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## Commentary

## A Logit Model of Brand Choice Calibrated on Scanner Data: A 25th Anniversary Perspective

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Guadagni and Little (1983) had a surprising (to the authors) number of citations, presumably because it was the first paper to build a useful model with UPC scanner panel data. More surprising (but not to the authors) was that the model, compared to those in most academic papers, found widespread practical application. The reason for this was that a small, entrepreneurial consulting firm developed and sold applications based on the model. The paper also generated a substantial follow-on of academic literature. Examples illustrate a few of the directions in which later research went.

*Key words:* brand choice, multinomial logit, UPC data, marketing science practice

*History:* This paper was received November 6, 2007.

## 1. Introduction

Writing Guadagni and Little (1983) was actually quite exciting. When we finished, we felt good about the paper, but neither of us expected it to be as successful as it has been, either academically or in practice. Academically, the paper currently has over 460 citations, the second highest citation count of any paper in *Marketing Science* published prior to 1990, as measured by the ISI Web of Science. In practice, we have personally witnessed and/or participated in many applications of the model in consumer packaged goods (CPG) firms. This experience has occurred through the consulting practices, first, of Management Decision Systems, Inc. (MDS) and, later, of Information Resources, Inc. (IRI).

## 2. Why Was the Paper Successful?

In our 25th Anniversary Perspective we address two questions. First, what made the original paper a success, both academically and in practice? Second, what follow-on academic research had its roots in the original paper?

For the answer to first question, we draw on our own responses to a survey that each of us filled out for John Roberts, Stefan Stremersch, and Ujwal Kayande in 2007, as part of their project, "Understanding the intellectual foundations of the top 20 marketing science articles in the past 25 years" (hereafter called RSK07). Our answers to their Q&A provide a concise summary of background information

on Guadagni and Little, 1983 (hereafter GL83). In developing this information, we have shortened the RSK07 questions and edited our original answers:

Q1. What were the academic influences in the development and execution of the article?

*Guadagni:* McFadden's work on the logit, Silk and Urban's ASSESSOR, and Luce (see references in GL83)

Q2. Academic idea that influenced you most:

*Guadagni:* Consumers make choices to maximize utility. This can be modeled with parameters that can then be estimated empirically.

Q3. Practitioner influences in development and execution.

*Guadagni:* Bob Klein and Phil Johnson, then at MDS

Q4. Practical/managerial idea that influenced you most:

*Guadagni:* The desire for accurate and actionable estimates of marketing-mix response. The advent of UPC scanner panel data gave us the opportunity to observe unobtrusively both consumer purchasing and the environment in which the purchasing took place. We believed the richness of the data could yield hitherto unobtainable accuracy.

Q5. Did you cooperate with practitioners when developing the article? If so, with what intensity on a scale of 1–10?

*Guadagni:* Yes. Intensity of 8.

Q6. Any special efforts to diffuse your work to academics and/or practitioners?

*Guadagni:* We spoke at various academic and practitioner conferences. However, the most important reason the research gained notoriety was that our paper was one of the first journal publications to use UPC scanner panel data.

Q7. Stage of career when your article was written: How many years of experience in practice did you have? Academia?

*Guadagni:* 3 years practice, 0 years academia

*Little:* An estimated 4 equivalent years of practice over 16 years at MDS, including summers. 26 years an academic

Q8. Why do you think this paper had so much impact?

*Guadagni:* Much of the impact was due to its early use of household data from UPC scanners. The underlying model used in the paper is both elegant and based on a consistent theory. The paper showed that the model had predictive validity. Finally, there were successful commercial products developed that were based on the research described in the paper.

*Little:* This question has fascinated me for years. Everything Peter says is true, but I have added the following two sections that amplify our response.

## 2.1. Academic Impact

Lucky timing was important, to be sure, but to paraphrase Pasteur, “Chance favors the prepared mind.” In our case, it also favored a prepared organization. Bob Klein of MDS learned that the data supplier, SAMI, was running a pilot UPC scanner panel in Kansas City. Peter had a summer job at MDS via a lead from me. All three of us recognized that the data was unique for its time and might be extremely interesting both academically and in practice. MDS was happy to sponsor its part, and so Peter had the hands-on time to work on the research, first in his MDS summer job and later in his SM thesis under me.

The multinomial logit was not new. McFadden, Ben-Akiva, and others had been using it in transportation for some time. Peter decided to try it on the Kansas City scanner panel data. However, this was not the result of reading McFadden, although we both later did. It was from academic exposure to the pretest market model ASSESSOR of Silk and Urban (1978) at MIT. The latter uses a single-variable logit model in part of its estimation. In implementing ASSESSOR, MDS employed Ben-Akiva’s FORTRAN code for the multinomial logit. Peter used the same code in its full multivariate capacity to model the Kansas City data.

At about the same time, Information Resources, Inc. (IRI) gave academics a well-documented scanner panel database for coffee. So CPG scanner panel data was beginning to be in the air.

GL83 came out in *Marketing Science*. The share tracking curves were remarkable. I had never seen anything like them before. In addition, the paper was reasonably easy to read and laid out how to do the

model building and analysis. The academics looked at the paper and said, “There is surely more to be done. This is something I can do if I can obtain data.” Several data sets emerged from IRI. Nielsen helped by starting up ERIM, an instrumented test market, to compete with IRI’s BehaviorScan, and then scrapping the service rather quickly because it lost too much money. However, Nielsen kindly packaged the data from several product categories and made it available to academics.

There followed an academic feeding frenzy. Many multinomial logit papers appeared. After all, what could be more important in marketing than customer choice? There was a certain amount of new theory and much embellishment of existing theory. Thanks to the visibility and economic importance of CPG products, the resulting research arguably had managerial relevance and sometimes emphatically did. Some papers were first class and won prizes. A large fraction of the papers cited GL83. The multinomial logit model with loyalty variables included in some form fit UPC data so well that it became a de facto standard of comparison that authors presented to demonstrate the quality of their new choice models, especially in applications to consumer packaged goods.

Another academic impact arose because GL83 began to appear on reading lists for Ph.D. seminars and general exams. A generation of marketing academics read the paper. Any paper that has practical impact also has academic impact through teaching because teachers thirst for academic work that has become relevant.

## 2.2. Impact on Practice

I think the biggest impact of GL83 on marketing practice came from innovative consultants at MDS and later IRI. Peter is a prime example but not the only one. Several of the key people were bright master’s degree graduates from MIT or Wharton, who viewed consulting as much more fun, as well as much more remunerative, than grinding out a Ph.D. They tended not to get caught up in the niceties that academics dwell on. Instead, they went for the jugular of practical importance.

The practicing consultants, often in cooperation with academics, developed new application products based on the multinomial logit. One was CouponScan, which was the first credible (and transparent) evaluation of cents-off coupons in the Free Standing Inserts (FSIs) that are included in Sunday newspapers (see Little 1994). The developers were Peter, myself, and Doug Honnold (another MIT master’s graduate without a doctorate, who surely could have obtained one.) The transparency was the result of academic publication: GL83 and Little (1994). CouponScan was commercially successful. I have a tee-shirt

from its heyday that reads: “Late Night with Coupon-Scan.” Another successful IRI application was “Market Simulator” by Honnold, which supported product line decisions. Still another was called “The Mind of the Customer,” which, in its panel data version, rather ingeniously analyzed attribute importance to customers (as opposed to brand-size importance). The analysis was based on academic work by Fader and Hardie (1996).

### 3. Follow-On Work in the Marketing Literature

As suggested by the editor, we give a brief overview of research following and building upon GL83. We have already mentioned papers by Fader and Hardie (1996) and Little (1994) that led to application products. Next we note a practical problem in the original GL83. The model calculates the probability of purchase of an SKU, given that a purchase in the product category has been made. Of great interest, however, is the effect of brand marketing-mix activity on the category purchase itself. This was tackled with the nested logit in an MIT working paper by Guadagni and Little (1987) and was eventually published in 1998 as a journal article, “When and What to Buy: A Nested Logit Model of Coffee Purchases” (hereafter GL98). To calibrate this model we need data on when the shopper makes trips to the supermarket and on further variables that may affect category purchase. The major one is household inventory of the product (here, coffee). Higher inventory leads to lower purchase rate. Inventory is not easily observed, but it can be sensibly modeled. The net result is to show that the marketing-mix variables increase unit sales, not only through increasing share but also through increasing category purchases. Other authors who have taken different approaches or have expanded GL98 include Bucklin and Lattin (1991), who differentiate between planned and opportunistic purchases, and Bucklin and Gupta (1992), who add response segments, i.e., groups of customers with similar values for their response parameters.

An observation made in GL83 is that the highly significant loyalty variable used there combines cross sectional (heterogeneity across customers) and time series (customer learning) effects in a single variable. Chintagunta (1992) extends the nested logit formulation by introducing a semiparametric treatment of heterogeneity to separate out that phenomenon. Another research trend has been toward

utility-maximizing models built up from theoretical arguments that specify customers’ decision processes. Variables are kept endogenous wherever possible. Erdem and Keane (1996) is a prize winning paper that has extended choice modeling in this direction.

The evolution of choice modeling continues. Smith and Brynjolfsson (2001) cite GL98 as they use the nested logit to investigate consumer switching behavior across internet portals.

### 4. Conclusions

Guadagni and Little (1983) and their follow-on research comprise a prototype of advances in theory and practice emanating from a university. An academic, with goals that included contributing to both theory and practice, cooperated with a practice-oriented student and a consulting firm to acquire data, build and calibrate a model, and publish the results in a top journal. Contributions to practice followed, as did further publications and new practice in a broadening cycle that went far beyond the initial participants.

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### References

- Bucklin, R. E., J. M. Lattin. 1991. A two-state model of purchase incidence and brand choice. *Marketing Sci.* 10(1) 24–39.
- Bucklin, R. E., S. Gupta. 1992. Brand choice, purchase incidence, and segmentation: An integrated approach. *J. Marketing Res.* 29(May) 201–205.
- Bucklin, R. E., J. M. Lattin. 1992. A model product category competition among grocery retailers. *J. Retailing* 68(3) 271–293.
- Chintagunta, P. K. 1992. Heterogeneity in nested logit models: An estimation approach and empirical results. *Internat. J. Res. Marketing* 9(2) 161–175.
- Erdem, T., M. Keane. 1996. Decision-making under uncertainty: Capturing dynamic brand choice processes in turbulent consumer goods markets. *Marketing Sci.* 15(1) 1–20.
- Fader, P. S., B. G. S. Hardie. 1996. Modeling consumer choice among SKUs. *J. Marketing Res.* 33(November) 442–452.
- Guadagni, P. M., J. D. C. Little. 1983. A logit model of brand choice calibrated on scanner data. *Marketing Sci.* 2(3) 203–238.
- Guadagni, P. M., J. D. C. Little. 1998. When and what to buy: A nested logit model of coffee purchase. *J. Forecasting* 27 303–326.
- Little, J. D. C. 1994. Modeling Market Response in Large Customer Panels. R. C. Blattberg, R. Glazer, J. D. C. Little, eds. *The Marketing Information Revolution*. Harvard Business School Press, Boston, MA.