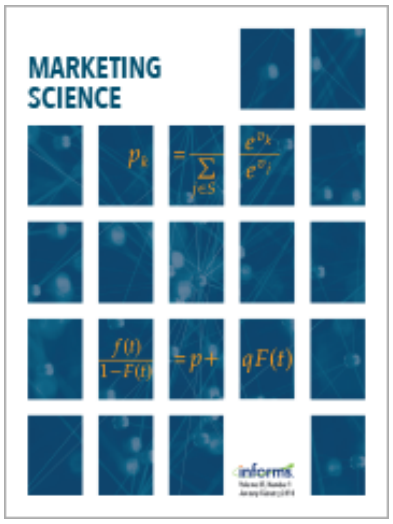

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Invited Commentary

Empirical Analysis of Theory-Based Models in Marketing

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There has been rapidly growing interest in structural models, and the review paper by Chintagunta et al. (2006) is a timely contribution. The paper identifies the key issues and provides an excellent assessment. A contemporaneous paper by Erdem et al. (2005) also offers a critical examination on some of the issues. My comments are in three areas. First, I selectively revisit some of the key issues in the paper and, in doing so, I hope I shed additional insight on these issues. Second, I discuss some of the recent papers that build on established psychological consumer behaviors. Third, I offer a brief list of potentially significant substantive problems for which structural models will be insightful.

1.1. Structural Versus Reduced-Form Models

At the outset, the review paper does an excellent job of discussing the structural versus reduced-form models. In particular, it is worth reiterating that predictive validation is not a compelling benchmark for assessing the merit of structural models. The paper carefully though cryptically states the merit of reduced-form models. Reduced-form models have their place and will continue to be a vigorous part of research in the field. Reduced-form models can identify unexpected empirical regularities that foster new theories. Since the work by Hauser and Shugan (1983), reaction to entry has been an issue of substantial interest. Contrary to expectations, Robinson (1988) and Bowman and Gatignon (1995) empirically show that the incumbent reacts only after a substantial time delay to entry. This surprising result led to the theory work by Kalra et al. (1998) that shows that delayed defensive reaction can arise in equilibrium. Also, a reduced-form model can advance our knowledge when a structural model of the same issue might be too difficult. Ainslie and Rossi (1998) study similarities in choice behavior across categories in an essentially reduced-form model. Yet, the work remains as the best on that issue even after several years. A structural formulation of this problem is extremely complex. An insistence on such a model, in all likelihood, would have led to no advance in this area.

Although invited commentaries are not formally peer-reviewed and represent the opinion of the author, authors were carefully chosen based on their outstanding expertise in the areas of their respective commentaries.

1.2. Partial Equilibrium Analysis

A number of papers have established that it is important to account for consumers' price expectations. A partial list includes Gönül and Srinivasan (1996), Erdem et al. (2003), and Sun et al. (2003). All these models underscore that the estimates are biased when such expectations are not incorporated. A natural issue that arises is what the rational firm should do as the Stakelberg leader? Modeling the demand *and* the supply side is critical to answer this question, yet such a full equilibrium analysis has remained largely elusive in most cases. The resulting model complexity and lack of data availability have hindered progress in this area. There is a real risk that continued partial equilibrium analysis will lead to the same inference in different contexts.

1.3. Limited Work on the Dynamic Supply-Side Analysis

The supply-side structural models have been gaining significant attention. They include uncovering the nature of competition such as Bertrand or Stakelberg (Kadiyali et al. 1996) or the significance of vertical differentiation (Besanko et al. 2003). Recently, Zhu et al. (2005) propose and estimate a structural model of entry across to investigate the determinants of cross-sectional differences in market structure in the retail discount store industry. Long-run changes in location, quality, and product offerings change the competitive marketplace. Estimating dynamic game-theoretic models is extremely complex and has hindered progress in this area. For example, Target, K-Mart, and WalMart were competitive in the first

15 years or so but diverged dramatically in their performances during the past 15 years (Zhu et al. 2005). An examination of this dynamic competition that has resulted in vastly divergent outcomes for the firms will be a significant research contribution. Without further investigation of competitive dynamics, the supply-side structural modeling will remain limited in its contribution.

2. Modeling Psychological Behavior in Structural Models

Structural models of brand choice typically have assumed that consumers' brand evaluations remain stable (e.g., Erdem and Keane 1996, Mehta et al. 2003). Rubin and Wenzel (1996) show in an experimental setting that consumers' imperfect recall is an increasing and concave function of time lapsed since the time of encoding the information. Mehta et al. (2004) show that incorporating forgetting in a structural Bayesian learning model provides an explanation for intertemporal and cross-sectional variation in both habit persistence and state dependence in purchase behavior. The forgetting model substantially improves over a model based on perfect recall. Mullainathan (2002) proposes a structural model of forgetting to study the impact of the imperfect recall of past predictors of consumers' future income on the present consumption decision. He incorporates the psychological concepts of "associativeness" and "rehearsal" in his model, and he derives the result that the probability of a consumer perfectly recalling a past predictor is an exponential function of the time lapsed.

In yet another attempt, Mehta et al. (2005) examine the issue of confirmatory bias in a structural model. In their paper, they investigate the influence of effect of advertising. Given the partisan source, consumers are likely to treat advertising as tentative claims subject to verification by consumption. At the time of consumption, however, their behavior will be consistent with the well-known confirmatory bias (Deighton 1984, Hoch and Ha 1986). In essence, they suggest and find empirical support that at the time of seeing the advertisement, the effect will be small but will be strongly reinforced upon consumption.

Most structural models on the demand side assume constant discounting by consumers. Lowenstein and Prelec (1992) and Laibson (1997) show evidence for a quasi-hyperbolic function. This is a fundamental issue that merits significant additional investigation. It might be interesting, for example, to estimate models with price expectations with such a discounting function. Because procrastination has been supported by such discounting, it might be useful to see if loyal or inert consumers vary in their discounting pattern when compared to consumers who often switch.

3. Substantive Issues That Merit Further Investigation

Information acquisition and interpretation is costly for consumers with limited cognitive resources. Search behavior with an explicit recognition of cost-benefit analysis is a ripe area for additional research. Mehta et al. (2003) show that price search is costly and, as a result, consumers often consider a small number of alternatives. Interestingly, in-store displays and feature ads do not influence quality perceptions. Models of sequential search, particularly in the area of durable goods, is an important and underresearched topic.

A fair and compelling criticism of structural models is the assumption that consumers have the ability to undertake daunting computational challenges. Consumers might often heuristics that might mimic the optimal conditions quite closely. A heuristical approach to solving complex optimization problems has a long history in the field of operations research, since the early work by Scarf (1960). Identifying consumer choice decision heuristics that might accomplish similar optimization will lend strong credence to structural models.

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