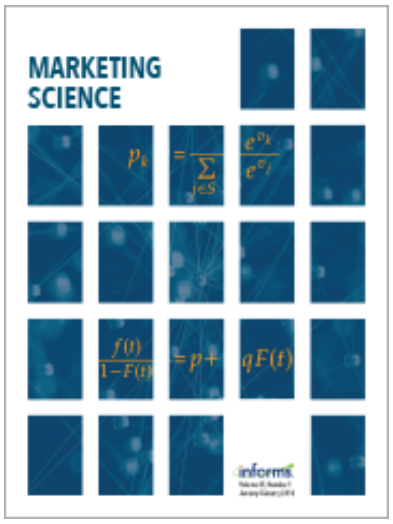

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Offering Pharmaceutical Samples: The Role of Physician Learning and Patient Payment Ability

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Physicians may learn about prescription drug effectiveness directly from the firm via detailing or from patient experience. Patient-mediated learning is aided by the use of free drug samples. The effective use of samples is hampered by a lack of understanding of its exact return on investment implications. We seek to fill this gap by incorporating the physician's sample allocation behavior in the firm's decision making. We uncover the following implications for firms as well as policy makers. First, we find that the optimal sampling level for a drug category is a nonmonotonic function of patient payment ability and the price of the drug. Second, an increase in the cost of samples can lead to an increase in sampling and a decrease in detailing when the physician's propensity to provide sample subsidies is high. Third, when future market growth is expected to be high (early stage product life cycle and/or chronic drugs) and sampling efficiency is low, the use of sampling is profitable for the firm but leads to lower market coverage than when sampling is disallowed.

Key words: pharmaceutical marketing; sampling; detailing; patient payment ability
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1. Introduction

Targeting of physicians through detailing and free drug samples constitutes the lion's share of pharmaceutical marketing budgets. Although sampling may be the single largest promotional expense for many firms, the return on this promotional investment has defied quantification, and these firms see a reduction in samples as a way to improve the bottom line (Lurker and Caprara 2005). Thus, the effective use of samples is hampered by a lack of understanding of the relationship between samples and changes in patient treatment behavior. This paper is an effort to fill this gap in understanding. Sampling differs from detailing in how the cost is incurred. The cost of sampling is not embedded in the operational cost of delivering the promotional campaign but in the retail value of product units given away for free. Furthermore, the delivery system for samples in the pharmaceutical industry is different from business-to-consumer settings. Samples have to be given to physicians who then dispense them to patients (consumers).[1] Thus, to understand the benefits of samples in the pharmaceutical industry, it is imperative to analyze the purpose for which a physician distributes them to patients. This has been the subject of significant speculation in trade journals. Lurker and Caprara (2005) use proprietary data gathered by ImpactRx to conclude that physicians use samples for two purposes. First, samples are given to patients diagnosed with a condition to ascertain the efficacy and tolerability of the drug. Second, samples are given as a subsidy to patients who do not have prescription coverage and may be unable to pay for such drugs otherwise. The key difference from the firm's point of view is that physician learning about patient–drug matches enables firms to increase future revenue, whereas sampling subsidies do not earn the firm any direct revenue. The value from these sampling benefits also depends on the level of detailing used by the firm. Detailing functions as an aid to physician learning about patient–drug matches similar to the learning benefits of sampling. Because detailing involves a sales rep making a physician office call, the marginal cost of providing an extra unit of detailing information is often much more than the marginal cost of a sample drop. However, a sample is an experience good, and its effectiveness as a learning tool for the physician depends crucially on the

[1] Henceforth, we will use the term "patient" instead of "consumer" or "customer." It is implied in this context that the patient is the eventual consumer of the product.

patient's feedback on drug effectiveness. As a result, sampling is a relatively inefficient form of learning about patient–drug match compared with detailing. Our objective in this paper is to find the optimal sampling and detailing plan given the inherent cost–efficiency trade-off between sampling and detailing by incorporating the physician's sample allocation behavior. To the best of our knowledge, our paper is the first to address this issue. The rest of this paper is organized as follows. Section 2 provides details on related academic literature. In §3 we lay out the main model and analyze the optimal solution. In §4, we analyze the sampling decision from the perspective of a social planner. The proofs of all propositions are provided in Online Appendix A (available as supplemental material at http://dx.doi.org/10.1287/mksc.1120.0743). Finally, we conclude in §5 with managerial implications and directions for future research.

2. Related Literature

The topic of pharmaceutical sampling has received increasing attention in the academic literature. Much of this work is purely empirical in nature. Gönül et al. (2001) and Manchanda et al. (2004) show that detailing and sampling have a positive impact on physician prescriptions. Manchanda et al. (2004) further show a negative interaction between detailing and sampling effects. Mizik and Jacobson (2004) study the same issue for three drugs of a specific pharmaceutical firm and show that the effects of samples can be modest. Joseph and Mantrala (2009) form a theoretical model of samples in the context of competition. However, they only look at the efficiency of patient–drug match and do not consider the firm's profit maximization problem. We analyze the firm's promotional optimization problem and relate the results to drug category characteristics such as price and patient payment ability. The public health/public policy literature has also been interested in sampling because of a major debate in these circles as to whether samples are merely a marketing tool for pharmaceutical firms or serve as a safety net for the uninsured. Cutrona et al. (2008) test this idea by classifying patients based on whether they have access to insurance coverage and evaluating the fraction of insured/uninsured patients who receive samples. We take the position that the marketing purpose of samples is to increase physician learning and thereby increase sales for the pharmaceutical firm.

Our work also builds on recent empirical research on physician learning. Physician learning about drug attributes plays a key role in prescription decisions. This learning continues to be important even as the product market matures because physicians need to be provided reminders about various drug attributes (Narayanan et al. 2005). Existing studies have shown that both within-patient (Crawford and Shum 2005) and across-patient (Coscelli and Shum 2004) learning are significant in prescription pharmaceutical markets. We assume, based on empirical evidence, that such learning occurs in pharmaceutical markets and evaluate the optimal sampling decision for a profit maximizing firm. Furthermore, we explore the public policy implications of sampling through an analysis of market coverage as a function of different primitive parameters.

3. The Main Model

3.1. Basic Parameters and Variables

We consider a monopolist selling a prescription drug. We divide time into two discrete periods. The patient requires only one period of medication to be cured of this illness if the disease is of the acute type (e.g., strep throat) and two periods of treatment if the illness is of the chronic type (e.g., hypertension). The first period under consideration is our focal period, where detailing and sampling decisions are made. However, first-period detailing and sampling stock results in learning that carries over (but may depreciate) to the second period. A unit mass of patients suffer from the illness in the first time period and hence approach a physician for treatment. A proportion θ of these patients have the ability to pay for the focal drug under consideration. The firm has full information about this parameter θ. The total mass of patients (normalized to 1) is heterogeneous in patient type (as described by health characteristics), and these patient types are uniformly distributed. The fact that overall drug effectiveness (including efficacy, side effects, and drug interactions) varies significantly across patients with different health characteristics is widely recognized (Arnst 2004). The drug under consideration works for a fraction 1/2 of the total number of patients.[2] Although the physician may be aware of this fraction, she does not know whether or not the drug works for a specific patient. Here, *works* means that the drug is more effective when compared with a benchmark drug. We assume that the benchmark drug is effective on all patients (albeit with a lower degree of efficacy than the focal drug). The level of detailing for a physician is given by the variable α, where $0 \le \alpha \le 1$. To achieve the effective detailing level of α, the firm incurs a cost of $k \cdot \alpha^2$, where $k \ge 0$. In a single detailing call, α represents the quantum of information that the sales rep provides. Because the provision of this information takes time, and getting

[2] All our results hold if we allow this fraction to take on a general value different from 1/2. The analysis of this case is available from the authors upon request.

physician time is difficult, the cost increases in a convex fashion. At the detailing level of α, the physician can identify a positive match for the drug with an α proportion of the total market for the firm. Because the firm's market size is $\frac{1}{2}$ by assumption, $\frac{1}{2}\alpha$ patients in total are identified. We assume that the number of samples distributed by the firm to the physician is S. We assume that the production cost of the drug is c and the price of the drug is p. We assume price to be exogenous in order to generate key insights of value in the pharmaceutical context. In pharmaceutical markets, the price setting is a result of many complex factors such as characteristics of the drug, prevalent healthcare policy, and managed care issues. Thus, we assume that price is simply a function of the product category, and the firm makes only promotional decisions.

3.2. Physician Behavior and Sample Allocation

Using detailing information alone, a physician will prescribe the focal drug to identified patients with payment ability. For a patient unidentified by detailing, the physician will make a decision based on the patient's surplus calculated as the expected efficacy of the focal drug minus the price paid. We assume that the value of expected efficacy[3] is greater than 0 but lower than p and that the expected efficacy of the focal drug is higher than patient surplus from the benchmark drug. These assumptions ensure the following outcomes: (1) The physician prefers giving out free samples of the focal drug to unidentified patients rather than prescribing the benchmark drug. (2) A free sample of the focal drug provides positive surplus to an unidentified patient, but a paid prescription does not and hence the focal drug is never prescribed to an unidentified patient; however, (3) an unidentified patient may receive a free sample if available. We also assume that the physician makes a certain fraction of samples available as subsidies to patients who are identified but do not have the ability to pay. For a given detailing level α and patient payment ability θ, the number of such patients is $\frac{1}{2}\alpha(1-\theta)$. The physician is willing to give out samples to only a ϕ fraction of such patients. This implies that the physician will allocate the remaining samples $S - \phi \cdot \frac{1}{2} \cdot \alpha(1-\theta)$ in the following way. She will give samples to unidentified patients until S samples are exhausted or the unidentified patients are exhausted $(1-\frac{1}{2}\alpha)$. At this point, because all unidentified patients have been provided with samples, the physician's learning about patient type is already complete, and any additional samples can only be used for identified patients. Thus, the firm does not benefit through the delivery of these additional samples. Because the firm knows the patient payment ability parameter θ and its own detailing level α, it will never offer such additional samples at the optimum solution. Hence, a constraint that should hold for the sampling decision variable is $S \leq (1-\frac{1}{2}\alpha) + \phi \cdot \frac{1}{2} \cdot \alpha(1-\theta)$. In addition, we must account for the fact that samples for prescription products cannot typically be delivered to physicians unless there is some detailing activity. Because we are primarily concerned with prescription products, we will assume that all samples are delivered through a detailing call. Hence, if $\alpha = 0$, then S must also be 0. We implement this using an indicator function I, which is defined as $I = 1$ if $\alpha > 0$ and $I = 0$ if $\alpha = 0$. This indicator function can be incorporated on the right-hand side of the sampling constraint to implement the required condition: $S \leq [(1-\frac{1}{2}\alpha) + \phi \cdot \frac{1}{2} \cdot \alpha(1-\theta)]I$. Having laid out the dynamics of physician behavior, we next describe the profit function.

3.3. Firm Profit Function

We assume that all physicians capable of treating the illness under consideration are homogeneous in terms of their prescription behavior. Consequently, it suffices to look at the profit of the firm from a single physician. Because the impact of learning occurs only in period 2, the profit of the firm in the first period is

$$\pi^1 = \tfrac{1}{2}\alpha\theta(p-c) - k\alpha^2 - cS, \tag{1}$$

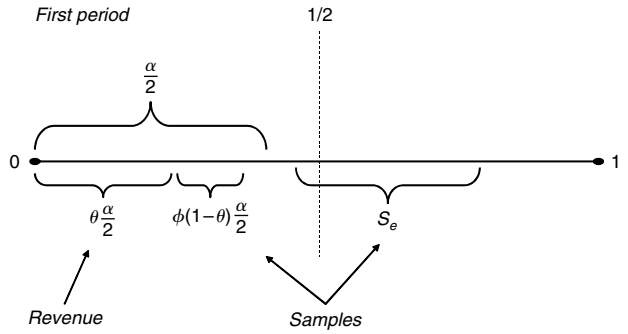
where $\frac{1}{2}\alpha\theta$ is the number of patients who are identified to fit the drug and can pay for it. The cost of samples is a simple linear form because the cost of a sample is the production cost of the sample. Samples are delivered during a detailing call and incur no separate delivery costs.[4]

In the second period, first-period detailing has two effects: If the illness is of the acute form, the physician can identify patient types (but physically different patients) by detailing in the first period. If the illness is of the chronic form, the physician can not only identify patient types but also prescribe to the same patients seen in the first round. We capture these long-term effects using the parameter δ. This is a *market growth* parameter that reflects how chronic the disease is and the number of new patients with a similar health profile who visit the physician in the second period (i.e., it reflects the life cycle stage of the product). Given that δ is a market growth parameter, it can take on values larger than 1. If the number of samples given for the purpose of learning $\max\{S - \frac{1}{2}\phi\alpha \cdot (1-\theta), 0\} = S_e$ is less than $1-\frac{1}{2}\alpha$ and the physician does not know ex ante whether or not a patient fits

[3] We use the term "expected efficacy" because the patient is unidentified and hence may or may not match the drug supplied to her.

[4] We can add a cost term for detailing that depends on the number of samples delivered. This does not qualitatively change our main insights.

Figure 1 Patient Identification Through Samples



Note. Expected identified patients in future periods due to samples in period 1 are equal to the following: $\delta\lambda S_e((\frac{1}{2}(1-\alpha))/(1-\frac{1}{2}\alpha)) = \delta\lambda S_e((1-\alpha)/(2-\alpha))$.

a drug, it is possible that some unidentified patient types who fit the drug may not receive a sample. In Figure 1, all patients in the left part (divided by the dashed line) of the unit segment fit the drug. However, not all patient types in the left part are covered by either detailing or samples. In Figure 1, this set of patient types is represented by that part in the left that is not covered by braces. Thus, for any given value of detailing α and sampling S, the physician may be unable to identify all patient types who fit the drug. In expectation, the fraction of effective samples that can be converted to sales in the second period by accurate identification depends on the ratio of unidentified but positively matching patients to the total number of unidentified patients, for a given level of detailing. This ratio is given by the expression $\frac{1}{2}(1-\alpha)/(1-\frac{1}{2}\alpha) = (1-\alpha)/(2-\alpha)$. Furthermore, this ratio needs to be adjusted for the efficiency of sampling. The lack of patient compliance to prescribed medication is an important issue that pharmaceutical firms and policy makers have to address (Wosinska 2005). In the case of a prescription-based product, there is no loss of revenue to the firm when a patient purchases a drug and decides not to use it. However, this is not the case with free samples because not using a sample reduces learning benefits that can result in future sales. Apart from compliance, biological sources of uncertainty might prevent a physician from learning perfectly through sampling. We represent this inefficiency by a parameter λ. Consequently, in the second period, physicians may know the fit of the drug to the following number of patient types: $\alpha/2 + \lambda \cdot \min\{1-\alpha/2, S_e\} \cdot ((1-\alpha)/(2-\alpha))$. The first term represents the patient types identified by detailing, and the second term represents the patient types identified by sampling. Because the firm accrues revenue only from patients with the ability to pay, the profit to the firm in the second period is

$$\pi^2 = \left\{\frac{\alpha}{2} + \lambda \cdot \min\left\{1-\frac{\alpha}{2}, S_e\right\} \cdot \left(\frac{1-\alpha}{2-\alpha}\right)\right\} \delta\theta(p-c). \quad (2)$$

Note that the profit from the second period is obtained after adjusting for the market growth parameter δ. The total two-period profit to the firm π is given by adding the expressions given by Equations (1) and (2):

$$\pi = (1+\delta)\frac{\alpha}{2}\theta(p-c) + \delta \cdot \lambda \cdot \min\left\{1-\frac{\alpha}{2}, S_e\right\} \cdot \left(\frac{1-\alpha}{2-\alpha}\right)\theta(p-c) - k\alpha^2 - cS, \quad (3)$$

which is subject to the constraints $0 \le \alpha \le 1$ and $0 \le S \le [(1-\alpha/2) + \phi(\alpha/2)(1-\theta)]I$. The objective of the firm is to maximize this profit by setting the detailing and sampling levels α and S. Solving this optimization problem allows us to characterize the optimal solution as a function of the parameters p, k, c, θ, δ, λ, and ϕ. For this purpose, we define the threshold k_B^* (the exact definition for k_B^* is given in Online Appendix B) and state a result on the optimality of sampling for the firm.

Proposition 1. (1) *The pharmaceutical firm uses sampling when the detailing cost and markup of the drug are high enough*: $k \ge k_B^*$ *and* $(p-c)/c > 2/(\delta \cdot \lambda \cdot \theta)$.

(2) *The optimal sampling plan as a function of patient payment ability* θ *and price* p *has a nonmonotonic shape with a unique interior maximum.*

The proposition reveals that sampling is profitable for the firm only if the detailing cost and markup of the drug (i.e., $(p-c)/c$) exceed certain thresholds. When detailing cost k is low, detailing is more cost effective and efficient at matching patients with the drug compared with sampling. When the markup is too low, learning through sampling does not provide significant benefits in the second period. It is intuitive that the minimum markup required for sampling to be optimal is lower when the market growth (δ) is higher, the learning through sampling (λ) is more efficient, and more patients have payment ability (θ). However, once sampling becomes optimal, its exact magnitude decreases with an increase in patient payment ability or the price of the drug. This occurs because the marginal return on detailing increases with an increase in patient payment ability and price, and an increase in detailing reduces the number of patients that need to be identified by sampling. Next, we evaluate comparative statics with respect to the sampling cost c and capture its effects in the following proposition.

Proposition 2. *Whenever sampling is optimal and the following conditions hold*: $\lambda < 1$ *and* $\phi \ge (1-\theta(1+\delta(1-\lambda)))/(1-\theta)$, *the optimal detailing level is decreasing in* c *and the optimal sampling level is increasing in* c.

The increase of sampling level resulting from an increase in the cost of samples is counterintuitive

at first glance. The intuition for this is as follows. The firm relies more on detailing when sampling is inefficient ($\lambda < 1$). A higher level of detailing, however, leads to a higher level of sample subsidies, as more patients without payment ability are identified to match the drug. The cost of sample subsidies increases as c and ϕ increase. Therefore, to reduce the high cost of sample subsidies when c increases, it can be optimal for the firm to reduce detailing and substitute it with more sampling. In essence, when the cost of sampling increases, detailing may become relatively more costly than sampling because of the sample subsidies provided to the patients identified by detailing. Hence, more sampling but less detailing may be used when c is higher. One managerial implication of this result is that an improvement in production technology that reduces the cost of a sample does not imply an increase in the number of samples delivered, under some conditions. Having discussed the sampling decision from the firm's perspective, we move to the perspective of a social planner.

4. Implications for a Social Planner

Thus far, we have analyzed promotional decisions at the individual firm level, with price as an exogenous parameter. Given this context for a health-related product, the social planner may be primarily interested in maximizing market coverage without concern for the specific price paid by any customer. In our setting, market coverage includes all patients across the two periods who receive (either for free or by paying for it) a positively matching drug for treatment. We denote α_S^* and α_N^* as the optimal detailing levels with and without sampling, respectively. The corresponding market coverage expressions are

$$\begin{aligned}&\text{Market Coverage (with samples)}\\&= \theta \cdot \tfrac{1}{2} \cdot \alpha_S^* + \phi \cdot (1-\theta) \cdot \tfrac{1}{2} \cdot \alpha_S^* + \tfrac{1}{2} \cdot (1-\alpha_S^*)\\&\quad + \theta \cdot \delta \cdot \left[\tfrac{1}{2} \cdot \alpha_S^* + \lambda \cdot \tfrac{1}{2} \cdot (1-\alpha_S^*)\right], \qquad (4)\\&\text{Market Coverage (without samples)}\\&= \theta \cdot (1+\delta) \cdot \tfrac{1}{2} \cdot \alpha_N^*. \qquad (5)\end{aligned}$$

Suppose that the basic parameter conditions are such that the firm finds sampling to be optimal. Would market coverage decrease when compared with the pure detailing case? The next proposition answers this question. For tractability, we evaluate market coverage at $c = 0$ and $\phi = 0$.[5]

Proposition 3. *At $c = 0$, when $k \geq k_B^*$, sampling efficiency λ is positive but low enough and the market growth parameter δ is high enough, market coverage declines compared with the scenario where sampling is disallowed.*

[5] It is possible to relax these parameter assumptions and evaluate the corresponding conditions numerically. We omit this analysis in the paper in the interest of brevity.

The exact thresholds for λ and δ are given in Online Appendix B. Proposition 3 highlights the fact that a social planner or regulator may want to curb the use of sampling when sampling efficiency is low and future market growth is high. The intuition for this is as follows. Sampling is used to substitute for detailing when the cost of sample is low (e.g., $c = 0$). Low sampling efficiency, however, negatively affects the market coverage in the second period, and this negative impact is higher when the market growth is high. On the other hand, if sampling is disallowed, the firm optimally adopts a higher detailing level with higher market growth, which leads to higher market coverage. Therefore, as shown by Proposition 3, market coverage may decline when sampling is allowed if sampling efficiency is low and market growth is high. Because sampling efficiency and future market growth can vary across product categories, a social planner needs to carefully evaluate drug category characteristics in determining sampling policy for the prescription pharmaceutical industry.

5. Concluding Remarks

Promotion directed at physicians still occupies a dominant position in the pharmaceutical firm's marketing budget. Although detailing is an essential part of promotional activity in the physician's office, a detailing call may frequently involve the distribution of free samples. Physician learning is a critical factor in prescription decisions, and both detailing and sampling help in this process. Whereas detailing is a form of direct communication between the firm and the physician, sampling enables patient-mediated learning. Detailing is a costly but more efficient form of promotion because the firm has to provide specific clinical information that aids in matching a drug with a patient type, whereas sampling can be inefficient due to several uncontrollable factors such as patient compliance. A pharmaceutical firm has to optimize detailing and sampling by taking physician behavior and sampling inefficiency into account. We examine the firm's promotional resource allocation problem across detailing and sampling in the context of this cost–efficiency trade-off. We find that the markup of the drug is a crucial factor in the decision to offer free samples. A minimum markup is required for sampling to be offered, and this markup threshold decreases with an increase in the patient payment ability, the efficiency of physician learning through sampling, and future market growth. However, once this threshold is reached, optimal sampling is a decreasing function of patient payment ability and drug price. Our analysis shows that managers

need to understand the impact of the nonmonotonic nature of these factors on the optimal sampling decision. We also show that an increase in the cost of samples can increase rather than decrease the level of sampling when the physician propensity to provide sample subsidies is high. This occurs because the firm reduces the detailing level to minimize the cost of sampling subsidy incurred for patients who cannot afford the drug. As a result, samples are used more efficiently for the purpose of learning. We also find that, if sampling is optimal for a firm, market coverage may be reduced when compared with a case when samples are disallowed if sampling efficiency is low enough and future market growth is high enough. Future market growth can be drug category dependent because the value of this market growth parameter is likely to be higher for drug categories at an early stage of their life cycle or when the drug is meant for chronic use. Thus, the social planner needs to carefully evaluate drug category characteristics in determining sampling policy.

There are several fruitful directions for future research. In this paper, the price of the drug is treated as exogenous. To understand pricing decisions in this context, we need to incorporate factors such as the structure of the managed care industry and other contracting issues, which are outside the scope of our paper. Future research could shed some light on how firms should incorporate managed care contracting issues in their sampling decisions.

Supplemental Material

Supplemental material to this paper is available at http://dx.doi.org/10.1287/mksc.1120.0743.

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References

Arnst C (2004) The waning of the blockbuster drug. *Business Week* (October 17) http://businessweek.com/stories/2004-10-17/the-waning-of-the-blockbuster-drug.

Coscelli A, Shum M (2004) An empirical model of learning and patient spillovers in new drug entry. *J. Econometrics* 122(2): 213–246.

Crawford GS, Shum M (2005) Uncertainty and learning in pharmaceutical demand. *Econometrica* 73(4):1137–1173.

Cutrona SL, Woolhandler S, Lasser KE, Bor DH, McCormick D, Himmelstein DJ (2008) Characteristics of recipients of free prescription drug samples: A nationally representative analysis. *Amer. J. Public Health* 98(2):284–289.

Gönül F, Carter F, Petrova E, Srinivasan K (2001) Promotion of prescription drugs and its impact on physicians' choice behavior. *J. Marketing* 65(3):79–90.

Joseph K, Mantrala M (2009) A model of the role of free drug samples in physicians' prescription decisions. *Marketing Lett.* 20(1):15–29.

Lurker N, Caprara B (2005) The sampling subsidy. *Pharmaceutical Executive* (February 1) http://www.pharmexec.com/pharmexec/PE+Features/The-Sampling-Subsidy/ArticleStandard/Article/detail/146582.

Manchanda P, Rossi PE, Chintagunta PK (2004) Response modeling with nonrandom marketing-mix variables. *J. Marketing Res.* 41(4):467–478.

Mizik N, Jacobson R (2004) Are physicians "easy marks"? Quantifying the effects of detailing and sampling on new prescriptions. *Management Sci.* 50(12):1704–1715.

Narayanan S, Manchanda P, Chintagunta PK (2005) Temporal differences in the role of marketing communication in new product categories. *J. Marketing Res.* 42(3):278–290.

Wosinska M (2005) Direct-to-consumer advertising and drug therapy compliance. *J. Marketing Res.* 42(3):323–332.