Research Statement
K. Sudhir

My primary research interest is in the empirical analysis of firms’ competitive marketing strategies. I have also worked on analytical research using game theoretic tools to complement my empirical interests. A second area of research interest is new product forecasting. I outline the key contributions and the themes underlying my research in this statement.

Primary Research Area: Empirical Analysis of Firms’ Competitive Marketing Strategies

Broad Positioning of My Research

Game theoretic analysis has highlighted the fact that competitive strategies are very sensitive to idiosyncratic characteristics of individual markets. This has led to a shift in emphasis from cross-industry studies (e.g. PIMS data studies based on the Structure-Conduct-Performance (SCP) paradigm) to industry-specific studies in both the Empirical Industrial Organization and Marketing literatures. In marketing, industry-specific analysis of competition traditionally used “reduced form” reaction function techniques. The reaction function approach does not isolate the strategic competitive effect from the demand and cost effects in evaluating firm choices. In contrast, I focus on structural models of competition that decompose the demand, cost and strategic behavior components. This decomposition enables me to make more insightful inferences about strategic competitive behavior.

I began this agenda of research in my dissertation. I continue to build on this agenda with papers addressing both substantive issues in competitive marketing strategy and methodological issues in estimating “structural” models of competition. I discuss below the three main themes along which my work has contributed to this literature.

1. Empirically Modeling the Retailer as a Strategic Player

Structural Modeling of Retailer: I am most associated with research on “structurally” modeling the retailer as a strategic player in empirical work. Early research, (e.g., Kadiyali et al., Journal of Business 1996; Journal of Econometrics 1998), assumed that the retailer is a “passive” player who charges a constant markup. While this assumption seemed reasonable, I showed mathematically in my job market essay [A1], that the constant markup assumption leads to an econometric model that is econometrically indistinguishable from the category profit maximizing retailer model. The proof suggested that the previous research may have interpreted category profit maximizing behavior by the retailer as evidence of cooperative behavior among manufacturers. Therefore, I argued that it is critical to model the retailer as a strategic player. My empirical analysis supported this argument.

Theoretical models suggested a number of alternative strategic manufacturer-retailer relationships (e.g., Manufacturer Stackelberg, Vertical Nash). To empirically determine the appropriate strategic
manufacturer-retailer interaction, I developed an approach to map alternative game-theoretic models of manufacturer-retailer interactions into empirically testable econometric models and use model fit to guide the inference of manufacturer-retailer strategic behavior. I found evidence of Manufacturer-Stackelberg leadership in my analysis.

This paper won the Bass dissertation paper award and has been very influential in generating further empirical work in both the marketing and economics literature. Berto Villas-Boas extends my analysis for the random coefficients logit model in her Economics PhD dissertation from UC Berkeley. In marketing, Villas-Boas and Zhao (JMR 2005) model manufacturer-retailer interactions using individual level data. Besanko, Dube and Gupta (Management Science, 2003) use a discrete heterogeneity logit model when modeling the strategic retailer. I have applied the refinements in Berto Villas-Boas and Villas-Boas and Zhao in papers coauthored with Hai Che and P.B. Seetharaman [B1] and Joseph Pancras [B2]. I discuss the substantive issues in [B1] and [B2] in subsequent sections.

**Store Brands:** With Sergio Meza [B3], I investigate the strategic role of the retailer in aiding store brand success. While previous research has focused on consumer demand and low manufacturing cost for store brands to explain their success, I find that the retailer uses its power to set retail prices to aid the success of store brands. The retailer sets higher prices for national brands that are in direct competition with its store brands and lower prices for national brands that are not in direct competition with the store brands. Thus the retailer uses its ability to set retail prices strategically to help store brands gain market share.

Why does a retailer support store brands over national brands? There are several obvious reasons. In [A2] (with Debu Talukdar), I test for one specific reason: Do store brands help improve store loyalty and reduce retail competition because they are unique to the store? Alternatively, do they reduce overall store profitability by increasing retail competition for price sensitive buyers? I find that consumers who buy store brands tend to be more store-loyal and more profitable, supporting the rationale that store brands help reduce the extent of retail competition.

**Retail Passthrough for Seasonal Products:** Many manufacturers offer trade promotion (lower wholesale prices to retailer) during high demand periods to obtain greater retail sales. But not all trade promotions are equally effective in increasing retail sales, because a strategic retailer will not necessarily passthrough all trade deals. In [A3] (with Sergio Mezo), I find that the retailer magnifies the trade promotions and offers a low retail price if the product drives aggregate store demand, but the retailer does not increase passthrough if the product has limited impact on aggregate store demand. This suggests that only manufacturers who sell products that drive aggregate store demand will benefit from trade promotions in high demand periods.
New Product Acceptance by Retailer: Retailers decide which new products to stock in their stores. Slotting allowances are lump-sum payments paid by manufacturers to a retailer to obtain shelf-space for new products. There is considerable debate among academics, regulators and practitioners on whether slotting allowances for new products enhance efficiency or hinder competition. But thus far, there has been no empirical work on this problem, due to lack of data. In [A4], I (with Vithala Rao) shed empirical light on this issue by analyzing an unusually detailed dataset of over a 1000 new products that were offered to a retailer during a six month period. The data contained information on the terms of trade offered by manufacturers (including slotting allowances), and the retailer decisions about whether to accept or reject the product. I find empirical support for several efficiency-enhancing rationales and little support for anti-competitive ones. Therefore I conclude that the FTC was probably right in being circumspect about banning slotting allowances outright as is typically demanded by small manufacturers.

2. Richer Modeling of Demand and its Impact on Inference of Competitive Behavior

Modeling Consumer Heterogeneity with Aggregate Level Data: Demand-side marketing researchers have routinely estimated rich models of consumer choice (modeling heterogeneity, state dependence, consideration sets, etc.) in a logit framework using household data. But early empirical research on competitive behavior estimated reduced form linear or log linear demand models using aggregate data. Thus the two streams of research were evolving independently.

Since demand characteristics such as heterogeneity and state dependence significantly impact aggregate demand elasticities, I believed that an accurate inference of strategic behavior requires one to correctly “control” for these demand effects. When Berry, Levinsohn and Pakes (1995) showed how flexible random coefficient logit models that account for consumer heterogeneity could be estimated using aggregate data, I was excited about the possibility of bringing closer the demand and supply side streams of research by modeling consumer heterogeneity using aggregate data. I also believed that an important side effect of bringing these two streams of research together would be to broaden the set of researchers interested in the emerging area of empirical analysis of competitive marketing strategy.

In my second dissertation essay [A5], I therefore introduced the flexible random coefficients logit demand model as an ingredient of empirical analysis of competitive strategy into the marketing literature. I followed BLP in estimating a random coefficients logit model of demand of the US auto market. Given my interest in inferring competitive strategies among firms, I extended the BLP model on the supply side to infer competitive behavior. As I expected, this has led to a flurry of research and the random coefficients logit model is now the staple demand side model when researchers in marketing analyze competitive strategies. In the 2001 Triennial Choice Conference (organized by UC Berkeley), a panel of researchers from marketing and economics focused on these applications. I was invited to be a member of
this panel. We published a paper titled “Structural Applications of the Logit Model” in the journal *Marketing Letters* [A6] based on the panel discussions.

**Time-Varying Preferences and Competitive Market Structure:** A key assumption in BLP and much of the literature on the auto market including [A5] is that the underlying consumer preferences for products are invariant over time. This is unreasonable when demand systems are measured using data over decades. For example in the last twenty years consumer preferences for minivans, sedans and SUVs have considerably evolved over time. In [B4] (with Jackie Luan), I address the problem of inferring evolving preferences as a new product form gains consumer acceptance over time. I develop an integrated Generalized Method of Moments (GMM) estimation procedure that combines the accuracy of sales information in aggregate data with rich and detailed information on evolving consumer preferences in repeated cross-sectional consumer choice data to identify such a model. The method enables us to obtain interesting insights on how competition between SUVs, minivans and sedans has evolved over time.

**State Dependence and Forward Looking Behavior among Manufacturers and Retailers:** I continue to work towards my goal of embedding insights from pure demand side research into supply side analysis of competitive behavior. In work with Hai Che and P.B. Seetharaman [B1], we explore the impact of state dependence on competitive behavior. We model two kinds of state dependence: (1) inertia, where past brand purchases increase the probability of buying the same brand and (2) variety seeking, where past brand purchases increase the probability of buying other brands. Specifically, we show that the high prices in the cereal market are due to low price elasticities induced by high levels of inertia and variety seeking and not due to the high levels of tacit cooperation among the firms. Further, we find that firms recognize the dynamics in price elasticities induced by consumer state dependence and are forward looking when setting prices. But their decision horizons are short, i.e., managers only look at the impact of their current decisions only one period into the future, a finding that is consistent with the notion of bounded rationality of managers. The implication is that assuming complex infinite horizon dynamic forward looking behavior by firms (routinely done in many extant research papers on firm dynamics) can yield less precise forecasts relative to simpler models that only account for “short-term” dynamics.

In [B1], we develop an attribute based inertia and variety seeking formulation that enables us to discover evidence of variety seeking among the over 100 brands in the breakfast cereal market. Related to this, I have developed (with Jack Lee and Joel Steckel) [A7] a stochastic choice formulation that accounts for variety seeking and inertia in consumer choice using the idea that consumers have multiple ideal points that may vary over time (variety seeking) or remain the same (inertia). We find evidence for both inertia and variety seeking among consumers. Apart from state dependence, I am currently investigating
the importance of modeling other aspects of consumer behavior on the inference of strategic behavior. For example, I am currently investigating the impact of consideration set formation on pricing with Joseph Pancras [C1].

**Functional Forms and Retail Passthrough:** In [A1], I also address the issue of appropriate demand side models when the retailer is a strategic player. Recent theoretical research shows that the demand functional form dictates the optimal passthrough by retailers. A linear or logit model always leads to optimal retail pass-through of less than 100%, while a multiplicative model always leads to optimal retail pass-through greater than 100%. Therefore, when calibrating decision support models for trade promotions, one should test for the appropriate functional form of demand not only in terms of fit to the demand data, but also on how much passthrough occurs in the market. In my analysis, the data favor the use of the logit demand model (relative to the multiplicative demand model) when accounting for strategic retailer behavior. Hence, even though the multiplicative model fit the data better on the demand side and is widely used in industry as a pure demand side model, it would be better to use the logit model in trade promotion decision support systems, where we need to account for strategic retailer behavior. The research has important theoretical implications for analytical papers modeling channel behavior, because their results about passthrough are affected by the functional form chosen by the modeler.

**Time-Varying Competition:** In many markets, prices fall as aggregate demand or costs increase. Yet, static game theoretic models typically suggest that an increase in demand or cost should cause an increase in prices. In [A8] (with Pradeep Chintagunta and Vrinda Kadiyali), I argue that the reason for this disparity between theoretical predictions and observed outcomes is that the theoretical models (and extant structural empirical models of differentiated product markets) do not allow competition to vary over time as a function of demand and costs. Apart from the direct effect of demand and cost on prices accounted for in extant models, we suggest that there is an indirect effect that intensifies competition as demand and cost increase and this intense competition leads to the fall in prices.

Theoretical analysis of repeated games (e.g. Rotemberg and Saloner, AER 1986) suggests that this indirect effect can be important. In this paper, I develop an empirical framework to measure both the direct and indirect effects. I find that that the indirect effects are very large in magnitude and can substantially improve the ability to forecast prices in the of the US photographic film market. I also test a number of alternative theoretical hypotheses on time varying competition in the economics literature. We hope our empirical results in this paper will encourage researchers in marketing to relax the currently routine assumption of “time invariant” competition. [A3] has a similar “time varying” spirit to this paper in which we look at how retail passthrough varies over time.
3. Promotions

**Personalization Services for Price Promotion:** One-to-one marketing has become increasingly feasible given the cost-effectiveness of data storage and targeted delivery technologies. In response, a personalization services industry that helps manufacturers and retailers to create personalized pricing, promotions and advertising programs targeted to consumers has emerged. In a paper with Joseph Pancras [B2], I take the first step towards empirically investigating the strategic decisions faced by such personalization services firms. Specifically, we investigate whether such personalization services firms should exclusively sell to only one client in the category (and thus restrict their demand, but potentially increase the value to the one client) or sell on a non-exclusive basis to any client willing to pay for the service (expand demand, but reduce potential value to each client). Further, increased accuracy of data may lead to greater price competition among clients (and therefore reduced value). We therefore jointly assess the questions of “who to sell to” (exclusive/non-exclusive), “what to sell” (the extent of accuracy) and at “what price.”

**Targeted Promotions on the Internet:** In [A9] (with Yuxin Chen), using game theoretic analysis, I address the question of how the convergence of low search cost and cheap, effective targeting affect the nature of price competition on the Internet. Theoretical research on search costs suggests that low search costs should lead to greater price competition. Theoretical research on targeting also suggests that the ability to target leads to greater price competition. Taken together, we may expect that low search costs and greater ability to target on the Internet will lead to greater price competition. In this paper, we argue that the effectiveness of targeting itself improves as search costs fall. We show that such targeted promotions can serve as an effective counterweight to keep average prices high despite the downward pressure on prices due to low search costs.

**Loyalty Programs and Promotions:** Many analytical models suggest that firms should charge higher prices from their loyal consumers, compared to switchers. Yet in many real markets, loyals receive lower prices than the switchers. While some analytical work has recently emerged to address this puzzle, I am developing an analytical model with Jiwoong Shin [C2] that sheds new insights. We incorporate two key facts from real world markets that have not been modeled in extant research: (1) the 80/20 rule that a disproportionate share of one’s business comes from a small share of customers and (2) firms have more information about their own customers than their competitors. Our analysis shows that firms indeed will treat their most profitable customers better (with better service, lower “real” prices), taking advantage of the greater information they have about their current customers (enabling them to identify the high/low revenue customers) relative to the competition.
**The Spatial and Temporal Dimension of Consumer Responses to Promotions:** In [B5] (with Dinesh Gauri and Debu Talukdar), I investigate consumer responses to promotions in grocery markets, where there are frequent and repeated promotions. Our key insight is that consumers take advantage of price promotions through cherry picking both on a temporal “when” dimension and a spatial “where” dimension. Our research sheds insights on who is likely to engage in spatial, temporal or both types of cherry picking. This perspective suggests that promotions have both an aggressive role (to draw other store’s consumers) and a defensive role (to keep price sensitive customers loyal to their preferred store rather than switch stores by helping them get lower average prices over time). This research has helped us understand the puzzle involved in why retailers price promote far more often than is warranted by the extent of store switching that is observed in equilibrium. I am currently developing an analytical model with Jiwoong Shin [C3] to explain this phenomenon.

**B. Secondary Research Interest: New Product Forecasting**

Many of my research papers discussed earlier have also addressed the issue of forecasting sales for existing products along with modeling competitive behavior. The following two papers focus primarily on forecasting for new products: (1) in the context of global marketing and (2) in the context of short life-cycle entertainment products.

**Global Marketing:** Marketing researchers have successfully used the Bass diffusion model to forecast new product sales with limited early sales data. In a global new product introduction context, firms usually have past sales data about how similar products diffused in the past in a country (country experience) and how the same product has diffused in other countries where the product was introduced earlier (product experience). In [A10], I developed a Hierarchical Bayes estimation procedure (with Debu Talukdar and Andrew Ainslie) to optimally combine past “country experiences” and “product experiences” to improve sales forecasting. An interesting finding is that product experiences are more useful in predicting the speed of diffusion, while country experiences are more useful in predicting eventual market size. In contrast to previous international studies that focused only on the developed countries of North America and Western Europe, we also analyze developed and developing countries from Asia and South America. We were thus able get richer insights about the differences in product diffusion across developed and developing countries. I am also beginning some new research (with Natasha Zhang) on optimal movie release timing strategies across a number of countries.

**Entertainment Products with Short Life Cycles:** Many entertainments products such as movies and DVDs have short product life cycles and marketers need to make their marketing mix decisions even
before the product is launched. Traditional experimentation approaches to calibrate price elasticity will not work in these markets. In a paper with Jackie Luan [B6], I develop an approach to forecast sales and advertising responsiveness to a DVD before the product launch using information about how the corresponding movie sold previously. While much work in marketing has focused on the issue of “intercept endogeneity,” i.e., unobserved to researcher factors known to managers that affects sales levels, a new methodological challenge here is the issue of “slope endogeneity,” i.e., there are unobserved factors about advertising responsiveness (the slope) that affects manager’s decisions about how much to advertise. We develop a new method to address this “slope endogeneity” problem in this paper. We find that extant methods ignoring this slope endogeneity underestimates advertising responsiveness by about 20%, leading to erroneous sales forecasts and recommendations for the optimal levels of advertising.

Future Areas of Work

In my third dissertation essay [A11] (coauthored with Vrinda Kadiyali and Vithala Rao), we review the extant literature on structural models of strategic behavior and offer a prospectus for potential future work in this area. This paper won the Honorable Mention Award for the Best Paper published in the International Journal of Research in Marketing in 2001. In 2004, at the Triennial Choice Conference organized by the University of Colorado, I chaired a session (along with JP Dube) on the new developments and potential future areas of research related to firm dynamics, positioning and entry/exit decisions. We published a paper titled “Recent Advances in Structural Modeling: Dynamics, Product Positioning and Entry” in the journal Marketing Letters [A12] based on the panel discussions. I believe [A11] has served as a road map for much of my research since my dissertation and [A12] outlines in more detail future research areas of interest in these select areas.

I am actively involved with many industry-collaborative research projects spawned by the Center for Customer Insights at Yale. For example, I am currently working on modeling dynamic customer lifetime value for a bank offering a portfolio of services and a consumer response model for bank promotions. I believe that industry practitioners can not only serve as useful data sources, but also help academics ask interesting and relevant research questions, that are intellectually challenging. For example, my interest in forecasting advertising responsiveness for new DVDs [B6] arose from my conversations with industry modelers working on this problem. The paper turned out to be both substantively important and methodologically challenging and at the same time useful for practitioners.

Conclusion

In summary, my research makes a number of substantive and methodological contributions in the empirical analysis of competitive marketing strategy. While my primary research interests are empirical, I
have also worked on analytical models using game-theoretic modeling. My work in new product forecasting across countries is illustrative of broader interests in areas such as global marketing.

My empirical research has covered a diverse range of industries. I have investigated the auto market, the personalization services market, the entertainment industry (movies and DVDs), retailing, the photographic film market and several frequently purchased consumer packaged goods markets (e.g. breakfast cereal, yogurt and ketchup) within the United States. I have also investigated a number of global markets using data on a range of technology products such as VCRs, fax machines, microwaves and CD players.

A key distinguishing aspect of my empirical research on competitive behavior is that the econometric modeling is closely integrated with theoretical assumptions (e.g., [A1], [B1] and [B2]). Further, the hypotheses and key findings in my papers are informed by a deep qualitative understanding of the insights from game-theoretic research (as exemplified in [A4 and A9]). I will continue to maintain these links in my future research, because of the great value in bridging the gap between theoretical and empirical research in understanding strategic behavior among firms.
List of Published Papers/Working Papers/Work in Progress

A. Published or Forthcoming Papers

B. Working Papers under Review
1. "Competitive Pricing under State Dependent Demand: Do Firms Look Ahead? How Far Ahead?" (with Hai Che and P.B. Seetharaman), under 2nd round review at Journal of Marketing Research.
2. "Personalization Services Firms: What to Sell, To Whom to Sell and For How Much" (with Joseph Pancras), revision for 2nd round being prepared for Journal of Marketing Research.
3. "In Favor or Out of Favor: Effects of the 80/20 Rule and Information Asymmetry on Designing Loyalty Programs," (with Jiwoong Shin), revision for 2nd round being prepared for Quantitative Marketing and Economics.

C. Work in Progress
2. “Punish or Reward Loyalists? The Effects of the 80/20 Rule and Information Asymmetry on Designing Loyalty Programs,” (with Jiwoun Shin).