What do consumers consider before they choose? Identification from asymmetric demand responses

by Jason Abaluck, Abi Adams

Miguel Acosta and Solomon Gofere[2]

Columbia Economics and SIPA

October 7, 2017

[2] A worse version of Guy's slides.

Problem

- Discrete Choice Models assume that individuals consider all goods - no identification problem
- Consideration Set Models relax this - inattention, search costs, unobserved constraints
  - Attach probability (of being considered) to each subset of options
- But, introducing this notion that consumers decide what goods to consider when making choices introduces an identification problem
  - Change in a characteristic of certain good that leads to change in demand can be either due to change in the set considered or due to change in utility from the good
- Many studies used auxilliary data or exclusion restrictions to circumvent this identification problem.
- This study takes an alternative approach to address this identification problem

Approach

- Show how restrictions on choice probabilities can be used to identify preferences and consideration probabilities
- Express consideration probabilities in terms of differences in cross-derivatives estimated from the cross-sectional data
- Illustrate their approach in a simple, stylized example
- Generalize the method to be able to use it to provide identification in non-trivial examples, particularly ASC and DSC models, which are used in the literature
- Show methods application to various data types (lab experiment, on-line, others).

Motivating Example

- Consider a consumer selecting from two products, $j = \{0, 1\}$ with price x_j
- $j = 0$ is always considered - the consumer may or may not pay attention to $j = 1$. Let $\mu(x_0)$ be the probability s/he pays attention to both goods given x_0
  - If the consumer does not pay attention to $j = 1$, then s/he always picks $j = 0$
  - If the consumer decides to pay attention to $j = 1$, then s/he always picks the utility-maximizing good.
- Then the probabilities the consumer picks $j = 0, 1$ are
  $s_0(x_0, x_1) = 1 - \mu + \mu * s_0^*(x_0, x_1)$
  $s_1(x_0, x_1) = \mu * s_1^*(x_0, x_1)$

Motivating Example cont'd

- Want to show that we can identify s_0^*, s_1^* using data on how observable s_j vary with product attributes.
- The key is that maximizing behavior implies symmetry given full consideration (here, only care about price differences).
- Differentiating the shares equation and using that the shares conditional on consideration satisfy symmetry we have:
  $\frac{\partial s_1}{\partial x_0} - \frac{\partial s_0}{\partial x_1} = \frac{\partial \mu}{\partial x_0} s_1^* = \frac{\partial log(\mu)}{\partial x_0} s_1$
- We can rearrange to obtain $\frac{\partial log(\mu)}{\partial x_0} = \frac{1}{s_1}[\frac{\partial s_1}{\partial x_0} - \frac{\partial s_0}{\partial x_1}]$ showing that we can directly derive the consideration probabilities from choice probabilities.
- Further rearranging and integrating over the price support of good 0 gives us the level of attention:
  $\mu(\bar{x_0}) = \int_{\bar{x_0}}^{\infty} \frac{1}{s_1}[\frac{\partial s_1}{\partial x_0} - \frac{\partial s_0}{\partial x_1}] dx_0$

General Model, Less Math

This model makes every model its special case.

- Individual i and J products with characteristics x_{ij}
- Random utility, additively separable in *special* characteristic
- Probability that a subset of $\{1, \ldots, J\}$ is considered depends non-zeroly on the characteristic of the special good.
- These plus a couple of seemingly-technical assumptions imply:

Theorem

These theorems imply that non-equal cross-special derivatives[3] *probability that the entire choice set is considered is less than 1.*

[3] And the presence of special level invariance.

Identification

Without more structure on how consideration sets are chosen, identifying the model parameters is hopeless. Two alternatives:

- ASC: Under *Alternative-Specific Consideration*, the probability that a good is considered depends only on its own characteristics.
- DSC: Under *Default-Specific Consideration* there is a default good, and either (1) only the default is considered or (2) all other options are considered. The special characteristic of the default determines the consideration set.

Empirics: ASC

Yale Bookstore Experiment

- Let subjects pick from random subsets of Yale items
- Model correctly predicts consideration set

Expedia: data on characteristics of hotels

- Utility is lower for high-priced hotels, and higher for more starts, higher reviews, better locations, and higher search positions.
- Impact of search position comes from attention

Empirics: DSC

Medicare

- Utility makes sense
- "Inertia," previously attributed to fixed costs, is due to inattention.

Conclusion

- Show that consideration set probabilities can be identified from asymmetries in the matrix of cross-derivatives of choice probabilities w.r.t characteristics of rival goods.
- Thus in these cases we don't need auxiliary data or artificial constructions to identify if a consumer chose a good because of utility or because of consideration
- One caveat is that the results are sufficient but not necessary for identification of consideration probabilities