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Pricing Theory and the Role of Marketing Science

Professor Rao provides a comprehensive review of pricing research in marketing science. I will not repeat the details here, save to say that the review indicates a diversity of pricing research within the developing field of marketing science.

Professor Rao's review and the other papers in this issue, from the second Rochester Conference on the interface of economics and marketing science, provide us with the opportunity to reflect on the continuing joint evolution of our two disciplines. As a marketing scientist who has found economic models and concepts useful in addressing marketing issues, let me comment on these evolutions from a marketing science perspective. However, as I portray these evolutions in the extreme, I note that the boundaries are fluid, with much overlap and merging of ideas and issues. Differences are in degree, not in fundamental philosophy.

In the extreme, price theory in economics deals with how markets behave while price theory in marketing science deals with how managers should act. It is true that one must understand how managers behave in order to model market behavior and that one must understand how markets behave in order to advise managers. The difference is not in the comprehensiveness of the analyses but in the emphasis. A typical economic analysis will simplify the model of the manager's task in order to study the essential forces of the market. In contrast, the typical marketing science analysis will simplify the model of the market mechanism in order to study the essential profit impacts of the actions by the marketing manager. I will comment more on these simplifications later.

Economics is a mature science with roots in the eighteenth century, when Adam Smith (1776) observed the English marketplace and formulated his famous "invisible hand" theory. Since then, the field has evolved in many rich and varied ways. A myriad of researchers has

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developed a series of elegant mathematical theories, as well as empirical evidence on how markets behave. Price response has been and continues to be at the core of economic science. (However, it would be misleading to suggest that economic theorists are univocal in their support of a single set of axioms and their implications. Witness the continuing debates among Keynesians, monetarists, supply siders, and other schools of thought.)

In contrast, marketing science is an embryonic science. It has its roots in early twentieth-century advertising research, but the explosion of systematic scientific study is less than 20 years old. As such, marketing science is still early in its life cycle. Steadily, a wealth of empirical observations are accumulating, and recently we have begun to see some empirically grounded marketing-science mathematical theories germinate. For example, Srinivasan (1981) and Jagpal (1982) have built upon Farley's (1964) theory of sales force compensation. Shugan (1983) has developed a theory of implicit understandings in channels to explain how price margins are allocated across channel members. Blattberg et al. (1978) merge economic theory and marketing observations in a theory of deal-prone consumers.

Clearly, to study pricing, marketing science can learn from and build on the body of economic theory much as Renaissance physicists learned from the ancient Greeks and modern physicists (special relativity, quantum mechanics, etc.) learned from Renaissance physicists. At the same time, economic scientists can learn from the fresh ideas and empirical observations of marketing science. In physics, in the sixteenth century, the Ptolemaic model had been elaborated upon for 14 centuries, but when Tycho Brahe set out to test and combine the Ptolemaic model with the newly formulated Copernican model, he collected empirical data that enabled his assistant, Johannes Kepler, to formulate a theory that changed our understanding of celestial mechanics. Perhaps marketing and economics scientists must question price theory when it conflicts with empirical observations.

With these perspectives in mind, let us now examine how each discipline can contribute to the other. I base my speculations on the state of the art reviews by Rao and Nagle.

Economics Offers Marketing a Theoretical Framework

It is clear from Nagle's paper in this issue that economics has developed theories for phenomena applicable to marketing problems. For example, bundling issues abound in book clubs, opera subscriptions, and even season tickets to the Boston Celtics. (Exhibition tickets are now included with a season ticket to regular season games.) "Self-enforcing agreements" may provide a key to unravel some of the mystery of power in channels of distribution. Search and experience attri-

butes are becoming more important as marketing scientists turn their interests more toward consumer durables. Two-part pricing is a key issue to many industrial marketers. Nonlinear pricing is all around us. Almost every frequently purchased consumer packaged good decreases in unit price as the size of the box increases. These issues have been addressed in the marketing literature; for instance, Guadagni and Little (1982) model choice for different sizes of coffee, but not within the elegant economic framework.

One issue that is not explicitly discussed by Nagle but pervades his review is the issue of market equilibrium. One of the strengths of economic theory is that many models consider not how a single firm reacts, but instead the end result of firms acting and reacting to one another until a stable price equilibrium is attained. By understanding such market equilibria, a manager can understand the long-term implications of his actions.

Equilibrium analysis has tremendous potential as more marketing scientists turn to strategic problems in which the reaction of a competitor can be as important as the reactions of consumers. Preceding today's strategic analyses, most marketing science models analyzed tactical decisions (advertising budgets, promotional campaigns, etc.). It was sufficient to merge competitive reaction with consumer response to treat it as an error term, because competitors were unlikely to react unless the change in tactics was sufficiently large. If the change was sufficiently large, competitive reaction could be handled by "what if" simulations. For example, Little (1975) models the impact of competitive actions but does not forecast these actions endogenously. Urban and Hauser (1980, pp. 343–54) present a "what if" example based on competitive reaction to the launch of a new laundry detergent.

Fortunately, equilibrium models are entering marketing thought. For example, Eliashberg (1981) analyzes a game theoretic equilibrium for marketing actions. Unfortunately, his analyses make a number of assumptions that many may find unacceptable and his model is limited to two actors, each allowed one action with two levels. Criticism can be leveled also against a model that Steven Shugan and I have developed for defensive strategy (Hauser and Shugan 1983). We analyze the equilibrium where only the attacking and defending brand can act, where all other brands are held constant. Despite these criticisms, I feel these marketing science models represent interesting first steps because, while they sacrifice some equilibrium considerations, they emphasize much more richness in marketing phenomena than I see in many economic equilibrium models.

However, the marketing scientist should proceed with caution into the quagmire of equilibrium analyses. To obtain analytic results, assumptions must be made. These assumptions may be appropriate when one's focus is the market but may be overly restrictive for marketing

problems. For example, symmetry, uniformly distributed tastes, and unidimensional quality scales are not uncommon assumptions. Some equilibrium analyses require that firms act as if their competitor holds a constant strategy (although the firm may predict where such myopic unilateral behavior will lead).

It is incumbent on marketing scientists to adapt, not simply adopt, economic theory. For example, Lancaster (1980) and Lane (1980) solve price equilibria, but in doing so make a large number of simplifying assumptions, one of which is uniformly distributed consumer tastes. In analyzing a similar problem from a marketing perspective, Shugan and I found that the direction of price response potentially reverses if one relaxes the assumption of uniformly distributed tastes and hence allows market segmentation. However, we suggest that the new results may not reverse if one relaxes our assumption about equilibrium (see Hauser and Shugan 1983, theorems 2 and 5).

In sum, economic theorists have developed creative concepts, powerful analytic tools, and some interesting implications. Much of this work addresses problems that are important to the manager but which have only begun to be addressed by marketing scientists. However, the economic tools represent an opportunity, not a panacea. That opportunity will be realized only if the economic tools are used with caution and if their assumptions are scrutinized and adapted in the light of the massed empirical evidence of marketing science.

Marketing Offers Economics Empirical Grounding, Measurement, Consumer Models, and an Understanding of the Manager's Problems

Tycho Brahe's data did not differ by much from the predictions of Ptolemy and Copernicus, but they did differ. Fortunately, Kepler had such extreme faith in the accuracy of Brahe's data that he questioned both the Ptolemaic and Copernican models and in the process developed a revolutionary new theory of celestial mechanics. Kepler's Laws, as his theory became known, ultimately led Newton to formulate an even more basic theory.

For an interesting marketing science paper that uses empirical evidence to question the specification of two economic-theory-based models of advertising, I recommend Little (1979). Little first examines a variety of empirical studies to abstract five phenomena of advertising response that are well documented. He then examines the Vidale-Wolfe (1957) and Nerlove-Arrow (1962) advertising models in the light of these phenomena and finds them logically inconsistent with the phenomena. He goes on to identify a model, based on Lanchester's model of warfare (Kimball 1957), that (1) can handle most of the identified phenomena, (2) is as parsimonious as the Vidale-Wolfe and Nerlove-Arrow models, and (3) is more consistent with observed behavior. A

mathematical economic analysis based on the new model may someday yield excitingly rich and varied implications.

I know of no such unification based on marketing observations of price response. (Indeed, the accumulated data is not as extensive for price response as for advertising response.) But, I hope such a unification is forthcoming. At least marketing folk wisdom is available. Little (in private conversation) points out that temporary price reductions often differ from permanent price reductions because such "promotions" are usually tied in with special "end-aisle displays," "shelf-talkers," and supplementary advertising. These actions have an effect beyond simple price elasticity. Blattberg et al. (1978) suggest that certain consumers anticipate a return to the steady-state price and so increase their home inventory. In the future, with the advent of large transactional data bases based on universal product code (UPC) panels, an improved empirically grounded price-response theory may question the foundations of some economic models.

Side by side with accumulated empirical experience is marketing's focus on measurement. To be successful, normative models must be used and to use them, one must be able to measure parameters. (I note, however, that new theory may be based on new interpretations of previous measurement. It may not need new measurement.)

Examples of measurement abound. Hanssens (1980) uses ARIMA models to estimate price elasticity. Goldberg, Green, and Wind (in this issue) use a direct measurement procedure called conjoint measurement to obtain a distribution of "utility" functions mapping price and product attributes into a preference scale. Guadagni and Little (1982) use logit models calibrated on UPC data to obtain market response to price and promotion. And, some of my own work (Hauser and Simmie 1981, Hauser and Gaskin 1983, and Hauser and Shugan 1983) uses price-scaled perceptual mapping procedures to model price response.[1] I have no doubt that, with the appropriate caveats and with reasonable error bounds, these and other marketing science procedures can parameterize economic models of price response.

Price response may not be separable from consumer information processing. Price carries cues that influence consumers' perceptions and agendas; price helps consumers frame decisions; and price may be more than just time and money.[2] Many marketing scientists have focused on consumer information processing. These models of con-

1. That is, perceptual maps in which the dimensions are attributes such as "effectiveness" per dollar rather than simply effectiveness.

2. Consumers can, e.g., infer perceptions of quality from price or use price to screen products from their choice sets (i.e., form a sequential or agenda-based decision rule) (see Hauser and Tversky 1983). Price may also form a reference value from which gains and losses are measured. Since perceived gains are not symmetric with perceived losses, such reference values can influence choices. See Tversky and Kahneman (1981).

sumer response are rich in psychological phenomena and are often empirically grounded. Merging these models with mathematical economic theory holds unbounded potential for new insights. Rather than review this literature in detail, I refer the reader to Bettman (1979), Shugan (1980), Tversky and Kahneman (1981), and Sternthal and Craig (1982).

Finally, marketing scientists, by self-selection, tend to be close to managerial decision making. Hence, normative and descriptive marketing science models are developed to incorporate decision variables that are of interest to marketing managers. Thus, at the level of the firm, the models are often more complex than corresponding economics models. This added complexity is both necessary and relevant. Sometimes price-setting actions can be decoupled from other marketing actions (see, e.g., Hauser and Shugan 1983, theorem 6), but in other cases they cannot (e.g., Shugan 1983). Perhaps, ultimately, the essential marketing phenomena can be abstracted from the complexity of today's marketing models. The process of abstraction and the incorporation of new marketing phenomena in economic theory will improve the theoretical base in both disciplines.

Some Challenges

It is easy to suggest the need for a unified comprehensive model, but such a comprehensive model may be too complex to be useful. I feel the greatest opportunity for cross-fertilization is in understanding the appropriate trade-offs for the problems being addressed. When the focus is on market behavior, the challenge is to abstract essential marketing phenomena to which policy implications are sensitive. When the focus is on normative analyses for a target firm, the challenge is to adapt economic theory through marketing science modifications. This will ensure that actions that appear good in the short run are indeed in the long-term interests of the firm. Both challenges are exciting, rewarding, stimulating, formidable, intriguing, and fun.

Conferences such as this facilitate dialogue that encourages us to understand the "other" discipline and, in doing so, to understand our own discipline better. Such dialogue enables us to disencumber our own belief structures and to avoid religious fervor, such as that encountered in the sixteenth and seventeenth centuries by Copernicus, Kepler, and Galileo when they challenged established scientific theories.[3]

3. For those readers who have the history of science stored in the shadowy recesses of long-term memory, the model of celestial mechanics developed in A.D. 146 by Ptolemy put the earth at the center of the universe and explained the motion of the sun, the moon, and the stars as an amazingly complex set of spheres within spheres. In 1543 Copernicus placed the sun at the center with the earth revolving around it, but he had to retain Ptolemaic "epicycles" to explain some of the complex motions of planets. (Centuries before Ptolemy, a few Greek philosophers placed the sun at the center, but these ideas

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were discarded in favor of the Ptolemaic model.) Finally, in 1609, using the data of Tycho Brahe, Kepler published his three laws of motion, which explained the motion of the planets better. In 1916, of course, Einstein explained the precession of the orbit of Mercury with General Relativity, and . . .