + \alpha_i + \gamma_t + \omega_m + \varepsilon_{ijt}$$

Table 4
Second-stage hedonic regression results for the property fixed effects model.

	(1) Basic 3 km	(2) No ECS_{jt} 3 km	(3) Basic 5 km	(4) County time trend	(5) Subdiv. time trend
ln(DO)	0.0116***	0.0113***	0.0129***	0.0111***	0.00967***
	(0.00306)	(0.00306)	(0.00442)	(0.00318)	(0.00340)
ECS_{jt}	0.251***		0.0165	0.0609	0.0272
	(0.0814)		(0.0771)	(0.0795)	(0.0846)
Property age	−0.0123***	−0.0123***	0.0112	−0.0135***	−0.0139***
	(0.00328)	(0.00328)	(0.00822)	(0.00326)	(0.00336)
Property FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Sale month FE	Yes	Yes	Yes	Yes	Yes
County-year trend	No	No	No	Yes	No
Subdivision-year trend	No	No	No	No	Yes
Observations	146,903	146,903	166,706	146,903	125,276
R-squared	0.627	0.627	0.661	0.633	0.632
MWTP for 1 mg/L local DO ($)	459	448	516	440	383
MWTP for 1 mg/L Tampa Bay DO ($)	37,769	N/A	2,483	9,164	4,093

Estimated standard errors in parentheses are clustered by property.
*$p < 0.10$, **$p < 0.05$, ***$p < 0.01$
Notes: The dependent variable is the log property transaction price. Column 1 uses a 3-km radius to define average water quality around properties. Column 2 drops the recreational utility index, ECS_{jt}. Column 3 repeats Column 1, using a 5-km instead of a 3-km radius to define average water quality around properties. *N* rises in Column 3 because more repeat sales are located within 5 km of at least one water quality monitor than within 3 km. Column 4 includes county-specific trends as additional controls. Column 5 includes census subdivision-specific trends. Reported coefficient estimates and standard errors are obtained using multiple imputation, using methods described in detail in Section 5.2.1.

Revealed vs. Stated Preferences

- In general, there are two ways to record a person's preferences.
    - So far in class we've learned about revealed preferences. We have talked about the Travel Cost Model where we observe people visiting a park etc., and we have talked about the Hedonic Price Model where we observe people purchasing homes or other composite goods. In both of these cases, people "reveal" their preferences through their consumption choices.

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  - However, what about cases where people might have preferences for something, but it's not possible for them to "reveal" them through conventional markets?
  - By constructing a hypothetical market, researchers can observe people making decisions or "stating" what they would choose if presented the opportunity in the real world.

Stated Preferences by any other name

- The phrase “stated preferences” has a long history in environmental economics.
- Among other things, it is often called “contingent valuation” or “discrete choice experiments”. Regardless of what it is called, these approaches share a common theme whereby they ask a person a question.

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- 1989 – Exxon Valdez Oil Spill - $7.2b in damage (Carson et al. 1992/2003)
- 1994 – Diamond and Hausman (1994) refute use of CV estimates
- 2010 – BP Deepwater Horizon Oil Spill - $17.2b in damage (Bishop et al. 2017)

Exxon Valdez Oil Spill 1989

Overlooked Benefits of Nutrient Reductions in the Mississippi River Basin (here)
By: Parthum and Ando (2020)

Abstract: Improvements in local surface water quality in the Mississippi River Basin (MRB) can contribute to the regional environmental goals of reducing hypoxia in the Gulf of Mexico. To inform estimates of the benefits of water quality policy, we use a choice experiment survey in a typical sub-watershed of the MRB to estimate willingness to pay for local environmental improvements and helping to reduce hypoxia far downstream. We find that residents place large values on reduced local algal blooms, improved local fish populations and diversity, and meeting local commitments to help with the regional environmental problem.

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2. How are those values distributed across geography and do they differ among rural and urban areas (does the “rural-urban divide” exist in nonmarket values)?

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1. What is the value of reducing nutrient pollution in the Mississippi River Basin?
   - $9 - $62 per household per year (depends on the policy) and $3.6m to $9.7m total in the watershed

2. How are those values distributed across geography and do they differ among rural and urban areas (does the "rural-urban divide" exist in nonmarket values)?
   - Rural household value reductions just the same as urban households, and the total WTP depends more on the location of the improvement than on the demographics of that location.

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The Data:

1. Survey of 343 respondents. Each answered 6 survey questions.

Survey Design:

1. Each individual was shown a map of the area and where they live in comparison to the ecological improvements.
2. Among other measures taken ("cheap talk script", certainty questions, etc.), the maps help reduce respondent error and cognition, improving the overall efficiency of the coefficient estimates.

Concern: Internal Validity

- A common criticism of stated preference research involves the internal validity of the survey responses. After all, people are simply stating what they will choose, not actually buying.

1. "Cheap talk" script, or the "please try hard and please be honest" script

> "Experience from previous similar surveys is that people often say they would be willing to pay more money for something than they actually would. For example, in one study, 80% of people said they would buy a product, but when a store actually stocked the product, only 43% of people actually bought the new product. It is important that you make each of your upcoming selections like you would if you were actually facing these exact choices in reality. Note that paying for environmental improvement means you would have less money available for other purchases."

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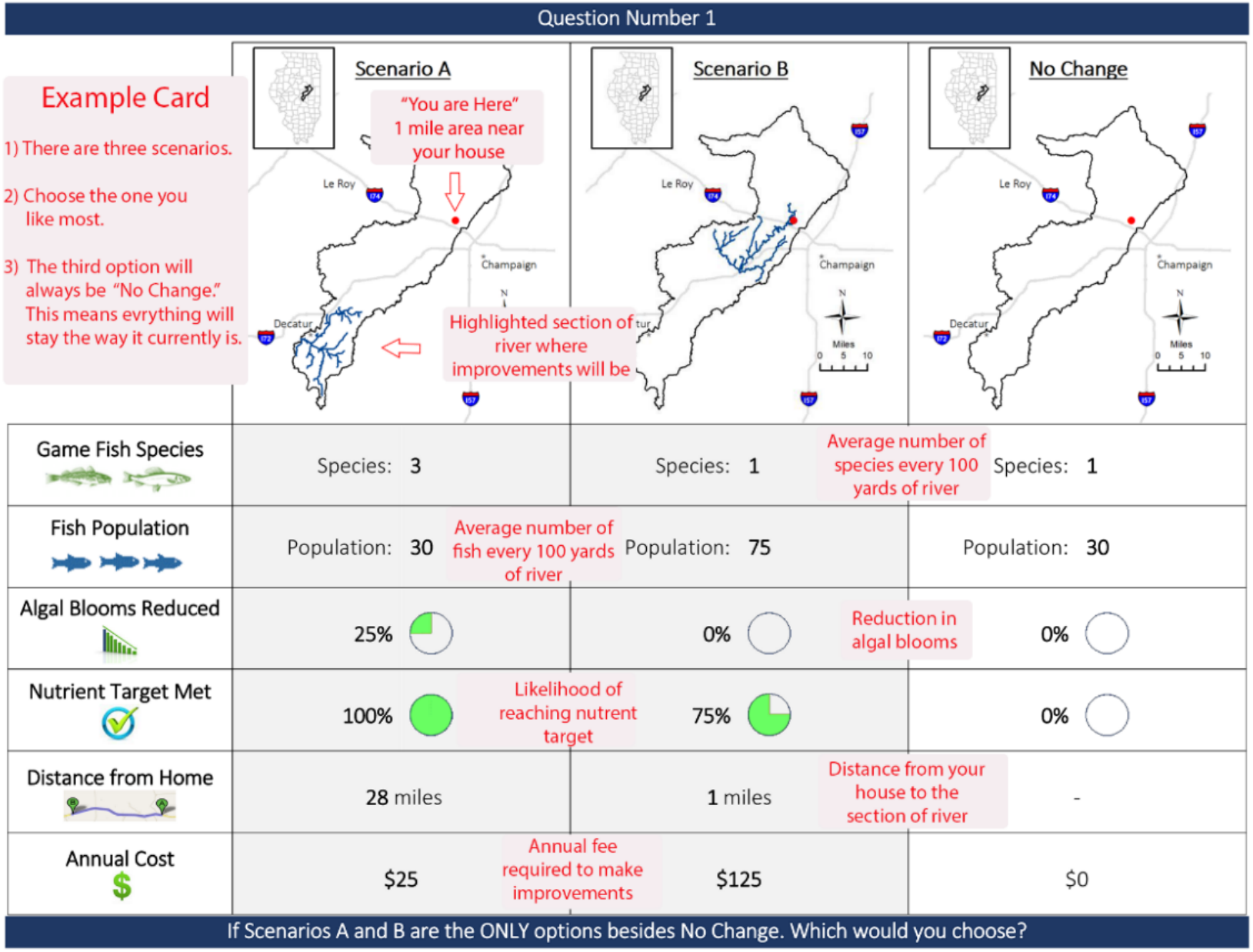
2. Certainty follow-up questions:

> "How confident are you in your answer?" With the range: "0 - not at all confident"; "1- somewhat confident"; and "2 - very confident."

Concern: Respondent Comprehension



- A second common criticism involves the respondent's comprehension of the survey.
- Here, we address this concern by providing place-specific improvements with individual-specific maps that show the respondent exactly where they live in comparison to the improvement.

Concern: Representativeness of the Sample

- A third common criticism involves both the internal and external validity of the survey.
- How comparable is the sample to the population?
- Researchers will often provide a table that summarizes the similarities and differences across key dimensions such as sex, age, income, and education.

Table B.2: Differences between Survey Respondents and U.S.Census (2019)

	(1) Respondents	(2) Census	(3) Difference
Works in Agriculture	0.15 (0.00)	0.05 (0.03)	-0.10*** (0.01)
Male	0.32 (0.00)	0.50 (0.04)	0.18*** (0.01)
White	0.77 (0.00)	0.94 (0.10)	0.16*** (0.02)
Homeowner	0.57 (0.00)	0.75 (0.16)	0.18*** (0.03)
Age			
18 - 29	0.22 (0.23)	0.18 (0.04)	-0.05 (0.04)
30 - 44	0.30 (0.31)	0.23 (0.04)	-0.07 (0.06)
45 - 64	0.36 (0.35)	0.38 (0.04)	0.02 (0.06)
> 65	0.12 (0.20)	0.21 (0.05)	0.09** (0.04)
Household income ($k)			
< $25,000	0.06 (0.10)	0.12 (0.17)	0.07* (0.03)
$25,000 - $34,999	0.01 (0.03)	0.07 (0.03)	0.07*** (0.01)
$35,000 - $49,999	0.15 (0.24)	0.13 (0.08)	-0.02
$50,000 - $74,999	0.20 (0.31)	0.20 (0.06)	0.00 (0.06)
$75,000 - $99,999	0.22 (0.31)	0.18 (0.07)	-0.04 (0.06)
$100,000 - $149,999	0.18 (0.27)	0.17 (0.07)	-0.00 (0.05)
$150,000 - $199,999	0.18 (0.22)	0.07 (0.05)	-0.11*** (0.04)
> $200,000	0.01 (0.02)	0.04 (0.04)	0.04*** (0.01)
Education			
Less than high school	0.22 (0.29)	0.06 (0.04)	-0.16*** (0.05)
High school/GED	0.12 (0.27)	0.35 (0.09)	0.23*** (0.05)
Some college	0.21 (0.22)	0.24 (0.04)	0.03 (0.04)
Two-year degree	0.08 (0.21)	0.09 (0.02)	0.01 (0.04)
Four-year degree	0.19 (0.20)	0.16 (0.07)	-0.03 (0.04)
Graduate degree	0.18 (0.33)	0.08 (0.07)	-0.10 (0.06)
Zip Codes	42	42	42

Standard errors in parentheses *p<0.1; **p<0.05; ***p<0.01

Random Utility Model (RUM)

$$U_{ijt} = -\alpha_i price_{jt} + \beta_i' x_{ijt} + e_{\mathrm{ijt}}$$

The RUM is not specific to environmental economics. In fact, it originated in the Industrial Organization literature (cereal and modes of transportation!). It is often used in housing location models, transportation decision models, and many other things that have a "discrete" choice setting.

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The model predicts the probability of a particular choice based on a set of explanatory variables ("right hand side").

$$P_{ijt} = Prob\left(U_{ijt} > U_{ikt}\right) = \frac{\exp\left(U_{it,j=1}\right)}{\sum_j^J \exp\left(U_{ijt}\right)}$$

Results

Table 2: MWTP to Reduce Nutrient Transmission to the Gulf of Mexico

	(1) Full Sample		(2) ASC Heterogeneity	
	Mean MWTP	Std. Dev.	Mean MWTP	Std. Dev.
Distance (miles)	-0.67***	92.57***	-0.68***	1.22***
	(0.15)	(18.69)	(0.15)	(0.26)
Fish Species	4.73**	1.06***	4.72**	12.32***
	(1.48)	(0.26)	(1.55)	(2.14)
Fish Population	0.17**	6.58***	0.16**	0.38***
	(0.06)	(2.12)	(0.06)	(0.08)
Algal Blooms (%)	0.77***	0.35**	0.88***	0.96***
	(0.11)	(0.09)	(0.1)	(0.13)
Nutrient Target (%)	0.95***	0.85***	1.14***	0.89***
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Status Quo (No Program)	-69.49***	1.42***	-20.25	77.02***
	(14.78)	(0.23)	(13.48)	(21.19)
Status Quo × Rural			-48.79***	171.45***
			(14.33)	(26.29)
Status Quo × Aware of Water Issues			-65.82***	106.84***
			(16.34)	(21.01)
λ (cost coefficient)	-3.17***	0.85***	-2.71***	0.77***
	(0.32)	(0.13)	(0.42)	(0.12)
Observations (Respondents)	2058 (343)		2058 (343)	
Log-likelihood	-1717.19		-1717.77	
AIC	3506.38		3527.54	
McFadden ρ^2	0.15		0.15	

Note: Column 1 provides the results of the WTP-space model for the pooled (full) sample. Column 2 introduces an interaction between the Status Quo dummy and respondent characteristics. Correlation matrices of the random parameters can be found in the appendix (Table B.7). Standard errors in parentheses where $^{*}p < 0.1$, $^{**}p < 0.05$, and $^{***}p < 0.01$.

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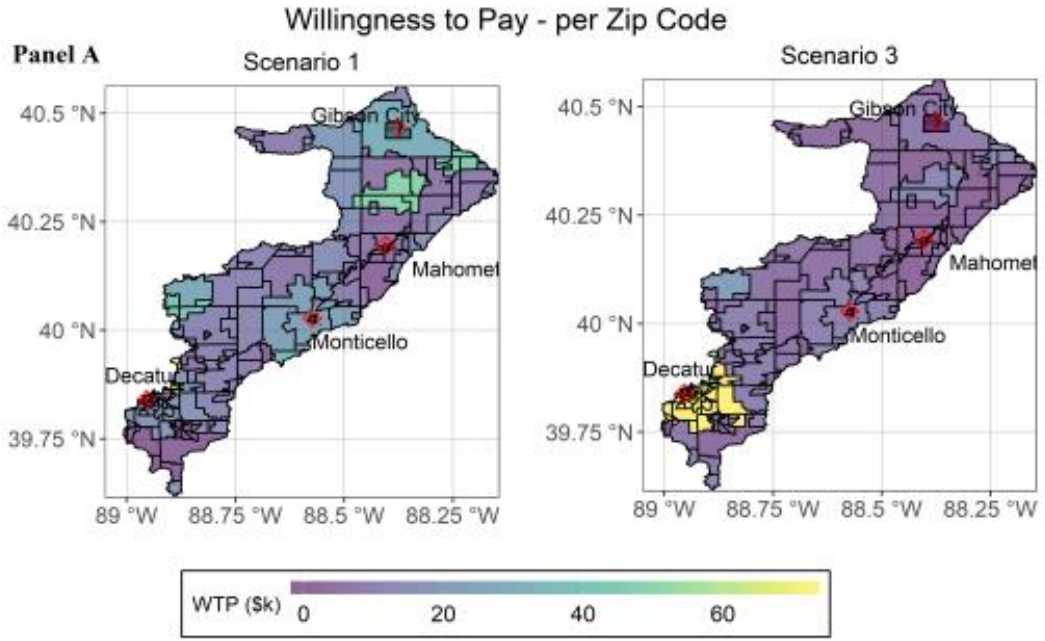

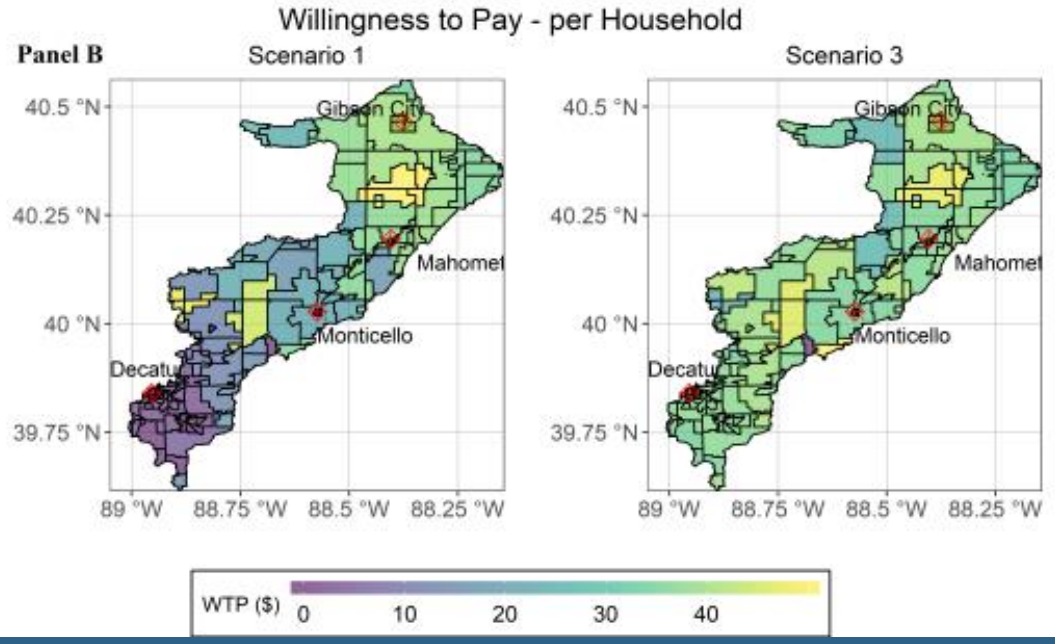

- While the total value from reductions in nutrient pollution accrues to urban population centers, the marginal willingness to pay is uniform throughout the watershed.
- We do not find evidence of a “rural-urban divide” in willingness to pay for surface water quality improvements.

Next class

- Defensive Behavior:
    - Self-Protection and Value of Statistical Life Estimation
      By Shogren and Stamland (2005)

- Case Study #1 - **due September 27th by 11:59pm**
    - I gave you a few extra days but DON'T DELAY!
    - Most of your time will be spent getting R and Rstudio working.
    - The instructions are straight forward and I provide you with all the steps.