

*Research Statement*

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## 1. BRIEF BIO

Scott Fay is an Assistant Professor of Marketing in the Warrington College of Business at the University of Florida. He received a Ph.D. in Economics from the University of Michigan in 2001. Professor Fay's research interests include reverse auctions, opaque products, the personalization process, the bundling of information goods, shipping fee schedules, retail price endings and consumer bankruptcy. His research has been published (or is in press) in *Marketing Science* (3 times), the *American Economic Review*, and in the *Journal of Retailing*. Professor Fay was elected and served two terms as the newsletter editor for INFORMS Society for Marketing Science (2002-2006), producing bi-annual newsletters for this organization. He serves on the editorial board and as a Guest Area Editor for *Marketing Science*. He is also a frequent ad hoc reviewer for several other journals, including *Management Science* and the *Journal of Marketing Research*.

## 2. OVERVIEW OF RESEARCH

### General Overview

My doctoral training is in the field of economics, specializing in game theory, industrial organization, and public finance. In transitioning from economics to marketing, my research approach has been to identify important substantive marketing problems and then to construct parsimonious analytical models that yield fundamental insights about firm and consumer behavior. I am particularly interested in examining how firms can harness the power of new technologies. The Internet and other new technologies have shaped (and continue to shape) the market environment in many interesting ways. Some specific examples of these effects include: reducing arbitrage by allowing the firm to attach a product or service to a particular customer (e.g., through electronic tickets), enabling firms to better learn customers' preferences (due to new data sources, such as cookies to track website navigation, and increased computing power to process such data), and transferring order assembly and delivery responsibilities from consumers to firms. E-retailers have experimented with a diverse range of business models in order to adapt to and capitalize upon these evolving market conditions. However, not all adopted strategies are necessarily profitable and not all of these business models have necessarily been optimally implemented. Thus, a consistent theme across my research is trying to identify unique and interesting retail strategies and then seeking to develop a fundamental understanding of how firms can best exploit these market opportunities. For example, the low transaction costs of interacting between customers and e-retailers (relative to brick-and-mortar firms), has enabled firms (such as *Priceline*) to ask customers to bid for their products rather than to post prices. I am interested in discovering how to structure reverse auctions optimally in B-to-C markets.

In the subsections that follow, I briefly describe the specific business models and market opportunities that I am interested in. These include (1) Reverse auctions in B-to-C markets; (2) Probabilistic Products; (3) The learning stage of the personalization process; (4) Shipping fee schedules; and (5) Bundling of information goods. In section 3, I provide more detailed descriptions of each of the publications and working papers that I refer to in Section 2. Full papers are available online at <http://plaza.ufl.edu/faysa/papers.htm>.

### Reverse Auctions

#### *Background*

As my extended family's unofficial travel agent, I am often searching the Internet for the best deals on airfare. I have become fascinated with the business model of *Priceline.com*. Rather than posting a price for a given itinerary, *Priceline* invites users to make their own offers, hence the slogan "Name-Your-Own-Price" (NYOP). In a traditional auction, the good is not sold until all bids are in and thus bidders compete against one another. In contrast, in the NYOP format offers are made and accepted sequentially, i.e., if the bid exceeds the unobserved threshold price. In my initial attempt to purchase from *Priceline*, my first question was, "What should I bid?" I tried something preposterously low which, not surprisingly, was promptly rejected. But, when I tried

raising my bid, I discovered that the website would not accept another bid from me for this itinerary for seven days. Determined to find a way around this single-bid restriction, I proceeded to enter another bid, but this time using a different credit card. Sure enough, my offer was allowed to go through (but was rejected due to still being too low). After going through my pile of credit cards, I wondered if anyone else had pursued such a strategy. A web search led me to BiddingForTravel.com, an online community which not only revealed that there were other consumers actively trying (and succeeding) in avoiding *Priceline*'s single-bid restriction, but also that there are a number of other loopholes in *Priceline*'s system. Furthermore, users post their exact bidding strategies along with their results. This provides a wealth of information to users in trying to formulate their own bid strategies (e.g., from this data one can estimate the probability a given bid will be accepted).

My observations spurred a number of research questions about how a firm could best utilize a NYOP selling format: Is it advantageous to restrict consumers to a single bid? If so, why? What is the impact of heterogeneity in customer sophistication (e.g., some consumers are aware of loopholes to avoid bidding restrictions why others are not aware of these loopholes)? How is a seller impacted as consumers become more knowledgeable in their bidding (e.g., they are able to more accurately estimate the distribution of the price threshold)? How often should a firm change its price threshold? One of my key research thrusts has been to address such questions in order to gain a better understanding about how to structure a NYOP selling format optimally. Thus far, I have produced four papers on this topic (which are briefly described below).

"Partial Repeat Bidding in the Name-Your-Own-Price Channel" *Marketing Science* (2004)

In this paper, I formally model the NYOP market from a firm's perspective in order to gain a more fundamental understanding of how to structure the NYOP mechanism. In particular, I focus on whether a firm benefits from limiting consumers to a single bid or whether a firm could be better off by allowing consumers to re-bid if a previous offer is rejected. Recall from the narrative above that *Priceline* imposes a single-bid restriction, but some consumers can circumvent this policy by masking their true identities or by following procedures outlined at BiddingForTravel.com. Thus, the actual environment at *Priceline* is best described as "partial repeat bidding," i.e., some less sophisticated consumers can only bid once per item, while more sophisticated consumers can submit multiple bids. In this paper, I introduce a model in order to examine whether a NYOP firm benefits from discouraging consumers from re-bidding if a previous offer was unsuccessful, being careful to account for how a bidding policy will impact bid levels and for the fact that single-bid restrictions can only be imperfectly enforced. I find that (compared to "partial repeat bidding") profit would be higher if all consumers were limited to a single bid or if all consumers were allowed to re-bid. Furthermore, profit is not monotonic in the amount of re-bidding. Therefore, a NYOP firm may increase its profits by encouraging, rather than discouraging, users to re-bid if complete elimination of all surreptitious re-bidding is costly and/or technically infeasible.

This paper has brought attention to a pricing mechanism that had previously received very little attention in the academic community. Thus, this paper spurred additional research as exemplified

by the 8 citations it has received according to SSCI and the 37 citations it has received according to Google Scholar (even though it was only published 3 years ago).

### " Reverse Pricing: The Role of Customer Expectations " (Working Paper)

This paper considers how consumers' expectations about the NYOP seller's (hidden) threshold price affect bidding behavior (i.e., whether consumers bid at all and how much they bid). Specifically, I examine how bidders' expectations affect a NYOP seller and how a seller is affected as consumers form more accurate expectations about its threshold price. While one might speculate that the NYOP seller's profits are eroded as consumers become better informed, I find that there are situations in which profit increases as consumers become better informed about the true price threshold. Interestingly, I find that uninformed customers can be detrimental to the firm either if these consumers are over-optimistic (i.e., consumers expect the threshold price is lower, on average, than it truly is) OR if consumers are sufficiently over-pessimistic (i.e., consumers think the price threshold is much higher than it truly is). These results are especially important because they suggest ways a NYOP seller can use its pricing rule to influence expectations and thus its profitability. For instance, if customers accurately anticipate the retailer's procedure for setting the threshold price, a seller may benefit from either (1) rejecting profitable bids in order to induce other consumers to form higher expectations (and thus place higher bids) or (2) accepting bids below its costs (in order to raise participation rates).

### "Competitive Reasons for the Name-Your-Own-Price Channel" (Working Paper)

Previous papers in the literature have revealed several disadvantages of the NYOP format relative to posted prices. In particular, due to uncertainty about the actual price threshold, consumers shade their bids (i.e., place bids that are well below their reservation values) and incur significant frictional costs when bidding. This paper asks the important question, "Why would a seller choose to use the NYOP format?". I show that the NYOP business model can help soften competition. When consumers differ in their frictional costs (i.e., the shopping hassle) they experience when bidding at a NYOP retailer, the NYOP format can be a mechanism for differentiating a retailer from a posted-price rival. Beyond providing a motivation for using a NYOP mechanism, competition also has important implications for the optimal structure of the NYOP format. For example, this paper shows that prohibiting re-bidding may benefit a NYOP firm by reducing price rivalry.

### "Implications of Expected Variability in the Seller's Threshold Price in Name-Your-Own-Price Auctions" (with Juliano Laran, Working Paper)

This paper considers the NYOP format from a dynamic perspective. It is clear that consumers anticipate that the threshold price may change over time. This paper studies the optimal bidding patterns in such an environment. Specifically, we explore how the magnitude of expected variability in the threshold price affects the optimal pattern of bid sequences (e.g., strictly increasing over time or following a non-monotonic pattern), the level of bids, and customer satisfaction. We find that consumers are reluctant to place high bids when they expect the threshold price to change over time. Thus, price threshold variability leads to overall lower bids. Interestingly, we find that when variability is modest, consumers may have an incentive to use non-monotonic bidding patterns. Rather than steadily increasing their bids over time, consumers

will, at some point in the bid sequence, decrease their bid. The empirical observations by Spann and Tellis (*Journal of Marketing*, 2006) suggest that actual consumer bidding behavior differs substantially from the normative predictions based on previous analytical models. Our model helps address this inconsistency by arguing that this “drop-bidding” phenomenon can be explained by the fact that consumers anticipate that the threshold price may have changed between their bids. These findings are important because they suggest that 1) models based on rational consumers remain valid in this market setting; 2) a NYOP seller needs to account for what information consumers have at their disposal because this information can significantly influence the timing, magnitude, and pattern of consumers’ bids, as well as customer satisfaction and likelihood of return; and 3) NYOP sellers have important decision variable at their disposal, i.e., how frequently they should change their threshold prices.

### **Probabilistic Products**

With my familiarity with the travel industry, I have also been intrigued by the opacity of *Priceline*’s travel service offerings, i.e., details of an itinerary (e.g., departure time, connection city, and airline) are not revealed until after a consumer has bid and his/her bid has been accepted. Furthermore, as a researcher, I see that *Priceline* operates in a complicated market environment with many unique industry characteristics, e.g., it is an online intermediary that depends on multiple suppliers (such as different airlines and hotel chains) and also competes with these suppliers’ direct channels, it is subject to special characteristics of the travel industry (such as a non-storable good with capacity constraints), and it sets prices via a complicated buyer bidding system. It is unclear whether other firms who are not subject to these specific industry characteristics might benefit from offering opaque goods. These observations have spawned a series of research questions: What is the benefit to a firm from hiding the product identity from consumers? How do consumers value such “opaque” products? Is this a general business model that can be useful to other sellers besides *Priceline*? Three research papers have resulted from seeking answers to these questions.

“Probabilistic Goods: A Creative Way of Selling Products and Services” (with Jinhong Xie, *Marketing Science*, forthcoming)

In this paper, we seek to uncover the fundamental factors required for a seller to benefit from hiding a product’s identity from consumers. We define the term, “probabilistic goods,” to define such virtual products which consist of offering a probability of getting any one of a set of multiple distinct items. We define “probabilistic selling” as the selling strategy under which the seller creates probabilistic goods using the seller’s existing distinct products or services (i.e., “component” goods) and offers such probabilistic goods to potential buyers as additional purchase choices. For example, a retailer selling two different colors of sweaters, red and green, may offer an additional “probabilistic sweater,” which can be either the red or green sweater. Or, a theatre that offers two different shows on a given weekend can sell an additional probabilistic ticket, which can be for either the Saturday night or Sunday night performance. Our objectives are to explore whether probabilistic selling can be a general marketing tool and to uncover the conditions for its profitability.

In this paper, we develop a formal model to better understand the fundamental motivations behind probabilistic selling. We find that probabilistic selling has the potential to benefit many sellers because it allows one to segment a market on the basis of variations across consumers on how strongly they prefer one component product over the other ones. This selling strategy is particularly beneficial when sellers are uncertain about demand across the component products and thus can provide a buffer against a seller's own demand uncertainty. These results are very important because they suggest that probabilistic selling can improve profits for sellers who operate in markets that are very dissimilar to *Priceline's*.

“Reducing Seller Uncertainty by Offering More Choices to Your Customers: Advance Selling vs. Probabilistic Selling,” (with Jinhong Xie, Working Paper)

In this paper, we explore whether probabilistic selling outperforms other mechanisms that are at a firm's disposal. In particular, we focus on advance selling and ask under what conditions (if any) a firm would benefit more from introducing probabilistic selling rather than from advance selling. We notice that probabilistic selling shares a similarity with advance selling – both selling strategies benefit the seller by introducing buyer uncertainty. Information asymmetry often negatively impacts sellers who use a conventional selling strategy (i.e., only sell component goods). Since consumers possess private information about their valuations for product or service offerings (i.e., the consumer knows his or her own valuations, but the seller does not observe these valuations), a seller cannot engage in first degree price discrimination. As a result, consumers with high valuations may end up obtaining a positive surplus while consumers with low valuations (but still larger than marginal cost) may not consume at all. We find that both advance selling and probabilistic selling can reduce or eliminate this information asymmetry – neither the consumer nor the seller will know their valuation from consumption if the sale takes place in advance of value realizations (as in advance selling) or if product assignments are made randomly (as in probabilistic selling). In this working paper, we find that although both advance selling and probabilistic selling introduce buyer uncertainty, these two mechanisms differ substantially in their underlying motivation. Advance selling allows the seller to homogenize consumers who would be differentiated at a later point in time, while probabilistic selling capitalizes on the heterogeneity by selling a probabilistic product to those consumers with low realizations and selling component products to those with high realizations for only one of the products. A primary contribution of this paper is that we show when and why each of these aforementioned selling strategies is preferred over the other. Interestingly, we identify conditions under which probabilistic selling and advance selling yield equivalent profit despite these differences.

“Selling an Opaque Product through an Intermediary: The Case of Disguising One's Product.” *Journal of Retailing* (2008)

In this paper, I seek to understand how an intermediary channel structure affects the profitability of probabilistic selling. I introduce a framework that more closely represents the business model employed by current sellers of probabilistic products, such as *Priceline*. In particular, the model incorporates an intermediary who sells probabilistic products and competes against service providers who provide the component services directly to consumers. I find that probabilistic

goods may allow service providers and manufacturers to appeal to the most price sensitive / least brand-loyal consumers, and thus can be a mechanism for reducing price competition in traditional markets. It is also possible that probabilistic selling can result in a prisoner's dilemma, i.e., an intermediary that sells probabilistic goods can reduce industry profits yet each supplier has an incentive to sell items through the intermediary.

### *Managerial and Commercial Applications*

These preceding three papers strive to provide insight about which product classes / market settings are most appropriate for probabilistic selling and thus also to guide firms' efforts to expand this business model beyond travel services. The results suggest that probabilistic selling has the potential to be commercially viable in a wide range of market settings. To explore this potential business opportunity, Jinhong Xie and I have identified a variety of mechanisms for creating and selling probabilistic goods. The University of Florida has identified our research as being promising commercially and, as a result, has provided legal and financial support for this endeavor. With the support of the university, we have filed for a full utility patent ("Systems and Methods for Creating Probabilistic Products and for Facilitating Probabilistic Selling"; Utility Patent Application, Serial Number 11/940,746; International Application Number PCT/US07/84809) and have taken initial steps towards introducing this technology into the marketplace. The preliminary response by retailers has been very encouraging. Thus, we are hopeful that many of our ideas will be implemented in practice and that, in turn, we will learn more about probabilistic selling (e.g., how consumers respond to probabilistic goods, what problems retailers face when implementing this selling strategy, and how to select the appropriate prices and composition of probabilistic products).

### **Personalization**

Emerging technologies (e.g., cookies, improved interfaces, and recommendation systems based upon case-based reasoning, collaborative filtering, dynamic taxonomy hierarchy, or fuzzy logic) allow firms to collect and interpret information about customers' preferences. Some of these tools can be costly to acquire and technically difficult to implement. Thus, retailers must be selective about which new technologies they adopt. In our working paper, "Strategic Implications of Alternative Learning Approaches in the Personalization Process" (with Debanjan Mitra and Qiong Wang, under review at the *Journal of Marketing Research*), we explore the strategic aspects of such adoption decisions. In particular, we are interested in how a firm can affect and is affected by the adoption decision of a rival firm, as well as the impact of these decisions on the degree of price rivalry within a market.

There is a general consensus in the marketing literature and in practice that customizing products and services provides a way for firms to increase their profits and to increase customer loyalty. However, personalization is only possible if a firm knows what a customer's "ideal" product is. Thus, a critical step in the personalization process is the learning stage in which a firm discovers customers' preferences (Murthi and Sarkar 2003). In our paper, we identify two distinct approaches for learning customer preferences: Solicited Learning (*S-Learning*) and Observational Learning (*O-Learning*). *S-Learning* occurs when products are personalized on the

basis of information “solicited” from the consumer at the time of purchase, e.g., at Nikeid.com a customer designs an athletic shoe by selecting each element to his/her specifications. *O-Learning* occurs when a firm learns a consumer’s preferences by “observing” that consumer during previous interactions, e.g., at Pandora.com, based on the user’s previous listening pattern, personalized recommendations are made as to which new releases s/he would most enjoy. Our paper seeks to understand the impact of these two approaches to learning on the degree of price competition and on which technology will be utilized by a competitor. In addition to our analytical model, we present two case studies and empirical evidence based on a survey of purchasing managers. This research is important because it helps firms assess which new technologies they should adopt. In particular, we argue that evaluation of a new technology should not be based solely upon how well it does at uncovering customers’ preferences, but that one should also consider how adoption of this technology may shape the competitive landscape of a market. For example, our research suggests that, in some circumstances, investing in *S-Learning* technology may help a firm obtain a long-term competitive advantage and, in other circumstances, investing in *O-Learning* technology may help create a mutually-profitable market.

### **Shipping Fee Schedules**

For online and direct retailers, their physical products are spatially separated from the customer at the time of purchase. Thus, such firms incur the costs of order assembly and delivery, and must decide how to charge for these services. Consumers, in a brick-and-mortar setting, may be used to assembling (e.g., filling their shopping carts with groceries) and delivering (e.g., loading the groceries into their cars and driving home) orders for themselves. Thus, consumers often respond negatively to having to pay for shipping and handling at an online retailer, and as a result, retailers are struggling to determine the optimal shipping fee schedules. Our paper, “An Empirical Study of the Impact of Nonlinear Shipping and Handling Fees on Purchase Incidence and Expenditure Decisions” (with Michael Lewis and Vishal Singh, *Marketing Science*, 2006) studies how shipping and handling charges impact customer order incidence and basket size, with empirical estimations based on data from an online grocer. Our analysis suggests that, although shipping fee promotions (e.g., “free shipping for large orders”) can impact order incidence and order size, the losses in revenue from shipping fees are likely to outweigh the increases in purchases from within a firm’s existing customer base. Although many retailers use shipping fee promotions, our analysis suggests for such promotions to be profitable, they need to induce sizeable jumps in customer acquisition rates.

### **Bundling of Information Goods**

Information goods (e.g., newspaper articles) are characterized by high fixed (first-copy) costs, but low costs for the production of additional copies. Although this cost structure characterizes print-on-paper publishing, it is greatly exaggerated in electronic publishing due to the fact that computing and digital communications costs have both decreased at the remarkable rate of about 30% per year since the early 1960s (MacKie-Mason and Varian 1996). Furthermore, the flexibility of digital technology permits a wider range of pricing options for an electronic

publisher (e.g., while it is not economically feasible for the New York Times to sell articles individually if it must print articles separately and physically deliver them to customers through the postal system, it becomes feasible for consumers to download from a website and to pay for only those articles they desire to read, which indeed is the model implemented by the New York Times for its archives). I am interested in studying when and how bundling of information goods could be beneficial for retailers who sell information goods. This interest has generated three papers.

Our working paper, “Competition Between Firms that Bundle Information Goods” (with Jeffrey MacKie-Mason) considers the impact of competition on the bundling decision, profitability, and consumer welfare. In particular, this research is predicated on the ideas that online service providers compete for readers’ attention even if the content is not identical across suppliers, and that technological advances have enabled providers to sell content in ways that would not be feasible in a print world, e.g., selling articles separately or in extremely large bundles. Our most important finding is that bundling can greatly intensify competition. Once a consumer has purchased a subscription from one firm, s/he has an incentive to consume a large number of items from that particular firm (at zero marginal cost) rather than purchase items from another firm (at an additional cost). This results in “winner takes all” competition in which firms lower their bundle prices in order to attract consumers. We find that although competition between bundling reduces industry profits, each firm often has a unilateral incentive to adopt bundle pricing rather than per-unit pricing. From a consumer’s perspective, this is advantageous since it implies the availability of large bundles at low subscription prices. However, this benefit comes at a trade-off – the firms have less incentive to invest in content. This analysis helps explain why few online content providers have been able to successfully charge for their content (either on a subscription or a per-unit basis) and must instead rely primarily on advertising revenue to fund their operations.

I also have two (co-authored) manuscripts published in the refereed *Proceedings of the ACM Conference on Electronic Commerce*.<sup>1</sup> Our paper, “Competitive Bundling of Categorized Information Goods” (2000), discusses how the emerging development of automated (and hence low-priced) technologies permits consumers to pick and choose items to compose their own customized bundles based on information categories. Another paper, “Automated Strategy Searches in an Electronic Goods Market: Learning and Complex Price Schedules” (1999), considers a more complex set of bundling options. In particular, rather than just considering a bundle price for all the information goods or a per-unit charge for each article chosen, we also consider intermediate bundle sizes such as a price for 2 articles, a price for 3 articles, etc. A key insight from our analysis is that the full value of a bundling scheme not only depends on the profit earned when the prices are set optimally but also depends upon how much profit the scheme generates in the learning period as the firm searches for the optimal prices.

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<sup>1</sup> Both of these papers were accepted after a thorough review process. The paper in the EC-99 conference was one of only 21 papers accepted out of 72 total submissions; the one in EC-00 was one of 29 papers accepted out of 150 submissions.

## **Personal Bankruptcy**

In addition to my work in marketing, I have also produced a paper the *American Economic Review* regarding personal bankruptcy. This paper was first developed as I was pursuing my Ph.D. in Economics at the University of Michigan. Erik Hurst (a fellow graduate student at that time) and I were initially attracted to this area of research while discussing an article from the newspaper which cited large differences across states both in terms of divorce rates and in filings for personal bankruptcy. We were intrigued by the underlying causes of bankruptcy, how and if these causes could be estimated empirically, and how bankruptcy policy might affect filing rates. We were particularly interested in identifying the effect of differences in social stigma that might arise across states (e.g., in Kansas, where I was raised, there seems to be great social disapproval of bankruptcy, while in more liberal states, such stigma may not be as strong). Pursuing this research interest ultimately led to a publication in the *AER*.

Filing for bankruptcy by consumers used to be very uncommon and something consumers (and the press) would rarely talk about. But, in the mid-1980s, bankruptcy rates began to rise exponentially. The total number on non-business bankruptcy filings more than doubled between 1984 and 1989 and then doubled again between 1989 and 1997. Thus, personal bankruptcy went from a rare occurrence (only 0.3 percent of households in 1984) to a routine event (1.35 percent of households in 1998). Not surprisingly, lenders losses due to bankruptcies also were on the rise during this period, reaching about \$39 billion in 1998. As a result of the growing prevalence of the number and severity of bankruptcy cases, policy makers and academics were very interested in developing a better understanding of the factors which influence bankruptcy filings. Most early research (originating primarily from the sociological and legal perspectives) addressed this question by carefully examining those households that filed for bankruptcy. For instance, one might observe that a high proportion of households that filed for bankruptcy experienced a recent job loss, a severe health problem, or a divorce (relative to the general population). Thus, the research produced the perspective that bankruptcy was usually the result of adverse events. This viewpoint led to the policy recommendation that policy makers should view the filer as a victim of circumstance. And, in fact, bankruptcy policy seemed consistent with this viewpoint – bankruptcy exemptions (i.e., the amount of assets a household was allowed to retain after declaring bankruptcy) were generous and the administrative procedures were rather undemanding.

However, in our paper, “The Household Bankruptcy Decision” (with Erik Hurst and Michelle White, *American Economic Review*, 2002) we find evidence for a quite different perspective. In this paper, we use the *Panel Study of Income Dynamics* (PSID) data set which allows us to estimate which factors influence a household to file for bankruptcy in a way the previous research could not. Because the PSID tracks a panel of households over time, we have data for households both before and after they declare bankruptcy, as well as data for households who never filed for bankruptcy. Our analysis yields a number of interesting results. First, we find that many consumers who would financially benefit from filing for bankruptcy do not file for bankruptcy. This leads one to question why some households facing adverse circumstances do not file. While others have previously asked this question, our paper offers several unique and interesting answers to this question (see the next two points). Second, we find that the magnitude of the financial benefit from filing for bankruptcy is the most important determinant of whether a

household will file. While this may seem intuitive, recall that the previous prevailing view was that exogenous factors cause bankruptcies. In contrast, this paper finds that after controlling for the financial benefit, recent job loss and severe health problems do not significantly affect the bankruptcy filing decision. Thus, all else equal, a household that accumulates a large debt relative to its assets because of experiencing large hospital bills is no more likely to file for bankruptcy than a household that accumulates a large debt due to excessive credit card expenditures. Third, we find that another important factor in the bankruptcy decision is stigma and/or information flows. In particular, we find that districts that have experienced a past rise in the bankruptcy rate will increase the propensity of households from that district to file in the future. This is consistent with the idea that consumers learn about bankruptcy from the press or from friends, and that bankruptcy becomes less taboo if more people are already filing.

This paper was referenced during discussion on the floor of Congress and thus may have had some role in the tougher bankruptcy laws that now exist (e.g., the Bankruptcy Abuse Prevention and Consumer Protection Act of 2005 forces higher income households into Chapter 13 bankruptcy – which requires households to use future income to pay debts – rather than Chapter 7 bankruptcy, which dismisses debts altogether). This paper also has 30 citations according to the SSCI and 134 citations according to Google Scholar (including those papers that cite this research in its working paper form).

### 3. PAPER DESCRIPTIONS

**Fay, Scott and Jinhong Xie (2008). “Probabilistic Goods: A Creative Way of Selling Products and Services” *Marketing Science* (forthcoming).**

In this paper, we explore the fundamental product/market conditions required for the benefit of introducing uncertainty in product assignments by offering “probabilistic goods,” which we define as a gamble involving a probability of getting any one of a set of multiple distinct items. We use Probabilistic Selling to denote the selling strategy under which the seller creates probabilistic goods using the seller’s existing distinct products or services (referred to hereafter as component goods) and offers such probabilistic goods to potential buyers as additional purchase choices. For example, a retailer selling two different colors of sweaters, red and green, may offer an additional “probabilistic sweater,” which can be either the red or green sweater. A theatre that offers two different shows on a given weekend can sell an additional probabilistic ticket, “Saturday or Sunday Performance.” We use the term Traditional Selling to denote the conventional selling strategy under which the seller only offers the component goods for sale.

The fact that probabilistic goods are virtual rather than concrete products or services suggests that understanding such a new way of selling products and services can be particularly valuable to practitioners because this selling strategy allows a firm to extend its product line without incurring new product development costs. The concept of probabilistic goods opens up a new dimension for segmenting a market, which can help firms for which traditional line extensions may be logistically impossible. For instance, a theatre that is already open every night of the week may not be able to introduce an additional performance, but it could offer a number of different probabilistic tickets using its current performances as the component goods (e.g., “Tuesday or Wednesday” and “Wednesday or Thursday”). The “virtual” nature of probabilistic goods also offers firms flexibility to adjust the length of their product line dynamically (e.g., a cruise line could offer an additional 4-day “Eastern or Western Bahamas” cruise only in November but not in December).

In this paper, we examine WHY, WHEN and HOW a seller can benefit from introducing a probabilistic good. We find that probabilistic selling has a fundamental advantage of allowing the seller to benefit from a special type of buyer heterogeneity—differentiation in the strength of buyers’ preferences. A discounted probabilistic good attracts consumers with relative weak preferences between the component goods, while those consumers with strong preferences will still purchase the component goods. This segmentation allows the seller to price discriminate and can also lead to market expansion. We also find that creating buyer uncertainty in product assignments is a new way for sellers to deal with their own market uncertainty. We illustrate two such benefits: (a) offering probabilistic goods can reduce the seller’s information disadvantage and lessen the negative effect of demand uncertainty on profit, and (b) offering probabilistic goods can solve the mismatch between capacity and demand and enhance efficiency. These results have important practical applications because they suggest that probabilistic selling is a general marketing tool that can benefit many sellers.

**Fay, Scott (2008). “Selling an Opaque Product through an Intermediary: The Case of Disguising One’s Product.” *Journal of Retailing* 84(1): 59-75.**

In this paper, I model two service providers, A and B, who sell their respective component services in a direct channel, and also have the option of distributing an “opaque” product through an intermediary. This product is opaque because the intermediary withholds the identity of the good it offers and instead only informs a consumer that if she purchases from the intermediary, she will receive either the service provided by firm A or the service provided by firm B. Such a market structure closely resembles the travel service offering of *Hotwire*, e.g., one can reserve a rental car through traditional channels or one can purchase from hotwire.com and receive a car from *Avis*, *Budget*, or *Hertz*, where the supplier is not revealed until after purchase.

The key issue of this paper is how the introduction of competing rival service providers impacts the profitability and implementation of probabilistic selling. In particular, I address the following research questions:

1. How does the introduction of an opaque product affect the prices of non-opaque goods?
2. How does an opaque good affect industry profitability?
3. How many consumers and what types will be attracted to an opaque product?
4. How will the answers to the questions above depend on how many units are allocated to the opaque channel?
5. Under what conditions would a service provider choose to use the opaque channel?

I find that entry by an opaque intermediary will intensify competition if there is little brand-loyalty in the marketplace. However, entry may relax competition if there is at least a moderate amount of brand-loyalty. In fact, the opaque product may sell at prices higher than what traditional prices would have been in the absence of an opaque intermediary. In this moderate-to-strong brand-loyalty case, prices are not monotonic in the level of the intermediary’s activity. When market share of the intermediary is low, as the intermediary grows, market prices fall. But, if the intermediary becomes sufficiently large, all prices (both for the opaque good and for the traditional goods) rise. This suggests that if a service provider finds that an opaque intermediary is cannibalizing its direct sales, then it may be advantageous to allocate an even greater (rather than fewer) number of units of its inventory to the opaque channel. Another interesting finding is that even when the opaque channel increases all prices and industry-wide profits, some service providers may not benefit from its presence. I discuss a number of interesting managerial implications both for service providers and for an opaque intermediary.

**Lewis, Michael, Vishal Singh, and Scott Fay (2006). “An Empirical Study of the Impact of Nonlinear Shipping and Handling Fees on Purchase Incidence and Expenditure Decisions.” *Marketing Science* 25.1 (January – February): 51-64.**

In this paper, we study the impact of shipping fees on the buying behavior for customers of online and direct retailers. For these businesses, the physical products are spatially separated from the customer at the time of purchase. Thus, the firm incurs the costs of order assembly and delivery, and must decide how to charge for these services. This is a nontrivial task because shipping-fee schedules can have a large impact on order incidence. For example, survey data finds that customers are dissatisfied with shipping fees, where over than 60% of online shoppers report they have abandoned an order at the point when shipping fees are added (Jupiter Communications 2001) and over 50% of consumers list shipping fees as their main complaint about online retailing (Ernst and Young 1999).

In this paper, we develop a model to investigate the role of different shipping-fee schedules on buyer behavior in terms of order incidence and the distribution of order sizes. Using a database from an online grocer that includes transaction histories for 25,000 unique customers and information on marketing activity related to pricing and promotions, we provide empirical evidence of the magnitude of consumer response to shipping-fee levels and promotions.

Our results indicate that shipping fees significantly affect both order-incidence rates and expenditure levels. In terms of specific shipping policies, we find that “free-shipping” promotions greatly increase order incidence rates but lead to smaller order amounts (and, obviously, eliminate shipping-fee revenues). We also find that order-size-based shipping discounts, such as a “free shipping on large baskets” policy which waives fees for larger orders, succeed in shifting customers to larger orders but have minor effects on order incidence. However, our profitability calculations show that while both shipping promotions increase demand, the increased merchandise revenues are not large enough offset the corresponding lost shipping revenues.

Interestingly, we find significant heterogeneity across households in responsiveness to shipping charges and marketing variables. Increased order incidence in response to free shipping ranges from over 35% to about 10% for the different segments. Similarly, we find significant differences in the impact of fulfillment failures across the segments. For example, stock-outs have an insignificant impact on three of the four segments, but this type of service failure has a significant negative effect on the high-frequency customers in Segment 4. A benefit of the segment-level analysis is that it suggests opportunities for the retailer to exploit heterogeneity in the population by customizing shipping charges and order fulfillment policies. Using purchase histories, a firm could classify its customers into various segments and then set shipping fees to maximize profits for each segment. In our data, we would recommend offering “free shipping on large baskets” only to two of the four segments. Such a customized shipping-fee schedule is predicted to increase the firm’s net contribution by 4.4% relative to the increasing-fee base policy, while a blanket promotion would result in losses relative to the base policy. Similarly, when inventories of specific items are low, it may be advisable to base fulfillment priorities on customer characteristics so as to minimize the probability that high-frequency customers suffer stock-outs.

**Fay, Scott (2004), “Partial Repeat Bidding in the Name-Your-Own-Price Channel.”**  
***Marketing Science* 23.3 (Summer): 407-418.**

In the Name-Your-Own-Price (NYOP) channel, as in an auction, buyers rather than sellers suggest a price for a product with a transaction occurring only if a seller is willing to accept the quoted price. However, unlike an auction, a NYOP firm faces consumers that arrive asynchronously. Thus, the firm must make acceptance decisions before observing all bids. This paper seeks to address several important substantive questions: (1) What is the optimal price cutoff for the minimum bid the NYOP firm will accept? (2) Should a NYOP firm restrict consumers to a single bid? (3) In the event that a single-bid restriction cannot be perfectly enforced, is surreptitious re-bidding detrimental to the NYOP firm? (4) If so, is it beneficial to suppress such behavior, even if complete elimination is not feasible?

As a new, evolving business model, these questions listed above are important because there is no consensus on how to best structure the NYOP mechanism. For example, some NYOP firms (e.g., *Priceline* and *eBay Travel*) limit consumers to a single bid for a given item, while others (such as *All Cruise Auction*) openly allow consumers to re-bid if a previous bid was rejected. Furthermore, one must note that a single-bid restriction might not be perfectly enforceable. On the Internet, which accords the user an inherent degree of anonymity, sophisticated bidders can circumvent the policy by disguising a re-bid as if it originated from a new consumer.

The results from this paper offer insight on how a NYOP firm can establish bidding rules to maximize its profit. If there are no bidding costs, I find that a single-bid restriction does not improve a firm’s profit, i.e., the firm could do just as well by allowing all of its customers to re-bid. Furthermore, surreptitious re-bidding will reduce profit (if the firm institutes a partially enforced single-bid restriction). However, if frictional costs are present, e.g., a consumer must wait for a response to a previous bid before proceeding on with a subsequent bid, the single-bid restriction, assuming it is perfectly enforced, does strictly benefit the firm. Furthermore, even if such a restriction cannot be perfectly enforced, it will be preferable to a policy that openly allows re-bidding if surreptitious bidding is relatively rare. On the other hand, I find that the firm would benefit from encouraging re-bids (e.g., by making the loopholes in its single-bid restriction more widely known) if surreptitious re-bidding is already prevalent. In short, a NYOP firm should attempt to gauge how much surreptitious re-bidding is occurring; else, it does not know whether to reward or punish violators of its single-bid policy.

This paper contributes to the marketing literature in several ways. First, it presents an initial examination of a unique and important business model. The emergence of the Internet has allowed firms to use a wider range of pricing mechanisms and, thus, how to structure such mechanisms, including the NYOP model, is of increased importance to both practitioners and marketing researchers. Second, this paper identifies and studies a novel phenomenon in which a portion of the population is restricted to a single bid while others can re-bid. The intuition developed in this paper not only has important implications for NYOP markets but also for a broad range of non-NYOP markets. Modelers commonly assume that the selling mechanism is fully known by all consumers—the firm is committed to posted prices, transactions only occur after negotiation, or, in the case of auctions, that the auction rules are known by all participating parties. Clearly, such assumptions are representative of many store environments—no

negotiation occurs at the supermarket; almost all consumers haggle to some degree when making a new car or used car purchase. However, in other environments, negotiation may take place surreptitiously— the publicly stated policy is that the sticker price is nonnegotiable, but price concessions can be obtained if one gains direct access to the manager or owner (i.e., someone who has the authority to haggle). This paper provides an approach for modeling such situations.

**Fay, Scott, Erik Hurst, and Michelle White (2002). "The Household Bankruptcy Decision." *American Economic Review* 92.3 (June): 706-718.**

Personal bankruptcy filings rose from 0.3 percent of households per year in 1984 to around 1.35 percent in 1998. Lenders lost about \$39 billion in 1998 due to personal bankruptcy filings. But, it is uncertain why filings have increased so rapidly. The sociologically oriented literature on the bankruptcy filing decision argues that households file for bankruptcy when unexpected adverse events occur which reduce their ability to repay their debts, i.e., a non-strategic view of bankruptcy (Sullivan et al. 1989). In contrast, a strategic model of bankruptcy predicts that households are more likely to file when their financial benefit from filing is higher. A household's financial benefit from filing for bankruptcy is the value of debt discharged (e.g., credit card debt) minus the value of their nonexempt assets (e.g., personal property that exceeds allowable exemptions).

To test these competing hypotheses, we use the Panel Study of Income Dynamics (PSID) data, which, in 1996, asked respondents whether they had ever filed for bankruptcy and, if so, in what year(s). Our data set is a combined cross-section, time-series sample of PSID households in the years 1984-1995. We run a series of probit regressions to test three hypotheses: whether households are more likely to file for bankruptcy as their net financial benefit from filing increases, whether (controlling for financial benefit) they are more likely to file for bankruptcy when adverse events occur, and whether households' bankruptcy decisions are influenced by average bankruptcy filing rates in the localities where they live. This last variable is entered due to our notion that an increase in a district's filing rate may start an information cascade which causes the trend of bankruptcy filings in the district to differ from the national trend. We conjecture that if households live in a district with a higher bankruptcy filing rate, then they are more likely to hear firsthand about bankruptcy from friends or relatives because the latter are more likely to have filed. This information will tend to make households more comfortable with the idea of bankruptcy, so that the level of bankruptcy stigma falls, and individual households' probabilities of filing rise.

We find strong support for the strategic model of bankruptcy. In particular, our model predicts that an increase of \$1,000 in households' financial benefit from bankruptcy would result in a 7-percent increase in the number of bankruptcy filings (or 90,000 additional bankruptcy filings per year). However, we find little support for the non-strategic model of bankruptcy. In particular, neither health problems nor spells of unemployment significantly impact the filing decision. Divorce is marginally significant ( $p = 0.077$ ). But, it is impossible to distinguish whether a rise in bankruptcy filing is due to divorce itself or due to legal counsel received during the divorce proceedings that advises clients to also file for bankruptcy. Finally, information flows and changes in stigma are an important determinant of whether households file. In particular, we estimate that the effect of an increase in a district's filing rate by one standard deviation (in a single year) is that the average probability of bankruptcy for households that live in that district would rise by 31 percent the following year.

**Fay, Scott and Jeffrey Kephart (2000). “Competitive Bundling of Categorized Information Goods.” *Proceedings of 2nd ACM Conference on Electronic Commerce* , 117-127.**

This paper focuses on two important characteristics of markets for information goods. First, the emerging development of automated (and hence low-priced) technologies permits consumers to pick and choose items to compose their own customized bundles based on information categories. Second, information providers, such as online journals, often compete with one another both on price and on the categorical composition of their bundles. It is of great practical interest to explore the strategies that sellers might use to set both price and bundle composition, and the market dynamics that ensue from such choices.

In this paper, we present and analyze a model in which multiple sellers compete to offer bundles of categorized information goods. We present a game-theoretic analysis of an oligopoly with homogeneous consumer preferences, both of a sequential game in which content choices precede price competition, and also of a game in which firms can make content and pricing choices simultaneously. We use simulations to explore a market in which the sellers employ a myopic best-response algorithm and to investigate more complex scenarios that include heterogeneous preferences and more than two sellers.

We find that timing has a large impact on the outcome. In the sequential version of the model, there is a continuum of equilibria in which the sum of articles (for each category) produced by an oligopoly equals the monopoly (and hence socially efficient) level. (The profits earned by each firm are positive, but sum to less than that of a monopolist.) However, when sellers choose their bundle and their price simultaneously, and buyers' preferences are homogeneous, then every seller individually sets its bundle size to that of the monopolist, and prices are driven down to cost. For simultaneous choice of bundles and prices, and heterogeneous preferences, we find that it is possible for sellers to sustain positive profits on average. Interestingly, in this case the market exhibits unending cycles in prices and bundle composition, with the monopolist bundle representing the largest bundle that is ever offered. These cyclical price wars are symptomatic of an underlying multi-peaked profit landscape.

An interesting characteristic of this market, as is commonly found throughout many streams of marketing literature, is that consumer heterogeneity has a large impact on firms and that the direction of this impact critically hinges on the competitive nature of the market. Intuitively, we find that a monopoly prefers homogeneous consumer preferences to heterogeneous ones because it can exploit homogeneity in order to extract greater surplus. However, the situation is reversed when there are two or more sellers. Homogeneity makes it possible for a seller to (temporarily) grab vast market share by undercutting its rivals, but such actions lead to a price war that ultimately eliminates profits for all sellers. When consumers are heterogeneous in their preferences, no seller can completely satisfy the entire market, and therefore several different profitable niches may be available to sellers. Even though our simulations allowed sellers to jump easily (without cost) to any niches that they desired, and they continually did so, we found that the sellers were consistently able to make finite profits.

**Brooks, Christopher, Scott Fay, Rajarshi Das, Jeffrey MacKie-Mason, Jeffrey Kephart, and Edmund Durfee (1999) "Automated Strategy Searches in an Electronic Goods Market: Learning and Complex Price Schedules." Proceedings of ACM Conference on Electronic Commerce, 31-40.**

In an electronic goods market, there are a nearly limitless number of bundling and unbundling possibilities. Considering only pricing structures that are based on the number of items in a bundle, and not on the identity of the items, there are families of such pricing functions with one free parameter, two parameters, and so forth. In the limit, the most general pricing function for this problem has  $N$  parameters, where  $N$  is the total number of different information goods under consideration. Therefore, producers of electronic information goods have a daunting challenge in determining how to explore the space of all possible bundles and price schemes to find the optimal combination.

Even though the space to be searched is very large, it is feasible to experiment over this space in an agent-mediated economy. It would seem reasonable to assume that a producer which has more free parameters to control in pricing will be more profitable since it will be able to fit the consumer demand curve more accurately. Why not always use unrestricted nonlinear pricing (a different, unconstrained price for every bundle size)? To address this question, we point out that determining the optimal prices, especially under complex schemes, requires knowledge about consumer preferences that a firm may not have. Learning about consumer preferences takes time; meanwhile, the firm is earning less than the optimal profit. Thus, one of our key insights is that the full value of a bundling scheme not only depends on the profit earned when the prices are set optimally but also depends upon how much profit the scheme generates in the learning period as the firm searches for the optimal prices.

In this paper, we derive the optimal prices under pricing schemes of varying complexity for a model with complete information. We measure the increase in profits as more parameters are controlled by a monopolist producer and find that the majority of the gains take place as we move from 1 to 2 parameters. We use simulations to explore a dynamic model in which the firm is uncertain about consumer valuations and thus learns the optimal prices gradually and perhaps imperfectly. As the complexity of a pricing schedule increases, it takes longer to learn, but in some cases, particularly that of a two-part tariffs, the transitional profits outperform those of the simpler pricing schemes. Interestingly, we find that schedules with the same number of parameters (e.g., pure bundling and linear pricing) may perform differently in the learning period, despite having identical steady-state profits.

**Fay, Scott (2008). “Reverse Pricing: The Role of Customer Expectations.” Working Paper (under review at *Management Science*).**

In a NYOP market, the seller’s threshold price determines which bids are accepted and which are rejected. Since the threshold price is the seller’s private information, consumers’ bidding strategies are based on expectations about this threshold price. In this paper, I use an analytical model to explore how consumers’ beliefs about the threshold price impacts the NYOP seller and how the seller can optimally use its pricing policy to manipulate beliefs. In particular, I address the following research questions: 1) Is a NYOP seller better or worse off as consumers become more knowledgeable?; 2) How should a NYOP seller choose its threshold price? How does this optimal level depend on consumer naiveté or sophistication?; and 3) Should a NYOP seller treat each transaction independently? When can a seller benefit from considering long-term implications of its pricing rule?

Understanding the impact of consumers becoming better informed is critical since it helps assess the long-run viability of the NYOP business model. Furthermore, this research provides insight about whether a NYOP seller should try to encourage consumers to become better informed (e.g., by advertising and/or supporting web forums that accurately convey information about the probability a given bid will be accepted) or whether a NYOP seller should attempt to curb such information flows. Finally, this paper identifies strategies a seller can use in order to adapt to an environment in which consumers form accurate expectations about the true threshold price.

For instance, I find that under several plausible conditions a NYOP seller benefits from having consumers be better informed about the true distribution of the threshold prices. The NYOP seller benefits from better informed bidders if either (a) current consumers consistently underestimate the actual threshold price and have low-to-moderate bidding costs; or (b) consumers consistently overestimate the actual threshold price and have sufficiently large bidding costs. In the former case, customer optimism results in low bids, and bid levels would increase if customers were better informed about the true distribution of prices. In the latter case, pessimism dissuades consumers from bidding, but if they were familiar with the true distribution of threshold price, they would be willing to bid.

Furthermore, if consumers are naïve, a NYOP seller may benefit from trying to inflate or deflate expectations about the threshold prices. However, to decide which direction is desirable, the seller needs to ascertain both consumers’ current expectations as well as their bidding costs. In addition, if consumers are sophisticated, rather than trying to maximize profit from each individual transaction (i.e., accepting any bid that exceeds its wholesale cost), the seller needs to take a more long-term approach. In particular, the seller needs to account for how acceptance/rejection decisions will impact bidding by other customers. For example, rejecting some bids that exceed its costs can be a desirable means to increase (future) bid levels (even though such a pricing rule sacrifices short-term profits). Or, accepting some bids which are below its costs can be optimal because it encourages customers to bid who otherwise would not and these customers can be very profitable to the firm when wholesale costs turns out to be low.

**Fay, Scott (2008). “Competitive Reasons for the Name-Your-Own-Price Channel.” Working Paper (under review at Marketing Letters – second round).**

The NYOP format is a relatively new business model that offers a non-traditional way of determining prices and distributive allocations. Under the NYOP format, the seller sets a hidden threshold price, consumers bid for units of its product, and any bid that exceeds this threshold price is accepted. While the extant literature has addressed many aspects of the NYOP model, somewhat surprisingly, little attention has been paid to why a firm might choose a NYOP format. Presumably, a firm would want to employ a NYOP format only if it is more profitable than alternate mechanisms. Yet, much of the extant literature indicates that the NYOP format does not outperform posted prices (either in theory or in practice). This is due to several disadvantages of the NYOP format relative to posted prices: 1) Uncertainty about the actual price threshold leads consumers shade their bids (i.e., place bids that are well below their reservation values); and 2) The NYOP format reduces the willingness-to-pay of consumers versus a posted-price format since consumers incur significant frictional costs when bidding.

This paper takes an important step towards developing a deeper understanding of why the NYOP format may be preferred to alternative selling mechanisms in order to understand when such a business model would be advantageous, and to structure the NYOP mechanism properly. In particular, I demonstrate that (1) the NYOP format may be superior to posted prices because it can soften competition with a rival; and (2) accounting for the role of the NYOP channel in softening competition has important implications for how a NYOP firm should set its rebidding policies.

The ability of the NYOP format to soften competition hinges on the fact that there is substantial heterogeneity in the frictional costs consumers face when bidding due to differences they have in opportunity costs of time, perceived difficulty of the task, experience, and other factors. This heterogeneity provides an avenue for segmenting a market where there is both a NYOP and a posted-price option. An NYOP firm has an incentive to target consumers with low frictional costs while the posted-price firm sells to consumers with high frictional costs. Thus, the NYOP format offers a mechanism for reducing price competition and increasing mutual profit.

I find that the NYOP format is most advantageous when a firm would face fierce price rivalry if it were to employ posted prices. This would be the case in markets where there is little store loyalty and products are undifferentiated. One example would be the competition between Hotwire and Priceline in the U.S. travel market since both of these e-tailers offer opaque travel goods. My findings suggest that by selling through a NYOP format rather than through posted prices, Priceline is able to reduce price rivalry with Hotwire (who uses posted prices). These findings also suggest that the NYOP format may be particularly useful for retailers competing online. Because they rely on the same manufacturers, retailers may find themselves selling a product that is undifferentiated from a rival’s product. This difficulty is further compounded in online markets since the lack of physical locations eliminates geographically-based differentiation. In such settings, the NYOP format may be a valuable tool for creating differentiation and thus relaxing price competition.

**Fay, Scott, Debanjan Mitra, and Qiong Wang (2008). “Strategic Implications of Alternative Learning Approaches in the Personalization Process.” Working Paper.**

While it is generally accepted that customizing products and/or services provides a way for firms to increase their profits and increase customer loyalty, personalization is only possible if a firm knows what a customer’s “ideal” product is. Thus, a critical step in the personalization process is the learning stage in which a firm discovers customers’ preferences. In this paper, we focus on how different learning approaches impact inter-firm competition. In particular, (1) we identify two distinct approaches for learning customer preferences and, for each approach, explore its impact on the degree of price rivalry within a market; and (2) we investigate firms’ incentives to invest in these learning approaches and the strategic implications of these choices.

Consider the following examples. At Nikeid.com, a customer designs an athletic shoe to his/her specifications, selecting each element of the shoe from the material of the sole to the color of the shoelace (Randall, Terwiesch, and Ulrich 2005). At Pandora.com, based on the user’s previous listening pattern, personalized recommendations are made as to which new releases he would most enjoy (Moser 2006). In this paper, we argue that these two companies use distinct learning approaches, which we label as S-Learning and O-Learning. In particular, Nikeid.com is an example of using S-Learning, where the firm relies on “solicited” information, i.e., products are personalized on the basis of information collected at the time of purchase. On the other-hand, O-Learning, as exemplified by Pandora.com, is based on previous “observations” about the customers’ preferences gathered through previous interactions with that particular customer. For instance, a firm that maintains a database consisting of personal purchase histories and click-stream data can use this knowledge to identify a potential user’s most preferred product offering.

We introduce a model based on search. In the absence of any effort by the firm, each customer engages in costly search to find which product she prefers. If the firm employs S-Learning, customers can avoid sequential search, but will incur additional effort (e.g., filling out surveys and/or acquiring the expertise needed to design their own products). In contrast, a firm that uses O-Learning eliminates all transaction costs since the firm already knows what customers want without any additional effort on the part of customers. However, the firm is only able to offer personalized recommendations for customers for whom it has historical data. We study how these two learning approaches impact the nature of competition within a market. Since O-Learning does not facilitate personalizing products for “new” customers but both old and new customers benefit from S-Learning, we have an intuitive finding that O-Learning, but not S-Learning, relaxes competition (i.e., each firm focuses on customer retention rather than customer acquisition). Furthermore, we identify six potential “strategic” equilibria for our analytical model. The premise behind each strategy is that investing (or not investing) in a particular learning approach can induce a desired response from its rival. For example, a firm’s early adoption of S-Learning may keep a rival from adopting that same learning approach. In this case, S-Learning provides the first-mover with a sustainable competitive advantage. In another strategy, a firm could decide to not invest in either learning approach in order to induce its rival to make the costly, but mutually beneficial, investment in O-Learning. We augment our theoretical results with two case studies and a survey of purchasing managers, finding evidence that is generally consistent with our theory.

**Fay, Scott and Jinhong Xie (2008). “Reducing Seller Uncertainty by Offering More Choices to Your Customers: Advance Selling vs. Probabilistic Selling.” Working Paper.**

In this paper, we focus on when and how a seller may benefit from introducing buyer uncertainty. Two selling strategies have been advanced in the literature—advance selling (AS) and probabilistic selling (PS). Under the PS strategy, the seller creates probabilistic goods using the seller’s existing component goods and offers such probabilistic goods to potential buyers as additional purchase choices. Under the AS strategy, a retailer sells the component goods both in the spot period and in the advance period. For example, a family entertainment center which offers both roller skating and miniature golf could sell these activities both at the door and in advance (e.g., via its website), where prices possibly depend on the time of purchase, e.g., a discount for buying in advance. In this paper, we show when and why each of these selling strategies is preferred over the other. This research is particularly vital and urgent to practitioners because advances in new technology are making implementation of both the advance selling strategy and the probabilistic selling strategy much more efficient and practical.

PS and AS share many similarities. Both mechanisms offer a seller a way to expand its market: Traditionally, a seller’s profit is hindered by the fact that some consumers do not purchase any product because they realize low valuations (relative to the market price) for each product. Under AS, the firm can sell to customers before they know they have low realizations. Alternatively, under PS, the seller can attract such consumers by offering them a probabilistic good at a discount. Furthermore, both AS and PS can reduce the margins on the component products.

Despite these similarities, we find that the two mechanisms differ substantially in their underlying motivation. AS allows the seller to homogenize consumers who would be differentiated at a later point in time, i.e., one sells to consumers before they observe their own idiosyncratic preference shocks. On the other hand, in PS, all sales are made after each consumer observes his or her own idiosyncratic preference shock. But, the firm is able to appeal to consumers with low valuations by selling them a probabilistic good while still maintaining higher margins on sales of the component products to the high valuation consumers. Thus, probabilistic selling capitalizes on the heterogeneity caused by idiosyncratic shocks. We find that advance selling is most advantageous in markets where consumers know which product they are likely to prefer, although they are uncertain as to its exact valuation. For instance, when planning a vacation, consumers may be confident as to their preferred destination but there may be some uncertainty about how much value they will derive from the trip itself (e.g., depending on the weather at that destination during that week and what work demands they may have at the time of the trip). On the other hand, probabilistic selling is most advantageous in markets where there is significant heterogeneity in consumers’ tastes. For example, consider a theater that shows newly-released movies. Some consumers may just want to see “a” movie while others will prefer one to the other, with these tastes varying along a spectrum.

**Fay, Scott and Juliano Laran (2008). “Implications of Expected Variability in the Seller’s Threshold Price in Name-Your-Own-Price Auctions.” Working Paper (under review at *Management Science*).**

A buyer in an NYOP auction faces a complex decision in choosing what bid(s) to place. She must balance the potential of bidding too high (in which case her bid exceeds the seller’s unrevealed threshold price and she will have overpaid for the product) and bidding too low (in which case her bid will be rejected and she either will incur the cost of additional bids or not receive the product). Previous normative models suggest that the optimal bidding pattern is for a bidder to start out low and then ratchet up her bids until a bid is accepted or an additional bid yields negative surplus, which occurs, for example, when the bidder has reached her willingness-to-pay for the product. However, Spann and Tellis (2006) present evidence that many consumers utilize non-monotonic bid sequences.

This divergence between theory and practice suggests the need for further study of this market. In particular, we suggest that an important characteristic of NYOP markets is that consumers expect that the seller’s undisclosed threshold price may change over time. We present empirical evidence that such expectations are consistent with the actual pricing observed by NYOP (and non-NYOP) sellers, especially in the travel market in which the NYOP format is frequently used. To study the impact of such expected fluctuations, we introduce a normative model that allows consumers to expect that the seller’s threshold price may change over time. We find that expected price variability has an important impact both on bid levels and on bid patterns. First, the perception of some probability of change in the threshold price dramatically reduces the maximum bid a consumer will place. Second, when there is some probability of change, a non-monotonic bidding strategy can be optimal, i.e., at a certain point in the bid sequence a bidder would prefer to reduce rather than to increase her bid. Third, we find that if a bidder believes the seller’s price may change, she has an incentive to postpone bidding especially when she intends to reduce the size of her bid.

We construct a simulated NYOP market to test our model. Our results are highly consistent with our model’s main predictions. Beyond confirming our hypotheses, our results suggest that expectations about threshold price changes may have a high practical importance. For example, we find that bid levels decline significantly when consumers face an environment where the threshold price is expected to change (e.g., the final bid of a bid sequence is approximately 20% higher when the consumer expects that the threshold price does not change relative to the expectation that the price threshold is constantly changing). And, in our simulated market, the NYOP seller earns nearly double the revenue when the price threshold does not change versus when it constantly changes. On the other hand, consumers report higher satisfaction and a higher proclivity for return visits as expected price variability increases. We conclude that an important characteristic of an NYOP channel is that consumers expect prices will change over time and that the impact of these expectations on consumer behavior are of great importance to practitioners.

**Fay, Scott and Debanjan Mitra (2008). “Managing Service Expectations in Online Markets: A Theory of E-tailer Pricing and Price-Ending Behavior.” Working Paper (under review at the *Journal of Retailing*).**

While there has been considerable research in marketing and economics on retail price-endings, there remain empirical regularities that are not explained in an integrated manner by the literature. For example, in contrast with standard intuition, many discounters (such as Wal-Mart and Tesco) avoid 9-endings, instead preferring ‘random’-ending prices (i.e., digits other than 9 or 0). To address this disconnect between theory and practice, we introduce an analytical model. Consistent with prior research, our model assumes the firm faces a kinked demand function with discontinuities between consecutive 9-ending and 0-ending price points. While our demand function is identical to the Stiving (2000) model, we propose two modifications so as to extend it to a retail setting. First, the prices are set by retailers and not manufacturers. This modification may seem obvious but it raises a conceptual issue with the prior findings. Why should a retailer (as opposed to a manufacturer) incur a cost to signal the quality of a product that is also available with a competing retailer? To address this question, we propose a second modification to the original model – retailers signal the services provided at the store (as opposed to the quality of products). We broadly define services to include “all activities carried out for the purpose of encouraging the conclusion of a transaction” (European Court of Justice 2005). This broad definition of retail service also allows us to conceptualize customers as preferring low or high levels of service rather than to assume that a high level of service is universally preferred. Of course, it is easy to conceive situations when customers have a higher utility for higher retail service. But, there are also many situations in which customers will prefer lower levels of service. For example, consider frequently purchased product categories in which customers often purchase multiple products in one shopping trip. Since customers are unsure of their precise shopping basket prior to the trip, customers may prefer shopping at a low service ‘no-frills’ retailer who is likely to have a lower price for an ‘average’ basket of products.

We use a signaling model to explore such environments. In particular, when customers prefer a ‘no-frills’ service environment, conditions exist such that a lower service cost store will signal its lower costs through prices lower than the ‘normal’ profit-maximizing price. Likewise, when customers prefer a ‘luxury’ service environment, conditions exist such that a higher service cost store will signal its higher costs through prices higher than the ‘normal’ profit-maximizing price. Then, we examine the price endings that result in equilibrium. Our central finding is that 9-ending prices will be less frequent under a signaling scenario for both lower service cost and higher service cost stores compared to a non-signaling store whose profit is almost always maximized at a 9-ending price.

To empirically test our model, we collected a sample of 1544 retail prices of Internet retailers over 105 different products. Additionally, we collected 100 prices from each of 45 e-tailers. We find empirical support for each of our propositions derived from our analytical model. In summary, we find that (1) Retailers are less likely to use 9-ending prices when they intend to use prices to signal their level of service (either high or low); and (2) The extent of different price-endings is significantly associated with the service cost of a retailer.

**Fay, Scott and Jeffrey MacKie-Mason (2003). “Competition Between Firms that Bundle Information Goods.” Working Paper.**

Information goods (e.g., newspaper articles) are characterized by high fixed (first-copy) costs, but low costs for the production of additional copies. Although this cost structure characterizes print-on-paper publishing, it is greatly exaggerated in electronic publishing due to the fact that computing and digital communications costs have both decreased at the remarkable rate of about 30% per year since the early 1960s (MacKie-Mason and Varian 1996). Standard linear pricing for electronic information goods cannot result in efficient production or distribution because pricing at (near-zero) marginal cost would not recover the initial fixed costs. Fortunately, the flexibility of digital technology permits a wider range of responses to the cost problem (e.g., while it is not economically feasible for the New York Times to sell articles individually if it must print articles separately and physically deliver them to customers through the postal system, it becomes feasible for consumers to download from a website and to pay for only those articles they desire to read, which indeed is the model implemented by the New York Times for its archives).

In this paper, we offer insight into how the interaction between new technologies and the competitive environment is likely to affect readers, authors and publishers. In particular, we study the use of bundling when firms compete in the selling of information goods. In our analytical model, two firms each produce multiple imperfect substitutes. An important contribution of our work is that in addition to studying consumers who are stochastically identical in their average valuation of the bundled goods (consistent with much of the prior literature), we also consider consumers with heterogeneous preferences.

We find that bundling results in rather fierce competition. Consequently, consumers benefit from competitive bundling—more potential readers have access to the content at lower subscription fees. Furthermore, bundling results in efficient consumption decisions since subscribers face no extra fee for accessing additional items. We are also able to offer new insight into an issue raised by the prior literature. The standard results for stochastically identical consumers are that a bundling monopolist achieves the first best allocation and simultaneously extracts 100% of consumers’ surplus. This outcome does not seem to describe many information markets. Our model of a market with heterogeneous preferences provides one possible explanation for what we observe in actual markets. In our model, bundling is not generally fully efficient, and sometimes is even less efficient than per item selling. In addition, consumers retain a significant share of total surplus.

However, lower equilibrium prices means lower profits in a static setting and thus a reduction in firms’ incentives to invest in new content. Thus, in our dynamic model with endogenous content decisions, we find that there is an important trade-off – A monopoly is likely to produce closer to the efficient amount of content, but the higher prices on existing content that a monopolist charges lead to efficiency losses in distribution. We find that the distribution effect usually dominates so that a duopoly is welfare-improving even though it likely results in fewer total information goods.