MANAGEMENT SCIENCE
Vol. 53, No. 11, November 2007, pp. 1688–1701
ISSN 0025-1909 | EISSN 1526-5501 | 07 | 5311 | 1688

informs

DOI 10.1287/mnsc.1070.0718

The Debate on Influencing Doctors' Decisions: Are Drug Characteristics the Missing Link?

Sriram Venkataraman
Goizueta Business School, Emory University, Atlanta, Georgia 30322, svenka2@emory.edu

Stefan Stremersch
School of Economics, Erasmus University Rotterdam, 3000 DR Rotterdam, The Netherlands and
Fuqua School of Business, Duke University, Durham, North Carolina 27708, stefan.stremersch@duke.edu

Decision making by physicians on patients' treatment has come under increased public scrutiny. In fact, there is a fair amount of debate on the effects of marketing actions of pharmaceutical firms toward physicians and their impact on physician prescription behavior. While some scholars find a strong and positive influence of marketing actions, some find only moderate effects, and others even find negative effects. Debate is also mounting on the role of other influencers (such as patient requests) in physician decision making, both on prescriptions and sample dispensing. The authors argue that one factor that may tip the balance in this debate is the role of drug characteristics, such as a drug's effectiveness and a drug's side effects.

Using a unique data set, they show that marketing efforts—operationalized as detailing and symposium meetings of firms to physicians—and patient requests do affect physician decision making *differentially* across brands. Moreover, they find that the responsiveness of physicians' decision making to marketing efforts and patient requests depends upon the drug's effectiveness and side effects. This paper presents clear guidelines for public policy and managerial practice and envisions that the study of the role of drug characteristics, such as effectiveness and side effects, may lead to valuable insights in this surging public debate.

Key words: physician decision making; marketing effort; patient request; drug effectiveness; side effect; drug prescription; sampling; sample dispensing; detailing; pharmaceuticals; public policy
History: Accepted by Linda V. Green, public sector applications; received November 9, 2005. This paper was with the authors 6 months for 3 revisions. Published online in *Articles in Advance* September 14, 2007.

1. Introduction

Decision making by physicians regarding the drugs they treat patients with has come under increased scrutiny. As pharmaceutical expenses in the United States and other developed countries rise sharply with aging of the population, governments and regulators turn their attention to factors that may (adversely) affect physician drug decision making. Factors that draw particular attention are marketing actions of pharmaceutical firms targeted directly at physicians and patient requests for a specific drug. "There has been a public outcry, especially in America, over the cozy relationship between doctors and drug companies. Some practices are illegal, others are simply part of the customary trio of food, flattery, and friendship" (*The Economist* 2005, p. 9). The prosecution of Merck for its marketing actions for the drug Vioxx is a very recent, heavily publicized, case in point, that regulators take notice (*The Wall Street Journal* 2006).

Pharmaceutical firms spend a huge and ever-increasing budget on detailing visits (sales calls by pharmaceutical representatives) and meetings. The number of sales representatives in the pharmaceutical industry has undergone a six-fold increase in the last 20 years to approximately 100,000 today, and 77% of the companies are planning to further expand their sales force in 2005 (Hradecky 2004). Detailing (30.6%) and sampling (50.6%) to physicians amount to 81% of promotion spending by pharmaceutical firms in 2000 (Rosenthal et al. 2003). In addition, patients increasingly request a certain brand of drug from the physician. In the United States, one in three patients at some point has asked about a drug by name (Calabro 2003). It is a commonly held belief that such patient requests are often triggered by direct-to-consumer (DTC) advertising, presently at an all-time high of $4 billion in the United States (Edwards 2005).

The most important decision of a physician, especially if it concerns general practice physicians, is which drug to use in treatment of patients. The decisions physicians make on drug treatment can be witnessed through observing prescription behavior. They can also be observed in sampling behavior, as samples are provided together with a prescription (as a financial subsidy to the patient), or instead of a prescription (as a trial, e.g., when uncertainty about drug-patient interaction is high). Sample dispensing by physicians is rarely studied. Sampling is an important physician decision as well, because sampling may lead to pre-

scribed long-term treatment (Morelli and Koenigsberg 1992), and thus have significant consequences for pharmaceutical firms and public health.

Academic scholars and regulators have turned to assessing how both marketing actions of pharmaceutical firms and patient requests influence physician decision making on drug treatment, both prescription and sampling behavior. At this point, most research has been conducted on how marketing efforts targeted to physicians affect physicians' prescription behavior. Patient requests as a factor influencing physician decision making and sampling as a physician decision have received less attention so far.

Even in the relatively developed research stream on marketing efforts and prescription behavior, controversy has been raised recently. While some studies (e.g., Gönül et al. 2001) find that detailing has a positive and significant effect on prescriptions written, other studies find either a very modest effect (Mizik and Jacobson 2004) or no effect at all (Rosenthal et al. 2003) of detailing on brand prescriptions or sales. Recently, Leeflang et al. (2004) posited that the reason for these incongruent results is that prior models may be misspecified, in that they pool the effect of marketing expenditures across brands, while brands may in fact differ in the extent to which physicians are responsive to the marketing expenditures a firm makes to promote them through detailing, meetings or other promotional instruments. This is also the stance we take in the present study.

This study posits that drug characteristics, such as side effects and effectiveness, are a potential source for brand-specific differences, if any, in the responsiveness of physicians' brand prescription behavior to marketing efforts by pharmaceutical firms. Our insight may contribute to resolving the controversy on how marketing efforts of pharmaceutical firms affect prescription behavior. We also examine the role of these drug characteristics in the effect of other "influencers," such as patient requests, and other physician decisions, such as sample dispensing. A coherent picture arises from our empirical analysis. We find that drug characteristics affect both the influence patients (in this study through patient requests) as well as the pharmaceutical firms (in this study through their marketing efforts targeted to physicians) exert on physician decision making, both in a physician's prescription and a physician's sample-dispensing decisions. Thus, we underscore the importance of including drug characteristics in any study of influence by firms and/or patients on any drug treatment decision a physician makes. By our knowledge, this study is the first attempt to test for interactions between influencers (e.g., detailing by the pharmaceutical firm) and drug characteristics (e.g., efficacy) on physician behavior.

For this study, we have composed a unique data set that matches three data sources. The first contains detailed information on manufacturers' detailing visits to physicians, physician attendance at manufacturers' meetings, and drug requests of patients for 2,774 physicians in the United States, as well as the number of prescriptions written and samples dispensed by each of these physicians on a monthly basis. The second and third data sets we composed ourselves. These contain data on (1) effectiveness, and (2) side effects of each drug in our database.

The next section discusses the theoretical background. Section 3 describes our data set and the analysis methodology we use. Section 4 presents our results. Section 5 discusses our findings, their implications for public policy and management practice, and the study's limitations.

2. Background

This section first discusses prior research on the effects of pharmaceutical firms' marketing efforts on physician prescribing and explores their effects on sampling behavior by the physician, which until today remained unstudied. Second, we discuss the limited prior research on the effects of patient requests on physicians' prescription and sample-dispensing behavior. Third, we explore the role that drug characteristics may play on physician decisions and their interactions with firms' marketing efforts and patient requests. Fourth, we discuss any other relevant variables that may affect physicians' prescription and sample-dispensing behavior.

2.1. Effects of Pharmaceutical Firms' Marketing Efforts on Physician Prescription and Sample-Dispensing Behavior

One can divide the prior literature regarding the effect of pharmaceutical firms' marketing efforts on individual physicians' prescription behavior into two streams, namely, one finding positive effects and one finding mixed effects, at best. We discuss each stream in turn.

Gönül et al. (2001) and Manchanda and Chintagunta (2004) find that marketing efforts by pharmaceutical companies to the physician positively affect prescriptions issued by a physician, but there are diminishing returns to detailing. Manchanda et al. (2004) find that detailing positively affects prescription behavior, but that high-volume physicians, while being detailed more, are less responsive to detailing, as compared to low-volume physicians. Narayanan and Manchanda (2004) find that while detailing influenced physicians positively in an overwhelming number of cases, there was significant cross-sectional and temporal heterogeneity in physician responsiveness to detailing. Janakiraman et al. (2005) find that

nonpersistent physicians are responsive to both detailing and symposium meetings, while persistent physicians are only responsive to symposium meetings. Also, many studies that use aggregate (sales or prescription) data find a positive effect of detailing on drug sales (e.g., Chintagunta and Desiraju 2005; Narayanan et al. 2004, 2005; Neslin 2001; Rizzo 1999).

According to the prior literature, firms' marketing efforts may have a positive effect on prescription behavior because detailing visits or symposium meetings provide information to the physician on efficacy and side effects of the drug (Gönül et al. 2001). In line with a long tradition in economics (e.g., Becker and Murphy 1993, Grossman and Shapiro 1984, Leffler 1981), Narayanan et al. (2005) have argued that firms' marketing efforts may actually have both an informative role (e.g., reducing cognitive uncertainty) and a persuasive role (e.g., inducing positive affect).

Mizik and Jacobson (2004) find that marketing efforts by pharmaceutical companies to the physician positively affect new prescriptions issued by a physician, but the effect sizes are very modest. Their findings cast doubt about a strong and positive effect of marketing efforts on physician prescription behavior as evidenced in studies using aggregate and individual-level data. Parsons and Vanden Abeele (1981) find that physician prescription behavior is quite unresponsive to marketing efforts by pharmaceutical firms to the physician, and sales calls may even have a negative effect. Rosenthal et al. (2003) did not find robust and significant effects for detailing at the individual brand level.

To the best of our knowledge, there has been no prior research that examines the effect of marketing efforts on sample-dispensing behavior by the physician. The most useful research for our purposes is probably the sparse literature in medicine that examines the motives physicians have when dispensing free samples to their patients. Motives that have been cited are: (1) financial savings for patients; (2) convenience; (3) initiate therapy immediately; (4) demonstrate the appropriate use to patients; (5) adjust prescribed doses before the full prescription is purchased; and (6) evaluate early effectiveness or adverse effects (Chew et al. 2000, Duffy et al. 2003).

2.2. Effects of Patient Requests on Physician Prescription and Sample-Dispensing Behavior

Most of the research that studies the effects of patient requests on physician decision making is driven by the growing importance of DTC advertising in the United States, mostly after the FDA's 1997 Draft Guidance on DTC broadcast advertisements. DTC advertising is an important driver of patient requests (Mintzes et al. 2003), and scholars have only studied patient requests when triggered by DTC advertising, rather than any other reason.

In a study using standardized patients that portrayed major depression, 27% of all patients requesting Paxil also received a prescription for it, 26% received an alternative antidepressant, and 47% received no antidepressant, while only 3% of patients with the same condition were prescribed Paxil if they did not explicitly request Paxil (Kravitz et al. 2005). Also, in other settings, scholars found a positive relationship between patient requests and prescription (Kravitz et al. 2003, Lyles 2002, Mintzes et al. 2003) and physician referral (Kravitz et al. 2003). This positive relationship is driven by patient pressure, and research has shown that when physicians do not comply with patient requests, patients are less satisfied with their physician visit (Kravitz et al. 2003).

Underlying typical studies in this area is the notion that patient requests, especially if triggered by DTC advertising, are often for mild or trivial ailments (Weissman et al. 2004, Wilkes et al. 2000). Kravitz et al. (2003) found that subjective health distress predicted requests for physician services (referrals and prescriptions) more powerfully than did an objective count of chronic conditions, leading them to conclude that "requests may be driven more by anxiety than disease burden" (p. 1680). To the best of our knowledge, no research exists that examines the effect of patient requests on sample dispensing by the physician.

2.3. Moderating Role of Drug Characteristics

Even though prior research has stated that drug characteristics may moderate the above effects, their role in the effect of firms' marketing efforts and patients' requests on physician decision making remains unexplored (Leeflang et al. 2004). While a drug can be characterized among many dimensions, such as its approved indications, its dosage, its potency, its administration method and frequency, its interactions with food and other drugs, its toxicity, and its price, in this first exploratory study we will focus on two very salient product characteristics, namely, the drug's effectiveness and the drug's side effects.

A drug's effectiveness is the extent to which the drug reduces the likelihood of negative clinical endpoints. A drug's side effects are secondary, and usually adverse, effects of a drug. For instance, for statins, a drug's effectiveness is the extent to which it reduces the likelihood of negative clinical endpoints, such as (fatal or nonfatal) myocardial infarction or coronary heart disease. The side effects statins may show are effects such as gastro-intestinal reactions, headaches, and nausea.

Above, we referenced prior literature that found positive informative and persuasive effects of firms' marketing efforts on physician decision making. Now we explore the extent to which the effects of firms' marketing efforts on physician decision making may

depend upon the drug's effectiveness and side effects profile. When the firm promotes a more effective drug, as compared to a less effective drug, its ability to lower physician uncertainty about the drug and increase physicians' affect toward the drug is higher, as there will be stronger scientific evidence to back up the marketing effort (Azoulay 2002). The effect of the number of side effects on the relationship between a firm's marketing effort and a physician's decision making is more speculative. On the one hand, a drug with many side effects creates a high level of physician uncertainty (e.g., on the interaction between all these side effects), which can be effectively reduced by firms' marketing efforts, while a drug with few side effects creates a low level of physician uncertainty, thus reducing the need for—and the return on—uncertainty reduction through firms' marketing efforts (Narayanan et al. 2005). On the other hand, it will be harder for firms to persuade physicians to treat patients with a drug that has a high number of side effects as compared to a drug with a low number of side effects. Hence, the total interaction effect of side effects and a firm's marketing efforts is difficult to predict ex ante, and hence is worthy of empirical investigation.

As to patient requests, we also referred to prior literature that found patient requests to occur more often for mild conditions. Thus, we expect that patient requests for drugs with many side effects are honored by the physician in fewer cases than patient requests for drugs with few side effects. The reason is that drugs with many side effects may easily do more damage to the patient than the damage from the initial mild condition (Kravitz et al. 2005). We expect that patient requests for drugs with higher effectiveness are honored by the physician in more cases than patient requests for drugs with lower effectiveness. On the one hand, a physician may react more positively to an effective drug request as she or he has less uncertainty about the drug's therapeutic value. On the other hand, a physician that reacts favorably to a patient request for an effective drug is more likely to receive favorable feedback afterwards than when he reacts favorably to a patient request for an ineffective drug. Given this feedback, the physician will increase his favorable reaction to patient requests, when it concerns the effective drug, and will decrease his favorable reaction to patient requests, when it concerns the ineffective drug.

Summarizing, we, a priori, expect the following:

- Drug effectiveness may strengthen the effects of marketing efforts on prescription and sampling behavior by the physician.
- Drug effectiveness may strengthen the effects of patient requests on prescription and sampling behavior by the physician.
- Side effects of a drug may weaken or strengthen the effects of marketing efforts on prescription and sampling behavior (depending upon information—persuasion trade-off).
- Side effects of a drug may weaken the effects of patient requests on prescription and sampling behavior by the physician.

2.4. Other Variables

We control for other variables, as well, that may affect prescription and sampling behavior. First, we control for the number of prescriptions and samples for competing brands in the prescription model, while we control for competitive samples in the sampling model. Based on Mizik and Jacobson (2004), we expect that these effects may be positive or negative, without a clear ex ante expectation. They may be negative as prescriptions and samples for competing brands take away share of the focal brand (brand switching). They may also be positive, as increasing prescriptions and samples of competing brands can be indicative of growth in the drug category of the focal brand (category growth).

Second, we control for the effect of sample dispensing of the own brand on prescriptions. This effect may be positive or negative, dependent upon the reason why the physician dispenses a sample (see above). Narayanan and Manchanda (2006) argue that a physician may dispense a sample, as she or he is uncertain about a patient's response to the focal drug. This would imply a negative contemporaneous effect of own samples on own prescriptions, as the sample comes at the expense of a prescription. On the other hand, Narayanan and Manchanda (2006) also argue that a physician may financially subsidize low-income or low-coverage patients through sample dispensing, in which case a drug prescription usually comes with a free sample. This would imply a positive contemporaneous effect.

Third, we control for carry-over effects, allowing these effects to interact with drug effectiveness and side effects. Physician persistence is an often observed phenomenon, driven by habit persistence and feedback of patients (Janakiraman et al. 2005). We expect physician persistence to be more positive the more effective the drug is, as this will increase positive feedback of patients to the physician. On the other hand, the more side effects the drug has, the more negative feedback the physician will receive from patients, which in turn will lower physician persistence.

3. Data and Analysis

3.1. Data

The data sets used for the empirical analysis in this study include (a) physician-level panel data, (b) drug-approval database, and (c) clinical trial reports. The

Table 1 Descriptive Statistics and Correlation Table

Descriptive statistics					Correlation table						
Variable	Mean	Std. dev.	Min.	Max.	Prescriptions	Meeting	Detailing	Patient request	Competitive prescriptions	Samples	Competitive samples
Prescriptions	1.23	1.86	0	51	1						
Meeting	0.02	0.17	0	18	0.05	1					
Detailing	0.73	0.97	0	13	−0.00	0.04	1				
Patient request	0.07	0.48	0	41	0.05	0.00	−0.02	1			
Competitive prescription	3.69	3.94	0	80	0.36	0.01	−0.03	−0.03	1		
Samples	0.15	0.50	0	19	0.20	0.03	−0.04	−0.03	0.02	1	
Competitive samples	0.46	0.99	0	24	0.02	0.01	0.03	0.06	0.17	0.24	1

physician-level monthly panel data[1] span two years (January 2002–December 2003) and come from a large firm that specializes in pharmaceutical marketing. Due to confidentiality agreements, we cannot reveal the data source. The data sets contain information on three therapeutic categories, namely, (1) statins, (2) gastrointestinal and coagulation drugs, and (3) erectile dysfunction (ED). The panel is a representative sample of physicians balanced across geographic regions, specialties, and prescription volumes. Monthly brand-specific physician-level variables include total prescriptions written, total samples dispensed, total number of details, total number of meetings attended, and total number of patient requests. These data are collected directly from the physician office through an electronic database that collects prescription and detailing-call information. Unlike previously researched databases, our database has information on samples dispensed by the physician, facilitating a more complete understanding of physician behavior across two key variables—prescriptions written and samples dispensed. We calibrate our empirical model on the four most prescribed brands in each category. The shares of the focal brands are 85% in Category 1, 78% in Category 2, and 88% in Category 3.

Our measures for drug characteristics, effectiveness, and side effects were constructed as follows. We obtained the number of side effects from the drug-approval database from the FDA that includes not only a history of drug-application filing dates, approval dates, and drug-innovation classifications, but also a list of side effects that is periodically updated when new indications and/or side effects are announced.

We obtained drug effectiveness from a meta-analysis of clinical trial reports (source: National Institute for Health and Clinical Excellence). This meta-analysis provides a standardized measurement of effectiveness, namely, a standardized Z-score measure of the overall effectiveness of a brand relative to a placebo. Because these are standardized, the relative effectiveness of brands can be compared directly. The measurements are explained in full detail in the online appendix (provided in the e-companion).[2]

Table 1 provides the descriptive statistics and Pearson correlations for the variables of interest. Table 1 reflects variance in both the dependent variables of interest, i.e., prescriptions written (RX) and samples dispensed. The database includes, at the monthly level, all prescriptions within the examined drug categories by a panel of 2,774 physicians. In all, we have 39,880 observations.[3] From Table 1, we also observe that the correlations among the independent variables are small, hence attenuating multicollinearity problems in the analysis. No physician prescribes the same brand to all his or her patients.

3.2. Analysis

This section describes the empirical model. We begin by specifying the econometric model and end this section with a discussion on the estimation procedure.

3.2.1. Model. To estimate the effects of marketing activities on two physician decision variables—(a) prescriptions and (b) samples dispensed—we describe our estimated econometric model below. Note that the model we specify, given the intricacies of the available data, is a descriptive model that does not allow normative claims (Franses 2005).

3.2.1.1. Dependent Variables. These include the total number of prescriptions (to new and previously diagnosed patients) written and the total number of

[1] Note that our physician-level database includes measures of marketing efforts and prescription data directly at the physician level. Due to institutional factors like availability of generics, insurance coverage, retail distribution, etc., data collected at the pharmacy might not accurately reflect actual physician behavior. Because we have access to direct measures of physician-level variables, we can get a more accurate picture of effects of marketing activities on physician behavior.

[2] An electronic companion to this paper is available as part of the online version that can be found at http://mansci.journal.informs.org/.

[3] Our panel is an unbalanced panel as we do not observe all physicians in the panel for the complete data window, which is 24 months.

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