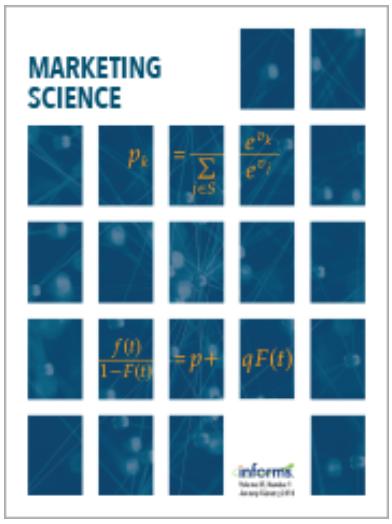

Marketing Science

Publication details, including instructions for authors and subscription information:
http://pubsonline.informs.org

Invited Commentary—Marketing Structural Models: "Keep It Real"

Michael J. Mazzeo,

To cite this article:
Michael J. Mazzeo, (2006) Invited Commentary—Marketing Structural Models: "Keep It Real". Marketing Science 25(6):617-619. https://doi.org/10.1287/mksc.1060.0235

MARKETING SCIENCE
Vol. 25, No. 6, November–December 2006, pp. 617–619
ISSN 0732-2399 | EISSN 1526-548X | 06 | 2506 | 0617

informs

DOI 10.1287/mksc.1060.0235

Invited Commentary

Marketing Structural Models: "Keep It Real"

Michael J. Mazzeo
Kellogg School of Management, Northwestern University, Evanston, Illinois 60208,
mazzeo@kellogg.northwestern.edu

In their article, "Structural Modeling in Marketing: Review and Assessment," Chintagunta, Erdem, Rossi, and Wedel (2006) provide a comprehensive survey of the contributions to the empirical marketing literature made by researchers using structural econometric modeling. More importantly, their review poses the question of whether structural methods should become more prominent in marketing research. Addressing that question requires a careful consideration of the potential gains of employing structure in this context, as well as the compromises necessary for implementation. Instead of specifically referencing many of the interesting papers cited by the authors, I will focus my comment on evaluating the value of structural approaches in marketing in more general terms.

Key words: structural modeling; empirical industrial organization

1. The Value of Structure: It Depends on What You Want to Know

Most simply put, a structural model uses a behavioral specification of economic agents (consumers and/or firms) to derive a relationship between endogenous and exogenous variables that may be observed by an empirical researcher. Structural models are most typically contrasted with *reduced-form* empirical approaches, where a "theory-free" statistical analysis is conducted to determine the relationship between economic values of interest.[1] Absent structure, an OLS regression of Y on X will produce the best linear predictor of Y given X. In some contexts—in particular, when the researcher hopes to isolate the correlation of a single variable when the relationships among multiple Xs are confounded—such basic statistical associations are potentially quite useful. If the analyst is convinced that the interactions that produced the data have not changed fundamentally (an assumption that may be as strong as any a structuralist would impose), such correlations may be appropriate for predictive purposes, as outlined in the article.

However, to the extent that the goal of the researcher goes beyond identifying statistical correlations, reduced-form analysis will be insufficient. Even for prediction, if the departure from X is too great, historical data cannot provide a useful benchmark for predicting Y. Furthermore, without structure, little can be inferred about causation from any revealed correlation. Estimating empirical relationships derived from economic theory, in contrast, will produce behavioral parameters that are inherently more fundamental and useful in counterfactual analysis. Because making recommendations to practitioners about the impacts of their actions is a prominent goal of marketing research, structural empirical analysis has a natural application in this field.

Other applications of structural estimation are not likely to be as applicable in marketing research.[2] Behavioral utility parameters can be used to make consumer welfare calculations, which are useful for public policy questions such as merger analysis. When tied to particular economic theories, parameters from structural estimation can be used to test these theories—again, this is not typically the goal of marketing research. Furthermore, the article usefully points out that marketing researchers must grapple with the underlying presumption of optimality when using structural methods. How can a marketing researcher recommend an action that would improve a firm's profitability based on an analysis that assumes firms were *already* maximizing profits? In such cases, it may be more appropriate to

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] Somewhere in-between are approaches that are experimental or that exploit some "natural" experiment to make causal inferences. These methods may have considerable promise, depending on the specifics of the application.

[2] These applications are much more relevant given the types of questions asked by industrial organization economists. Reiss and Wolak's (Forthcoming) review article provides a thorough treatment of the impact of structural modeling in empirical industrial organization.

frame a result in terms of some type of constraint or implied switching cost associated with the alternative policy. For example, the Chintagunta et al. (2003) paper finds that the supermarket they study can earn higher profits by changing the configurations of zones in which different prices are charged. The authors propose and evaluate several explanations for why the observed (suboptimal) prices nonetheless obtain, which is appropriate in the context of structural modeling based on optimizing behavior.

2. Assumptions and Inferences: The Value of Keeping It Real

Empirical structural modeling necessarily requires the researcher to formulate the theory of economic behavior from which the estimating equations derive. This could be considered either a bug or a feature, depending on how realistic the underlying theoretical formulation is. One needs only to take a quick skim over the theoretical industrial organization literature to appreciate the wide variety of (often conflicting) assumptions and findings regarding the strategic interactions of consumers and firms. Even if there is general agreement about the appropriate underlying theory, additional simplifying assumptions may be necessary to formulate an implementable econometric model given the data available to the researcher. Ultimately, the inferences that can be drawn from structural models become weaker as the abstraction from reality embodied in the theoretical assumptions increases.

As such, it is crucial for the analyst to be completely forthcoming about the assumptions in his or her structural model—distinguishing between those that reflect the author's preferred specification of the true underlying behavior and those that are compromises required due to estimation difficulties or data limitations. It is absolutely essential for readers to be able to evaluate these assumptions along with the empirical findings. For example, in his paper on retail franchises in the fast-food industry, Thomadsen (2005) carefully lists the specific assumptions about industry supply and market competition that are needed to estimate demand parameters without quantity information. This enumeration is accompanied by some evidence (both anecdotal and quantitative) to justify the assumptions and some introspection regarding the consequences of possible deviation from what is assumed.

The process of vetting and justifying assumptions is crucial for more than its own sake. Depending on the application, an implausible identifying assumption can lead directly to substantially biased empirical findings. Bresnahan's (1998) critique of Hausman's (1997) instrumentation approach (treating prices of products in other geographic markets as uncorrelated) is notable in that it includes both (1) a plausible alternative story that contradicts the maintained assumptions (related to unobserved national advertising) and (2) a clear presentation of the consequences on the estimated results. To generate convincing empirical findings that are useful to its audience, structural work needs to demonstrate that it is not subject to criticism on *at least one* of these dimensions.

This last point is worth emphasizing, because in some marketing applications the real underlying economic relationships may involve many interacting agents whose behavior is difficult to simultaneously incorporate into an econometric model. For example, the analysis of competition among manufacturers in a consumer packaged-good industry using data on consumer demand may or may not be compromised by the particular treatment of retailers in the model. To the extent that the chosen treatment abstracts from reality, it is the job of the researcher to demonstrate that the specification does not drive the empirical results. If that can be established, the findings are immune to a complaint that "retailer behavior is not modeled appropriately"—even if it is not, it does not matter. An analog may be found in the industrial organization literature on entry and product choice. Researchers have acknowledged that simplifying assumptions regarding the competitive interaction among firms and potential entrants are necessary to estimate any structural model, and so have attempted to demonstrate the impact of alternative sets of assumptions on the results.[3]

3. Conclusion

To conclude, it is useful to once again recall the comparison to reduced-form analysis. While structural work certainly requires more assumptions (and these assumptions may be difficult to justify), I would disagree with Chintagunta et al. that this represents a relative weakness as compared to reduced-form modeling. Beyond the statistical correlations, not much can be inferred without some theoretical basis for the estimation. This limits the usefulness of the results for practitioners absent a very strong assumption—that all the behavior underlying the observed data will persist. In contrast, well-argued structural work permits specific inferences about behavioral parameters that can potentially be used to answer questions about changes in the economic environment. While it is true that any inferences are

[3] For example, Mazzeo (2002) employs two different formulations of competition; these generate two distinct econometric models, but produce very similar estimated parameters. Ciliberto and Tamer (2006) explore this same idea by estimating parameter bounds encompassing the full range of potential assumptions where the true nature of competition is unobserved by the researcher.

strictly conditional on the maintained assumptions, the extent to which the conditions imposed weaken the inferences will vary. The ultimate influence of structural analytical methods in marketing (and other fields) will depend on a comparison between these stronger yet conditional inferences and what can be learned from theory-free statistical association.

Acknowledgment

The author thanks his colleague, Leemore Dafny, for helpful comments.

References

Bresnahan, T. F. 1998. The Apple-Cinnamon Cheerios war: Valuing new goods, identifying market power and economic measurement. Working paper, Stanford Department of Economics, Stanford University, Stanford, CA.

Chintagunta, P. K., J. P. Dube, V. Singh. 2003. Balancing profitability and customer welfare in a supermarket chain. *Quant. Marketing Econom.* **1**(1) 111–147.

Chintagunta, P. K., T. Erdem, P. Rossi, M. Wedel. 2006. Structural modeling in marketing: Review and assessment. *Marketing Sci.* **25**(6) 604–616.

Ciliberto, F., E. Tamer. 2006. Market structure and multiple equilibria in the airline industry. Working paper, University of Virginia, Charlottesville, VA.

Hausman, J. 1997. Valuation of new goods under perfect and imperfect competition. T. F. Bresnahan, R. Gordon, eds. *The Economics of New Goods*. University of Chicago Press, Chicago, IL.

Mazzeo, M. J. 2002. Product choice and oligopoly market structure. *RAND J. Econom.* **33**(2) 221–242.

Reiss, P. C., F. A. Wolak. Structural econometric modeling: Rationales and examples from industrial organization. *Handbook of Econometrics*. Forthcoming.

Thomadsen, R. 2005. The effect of ownership structure on prices in geographically differentiated industries. *RAND J. Econom.* **36**(4) 908–929.