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Using eye tracking to model non-attendance in choice experiments

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USING EYE TRACKING TO MODEL NON-ATTENDANCE IN CHOICE EXPERIMENTS

Daniel E. Chavez[1], Marco A. Palma[2], Alba J. Collart[3]

Why study attribute non-attendance (ANA)?

- Choice experiments are the weapon of choice in stated preference research (Hess, Hensher, and Daly, 2012)
- Hensher (2006) points out that subjects are not using all the information presented to make their choices.
- Attributes and attribute levels that are ignored or whose influence is considered marginal are regarded as non-attended (ANA)

What has been done in ANA?

- Stated ANA (Hensher, Rose, and Greene, 2005): Subjects are asked *ex-post* if they ignored certain attributes.
- Endogenous ANA (Hole, 2011): Based on the choices made, the ANA is inferred.
- Revealed ANA or RANA(Balcombe, Fraser, and McSorley, 2015): Use eye tracking to gauge actual attendance.
- We propose using the time fixated on an attribute relative to the time spent in the choice set as a measure of RANA: Weighted TVD.

Data

- Subjects from the general population were presented with twelve choice sets each consisting of four alternatives each, that include a no-purchase option
- Responses were incentivized by making one choice set binding. The binding choice set was determined by rolling a twelve sided die.
- The choice sets were presented in a 1920 x 1200 pixels screen, while a Tobii TX-300 recorded eye movements at 120 points per second

Models

Random utility framework:

$$U_{njt} = \beta(x_{njt}) + \varepsilon_{njt}$$

Where ε is iid and extreme value and x describes a vector of characteristics of individual *n* for alternative *j* in choice situation *t*.

Endogenous Attribute Attendance:

$$U_{njt} = \sum_{k \epsilon C_q} \beta^k x^k_{njt} + \varepsilon_{njt}$$

Where $C_q$is the entire set of attributes and *k* describes the subset of information used in a choice situation

Indicators for RANA are then used to adjust the EAA model to use endogenously determined and revealed ANA.

Weighted TVD by choice set

Results

	Full Attendance Conditional logit	Endogenously Estimated Attendance Logit	RANA adjusted EAA logit
Price	-0.39416***	-1.23427***	-1.21135***
	(0.09108)	(0.13174)	(0.11003)
Cod	-0.69755***	4.39943***	4.35678***
	(0.14116)	(0.52959)	(0.42436)
Mahi	0.27400**	4.16486***	4.23031***
	(0.12909)	(0.37745)	(0.31490)
Flounder	-0.68497***	3.69296***	3.64360***
	(0.11382)	(0.67035)	(0.525426)
Prod	1.56244***	2.14955***	2.20491***
	(0.31512)	(0.18236)	(0.16691)
ANAPrice		0.70178***	0.71797***
		(0.07768)	(0.08009)
ANACod		0.75133***	0.74696***
		(0.06721)	(0.06556)
ANAMahi		0.30303***	0.29788***
		(0.07024)	(0.06754)
ANAFlounder		0.77364***	0.77642***
		(0.08559)	(0.08598)
ANAProd		0.61781***	0.61965***
		(0.07800)	(0.07774)
N Obs	2880	2880	2880
Log-Likelihood	-907.87	-637.16	-624.50
AIC	1825.7	1293.32	1279.00

Conclusions

- Weighing time spent per attribute by choice set accounts for learning and fatigue effects
- Parameter estimates differ when ANA is accounted for versus when full attendance is assumed.
- Using the EAA model improves model fit and predictive power singlehandedly.
- Using RANA furthers the fit of the model.
- If eye tracking is available use it!

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