Identifying the presence of heterogeneous discrete choice mechanisms at an individual level

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Abstract

Individuals may follow different behavioural strategies, use heterogeneous choice mechanisms, or employ several heuristics to choose one alternative out of a potentially extensive choice set. Modelling the way people choose is a complex task, since different choice profiles must be accommodated into a single model. Several choice mechanisms have been proposed for modelling behaviour; they include the Random Utility Maximization (RUM) model, the Elimination by Aspects (EBA) model, the Random Regret Minimization (RRM) model, and the Satisficing model, among others.

Even though different choice mechanisms may coexist within a population --or even in different choices of a single individual--, most discrete choice models assume that only one mechanism is present. Indeed, models accounting explicitly for different choice mechanisms have been used only recently.

In order to model multiple choice mechanisms, two main approaches have been applied: (i) using a flexible formulation that may account for more than one mechanism and (ii) latent classes (LC) that models one choice mechanism per class.

The first approach generally requires less parameters to be estimated, but only a couple of choice mechanisms may be analysed simultaneously. The second approach, which is the one we considered in this paper, allows --in principle-- the use of any combination of choice mechanisms. This LC framework has been widely used in estimating discrete population heterogeneity of tastes, but has had limited usage for understanding the different choice mechanisms that coexist in the population.

One of the challenges of the LC framework relies on how to model the class membership, which is normally done by using the inverse Logit function. The most usual formulation is to only have a choice mechanism constant --similar to the alternative specific constant in RUM models-- which is the same across the population. More complex and explicative formulations have been found to be unidentifiable in practice without normalisation or external information. Indeed, modelling multiple choice mechanisms is not straightforward since both the class membership function and the choice mechanism functions must be modelled simultaneously.

Because using multiple choice mechanism requires modelling simultaneously the probability of selecting a choice mechanism and the choice process following the mechanism itself, it is a hard task. Moreover, the presence of a choice mechanism is never certain. We propose a methodology that enables to separately study the class membership and choice mechanism functions by identifying the presence of heterogeneous choice mechanisms at an individual level. The methodology is tested in synthetic data with satisfactory results. Not only we are able to identify the choice mechanism followed by the individuals, but also the choice mechanism structures (i.e. their parameters) were recovered.