Modelling Attribute Cut-Offs in Discrete Choice Experiments using Eye Tracking

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Discrete Choice Experiments (DCEs) are grounded at the intersection of psychology and economics. In DCEs, it has been generally assumed that the *passive bounded rationality* model applies. This means that decision makers attend to and rationally process all available information and make a trade-off between all attributes when choosing their preferred alternative. This assumption stems from the postulation that respondents use compensatory decision strategies to choose their most desired alternative. Such strategies assume that a better value of one attribute can compensate for a poorer value of another attribute (Payne et al., 1992). In reality, often the *rationally adaptive* model applies, whereby people use heuristics to make decisions due to limited cognitive abilities and being unable to process all available information (Caplin, 2016; Gigerenzer, Gaissmaier, 2011).

One example of a heuristic is the use of *attribute cut-offs* for consideration set screening. Attribute cut-offs are a minimum acceptable level set by individuals for a specific attribute (Huber, Klein, 1991). They use the cut-off to screen and eliminate alternatives from their choice set that do not satisfy their cut-off levels of critical attributes. This reduces their set of alternatives to choose among (consideration set). For example, if a consumer is in the market to buy a new coat, and the cut-off for price is $200, all coats over $200 will not be considered. Experimental evidence has shown that failure to account for the use of attribute cut-offs in models of consumer choices can generate biased estimates (Swait, 2001). This bias occurs because choice models are treating ignored attributes and levels as part of the decision/trade-off even though they were not considered when making a choice (Hensher et al., 2005). Therefore, this cognitive process can create errors, for example, when forecasting the success of a new product (Puckett, Hensher, 2008). If consumers do not evaluate all attributes to make a choice, the corresponding choice model should achieve the same by including heuristics in the modeling. Hence, our objective is to advance discrete choice modeling by accounting for cut-off levels, an important heuristic.

To develop a characterization of consumers' utilization of heuristics, a laboratory experiment was conducted in the U.S. with three key components: (1) an assessment of individual-specific cut-off values following Ding et al. (2012); (2) a DCE; and (3) an evaluation of selective information processing (heuristics) by measuring visual attention to DCE attributes with eye tracking. The experiment was conducted with 117 participants. The experimental design of the DCE included price, a pesticide-free label, a GM-free label and a region-of-origin label in the context of purchasing Medjool dates for consumption. Participants made choices for six choice sets displayed on a computer screen. The eye tracker was mounted to the bottom of the computer screen tracking their eye movement during choice making.

Preliminary results show that 41% of participants had no cut-off level for the study product, about one-third had at least one cut-off level. Most respondents had a cut-off level for pesticide-free labeling, meaning they would only buy Medjool dates if they were carrying a pesticide-free label, and the same holds for 30% with regards to GM-free labeling. Only a quarter has a cut-off level for region-of-origin. However, almost two-thirds have a cut-off for price. Using total visit duration as a measure of attention to an attribute, we find that participants paid most attention to the price followed by the pesticide-free label and the GM-free label. Least attention was paid to the region-of-origin.

Our data gives us a unique opportunity to investigate the relationship between attention and cut-off levels, as well as, between attention, cut-offs and choices. We hypothesize that attributes where a participant has a cut-off level receive more attention because (s)he wants to make sure to not violate their cut-off level. We investigate this hypothesis using Tobit models to account for visit duration when a cut-off is present. Specifically, we specify total visit duration as a function of dummy variables denoting cut-off levels for each attribute. Doing so we can test whether having a cut-off for an attribute affects attention. We then measure whether this affects choice. This answers the question whether attention varies based on existing cut-off values, and whether this affects subsequent decision making. Below we show preliminary results of how cut-off levels affect attention based on individual Tobit models. Findings show that attribute cut-offs for pesticide-free labeling and GM-free labeling increased attention. Having cut-offs for region-of-origin and price did not have significant effects on attention. Hence, results are inconclusive regarding the relationship between attention and attribute cut-offs. Next, we will proceed to test how this affects choice making.

Table. Effect of cut-offs on attention (in seconds)

Attribute	Coefficient	Standard Error	p-value
Pesticide-free label	1.283	0.604	0.036
GM-free label	0.944	0.553	0.091
Region-of-origin label	0.748	0.606	0.219
Price	0.120	0.860	0.889

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