

A reflection on analytical work in marketing: Three points of consensus

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Abstract This article presents three points of consensus about game-theoretic work in marketing: First, equilibrium analysis is necessary for studying situations that have strategic interactions. In many cases, empirical examination of these strategic scenarios is difficult or impossible, at least without the guidance of an equilibrium model.

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Second, more general models are not necessarily “better,” because institutional details matter. Thus, the appropriate compromise between generality and specificity depends on the scope of the research question. Finally, there should be a two-way road between theory and empirics—theory is necessary to interpret empirical results, while empirical findings should guide theoretical modeling choices.

Keywords Analytical work · Marketing · Game theory · Equilibrium analysis

1 Introduction

People make a wide variety of choices as consumers, managers, employers, and regulators. Most of these choices are not made in a vacuum but rather in a context of strategic interactions that make individual payoffs interdependent across the decision makers. This payoff interdependence leads to intertwined individual incentives, necessitating analysis of the entire system before one can predict and understand individual behavior. Analyzing such a complex system requires a precise mathematical framework to develop intuition and qualify theoretical predictions. A commonly used analytical framework is noncooperative game theory.

We organize the marketing literature rooted in the paradigm of game theory and present several general points on which the literature has reached a broad consensus. We also organize the literature according to three broad areas: competition, information, and market rules. This paper is not an exhaustive review of the literature. Instead, we use several particular examples from each area to illustrate the more general points of consensus that characterize the discourse in the literature. The points of consensus we propose are as follows:

1. Equilibrium analysis within an analytical framework is necessary for testing and refining conventional wisdom about situations with strategic interactions. Equilibrium as a solution concept ensures stability of the system under study, and equilibrium behavior can depart sharply from simpler intuition that does not consider the feedback inherent in strategic interactions.
2. Theoretical predictions can be sensitive to details of the modeling assumptions, making general predictions elusive. A trade-off exists between the generality of modeling assumptions and the usefulness of the resulting insights in answering a concrete question in a specific institutional situation. Therefore, more general models are not necessarily “better,” and the appropriate compromise between generality and usefulness depends on the scope of the question. Further, understanding which details significantly affect a theory's predictions can be informative in its own right.
3. A two-way road should exist between theory and empirics. In one direction, theory can inform data analysis. In the other direction, empirical analysis can inform the assumptions of the theory. Either way, we agree with Bass (1995, p. G12) that science is “a process of interaction between theory and data that leads to higher level explanations.”

These points are not new, as prior literature has discussed some of them (e.g., Bass 1995). The contribution of this paper is in collecting the points and illustrating them for the benefit of all marketing researchers.

2 Competition

Researchers have studied competition among firms since marketing became an academic discipline, and within the field, we have strong intuition about the effect of competition on prices, profits, and entry. For example, it may seem obvious that prices and profits of all firms fall when more firms enter a market. Without an analytical framework for systematic investigation of strategic interactions among firms, refining and qualifying this basic intuition further is difficult. With an analytical model, we can study the underlying forces that weaken or strengthen the effect of increased competition on market outcomes. Once we specify the underlying fundamentals of consumer and firm preferences, we see that the above intuition is not general, and its validity depends on the details of the model assumptions. Increasing the number of firms from one to two always reduces profits, but strategic interactions become more important when the number increases further. Thomadsen et al. (2012) demonstrate that in horizontally differentiated markets, including Hotelling-style linear markets or Salop-style circular markets, profits of all firms can rise with the entry of a third (or higher) competitor. The reason behind this result is that entry can cause firms to switch from a mass-appeal low-price strategy to a niche-appeal high-price strategy; if the new entry increases prices but does not steal too many customers, then profits for all incumbents can increase. Another situation where profits rise with the number of firms is in the spokes model (Chen and Riordan 2007). This reversal of the standard intuition is an example of the general theme of the interaction between empirical analysis and theory: standard theory can sometimes put an unduly tight straightjacket on the data because “standard” models are not necessarily innocuous or “assumption-free.” Chen and Riordan (2010) provide another example of the need for flexibility by showing that competitive market outcomes depend on the correlation of consumer preferences.

Another example of seemingly general conventional wisdom is the principle of vertical differentiation—that firms should avoid offering goods of the same quality to mitigate price competition (Shaked and Sutton 1982). Considering concrete institutional details can qualify the principle's applicability by revealing how it interacts with other market forces. For example, consumer variety seeking mitigates competition between two firms selling multiple units of a good. Since such variety seeking is most prevalent whenever both firms offer the same quality, the softening of price competition gives each firm an incentive to match its competitor in quality. Zeithammer and Thomadsen (2012) show that the resulting increase in profits is greater than differentiated firms could achieve, so the principle of differentiation does not hold with consumer variety seeking. This is a good example of a model both motivated by empirics (variety seeking has been documented in the consumer behavior literature) and a model that informs empirical analysis of entry.

Retail channel settings—another classic marketing topic—often involve complex interdependencies between channel members and competition among players both across and within each layer of the channel. This complexity again requires an analytical framework for modeling the entire system. The discipline has certainly made progress in developing intuition around channel conflict and double marginalization. The scope of these insights remains to be determined, and conventional wisdom is again sensitive to institutional details. When a manufacturer supplies two competing retailers, we can presume contracts will be renegotiated after downstream demand is realized, but how such renegotiation influences the retail competition is not a priori clear. Guo and Iyer

(2010) find that the ability to renegotiate with the manufacturer can reduce retail competition because the higher-priced retailer may win the favor of an exclusive contract. The manufacturer is willing to support such a reduction in retail competition because favoring one retailer can increase the manufacturer's bargaining power.

3 Information

A key ingredient of every game-theoretic model is the information each of the players possesses. In a market setting, most information is endogenous because it needs to be learned, either from a third-party signal or from other players (competitors, consumers, employees, suppliers, etc.). Such information endogeneity is another good reason for having an analytical framework. A classic example of information playing a crucial role occurs whenever a consumer needs to learn about a product before purchase. Sun et al. (2012) consider the consumer incentives to engage in such learning, and they find that a higher price can encourage consumers to research the product more instead of exiting the market. Hence, a higher price may result in a higher consumer willingness to pay—an effect documented empirically but often attributed to purely psychological sources. A new assumption about consumer uncertainty thus produces an empirically testable explanation of a puzzling phenomenon in consumer behavior. Sun et al. (2012) also show that despite the higher willingness to pay, consumer search may lead to a lower purchase incidence. As a result, they find it is not always in the seller's best interest to facilitate search.

When consumers have to learn the information from others, understanding not only the incentive to learn but also the incentive to reveal, and their often subtle interaction, is important. Godes and Mayzlin (2010) study the problem of an employer trying to credibly signal the nature of a task to potential employees, and they show that incentives can both motivate and communicate. That is, their model considers informational asymmetry over the ease of the selling task in that some firms have easy-to-sell products (“easy” products) and others have hard-to-sell products (“hard” products). The distinction is that easy products yield higher expected sales for a given level of salesperson effort. The potential hire is not able to observe the firm type prior to employment. Hence, in this situation, the shape of the compensation can signal the firm type to the potential hire, in addition to motivating the employee to expend high effort. Specifically, the cost of turnover can compel the hard-product employer not to mimic the steep incentive contract of an easy-product employer. A salesperson who works for a firm with a steep scheme expects to earn little when her sales are low since the pay scheme is moderate at the low end of the outcome distribution. On the other hand, she expects to earn a lot when her sales are high since the commission slope is steep at the high end of the distribution. We assume the informational asymmetry is resolved after the salesperson's experience at the company allows her to accurately assess the expected sales outcome for future periods. Then, she decides whether she should stay with the firm or leave. If she were to leave, replacing her would be costly for the firm. Hence, a hard-product firm would have a high probability of turnover if it claims its products are easy and offers a steep compensation plan. In this sense, the firm's adoption of the steep scheme “keeps the firm honest;” that is, it serves as the firm's commitment device, ensuring the salesperson that her sales will be on the high end. By understanding these employer incentives, potential employees come to believe that steeper incentives credibly signal an easier

task. This finding has important implications for our interpretation of real-world contracts because we need to think of them as not only incentive schemes but also as attempts to communicate non-verifiable information that has the potential to increase efficiency and change the balance of bargaining power within the interaction.

Shin and Sudhir (2010) find similar endogenous information themes in a completely different setting, namely, in customer-relationship management. Marketers have always understood that it can be profitable to learn about individual consumers today in order to better price-discriminate tomorrow. Firms routinely use customers' purchase-history data to better understand and learn about customers' preferences and use this information to optimize future prices (for an excellent review of this research area, see Fudenberg and Villas-Boas 2006). On the surface, it would seem that the ability to price discriminate based on what a firm learns about customer preferences should lead to greater profits. Yet, when consumers are savvy, such learning depends on their benevolence, and classic ratcheting arguments imply that forward-looking consumers who want to protect their future surplus may not be forthcoming about their valuation information (in order to protect their future surplus), and therefore, firms' profits may fall (Hart and Tirole 1988; Acquisti and Varian 2005; Villas-Boas 2004). The resulting delicate interaction is another example of an interdependent system that needs to be analyzed within a precise analytical framework and in which details of the assumptions are likely to have a strong impact on predictions. Shin et al. (2012) analyze a situation where some customers may cost more to serve than others. Firms then price discriminate based on this customer cost information as well as customers' preference information revealed through their past purchases. Under certain conditions, firms find that raising prices to "fire" high-cost (bad) customers is optimal, leading to profitable cost-based customer discrimination. Essentially, when cost-to-serve heterogeneity is large, the benefit from being able to discriminate between customers overwhelms the negative ratcheting effects due to consumers' strategic actions that prevent the firm from learning the information even if customers can endogenously choose the level of service (and thus cost to serve).

The above discussion may suggest more information is always "better" and that all firms should strive to learn as much as possible. This conjecture is a typical example of where single-agent intuition does not carry over to strategic settings. Pazgal and Soberman (2008, 2010) also focus on customer-relationship management, and they find that acquiring and using more information can sometimes make firms worse off despite their individual desire to gain more information. For example, identifying and differentiating between existing customers and new prospects can exacerbate price competition and lead to competing firms' mutual losses. However, learning not only about the identities of current customers but also about their preferences can be very profitable for the firms even in a competitive environment. On the consumer side, the authors show that being sophisticated and using the information customers possess about firms' pricing practices can actually harm forward-looking consumers when the firms correctly identify their intentions.

A notion much of the literature on information issues takes for granted is that all market participants hold beliefs consistent with reality. Orhun (2010) analyzes laboratory games designed to differentiate between beliefs and preferences, and she shows that the correlation between a person's own preferences and his/her beliefs about others in the same market makes identifying ultimate causes behind observed strategic behavior difficult. Orhun (2010) is another example of an analytical paper giving guidance to empirical researchers.

4 Market rules

So far, we have discussed a variety of market games that evolve out of the selfish interests of different participants in an exogenously determined institutional environment. However, in many industries, the environment itself, whether governed by formal government-sanctioned industry rules or informal norms, can change as the industry grows and matures. A compelling example is the music recording industry. It has witnessed the emergence not only of downloadable digital content but also of high-quality pirated music. The music industry initially embraced digital rights management (DRM) as an industry-wide means to fight piracy and thus increase the profits of all recording companies. Desai et al. (2011) challenge this conventional wisdom and show that, in certain cases, by removing DRM restrictions—thus making copying easier—the record labels can increase their profits and benefit all consumers. They build a specific model of a monopolist record label selling through two competing retailers—one specializing in traditional channels and the other in online channels. Moving from generality toward concreteness, they calibrate the model with behavioral and attitudinal data about consumers' preferences for CDs versus downloadable formats for music and their proclivities to steal or acquire pirated music. This model is thus a great example of the “other direction” on the two-way road between theory and empirical work. Desai et al. (2011) find that although DRM indeed reduces piracy, it may actually decrease the label's profits by destroying consumer value, because DRM imposes constraints on both the legal and the illegal users. Moreover, because only a legal user will purchase a DRM-restricted product, in a perverse sense, only the legal users will pay the price and suffer from the restrictions; illegal users will not be affected because the pirated product does not have DRM restrictions. The conventional line of thinking misses the impact of DRM technologies on the nature of competition in the legal music market, which in turn affects the consumers' proclivity to steal. In other words, because the label's DRM decisions affect wholesale prices, retailer incentives, retail prices, the level of competition in the market, and the incentives for consumers to steal, the net effect on profitability depends on the conditions the DRM technology imposes—in some cases, it improves profits for the label and, in other cases, it decreases them. Note that this insight could only be gleaned through an analytic model of the entire industry: the data yield insights about consumer behavior, but only an analytical framework can capture the complex interactions among the strategic players.

Market rules interact with competition in unexpected ways that are often best understood within a systematic analytical framework. A mantra of regulators worldwide is that competition is good for economic efficiency. However, this intuition is based on holding the compliance with market rules, such as consumer or environmental protection, constant as competition increases. Branco and Villas-Boas (2010) challenge this assumption by observing that compliance with rules is usually costly, and most real-world rules involve gray areas in which violators are not necessarily brought to justice. Because increased competition reduces the profits of most firms in a given industry, it reduces the consequences of getting caught while simultaneously reducing the marginal efficiency boost. Therefore, the cumulative detrimental effects of noncompliance can outweigh the efficiency benefits, and social welfare declines as competition increases. In contrast to the Desai et al. (2011) model, which is fine tuned

like a sharp photograph to answer a concrete question in a specific institutional situation, the Branco and Villas-Boas' model (2010) is painted in broad brushstrokes like a Japanese calligraphy to expose a general phenomenon permeating many settings. Yet, both papers have obvious merit stemming from the relevance and scope of the questions they answer.

5 Discussion

We believe theoretical modelers can usefully think of models as being concerned primarily with competition, information, and rules, because many of the harder questions to tackle both theoretically and empirically revolve around these themes, as illustrated by the papers discussed above. This classification is not meant to be a taxonomy but a convenient way to think about themes in theoretical modeling. Although each of these three broad areas place unique demands on modeling techniques and analytical methods, they share the common goal of improving our understanding of the forces at work in marketing situations. They also broadly share assumptions and methods.

In the past, there have been calls for theoretical modelers to pursue new directions with respect to both assumptions and methods. These include the need for linking theoretical modeling to marketing generalizations (Bass 1995), for investigations focusing on marketing actions that can be called rules (Shugan 2005), for theoretical analysis of those issues that are inherently hard to examine empirically (Coughlan et al. 2010), and for greater integration of behavioral regularities in theoretical models (Meyer et al. 2010). These are important ideas that theoretical modelers would do well to heed. How then are some of the current efforts faring at capturing these in theoretical models?

Bass (1995) argued for an interaction between empirical findings, in the form of empirical generalizations, and theoretical modeling. Going back and forth between observations and theory helps increase our understanding of marketing. Bass is emphatic that both ETET, empirics followed by theory in turn followed by empirics, and TETE, the same sequence starting with theory, are good ways to proceed. As an example cited in this paper, we observe that in some real-world industries, prices and profits rise after entry. A theoretical model can reproduce this empirical observation. In turn, the theoretical model can offer guidance to empirical researchers on the best way to formulate their models.

Shugan (2005) argues that game theory is an important framework for modeling and understanding “mutually beneficial transactions (i.e., a primary role of the marketing function)” (p. 527). His taxonomy of game-theoretic models in marketing focuses on inescapable games that must be played versus games with endogenous entry, such as bidders choosing whether to participate in an auction or retailers deciding whether to enter into a franchise agreement. In games with endogenous entry, Shugan emphasizes the importance of setting the rules of the game to facilitate a mutually beneficial entry, that is, setting the rules to realize potential gains from trade. The Desai et al. (2011) paper is a great example of a seemingly beneficial rule (DRM) hindering mutually profitable transactions from occurring.

Coughlan et al. (2010) have emphasized the role of theory in generating “insights that are conditional or strategic in nature, as opposed to first order or main effects.” Theory has an advantage in studying these more subtle effects because they are difficult to disentangle empirically from other factors. An example is Guo and Iyer's (2010) paper on the effect of renegotiation in distribution channels. Empirical examination of their effect is likely to be challenge, as foreseen by Coughlan et al., but the theoretical model provides insight into why a manufacturer may actually favor a retailer that charges a higher price.

Meyer et al. (2010) emphasize the role of beliefs that agents have about other players in a game especially “when information is subjective and less easy to observe.” Consistent with this view, the analysis of Orhun's (2010) laboratory experiments discussed in this paper is concerned with the correlation between beliefs and preferences and how that correlation makes disentangling the effect of each on strategic behavior empirically difficult.

We can see that even as theoretical modeling is becoming thematic, it is moving in the right direction by responding to the many challenges that require innovations in both modeling and techniques. We have offered a glimpse into how researchers have responded to these challenges by addressing issues of practical import. In addition, the concrete examples in this paper also illustrate the developing points of consensus on the most productive ways to advance the marketing theory literature.

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