Critique for:

Gönül, F., & Srinivasan, K. (1993). Modeling Multiple Sources of Heterogeneity in Multinomial Logit Models: Methodological and Managerial Issues. *Marketing Science*, *12*(3), 213–229.

This paper provides a framework for specifying and estimating heterogeneity in multiple sources in multinomial logit models. Three possible sources of heterogeneity are included in the augmented multinomial logit model. First, the model allows a random component in each intercept term in order to measuring variations on the intrinsic brand utility across households. Second, each parameter of the explanatory variables varies randomly across the households. Third, the model distinguishes between loyal and potentially switching households by including a measure of brand loyalty based on observed past purchase behavior.

The paper compares the augmented multinomial logit model with some nested and nonnested models. The nested models that the paper compares are 1) random intercepts and random parameters model, 2) random intercepts model, 3) multinomial logit model with no heterogeneity, and 4) random intercepts and loyalty specification. The first three nested models are estimated and compared in detail, while for the fourth nested model only summary results are presented for brevity. The paper also compares two additional nonnested models, 1) multinomial logit model with traditional loyalty specification, and 2) parsimonious heterogeneity model.

UPC scanner data on disposable diapers are used to estimate and compare models. The paper retains part of the full sample as a holdout sample in order to compare the predictions of different models.

The authors use Gauss Hermite quadrature to evaluate the integrals in estimation. Also, Hauser’s (1978) index is the measurement of the fit of a model. After comparing the augmented model with nested models, the paper summarizes that the findings offer strong evidence for variations across households in intercepts, parameters of explanatory variables, and support distinction of hardcore loyal households from the rest. Meanwhile, the performance of the models on the validation sample indicates that the augmented model can predict market share closer to actual shares than those of the nested models. The paper then turns to comparing augmented model with nonnested models. The first comparison with highly restrictive structures to parsimoniously capture unobserved heterogeneity suggests that this nonnested model may not be appropriate. When comparing the augmented model and the logit model with loyalty, a test proposed by Ben-Akiva and Lerman (1985) is introduced to adjusts for the number of parameters. Overall, the tests for the nonnested models also favors the augmented model and rejects those of nonnested models.

Managerial implications are given after the comparison of models. First, from the estimation and results, the authors find that price-sensitive households respond to coupon more than other households. Second, observing that the estimates suggest considerable variation in idiosyncratic preferences across households, possible segmentation of households is proposed (e.g. higher income, light user, etc.). Third, loyalty specification yields some interesting managerial insights such as high-income households are more likely to remain hardcore loyal, and such insights can help manager to develop targeted marketing strategies.

Research issues including computational issues and comparison with the multinomial probit are discussed at the penultimate part. The last part concludes the main methodological and managerial implications of the augmented model: 1) The three measures of heterogeneity across households are strongly supported, 2) the average impact of the marketing efforts on brand choice is greater than the level implied by simpler models, 3) incorporation of heterogeneity reduces the potential bias in estimation of parameters, 4) partial or parsimonious control of sources of heterogeneity may not be adequate, 5) providing immediate guidelines on market segmentation, and 6) directly answering several substantive issues on the interrelationships between a household’s reactions to marketing inputs. In this part, the paper also offers possible future extensions for the augmented model, including introducing random component differ by brand and incorporating a more detailed loyalty specification.

The strengths of this paper are: 1) This paper not only proposes the augmented multinomial logit model by merely introducing multiple sources of heterogeneity, but also comparing the augmented model with several nested models having none or some of the heterogeneous variables in order to test the significance of each source of heterogeneity. 2) Using nonnested models to facilitate comparison with the augmented model in order to test the performance of augmented model with other good models that are constructed in different approaches. 3) Using holdout samples and validation samples to test performance of each model, not merely comparing the performance during different models on one sample set. 4) Providing many managerial implications.

The weakness of this paper is: 1) Lack in details of nonparametric estimation. 2) Lack of testing this model in other dataset or other brands. 3) Computational issues.

Possible future extensions are listed below.

First, consider more on multiple sources of heterogeneity in both logit and probit models. In this way, closer predictions can be made with higher computational ability. Second, different approaches in customer segmentation can also be used in future research to get closer and practicable estimation. Third, calculate and analyze the elasticities within each customer segment in order to give more accruable and convincing suggestions to brand managers. Fourth, if the number of brands becomes larger, it is also possible to specify different groups of households and add a random component to each of the group intercept to make trade-off between heterogeneity and computational issues. Fifth, taking state dependence into account may be useful and lead to better managerial implications.