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THREE ESSAYS ON MARKETING STRATEGY ELEMENTS AND THE BRAND LIFE CYCLE IN THE PHARMACEUTICAL INDUSTRY

By

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ABSTRACT

THREE ESSAYS ON MARKETING STRATEGY ELEMENTS AND THE BRAND LIFE CYCLE IN THE PHARMACEUTICAL INDUSTRY

By

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It is of critical importance to marketers to be able to demonstrate the value of marketing efforts. The present study attempts to examine the impact of specific marketing communication activities (advertising and sales force). The pharmaceutical industry is chosen as the context of this study, focusing on one therapeutic category, gastrointestinal drugs (GID). Several distinct promotional channels are used in this industry, providing an interesting comparison of the value of these various efforts.

Essay One examines the financial impact (specifically, return on investment, or ROI) of pharmaceutical promotional activities. Furthermore, the ROI of these efforts over the stages of a brand's life cycle is examined. This provides for a thorough examination of how the ROI for each promotional effort varies over time. The results of this study provide guidance to managers as to how to optimize the promotional mix over a product's life cycle.

Essay Two investigates the effect of various promotional efforts (direct-to consumer advertising, journal advertising, and sales force) on sales. Additionally, the interaction effects between the promotional efforts are examined. The incorporation of additional moderator effects (competitive intensity and number of

years on the market) reveals noteworthy contingencies with respect to these relationships. The impact of these promotional efforts is rather complex, and is dependent upon a number of factors.

Lastly, Essay 3 examines the impact of a late entrant market entry on sales of incumbent brands. A significant portion of the market entry literature suggests that, compared to market pioneers, late entrants face significant disadvantages that must be overcome. This study explores the factors that contribute to a late entrant's success in achieving market leadership. Factors such as innovative product offerings as well as significant marketing efforts can contribute to a late entrant's success in the marketplace. Results indicate that late entrants can compete with incumbents by attempting to expand the existing market as well as shift sales from existing competitors. The present study has a number of important implications for managers in developing the optimal marketing mix strategy when faced with a product's late market entry.

Overall, this study reveals a number of noteworthy findings. The importance of personal selling, in comparison to advertising, within the promotional mix is noted. However, this research suggests that a number of contingency factors must be accounted for in considering the impact of various promotional efforts, such as the competitive environment and stage of the product's life cycle. This research also suggests that, contrary to a majority of the marketing literature, late entrants into a market can overcome disadvantages they face to become market leaders.

To my parents, Tamer and Judy Cavusgil,
and my brother, Emre Cavusgil

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INTRODUCTION

The present study examines the effects of various promotional efforts conducted in the pharmaceutical industry. Like many other industries, the pharmaceutical industry engages in various promotional activities to inform, persuade, and convert potential customers. The 'mix' of marketing strategies in this industry consists of direct-to-consumer (DTC) advertising, sales force efforts directed towards physicians (detailing), as well as other efforts such as journal advertising, and physician meetings and events. In 2004, the industry spent $20 billion on marketing (Lam 2004). "Pharmaceutical marketing," states David Gascoigne of the promotion management practice at IMS Consulting, " is about total brand communications – all forms of promotional activity working together across disciplines to develop synergy for the brand" (Lam 2004, p. 104). Indeed, branding is critical for pharmaceutical firms, particularly upon patent expiration when faced with generic substitution (Hallahan and Madell 1999; Laitin 2000).

Also critical to the pharmaceutical industry is effective management of the brand life cycle. In view of the limited brand life, manufacturers must be able to maximize profits during the drug's life and/or extend the time period during which sales can be generated. "If companies are to survive, they need to reshape the lifecycle curve so that the profitability portion starts earlier and the maturity part ends later. They need to find ways to provide greater value to patients while selling more and to do so for a longer period of time" (Daly and Kolassa 2004, p. 8). Firms must also be able to appropriately modify their strategy throughout the brand life cycle. Hofer (1975) contends that "the most fundamental variable in

determining an appropriate business strategy is the stage of the product life cycle" (p.798).

Given the substantial resources invested in marketing activities, little is known about their effectiveness in terms of generating expected outcomes. How effective are the various marketing efforts used by pharmaceutical companies? Does effectiveness vary across the life cycle of the brand? Do these strategies have different effects on brand sales vs. total therapeutic category sales? The present study addresses these fundamental questions. More specifically, the following three broad research questions are examined:

1. (a) For a given therapeutic category, what is the return on investment of DTC advertising, detailing, and journal advertising? (b) Does the ROI of these marketing efforts vary over the life cycle of the drug product?

2. (a) What are the effects of DTC advertising and detailing on brand sales? (b) What are their effects on overall sales of all brands within a particular therapeutic category? (c) Do DTC advertising and detailing have different roles? (d) What are the effects of the interaction of these strategies? (e) How does competition impact these promotional efforts?

3. (a) What are the effects of DTC advertising on sales of over-the-counter drugs compared to prescription drugs? (b) When a drug product switches from Rx (prescription) to over-the-counter, what is the impact on sales of other over-the-counter and Rx drugs?

Each set of research questions is addressed in a separate essay.

Research questions 1(a), 2(a-d), and 3(a) have been previously studied, though not extensively, within certain therapeutic categories (Berndt et al. 2002b; Narayanan et al. 2004). In particular cases, conflicting results have been found. The therapeutic category chosen for this study is gastrointestinal drugs. These drug products are most often used to treat the symptoms of acid reflux and GERD (gastroesophageal relfux disease). There have been several drugs

approved in this therapeutic category over the last 30 years, with many going off patent and being sold over-the-counter in the last decade. Since this study examines both prescription and over-the-counter products, this therapeutic category is appropriate to answer the research questions.

Distinct Aspects of the Pharmaceutical Industry

This section briefly attempts to highlight unique aspects of the pharmaceutical industry, which distinguish this industry from others. In addition, the nature of research conducted in this industry is compared to research conducted in a general context with respect to marketing mix activities.

The Nature of the Pharmaceutical Industry

The pharmaceutical industry is unique in many ways. These are noted here:

- In the pharmaceutical industry, there exists a 3rd party intermediary (the physician) who controls the dispensing of prescription drugs to consumers. Therefore, the consumer is not responsible for choosing which drug he/she will ultimately receive, with the exception of over-the-counter drug products.

- In the pharmaceutical industry, many consumers are not responsible for paying for the entire cost of the drug themselves. In this case, insurance companies cover a majority of the cost, while consumers pay a small co-pay when receiving a prescription drug. Therefore, in this case, price is a lesser issue when considering the choice of drug.

- Ethical drug products have a limited brand life cycle due to an established patent life (20 years). Pharmaceutical companies are therefore concerned with maximizing sales during this patent protection period as well as possibly generating additional sales post-patent.

- The pharmaceutical industry must follow extensive governmental regulations. This offers additional challenges when trying to bring drug products to market as well as the manner in which the drugs are promoted to physicians and consumers.

Due to the unique aspects of the pharmaceutical industry, the nature of research conducted in this field is distinctive in several ways compared to research conducted in the general context. The following highlights these differences.

- In a general context, the effect of advertising on *brand* outcomes (brand choice, brand equity) is often the central focus. In the pharmaceutical industry, the effects of advertising on both *brand* and *therapeutic category* sales have been contrasted.

- In the pharmaceutical industry, more so than in other industries, the varying effects of the two main types of promotional efforts: detailing (ie., sales force activities) and DTC advertising is of primary interest. The physician, not the consumer, holds the responsibility as to the choice of drug. As such, the differential effects of these efforts (for example, generating awareness vs. increasing sales) are emphasized.

- Because consumers generally do not pay full price for prescription drugs, often the issue of price and consumer price sensitivity is less significant in the pharmaceutical industry compared to other industries. Therefore, issues surrounding price have been examined to a lesser extent in the pharmaceutical context.

Background

The pharmaceutical industry is characterized by many unique features. One such unique feature is the nature of its relationship with consumers. More specifically, there exists a third party – the physician – who acts as an intermediary between the pharmaceutical firm and the consumer. For the case of prescription drugs, the consumer cannot obtain the drug without a physician's prescription. Consequently, pharmaceutical firms have long focused their promotional activities on physicians. This changed somewhat in 1997 when the Food and Drug Administration (FDA) relaxed its restrictions regarding advertising to consumers. Over the last decade, direct-to-consumer advertising has grown

significantly, increasing at an annual rate of 13-20% since 1997 (Singh and Smith 2005).

History of Direct-to-Consumer Advertising

Prior to 1997, the FDA allowed restricted advertising of drug products to consumers. Such advertising was limited to 'reminder' ads which could mention the brand but not conditions, or 'directive' ads which could mention the conditions but not the brand (Beltramini 2006). In 1997, after much deliberation, the FDA relaxed its rules, allowing pharmaceutical manufacturers to mention the name of the drug and related conditions. Additionally, the advertisement was to contain information about the drug's risks and provide sources of additional information, such as Internet addresses or phone numbers. With these relaxed restrictions came an insurgence of DTC advertising over the last decade.

Promotional Efforts in the Pharmaceutical Industry

Pharmaceutical manufacturing firms readily use two traditional marketing communication strategies: the 'push' strategy, where the firm attempts to influence the physician to push the product to the consumer, as well as the 'pull' strategy, in which case the firm attempts to influence the consumer by increasing consumer demand (Parker and Pettijohn 2005). The pull strategy is carried out through direct-to-consumer advertising campaigns. Such campaigns can be directed toward a specific drug product or a particular disease or condition (disease awareness campaign). The push strategy is carried out through direct interaction between pharmaceutical sales force representatives and physicians, also known as 'detailing'. Such encounters generally take place in the physician's

office or at meetings and events, during which the pharmaceutical representative informs the physician about the firm's product(s). Often, free drug samples are left with the physician to distribute to patients. An additional method of advertising to physicians is through the print media via medical journal advertising. Overall, detailing accounts for approximately 29% of promotional spending by pharmaceutical manufacturers' spending, while sampling accounts for 55%, DTC advertising accounts for 14%, and medical journal advertising comprises 2% of spending (Rosenthal et al. 2003). Although DTC advertising accounts for a minor portion of overall spending, DTC advertising to consumers has steadily risen since 1997.

The remainder of this dissertation is organized as follows: Essay One examines the ROI of pharmaceutical promotional efforts over the brand life cycle. Essay Two investigates the impact of promotional efforts on sales, incorporating additional moderator variables. Essay Three examines the impact of late entrant market entry into the Rx and OTC markets on sales of competitor drug products. This is followed by general conclusions summarizing the results the each study.

ESSAY ONE: Marketing Mix Variables and Return on Investment

Introduction

Recently, marketing scholars have devoted much attention to demonstrating accountability of the marketing function by attempting to quantify how marketing actions add to shareholder value (Day and Montgomery 1999; Rust et al. 2004). These scholars claim that there is considerable need to validate how marketing expenditures, such as marketing communications, influence marketplace performance. As such, conceptual frameworks linking marketing contributions to shareholder value have been proposed (Srivastava et al. 1998). Moreover, empirical studies have demonstrated how the marketing function contributes to perceptions of firm financial performance (Moorman and Rust 1999) as well as the positive impact of marketing communications on shareholder value (Luo and Donthu 2006).

Recognizing this need to demonstrate the value of marketing efforts, the present study attempts to examine the return on investment of specific marketing communication activities (advertising and sales force). Marketing scholars also distinguish between 'effectiveness' and 'efficiency' of marketing actions (Rust et al. 2004). The need to examine the efficiency of advertising has been suggested (Luo and Donthu 2001). Existing research suggests differing outcomes of these two marketing efforts, suggesting varying levels of effectiveness. This research is designed to (i) demonstrate the value of these two important marketing activities as well as (ii) assist managers in optimizing resource allocation in an effort to maximize returns from these investments.

The present study focuses on communication efforts in the pharmaceutical industry. Specifically, three types of promotional efforts are investigated: Direct-to-Consumer (DTC) advertising, detailing (personal selling) directed at physicians, and advertising in medical journals, also targeted to physicians. This study compares the return on investment (ROI) of these types of efforts in a particular therapeutic category: gastrointestinal drugs (GID). Our database comprises nine drug products and includes promotional expenditures over several years.

Furthermore, we additionally focus the analysis on various stages of the brand life cycle. This allows us to examine how the ROI of these promotional efforts vary over time. Because pharmaceutical drug products face a limited patent life, managing the brand life cycle is particularly crucial in this industry. Generally, a firm's marketing strategies will vary over the life cycle. Because marketing strategies, as well as the competitive environment, evolve over the brand life cycle, researches have noted the treatment of the brand life cycle as a contingency variable during strategy formulation (Anderson and Zeithaml 1984; Day 1981). Marketing scholars agree that strategy and tactics should vary depending on the stage of the brand life cycle (Kotler 1965; Parsons 1975; Thietart and Vivas 1984).

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Pharmaceutical manufacturing firms readily use two traditional marketing communication strategies: the 'push' strategy, where the firm attempts to influence the physician to push the product to the consumer, as well as the 'pull'

strategy, in which case the firm attempts to influence the consumer by increasing consumer demand (Parker and Pettijohn 2005). The pull strategy is carried out through direct-to-consumer advertising campaigns. Such campaigns can be directed toward a specific drug product or a particular disease or condition (disease awareness campaign). The push strategy is carried out through direct interaction between pharmaceutical sales force representatives and physicians, also known as 'detailing'. Such encounters generally take place in the physician's office or at meetings and events, during which the pharmaceutical representative informs the physician about the firm's product(s). Often, free drug samples are left with the physician to distribute to patients. An additional method of advertising to physicians is through the print media via medical journal advertising. Overall, detailing accounts for approximately 29% of promotional spending by pharmaceutical manufacturers' spending, while sampling accounts for 55%, DTC advertising accounts for 14%, and medical journal advertising comprises 2% of spending (Rosenthal et al. 2003). Although DTC advertising accounts for a minor portion of overall spending, DTC advertising to consumers has steadily risen in the last decade. This is due to the relaxation of FDA regulations regarding DTC advertising in 1997.

Pharmaceutical companies devote significant investments to promoting to consumers and physicians. In 2006, industry spending on DTC advertising was $4.5 billion (Kelly 2007). The cost of sampling was $19 billion in 2006 and detailing budgets were $7.7 billion in 2004 (Kelly 2007). Although considerable efforts are made to promote pharmaceutical drug products, it is unknown whether

or not these efforts are worthwhile, particularly with regards to DTC advertising. One purpose of the present study is to examine the return on investment of these various types of promotional efforts. The second goal is to examine how the ROI varies specifically over stages of the brand life cycle. Past research has neglected this level of analysis. Examining the ROI at various stages of the brand life cycle allows us to explore the variation in ROI of DTC advertising and detailing over time.

Conceptual Development and Hypotheses

One area of interest to marketing researchers is examining the return on investment of pharmaceutical promotional expenditures. Demonstrating the value of marketing communication efforts is important in most, if not all, industries. In the pharmaceutical industry, various researchers have specifically compared the ROI of DTC advertising and detailing, and to a lesser extent, journal advertising and advertising via physicians meetings and events. Table 1 provides an overview of studies examining the ROI of these various types of promotional efforts. This type of inquiry has been conducted for only a few therapeutic categories. Neslin (2001) examines the ROI of DTC, detailing, journal advertising, and physician meetings and events using a sample of 391 drugs covering several therapeutic categories. Wittink (2002) examines the ROI for DTC advertising, detailing, journal advertising, and physician meeting and events for three therapeutic categories: arthritis, asthma, and hypertension. Narayanan et al (2004) investigate the the ROI of DTC and detailing for antihistamine and

antiviral drugs. Chintagunta and Desiraju (2005) study the ROI of detailing for antidepressants.

Examining these results on the whole, we observe: ROI appears higher for journal advertising and detailing compared to DTC advertising and physician meetings and events. Across therapeutic categories, ROI for DTC advertising appears to be consistently low. However, for detailing, ROI ranges from $1.10 to $9.19. Similarly, for journal advertising, ROI ranges from $2.50 to $15.60. Such variability in results does not allow for firm conclusions to be drawn regarding the overall effectiveness of these promotional efforts. This inconsistency may result from differences across therapeutic categories or differences among life cycle stages. Utilizing differing methods to calculate ROI may also account for variability in results. Here, ROI is defined as the increase in prescription sales resulting from a $1.00 increase in promotional spending.

Table 1: Summary of findings on Return on Investment (ROI) of promotional activities.

	Neslin (2001)	Wittink (2002)	Wittink (2002)	Wittink (2002)
	391 drugs	**Arthritis**	**Asthma**	**Hypertension**
ROI (DTC)	$0.19	$0.10	$0.10	$0.10
ROI (detailing)	$1.72	$1.90	$1.40	$3.00
ROI (Journal Advertising)	$5.00	$5.50	$15.60	$2.50
ROI (Phys. Meetings/Events)	$3.56	$0.20	$0.07	$1.30

	Narayanan et al. (2004)	Narayanan et al. (2004)	Chintagunta & Desiraju (2005)
	Allergy	**Antiviral**	**Antidepressant**
ROI (DTC)	$0.66 - $0.85[a] $2.79 - $ 3.81[b]	$0.68[a] $2.86[a]	
ROI (detailing)	$1.10 - $1.49[a] $7.66 - $9.19[b]	$1.64 - $3.74[a] $8.11-$17.64[b]	$4.51 - $9.13

[a]current period; [b]multiperiod (current period + 11 subsequent periods)

Direct-to-Consumer Advertising in the Pharmaceutical Industry

The purpose of DTC advertising is to generate awareness of a condition and/or specific drug among consumers. The early advertising literature consists of "hierarchy of effects" models (Lavidge and Steiner 1961) in which consumers experience a sequence of effects when exposed to an advertisement. The first step in this process is awareness of the product's existence. A series of steps are followed until the final 'action' step, purchase of the product. In the case of DTC advertising in the pharmaceutical industry, the desired action by the consumer (in the case of Rx drugs) is a visit to the physician, since the consumer is not able to purchase the drug product directly. The DTC advertisement may or may not lead to a visit to the physician, depending on the consumer's interest in the advertising message. Because such advertising does not lead directly to a purchase by the consumer, it can be considered to be a less effective form of promotional effort compared to other tools, such as detailing.

Detailing/Personal Selling in the Pharmaceutical Industry

While previous research offers limited conclusive results, one can expect the ROI to be greater for promotional efforts directed at physicians (detailing and journal advertising) compared to efforts directed at consumers (DTC advertising). Detailing and journal advertising specifically target physicians, who are ultimately responsible for choosing which drug to prescribe. It is estimated that, because of their ability to write prescriptions, physicians control more than 80% of health care expenditures (Weeks et al. 2001). A disadvantage of DTC advertising is that it reaches unintended audiences since it is not a very targeted form of

communication (Breitstein 2004b). Also, detailing is a more personal, selectively focused one-on-one form of communication compared to DTC advertising, and as a result is more likely to have an impact on the choice of drug. Neslin (2001) suggests that "A DTC ad effects the medication of only one patient, whereas detailing, journal advertising, and physician meeting and events affect the prescribing behavior of one physician, who has several patients. These activities thus have a multiplier effect that DTC does not have." Previous research finds the salesperson to be the physician's most preferred source of information (Bauer and Wortzel 1966). Weitz and Bradford (1999) describe the changing role of the personal selling function as a type of relationship marketing, in which the seller has "considerable influence on the buyer's perceptions of the seller's reliability and value of the seller's services" (p.241).

The level of interaction between the pharmaceutical manufacturer representative and physician during the sales call is much greater than between the pharmaceutical firm and consumer. An examination of the sales force literature reveals a number of studies describing important determinants in selling effectiveness. Such individual determinants include motivation, skill, credibility, and ability to adapt to the selling situation (Churchill et al. 1985; McFarland et al. 2006; Sharma 1990; Spiro and Weitz 1990; Szymanski 1988; Webster 1968).

Researchers highlight the relative advantage of personal selling over other forms of communication in that it allows the intended message to "be adapted to the specific customer's needs and beliefs" (Weitz et al. 1986, p.174) therefore maximizing the effectiveness of the interaction (Weitz 1981). Models of buyer

seller interactions note the importance of communication during the exchange (Sheth 1976; Williams et al. 1990). Empirical studies suggest that communication styles are a determinant of success of the sales interaction (Williams and Spiro 1985). Weitz (1978) develops a model of five salesperson's activities important in influencing a consumer's choice. He notes that elements of the model capture features of "the salesperson's attempts to influence a customer's choice decision that differentiates interpersonal influence from mass media advertising" (Weitz 1978, p.503). This body of literature underscores the close nature and ability for one-on-one communication of the buyer seller interaction, in which the salesperson can adapt his/her message as needed. This varies from mass media advertising which is impersonal and is targeted toward a general audience. Fill (1995) suggests that "advertising is better for creating awareness, and personal selling is more effective at promoting action and purchase behavior" (p.12). Therefore, one can expect detailing to be a more effective communication tool compared to direct-to-consumer advertising due to (i) the personal nature of the seller-physician interaction which allows for effective communication, and (ii) the promotional effort being targeted toward the physician, rather than the consumer, who ultimately is responsible for the choice of drug. Since journal advertising is directed toward physicians, not consumers, this type of communication tool is also expected to be more effective than direct-to-consumer advertising. Literature also suggests that print advertising can be quite effective in increasing brand and category sales (McPheters 1991). Therefore, H_1 states:

H_1: The return on investment will be greater for detailing and journal advertising compared to direct-to-consumer advertising within the GID therapeutic category.

The Effectiveness of Marketing Efforts Over the Brand Life Cycle

Prescription pharmaceutical drugs have a finite life cycle. Such drugs are protected by a twenty-year government issued patent. The selling life cycle of any particular drug, however, is generally less than twenty years since manufacturers apply for patent during the drug development phase (generally during clinical trials) before the drug enters the market. Upon patent expiration, the manufacturer loses exclusive rights to the sell drug. Generic drugs are allowed to compete with branded drugs, and generally capture a large portion of the market given their significantly reduced price. Insurance companies advocate the use of generics over more expensive branded drugs since they generally endure a large portion of the drug's cost.

Pharmaceutical marketers must carefully plan the distribution of various marketing mix elements (DTC advertising, detailing, and journal advertising) over the entire life cycle of the drug. Therefore, the brand life cycle plays an important role in marketing strategy. The mix of such promotional efforts will depend upon, to a certain extent, the competitive environment, as well as the stage in the life cycle (Lancaster and Jobber 1986). One might expect these efforts to be significant early in the brand life cycle in order to inform consumers and physicians about new therapeutic treatments. In his review of the DTC advertising literature, Roth (1996) finds that most drugs employing DTC advertising were in the early stages of their brand life cycle. In their investigation

of antidepressant drugs, Currie and Park (2002) find that firms advertise heavily during product introduction to provide information about experience characteristics to consumers. In their review of the advertising literature, Vakratsas and Ambler (1999) find that advertising elasticities are significant for half of new brands and one-third of established brands, suggesting that advertising is more effective in the beginning of the life of a product. Lastly, Cox (1967) finds detailing and journal advertising to be highest during the growth stage of the life cycle, compared to the introduction and maturity stages.

Unsurprisingly, other researchers have found a complementary trend – a decline in advertising – at the end of the life cycle. For example, Caves et al (1991) find that, anticipating generic entry upon patent expiration, branded advertising begins to decline as patent expiration approaches. Such advertising falls "roughly 10 percent in the two years before patent expiration and then declines at a rate of roughly 25 percent a year between patent expiration and entry of the first generic competitor" (Caves et al 1991, p. 39). Similarly, Berndt et al (2002b) find a significant decrease in marketing efforts as branded drugs approach patent expiration. Ellison and Ellison (2000) find that in the pre-patent expiration period, firms in markets of intermediate size are most likely to reduce detailing and journal advertising. The rationale for this finding is that firms in intermediate markets may distort investments in an attempt to deter generic entry. They propose that the incentive to deter entry is greater in intermediate sized markets compared to small/large markets where entry deterrence is unnecessary/impossible.

In their review of the literature on detailing, Manchanda and Honka (2005) claim that research indicates a positive, but decreasing, effect of detailing over the life cycle of a drug. Narayanan et al (2005) further investigate the effects of detailing over the brand life cycle. Their research indicates that detailing has primarily indirect (informative) effects early on in the life cycle (6-14 months post launch) and direct (persuasive) effects dominate in later stages.

Given this modest body of literature, much remains to be explored regarding the effects of marketing mix activities over the life cycle of the drug. Specifically, are pharmaceutical promotional efforts equally effective over the entire life cycle? Considering the evidence that DTC advertising decreases over the brand life cycle, one would expect the effectiveness of such advertising to diminish over time. A main objective of DTC advertising is to promote awareness of the product and its usage context. If pharmaceutical manufacturers advertise over the life cycle of the drug, most consumers would be aware of the product, perhaps at an oversaturated level, as it nears patent expiration, limiting the effectiveness of DTC advertising. An exception to this is when the Rx drug will be sold over-the-counter upon patent expiration, and manufacturers' attempt to generate awareness of the drug's over-the-counter status.

A number of important factors occur over the brand life cycle, such as modifications to the combination of marketing strategy elements used as well as new, sometimes improved, products entering the market. A comprehensive understanding of the return on investment of these elements over time is crucial.

A review of the advertising literature (Vakratsas and Ambler 1999) suggests, based upon existing research, diminishing returns over time to advertising. For example, market response models indicate that advertising effects dissipate after three to fifteen months (Clarke 1976). Individual level theoretical explanations have been offered, such as Berlyne's (1970) two-factor theory and Krugman's (1972) three-exposure hypothesis. These theories suggest that the advertising response function has an inverted U-shape, and after several exposures, the effect of advertising decreases. Subjects initially respond positively to an advertisement, but upon repeated exposure, eventually tire of hearing the same message and subsequently generate a negative response.

Similarly, advertising "wearout" can occur, which refers to a decay in advertising quality over time (Bass et al. 2007; Calder and Sternthal 1980). Two sources of wearout exist: (i) r*epetition* wearout, where the consumer is repeatedly exposed to the advertisement and loses interest or becomes bored, and (ii) *copy* wearout, which is a decrease in advertising effectiveness over time (Naik et al. 1998). Wearout effects can depend on several factors, such as the nature of the advertisement, consumer motivation to process the advertisement, and level of competitive advertisements (Pechmann and Stewart 1990). Consumers may experience such wearout effects upon repeated exposure to advertisements over time, diminishing the effectiveness (thus lowering the ROI) of advertising over the brand's life cycle.

The Effects of Competition on Promotional Effectiveness

Another phenomenon generally occurring over the brand life cycle is an increase in the level of competitive intensity. The competitive dynamics of the marketplace are altered as new products enter (or leave) the market. Researchers have suggested that "competitive reactions can have a major impact on the effectiveness of the marketing variables" (Hanssens 1980, p.483) and must be accounted for (Erickson 1985; Gatignon 1984). Models measuring the impact of competitive entry on sales of incumbent firms have been developed (Mahajan et al. 1993). It is expected that as the competitive intensity increases over the brand life cycle, the effectiveness of marketing strategy elements will decrease. For example, during the detailing process, pharmaceutical representatives must compete with other manufacturers' representatives for limited time to meet with the physician. With less 'face time' to interact with the physician, the effectiveness of the detailing effort will diminish.

Two forces can be observed over the brand life cycle: (i) diminished effects of promotional activities, such as advertising, over time, as suggested by theoretical explanations of the effects of repeated exposures to advertising and wearout effects, as well as (ii) an increase in the competitive intensity as the number of brands in a particular category increase. Due to these effects, one can expect decreasing returns to advertising and detailing over the brand life cycle. The following hypotheses are offered:

> H_{2A}: The ROI of direct-to-consumer advertising is greatest during the early stages of the brand life cycle and diminishes over time within the GID therapeutic category.

H_{2B}: The ROI of detailing is greatest during the early stages of the brand life cycle and diminishes over time within the GID therapeutic category.

Empirical Analysis

Data

The data comprise observations on nine brands of drugs in the gastrointestinal drug category. The drugs included in this study are listed in Table 2. The data were obtained from various secondary sources, described below.

DTC Advertising. Direct-to-consumer advertising data was obtained from TNS Media. This variable covers monthly advertising expenditures by brand from 1995-2006.

Detailing Expenditures. This variable, obtained from Verispan, covers monthly detailing expenditures from 1991-2006.

Journal Advertising. This variable, obtained from Verispan, covers monthly journal advertising expenditures from 1999-2006.

Total number of prescriptions written / Total retail prescription sales. This variable, obtained from Verispan, covers the number of prescriptions written as well as total prescription retail sales on a monthly basis from 1991-2006.

Table 3 includes the variable definitions as well as descriptive statistics.

Table 2: List of gastrointestinal drug products

Gastrointestinal Drug Information			
Drug	**Rx Launch Date**	**OTC Launch Date**	**Patent Expiration Date**
Tagamet (cimetidine)	08 1977	08 1995	05 1994
Zantac (ranitidine hydrochloride)	06 1983	04 1996	07 1997
Pepcid (famotidine)	11 1986	06 1995	04 2001
Axid (nizatidine)	05 1988	07 1996	04 2002
Prilosec (omeprazole)	10 1989	09 2003	10 2001
Prevacid (lansoprazole)	05 1995		
Aciphex (rabeprazole sodium)	09 1999		
Protonix (pantoprazole sodium)	04 2000		
Nexium (esomeprazole sodium)	02 2001		

Table 3: Variable Definitions and Descriptive Statistics

Variable	**Definition**	**Mean****	**Standard Deviation**
*DTC**	DTC advertising expenditures		
DTCRx	DTC advertising expenditures in prescription (Rx) market	1159	4018
DTCOTC	DTC advertising expenditures in over-the-counter (OTC) market	826	2009
Detailing	Detailing advertising expenditures	2417	3292
JA	Journal advertising expenditures	79	203
*RxSales****	Retail prescription sales	62016	88658
TotalRx	Total number of prescriptions	551	698

* Note: DTC advertising expenditures were classified into the Rx as well as OTC markets

** All variables are in thousands (000)

***Primary dependent variable

Model

We employ OLS regression to test the hypotheses. We account for time-constant unobserved effects (c_i) in our analysis using a first differencing transformation (Wooldridge 2002). Such unobserved effects could include, for

example, physicians who frequently write prescriptions. Pharmaceutical firms will naturally detail more heavily to these physicians, thus causing the unobserved effect to be correlated with the detailing variable. The following model is used for each brand:

$$RxSales_{it} = \beta_0 + \beta_1 DTC_{it} + \beta_2 Detailing_{it} + \beta_3 JA_{it} + \delta dM_t + c_i + u_{it}$$

where, for brand i, *DTC* denotes direct-to-consumer advertising expenditures, *Detailing* denotes detailing expenditures, *JA* denotes journal advertising expenditures, and *RxSales* denotes Rx retail sales. *dM* denotes monthly dummy variables and *u* is the error term. The following equations denote the appropriate model applying the first differencing transformation:

$$\Delta RxSales_{it} = \beta_0 + \beta_1 \Delta DTC_{it} + \beta_2 \Delta Detailing_{it} + \beta_3 \Delta JA_{it} + \delta dM_t + u_{it}$$

The ROI of each type of promotional effort is given by the β coefficient in the sales equation. This represents the increase in sales if the promotional expenditure is increased by $1.00.

Results

The ROI for each brand across life cycle stages (provided by the unstandardized coefficient in the regression equation) is given in Tables 4, 5, and 6. These stages include Introduction, Growth, Maturity, and Decline. Each stage was determined by inspection of slope changes on the brand's life cycle curve. Results are also provided for the time period after patent expiration, during which competition from generic products is present. In some instances, life cycle stages were combined. (This was done when the distinction between stages was not clear, and also allowed for examination of a longer time period, therefore

including more data points). Table 7 provides the ROI for each promotional variable across the entire time period. Specifically, for brands 1-5, this includes the time period from Jan 1991 (the initial time point of the data set) until the brand's patent expiration date. For brands 6-9, this includes the time period from each brand's market entry until Nov 2006 (the final time point in the data set). Tables 8-11 provide the standardized coefficients for each analysis, allowing for comparison of the magnitude of the coefficients.

Hypothesis 1, which states that the ROI is greater for detailing and journal advertising compared to DTC advertising, is partially supported. We observe from Table 4 that the coefficient for DTC, in all cases, is not significant. In Table 5, we observe that the coefficient for detailing, in several cases, is positive and significant. We also observe from Table 7 that the coefficient for detailing is positive and significant for five brands. The coefficient for DTC advertising is positive and significant for only one brand, and is negative for one brand. These results, as a whole, suggest that the ROI is greater for detailing compared to DTC advertising.

The results in Table 7 also suggest that the ROI for journal advertising is not necessarily greater than the ROI for DTC advertising. The coefficient for journal advertising is significant and negative for one brand (β = -21.344 for Brand 3) whereas the coefficient for DTC advertising is significant and negative for one brand (β = -2.039) and is significant and positive for one brand (β = 0.572). In comparing Table 4 and Table 6, we find that while the coefficient for DTC advertising in not significant in any cases, the coefficient for journal

advertising is positive and significant for only one case, and is negative and significant for two cases. Therefore, we cannot conclude that the ROI is greater for journal advertising compared to DTC advertising.

Hypothesis$_{2A}$ suggests that the ROI for DTC advertising is greatest during the early stages of the brand life cycle and diminishes over time. This hypothesis is not supported. Observing Table 4, we find that the coefficient for DTC advertising is not significant in any case over the stages of the life cycle. Hypothesis$_{2B}$ states that the ROI of detailing is greatest during the early stages of the brand life cycle and diminishes over time. This hypothesis is not supported. The results presented in Table 5 indicate that the coefficient for detailing is positive and significant in many cases during the maturity stage, and nonsignificant in other stages of the life cycle. Additionally, with Brand 3, we see that the ROI for detailing is greater in later stages ($\beta_{Maturity} = 2.909$, $\beta_{Post\text{-}Patent\ Expiration} = 11.940$) compared to earlier stages ($\beta_{Growth} = 0.701$).

Table 4: ROI for DTC advertising over life cycle stages.

	β DTC_{Intro}	β DTC_{Growth}	β $DTC_{Maturity}$	β $DTC_{Decline}$	β DTC_{PPE}
Brand 1 (Tagamet)					
Brand 2 (Zantac)		9.918 (6.458)	0.158 (1.377)		22.988 (86.277)
Brand 3 (Pepcid)				-41.512 (52.377)	
Brand 4 (Axid)					
Brand 5 (Prilosec)		-0.268 (1.718)	-0.882 (0.860)	380.75 (382.46)	
Brand 6 (Prevacid)		-0.572 (0.668)	-0.093 (0.174)		
Brand 7 (Aciphex)	-14.043 (22.019)		1.213 (2.205)		
Brand 8 (Protonix)	45.360 (29.090)		-1.040 (0.929)		
Brand 9 (Nexium)	0.241 (0.196)		0.374 (0.412)		

PPE = Post – Patent Expiration

Standard errors are in parentheses

Table 5:ROI for Detailing (Det) over life cycle stages.

	β Det_{Intro}	β Det_{Growth}	β $Det_{Maturity}$	β $Det_{Decline}$	β Det_{PPE}
Brand 1 (Tagamet)			0.240 (0.274)		§**-2.811**** (1.329)
Brand 2 (Zantac)		1.369 (1.104)	0.301 (1.447)		5.493 (3.920)
Brand 3 (Pepcid)		**0.701*** (0.363)	**2.909**** (1.313)	4.010 (3.530)	**11.940*** (6.476)
Brand 4 (Axid)		0.133 (0.190)	0.633 (0.805)	0.958 (0.605)	-0.446 (0.706)
Brand 5 (Prilosec)	0.730 (0.448)	3.261 (2.603)	**4.967*** (2.412)	6.552 (8.896)	
Brand 6 (Prevacid)	-0.141 (0.417)	0.923 (1.827)	**3.136***** (0.538)		
Brand 7 (Aciphex)	0.495 (0.359)		0.359 (0.437)		
Brand 8 (Protonix)	0.370 (0.760)		**1.765*** (0.970)		
Brand 9 (Nexium)	-1.782 (1.493)		0.259 (1.008)		

§ including OTC launch dummy variable in regression

PPE = Post – Patent Expiration

Standard errors are in parentheses

*** Significant at 1% level

** Significant at 5% level

* Significant at 10% level

Table 6: ROI for Journal Advertising (JA) over life cycle stages.

	β JA_{Intro}	β JA_{Growth}	β $JA_{Maturity}$	β $JA_{Decline}$	β JA_{PPE}
Brand 1 (Tagamet)					
Brand 2 (Zantac)					
Brand 3 (Pepcid)				**-20.888*** (11.743)	
Brand 4 (Axid)					9.953 (15.860)
Brand 5 (Prilosec)		-34.337 (33.045)	-4.700 (13.204)	-28.139 (46.19)	
Brand 6 (Prevacid)		-3.332 (6.821)	-2.044 (6.963)		
Brand 7 (Aciphex)	4.481 (3.988)		**18.199*** (9.780)		
Brand 8 (Protonix)	-0.447 (3.902)		**-69.667**** (24.711)		
Brand 9 (Nexium)	-22.343 (14.951)		0.940 (17.767)		

PPE = Post – Patent Expiration

Standard errors are in parentheses

** Significant at 5% level

* Significant at 10% level

Table 7: ROI of all promotional elements (DTC advertising, Detailing, Journal Advertising) over the life cycle.

	β DTC	β Det	β JA	Time Period
Brand 1 (Tagamet)		0.240 (0.274)		Jan 1991 – May 1994§
Brand 2 (Zantac)	0.813 (1.002)	-0.054 (0.895)		Jan 1991 – July 1997§
Brand 3 (Pepcid)	-34.279 (35.211)	**1.510*** ** (0.523)	**-21.344**** (9.688)	Jan 1991 – April 2001§
Brand 4 (Axid)		0.280 (0.230)		Jan 1991 – April 2002§
Brand 5 (Prilosec)	0.512 (0.537)	**2.320**** (1.165)	-8.424 (8.420)	Jan 1991 – Oct 2001§
Brand 6 (Prevacid)	-0.024 (0.186)	**2.990*** ** (0.525)	-7.198 (4.877)	Rx launch – Nov 2006
Brand 7 (Aciphex)	0.604 (1.917)	**0.497*** (0.274)	3.218 (2.245)	Rx launch – Nov 2006
Brand 8 (Protonix)	**-2.039**** (1.002)	**1.097**** (0.501)	-3.859 (2.988)	Rx launch – Nov 2006
Brand 9 (Nexium)	**0.572*** ** (0.197)	0.731 (0.766)	-7.756 (12.524)	Rx launch – Nov 2006

§Patent expiration date

Standard errors are in parentheses

*** Significant at 1% level

** Significant at 5% level

* Significant at 10% level

Table 8: Standardized coefficient for DTC advertising variable over life cycle stages.

	β DTC_{Intro}	β DTC_{Growth}	β $DTC_{Maturity}$	β $DTC_{Decline}$	β DTC_{PPE}
Brand 1 (Tagamet)					
Brand 2 (Zantac)		0.206 (p=0.159)	0.016 (p=0.909)		0.027 (p=0.790)
Brand 3 (Pepcid)				-0.137 (p=0.442)	
Brand 4 (Axid)					
Brand 5 (Prilosec)		-0.020 (p=0.877)	-0.153 (p=0.319)	0.149 (p=0.325)	
Brand 6 (Prevacid)		-0.124 (p=0.401)	-0.030 (p=0.597)		
Brand 7 (Aciphex)	-0.180 (p=0.529)		0.064 (p=0.586)		
Brand 8 (Protonix)	0.214 (p=0.129)		-0.121 (p=0.278)		
Brand 9 (Nexium)	0.195 (p=0.235)		0.127 (p=0.375)		

PPE = Post – Patent Expiration

Table 9: Standardized coefficient for Detailing (Det) variable over life cycle stages.

	β Det_{Intro}	β Det_{Growth}	β $Det_{Maturity}$	β $Det_{Decline}$	β Det_{PPE}
Brand 1 (Tagamet)			0.043 (p=0.389)		[§]**-0.158**** (p=0.036)
Brand 2 (Zantac)		0.186 (p=0.246)	0.032 (p=0.837)		0.141 (p=0.164)
Brand 3 (Pepcid)		**0.176*** (p=0.062)	**0.304**** (p=0.033)	0.195 (p=0.276)	**0.242*** (p=0.071)
Brand 4 (Axid)		0.102 (p=0.491)	0.123 (p=0.437)	0.159 (p=0.121)	-0.137 (p=0.531)
Brand 5 (Prilosec)	0.187 (p=0.112)	0.172 (p=0.219)	**0.341*** (p=0.054)	0.125 (p=0.465)	
Brand 6 (Prevacid)	-0.110 (p=0.740)	0.090 (p=0.618)	**0.362***** (p=0.000)		
Brand 7 (Aciphex)	0.210 (p=0.180)		0.101 (p=0.417)		
Brand 8 (Protonix)	0.072 (p=0.629)		**0.255*** (p=0.087)		
Brand 9 (Nexium)	-0.402 (p=0.248)		0.039 (p=0.800)		

[§] including OTC launch dummy variable in regression

*** Significant at 1% level

** Significant at 5% level

* Significant at 10% level

Table 10: Standardized coefficient for Journal Advertising variable over life cycle stages.

	β JA_{Intro}	β JA_{Growth}	β $JA_{Maturity}$	β $JA_{Decline}$	β JA_{PPE}
Brand 1 (Tagamet)					
Brand 2 (Zantac)					
Brand 3 (Pepcid)				**-0.251*** (p=0.099)	
Brand 4 (Axid)					0.140 (p=0.534)
Brand 5 (Prilosec)		-0.128 (p=0.306)	-0.055 (p=0.726)	-0.091 (p=0.546)	
Brand 6 (Prevacid)		-0.075 (p=0.630)	-0.018 (p=0.770)		
Brand 7 (Aciphex)	0.291 (p=0.272)		**0.238*** (p=0.072)		
Brand 8 (Protonix)	-0.017 (p=0.910)		**-0.295**** (p=0.012)		
Brand 9 (Nexium)	-0.226 (p=0.152)		0.007 (p=0.958)		

** Significant at 5% level

* Significant at 10% level

Table 11: Standardized coefficient for all promotional elements (DTC advertising, Detailing, Journal Advertising) over the life cycle.

	β DTC	β Det	β JA	Time Period
Brand 1		0.043 (p=0.389)		Jan 1991 – May 1994§
Brand 2	0.069 (p=0.420)	-0.0056 (p=0.952)		Jan 1991 – July 1997 §
Brand 3	-0.061 (p=0.332)	**0.196*** (p=0.005)	**-0.138**** (p=0.030)	Jan 1991 – April 2001 §
Brand 4		0.085 (p=0.225)		Jan 1991 – April 2002§
Brand 5	0.071 (p=0.343)	**0.165**** (p=0.049)	-0.076 (p=0.319)	Jan 1991 – Oct 2001 §
Brand 6	-0.007 (p=0.898)	**0.359***** (p=0.000)	-0.087 (p=0.143)	Rx launch – Nov 2006
Brand 7	0.026 (p=0.754)	**0.160*** (p=0.074)	0.117 (p=0.156)	Rx launch – Nov 2006
Brand 8	**-0.167**** (p=0.046)	**0.236**** (p=0.032)	-0.137 (p=0.201)	Rx launch – Nov 2006
Brand 9	**0.279***** (p=0.005)	0.124 (p=0.344)	-0.060 (p=0.538)	Rx launch – Nov 2006

§Patent expiration date

*** Significant at 1% level

** Significant at 5% level

* Significant at 10% level

Discussion

Consistent with previous studies, the results presented here suggest greater returns from detailing compared to DTC advertising. Past research finds low ROI's for DTC advertising, and in some cases the ROI is in fact negative (Breitstein 2004b). Our results indicate a positive and significant effect of DTC advertising for only one brand, Nexium. This result is not particularly surprising considering the significant advertising campaign accompanying the launch of Nexium (Bazell 2007). Our results also indicate that the magnitude of the return on investment for detailing is comparable to previous results. Summarizing previous studies, Table 1 suggests that the ROI for detailing is in the $1.00 -

$4.00 range in most cases, although higher for certain categories, such as antidepressants. Our study finds that the ROI for detailing ranges from $0.50 - $2.99.

Interestingly, we do not find journal advertising to provide a significant return on investment. Tables 6 and 7 suggest that the ROI for journal advertising is actually negative in some cases, although it is positive and quite large for Brand 7 during the maturity stage ($\beta = 18.199$). Previous studies suggest a large range ($2.50 - $15.60) in the magnitude of ROI for journal advertising over various therapeutic categories. It is probable that the return on this type of promotional effort varies across therapeutic categories, and possibly across stages of the life cycle. Inconsistencies in results may be attributed to utilization of different methods to calculate the ROI values.

We do not find evidence of declining returns on DTC advertising or detailing. In fact, we find that the ROI for detailing is, in several cases, positive and significant during the maturity stage of the brand life cycle. This finding is encouraging for pharmaceutical marketers. This suggests that continued marketing efforts, as brands progress through their life cycles and new competitors enter the market, are worthwhile. This result is also somewhat consistent with that of Narayanan et al (2005) who find that detailing has persuasive effects in later stages of the life cycle. The insignificant results associated with DTC advertising suggest that, in general, this type of promotional effort generates lesser returns compared to detailing. Overall, these results

emphasize the importance of detailing compared to advertising efforts in the pharmaceutical industry.

The results reveal an interesting trend occurring as new products enter the gastrointestinal category, and the performance of the drug products change. For example, Prilosec was the first proton pump inhibitor to enter the market (these types of drugs are thought to be superior to the previous H_2 receptor antagonist drugs). We see a larger overall ROI of detailing ($\beta = 2.320$, $p < 0.05$) for Prilosec compared to several competitor products. We also see a high ROI of detailing for Prevacid ($\beta = 2.990$, $p < 0.01$) which entered the market after Prilosec. It is likely that drug attributes (such as effectiveness or side effects) also play a role in the success of promotional efforts in generating new prescriptions, particularly when new and improved drugs are introduced into the market.

Conclusion

A number of important findings are revealed in this study. We observe that the level of return on investment varies among the various types of pharmaceutical promotional efforts. Direct to consumer advertising does not appear to generate significant returns. Interestingly, pharmaceutical companies continue to invest heavily in this type of promotional effort. Perhaps other contingency factors play a greater role in effecting the ROI of DTC advertising. For example, the competitive intensity within the category may have a greater impact than life cycle stage in influencing the ROI.

It appears that detailing is more effective in generating positive returns compared to DTC advertising and journal advertising. This finding is consistent

with much of the literature, demonstrating the importance of this type of promotional effort. Interestingly, we do not find that the ROI of detailing tends to diminish over the life cycle of the brand. Therefore, pharmaceutical companies should continue to use this promotional channel throughout the stages of the product's life cycle.

ESSAY TWO: The Impact of Marketing Promotional Efforts on Sales

Introduction

Examining the value of promotional efforts is of fundamental concern to marketers. In fact, promotion is one of the essential components of the 4 P's of marketing. Therefore, marketing managers are continually concerned with maximizing outcomes (ie, sales revenues) from their investments in promotional efforts. Furthermore, an additional concern is how to optimally manage the mix of promotional efforts, which may include advertising, personal selling, etc.

The focus of the present study examines the impact of promotional efforts in the pharmaceutical industry. This industry provides a unique setting for such an inquiry. Promotional efforts in the pharmaceutical industry encompass multiple approaches, targeted to diverse groups.

Two primary marketing communication strategies are used in the pharmaceutical industry: the 'push' strategy, where the firm attempts to influence the physician to push the product to the consumer, as well as the 'pull' strategy, in which case the firm attempts to influence the consumer by increasing consumer demand (Parker and Pettijohn 2005). The pull strategy is carried out through direct-to-consumer (DTC) advertising campaigns. Such campaigns can be directed toward a specific drug product or a particular disease or condition (disease awareness campaign). The push strategy is carried out through direct interaction between pharmaceutical sales force representatives and physicians, also known as 'detailing'. Such encounters generally take place in the physician's office or at meetings and events, during which the pharmaceutical representative

informs the physician about the firm's product(s). Often, free drug samples are left with the physician to distribute to patients (known as sampling). An additional method of advertising to physicians is through the print media via medical journal advertising. Overall, detailing accounts for approximately 29% of promotional spending by pharmaceutical manufacturers, while sampling accounts for 55%, DTC advertising accounts for 14%, and medical journal advertising comprises 2% of spending (Rosenthal et al. 2003).

Over the last decade, there has been a significant increase in DTC advertising spending in the pharmaceutical industry. In 1997, the Food and Drug Administration relaxed regulations regarding advertising to consumers. As such, DTC advertising expenditures have risen from $1.1 billion in 1997 to $3.3 billion in 2005 (Fischer and Albers 2007). Furthermore, debates have recently occurred regarding the societal impact of DTC advertising. For example, some question whether or not DTC advertising leads to excessive drug utilization, particularly for newer drugs with unknown safety profiles (Finlayson and Mullner 2005). In fact, many physicians support a DTC advertising moratorium for all new drugs (Anonymous 2007). Given this recent attention surrounding the impact of DTC advertising, it is of value to further investigate its role among the mix of promotional efforts used in the pharmaceutical industry.

In the present study we examine the impact of DTC advertising, detailing, and journal advertising on both *brand* as well as *therapeutic category* sales. In doing so, we determine the return on investment (ROI) of various promotional efforts. In other words, we calculate the impact on sales of a $1.00 increase in

promotional spending. We choose to focus our analysis on one particular therapeutic category – the gastrointestinal drug category. Table 2 summarizes the products in this category. While studies that aggregate data among numerous product categories may be useful in some cases, we believe that our approach is preferable for the present analysis. Promotional efforts, such as DTC advertising, may be more effective for certain product categories. Aggregating data across categories results in a loss of important information specific to particular categories and/or brands. Industry insiders agree that "DTC is not performing as strongly across all brands as people think. For some it works brilliantly. But half the time it fizzles" (Lam 2004, p. 102).

In addition to investigating the main effects of these promotional efforts, we examine how the *interaction* of these promotional efforts impact sales as well. These efforts are generally conducted simultaneously, though often targeted to various groups (consumers and physicians). Therefore, we wish to explore the synergistic effects of these promotional mechanisms.

Previous research has examined the effects of pharmaceutical promotional efforts on sales in particular therapeutic categories (see Fischer and Albers (2007) for a brief overview). In certain cases, conflicting results have been found. We wish to add to these few studies by incorporating additional moderating effects. Specifically, the two additional variables we include are: (i) number of competitors in the category, and (ii) the number of years the product is on the market. One advantage of our dataset is that it includes nine drug products (both prescription (Rx) as well as over-the-counter (OTC)) in one

category, which is greater than most previous studies that have only included three or four products in a particular category. This therefore allows us to investigate broader issues such as competitive effects. Additionally, our data encompasses several years, providing the opportunity to examine effects over time.

The present study offers a number of important contributions. First, we explore the impact of two distinct, yet important, promotional channels in the pharmaceutical industry. This allows us to specifically compare the contribution to sales of these promotional efforts. Secondly, we further explore the interaction effects of these promotional variables. Lastly, we examine contingency effects by including additional moderator variables in the analysis.

An advantage of the present study is that we use an extensive data set covering a number of brands over several years. The data, which was obtained from several secondary sources, covers nine brands in the gastrointestinal drug category. This category (specifically, proton-pump inhibitors) is the second largest therapy class in the U.S., with prescription sales of $14.1 billion in 1997 (Longwell 2008). Our data set includes monthly data on promotional expenditures as well as data covering retail sales and total number of prescriptions. The majority of the data spans the years 1991-2006. This rich data set provides the opportunity to examine the impact of additional contingency variables omitted in previous studies.

Conceptual Development and Hypotheses

An issue of interest to marketing managers is the effects of promotional efforts on brand sales. In a general context, the impact of advertising on brand sales or brand choice has been studied extensively. In the pharmaceutical industry, much of the literature has examined the following questions: does DTC advertising increase sales of a particular brand or does such advertising simply increase category sales, affecting sales of all brands in a therapeutic category? How does DTC advertising compare to detailing? One premise that has been put forth is that DTC advertising induces patients to visit their physicians, yet the physician may prescribe a brand other than that advertised. This may happen for several reasons, such as the advertised brand may not be covered by the patient's insurance, or may interact with other drugs the patient is taking, etc.

A recent study by Rosenthal et al (2003), encompassing five different therapeutic categories found that DTC advertising does not appear to affect the relative market share of individual drugs within a therapeutic class. Iizuka and Jin (2005) similarly find that DTC advertising has little effect on brand choice in their study of three antihistamine prescription drugs. A previous study by these researchers examine two therapeutic categories, antihistamines and cholesterol medications, finding that DTC advertising leads to a large increase in the number of outpatient visits, yet does not effect specific choice among prescription drugs in a particular therapeutic class (Iizuka and Jin 2002). They conclude that "DTC advertising is primarily market expanding rather than business-stealing" (Iizuka and Jin 2002, p.4). In their study of cholesterol-reducing drugs, Calfee et al

(2002) find that DTC advertising does not have a significant effect on new prescriptions or renewals. They did, however, find evidence that advertising increased the proportion of cholesterol patients who had been successfully treated, suggesting that advertising fosters drug compliance. Wosinska (2005) also finds evidence that DTC advertising increases patient compliance of cholesterol-lowering medications. However, the effects of own-advertising were positive for two brands and negative for one. Donohue and Berndt (2004), in their study of antidepressant medications, find that DTC advertising does not influence drug choice for people diagnosed with depression, but does have a significant effect on those diagnosed with anxiety disorders. Bradford et al (2006) examine the effects of DTC advertising of two pain-relieving COX-2 inhibitors, Vioxx and Celebrex. Their results indicate that DTC advertising increases the number of prescriptions for both Vioxx and Celebrex; however, advertising of Celebrex had a significant effect on the rate of prescribing of Vioxx. On the whole, these studies suggest that DTC advertising has a total market-expanding effect, but does not significantly augment brand sales. Nonetheless, the precise effects of DTC advertising on brand sales remains unresolved.

Contrary to these findings, a limited number of researchers have found evidence that DTC advertising does impact brand sales. A few studies have examined such effects with respect to detailing. Wosinska (2002) finds that DTC advertising of cholesterol lowering drugs increases choice probability of a particular drug, but only for drugs listed on the insurer's formulary. Results also indicate that the impact of detailing is larger than the impact of DTC advertising

(approximately five times greater). Furthermore, DTC advertising has a temporary effect on choice, while the effects of detailing wear out slowly over the course of a year. Donohue and Berndt (2004) similarly find a significant positive impact of detailing on drug choice. Narayanan et al (2004) find that detailing and DTC advertising affect brand shares, though detailing has a greater effect than DTC advertising. Additionally, they find that DTC advertising has a significant effect on category sales while detailing does not. Hurwitz and Caves (1988) find that physician-directed promotion has a positive effect on the market shares between branded and generic drugs. Manchanda and Chintagunta (2004) find that detailing has a positive and significant impact on number of prescriptions written, though it has diminishing effects. Mizik and Jacobson (2004) also find a significant effect of detailing on new prescriptions. Berndt et al (2002a) show that marketing efforts (detailing and journal advertising) have a significant impact on relative market shares and total category sales of antidepressants. Berndt et al (1997) find that, at the market share level, relative sales of products are positively related to detailing efforts. Lastly, in their study of antihistamines, Iizuka and Jin (2005) find that detailing and medical journal advertising have significant and long term effects on prescription choice.

Direct-to-Consumer Advertising in the Pharmaceutical Industry

It appears from this modest body of research that DTC advertising has an overall market expanding effect, although there is limited evidence that such advertising has a significant impact on brand sales. Thus, DTC advertising seems to impact consumers by increasing awareness and perhaps compliance.

A recent Kaiser Family Foundation study (2001) finds that "prescription drug ads prompt many people to talk to their doctor about medicines they have seen advertised, and a small but significant minority of people say they received prescriptions for the drugs as a result" (p.12). Also, such advertisements may act as reminders for consumers already taking the drug to remain compliant with recommended therapy. Such effects of DTC advertising correspond to the 'informative', rather than 'persuasive', role of advertising in this context.

Generating a clear understanding of the effects of DTC advertising involves recognizing its purpose, which is to create awareness of a condition and/or specific drug among consumers. Much of the early advertising literature includes "hierarchy of effects" models (Lavidge and Steiner 1961) in which consumers experience a sequence of effects when exposed to an advertisement. The first step in this process is awareness of the product's existence. A series of steps are followed until the final 'action' step, purchase of the product. In the case of DTC advertising in the pharmaceutical industry, the desired action by the consumer (in the case of Rx drugs) is a visit to the physician, since the consumer is not able to purchase the drug product directly. The DTC advertisement may or may not lead to a visit to the physician, depending on the consumer's interest in the advertising message. Because such advertising does not lead directly to a purchase by the consumer, it can be considered to be a less effective form of promotional effort compared to other tools, such as detailing. Consistent with the literature, DTC advertising appears to initiate the hierarchy of effects generating

awareness by consumers and serving to inform them of the drug and/or condition.

Personal Selling (Detailing) in the Pharmaceutical Industry

Detailing seems to have a significantly larger effect on brand sales, providing evidence for the importance of this type of promotional effort. An examination of the personal selling and sales force literature reveals the benefits of personal selling over other forms of communication. The personal selling situation allows the intended message to "be adapted to the specific customer's needs and beliefs" (Weitz et al. 1986, p.174) therefore maximizing the effectiveness of the interaction (Weitz 1981). Models of buyer seller interactions note the importance of communication during the exchange (Sheth 1976; Williams et al. 1990). Empirical studies suggest that communication styles are a determinant of success of the sales interaction (Williams and Spiro 1985). Weitz (1978) develops a model of five salesperson's activities important in influencing a consumer's choice. He notes that elements of the model capture features of "the salesperson's attempts to influence a customer's choice decision that differentiates interpersonal influence from mass media advertising" (Weitz 1978, p.503).

This body of literature underscores the close nature and ability for one-on-one communication of the buyer seller interaction, in which the salesperson can adapt his/her message as needed. This varies from mass media advertising which is impersonal and is targeted toward a general audience. Fill (1995) suggests that "advertising is better for creating awareness, and personal selling

is more effective at promoting action and purchase behavior" (p.12). Therefore, one can expect detailing, in which the one-on-one interaction between the pharmaceutical sales rep and physician occurs, to be a more effective communication tool compared to direct-to-consumer advertising due to (i) the personal nature of the seller-physician interaction which allows for effective communication, and (ii) the promotional effort being targeted toward the physician, rather than the consumer, who ultimately is responsible for the choice of drug.

The literature to date provides conflicting empirical evidence as to the effects of DTC advertising on brand sales. Specifically, some researchers have found that DTC advertising has a positive impact on brand choice, while others have found no significant effect of this type of promotional effort on brand choice. Additional investigation regarding the effects of DTC advertising and detailing on brand vs. category sales is warranted. We wish to further examine the overall impact of these two different types of promotional efforts on total sales. H_3 states:

> H_{3A} Direct-to-consumer advertising will have a positive and significant effect on total category sales, but not individual brand sales within the GID drug category.
>
> H_{3B} Detailing will have a positive and significant effect on total category sales and individual brand sales within the GID drug category.

Interaction Among Promotional Efforts

Given that the pharmaceutical industry uses various types of promotional efforts directed at distinct groups (detailing and journal advertising are directed at physicians, while DTC advertising is directed toward consumers), one question of interest involves the interaction of these different promotional efforts. In other

words, what is the impact of the *combined* efforts? Considering that most pharmaceutical companies use a combination of these efforts to promote their products, clarification of these interaction effects is of crucial interest to marketing researchers. Yet little research has been carried out to examine the interaction effects of different types of promotional strategies.

Narayanan et al (2004) find significant interactions between detailing and DTC advertising as well as detailing and OME's (other marketing efforts, such as journal advertising and meetings and events), and DTC advertising and OME's. However, Iizuka and Jin (2005) do not find a significant interaction of either DTC advertising and detailing or DTC advertising and journal advertising. Similarly, Donohue and Berndt (2004) do not find a significant interaction between DTC advertising and detailing. Interestingly, Manchanda and Chintagunta (2004) find a negative interaction effect of detailing and sampling to physicians. However, Parsons and Vanden Abeele (1981) find a positive interaction effect of detailing and sampling. Thus, there is incomplete and conflicting evidence as to the interaction of different types of promotional strategies. See Table 12 for a summary of these studies and their findings.

Table 12: Summary of findings on interaction effects.

Reference	Therapeutic Category	Time Period Studied	Findings
Parsons and Vanden Abeele (1981)	Steroid prophylactic medication	1973-1974	• Positive interaction effect of detailing and sampling
Narayanan et al (2004)	Antihistamine	Apr 1993 – Mar 2002	• *Category sales*: no significant interaction effects • *Brand share*: (i) detailing x DTC advertising positive & sig., (ii) detailing x OME's negative & sig., (iii) DTC x OME's negative & sig.
Manchanda and Chintagunta (2004)	Not specified	Dec 1996-Nov 1998	• Significant negative interaction effect of detailing and sampling
Donohue and Berndt (2004)	Antidepressants	Jan 1997-Dec 2000	• No significant interaction between DTC advertising and detailing
Iizuka and Jin (2005)	Antihistamine	1997-2001	• Insignificant interaction effects for: (i) DTC advertising x detailing, (ii) DTC advertising x journal advertising

While one might intuitively expect positive interaction effects of these strategies due to the expected positive effect of each individual type of promotional effort by itself, some research contradicts this judgment. Narayanan et al (2004) offer a possible explanation for the negative interaction effect between detailing and DTC advertising. They suggest that the combined efforts produce a 'jamming' effect, stating "detailing is typically a scientific source of information for the physicians and DTC swamps the positive effect, perhaps when physicians generate counterarguments to the claims in the advertisements" (Narayanan et al. 2004, p.92). Further examination is necessary to help reconcile the varying results found in the literature. Given the hypothesized positive effects of each strategy alone (H_4), we propose that the combined effects of DTC advertising and detailing/journal advertising to be more pronounced. As such, H_4 states:

> $H_{4A:}$ There are positive and significant interaction effects between DTC advertising and detailing within the GID drug category.
>
> H_{4B}: There are positive and significant interaction effects between DTC advertising and journal advertising within the GID drug category.
>
> H_{4C}: There are positive and significant interaction effects between detailing and journal advertising within the GID drug category.

The Moderating Effect of Competition on Brand Sales

Marketers have long acknowledged that competition can significantly impact market performance on a number of levels. Firms do not operate in an isolated environment, and must continually adapt to a dynamic competitive environment. Porter's (1980) seminal work in the area of competition has contributed significantly to the marketing strategy literature. In this study, we aim

to investigate the role of competition in the effectiveness of promotional efforts. Specifically, we examine how the intensity of competition in our therapeutic category influences the impact of DTC advertising, detailing, and journal advertising among competing brands.

Marketing scholars have acknowledged that the impact of marketing can depend on how a firm's activities compare to those of competitors (Gatignon et al. 1990; Reibstein and Wittink 2005; Weitz 1985). These scholars also suggest that more attention is warranted toward issues such as examination of the effects of competitive intensity on marketing activities (Weitz 1985) as well as modeling the effect of competitive advertising (Bass et al. 2007). Previous empirical analyses do indeed demonstrate an influence of competition on promotional effectiveness. For example, Naik et al. (2005) examine competition across five brands in the detergents market. Their study indicates that advertising and promotion affect own as well as competitors' brand shares, and that each activity can attenuate the effectiveness of the other activity. Gatignon (1984) shows that competitive reactivity affects the relationship between advertising and price elasticity. We contribute to this literature by exploring the moderating effect of competition on different types of promotional efforts in the pharmaceutical industry.

While mathematical models within the marketing strategy literature do acknowledge competitive effects, we can gain deeper insight into specifically how competitors' advertisements can influence consumer processing of advertising information by examining the consumer behavior literature. This literature

suggests that competitive advertising can influence how consumers process information as well as consumer memory and recall. It is believed that the presence of competitive advertisements may produce interference effects in memory (Bagozzi and Silk 1983; Bettman 1979). Keller (1987) states that "when multiple brands advertise within a product category, unconnected ad memory traces may result such that consumers find it more difficult to remember which ad is associated with which brand in the product category" (p. 318). Empirical studies have validated the effects of competitive advertising. Burke & Srull (1988) demonstrate that advertising by competitors can lead to "brand-attribute interference," in which the brands interfere with each other in the consumers' memory. Their results also indicate that competitive advertising has a significant inhibitory effect on cued recall of brand information.

Research by Keller (1991) also provides evidence for interference effects of competitive advertising. Results from Keller's study suggest that the greater the number of competing brands advertising in a product category, the lower the recall of brand claims for a target ad. These interference effects result from confusion with competing advertisements. The presence of competing ads make communication efforts, such as brand claims and cognitive responses stored in memory, less accessible. Dahaner et al. (2008) demonstrate that increased levels of competitive advertising can negatively impact brand sales. These studies provide theoretical explanations as well as empirical support for the competitive effects of advertising on consumer response. It appears from this research that 'competitive clutter' (Kent 1995) has a negative impact on

advertising effectiveness. As the number of competitors in a product category increases, the ability of consumers to process and recall information from brand advertisements is inhibited. Therefore, we hypothesize:

> H_{5A}: The impact of DTC advertising on brand sales is negatively moderated by the competitive intensity within the GID therapeutic category.
>
> H_{5B}: The impact of journal advertising on brand sales is negatively moderated by the competitive intensity within the GID therapeutic category.

We also wish to examine how competition influences another form of promotional effort: detailing to physicians. Though scholars suggest that salesforce effectiveness is a function of the competitiveness of the sales environment (Gatignon and Hanssens 1987), little empirical research has investigated the relationship between competition and salesforce effectiveness. While research conducted by Ryans and Weinberg (1979) empirically demonstrates lower sales in territories with greater competition, this relationship has not been extensively investigated.

Intuitively speaking, one might expect similar competitive effects in a sales environment, compared to advertising. When physicians are visited by pharmaceutical sales representatives they are often presented with a large amount of complex information regarding a drug's benefits, efficacy, and other attributes. This information must be processed and retained in memory in a similar manner to consumers' processing of advertising information. The difference lies in the form of communication. For physicians, communication is direct and occurs verbally with a pharmaceutical representative whereas for

consumers, the information is presented in some type of advertisement form, such as television or print. Additionally, information presented to physicians is more detailed and complex. Ease of processing of this information by physicians may decrease with greater levels of communication occurring with numerous pharmaceutical representatives.

Greater competitive intensity within a category results in more visits to a given physician from various pharmaceutical representatives, and therefore more drug attribute information to process and later recall. Additionally, this can likely result in less time spent with individual reps, and therefore less "face time" and interaction with the physician, leading to fewer opportunities to convey information. As the level of competition increases, the amount of information processing necessary by the physician (via more representative visits) also intensifies. Representatives from competing firms have less of an opportunity to communicate information to the physician. We expect such competition to impair a given firm's detailing efforts. We hypothesize the following:

> H_{5C}: The impact of detailing on brand sales is negatively moderated by the competitive intensity within the GID therapeutic category.

The Moderating Effect of Market Longevity on Brand Sales

The effectiveness of promotional efforts may additionally vary over the brand life cycle of the product. We wish to examine this impact by including an additional moderator variable, years on the market, to the analysis. Specifically, we investigate the moderating effect of this variable on the impact of promotional efforts on brand sales.

One stream of research within the advertising literature has examined the long-term effects of advertising. The majority of these studies conclude that advertising does not have a long-term impact. For example, previous research suggests that advertising effects can dissipate within months (Assmus et al. 1984; Leone 1995). Other studies support the notion that short-term advertising effects are limited (Deighton et al. 1994; Dekimpe and Hanssens 1995; McDonald 1971; Tellis 1988). A review of the advertising literature (Vakratsas and Ambler 1999) suggests, based upon existing research, diminishing returns over time to advertising.

Individual level theoretical explanations have been offered, such as Berlyne's (1970) two-factor theory and Krugman's (1972) three-exposure hypothesis. These theories suggest that the advertising response function has an inverted U-shape, and after several exposures, the effect of advertising decreases. Subjects initially respond positively to an advertisement, but upon repeated exposure, eventually tire of hearing the same message and subsequently generate a negative response. Further repetition of the advertisement has no beneficial effect, and may be detrimental.

Similarly, advertising "wearout" can occur, which refers to a decay in advertising quality over time (Bass et al. 2007; Calder and Sternthal 1980). Two sources of wearout exist: (i) r*epetition* wearout, where the consumer is repeatedly exposed to the advertisement and loses interest or becomes bored, and (ii) *copy* wearout, which is a decrease in advertising effectiveness over time (Naik et al. 1998). Wearout effects can depend on several factors, such as the

nature of the advertisement, consumer motivation to process the advertisement, and level of competitive advertisements (Pechmann and Stewart 1990). Consumers may experience such wearout effects upon repeated exposure to advertisements over time, diminishing the effectiveness of advertising over time.

This body of research suggests reduced effects of advertising over time. This implies that as the product matures, the effectiveness of advertising efforts may lessen. When a product enters the market, the consumer may be less informed and more likely to depend on advertising to inform themselves (Tellis and Fornell 1988). However, as time passes, consumers may experience wearout upon repeated exposures to advertising. Therefore, we hypothesize:

> H_{6A}: The impact of DTC advertising on brand sales is negatively moderated by the number of years on the market within the GID therapeutic category.
>
> H_{6B}: The impact of journal advertising on brand sales is negatively moderated by the number of years on the market within the GID therapeutic category.

Less attention has been given to examining the long-term effects of personal selling efforts. Detailing is a more personal type of communication effort compared to advertising. Therefore, salesforce efforts may be readily modified over time in order to prevent the wearout effects observed upon repeated exposure to advertising. For example, pharmaceutical sales reps may be able to present new information to physicians regarding the latest news about a drug's benefits or new indications. Persistent interaction with physicians over the years should continually remind the physician about the drug product, therefore generating new prescriptions.

Narayanan et al (2005) find evidence for varying effects of detailing efforts on physician prescribing behavior during different stages of the life cycle. They find that during the introductory phase (6-14 months after introduction), detailing has a primarily indirect (informative) effect followed by direct (persuasive) effects during subsequent stages. However, additional studies find diminished effects of detailing efforts over time (Manchanda and Chintagunta 2004; Manchanda and Honka 2005). We argue that continued detailing efforts should have a positive impact on brand sales throughout the life of the product. Therefore, a positive interaction effect is hypothesized:

> H_{6C}: The impact of detailing on brand sales is positively moderated by the number of years on the market within the GID therapeutic category.

Empirical Analysis

Data

The data comprise observations on nine brands of drugs in the gastrointestinal drug category. The drugs included in this study are listed in Table 2. The observations are for the entire US. market on a monthly basis. The data was obtained from two secondary sources, Verispan and TNS Media.

DTC Advertising. Direct-to-consumer advertising data were obtained from TNS Media. This variable covers monthly advertising expenditures for each drug from 1995-2006.

Detailing Expenditures. This variable, obtained from Verispan, covers monthly detailing expenditures from 1991-2006.

Journal Advertising. This variable, obtained from Verispan, covers monthly journal advertising expenditures from 1999-2006.

Total number of prescriptions written / Total retail prescription sales. This variable, obtained from Verispan, covers the number of prescriptions written as well as total prescription retail sales on a monthly basis from 1991-2006.

Model

Brand Sales

We employ OLS regression to test the hypotheses. We account for time-constant unobserved effects (c_i) in our analysis using a first differencing transformation (Wooldridge 2002). Such unobserved effects could include, for example, physicians who frequently write prescriptions. Pharmaceutical firms will naturally detail more heavily to these physicians, thus causing the unobserved effect to be correlated with the detailing variable. We also include lagged independent variables to account for previous efforts having an effect on current period sales. The following model is used to examine brand sales:

$$RxSales_{it} = \beta_0 + \beta_1 DTC_{it} + \beta_2 Detailing_{it} + \beta_3 JA_{it} + \beta_4 DTC_{i,t-1} + \beta_5 Detailing_{i,t-1} + \beta_6 JA_{i,t-1} + \delta dM_t + \gamma dB_t + c_i + u_{it}$$

where, for brand i, *DTC* denotes direct-to-consumer advertising expenditures, *Detailing* denotes detailing expenditures, *JA* denotes journal advertising expenditures, and *RxSales* denotes Rx retail sales. *dM* denotes monthly dummy variables, dB_t represents brand dummy variables, and *u* is the error term. The following equation (Model 1 in Table 13) denotes the appropriate model applying the first differencing transformation:

$$\Delta RxSales_{it} = \beta_0 + \beta_1 \Delta DTC_{it} + \beta_2 \Delta Detailing_{it} + \beta_3 \Delta JA_{it} + \beta_4 \Delta DTC_{i,t-1} + \beta_5 \Delta Detailing_{i,t-1} + \beta_6 \Delta JA_{i,t-1} + \delta dM_t + \gamma dB_t + u_{it}$$

Interaction Effects

We additionally examine the interaction effects among the promotional variables as well as the contingency effects of competitive intensity and the number of years the product has been on the market. The interaction effects are sequentially added to the previous equation. The following model (Model 4 in Table 13) includes the full set of variables:

$$\Delta RxSales_{it} = \beta_0 + \beta_1 \Delta DTC_{it} + \beta_2 \Delta Detailing_{it} + \beta_3 \Delta JA_{it} + \beta_4 \Delta DTC_{i,t-1} + \beta_5 \Delta Detailing_{i,t-1} + \beta_6 \Delta JA_{i,t-1} + \beta_7 \Delta(DTC*Detailing) + \beta_8 \Delta(Detailing*JA) + \beta_9 \Delta(DTC*JA) + \beta_{10} \Delta(DTC*Comp) + \beta_{11} \Delta(Detailing*Comp) + \beta_{12} \Delta(JA*Comp) + \beta_{13} \Delta(DTC*Mrkt) + \beta_{14} \Delta(Detailing*Mrkt) + \beta_{15} \Delta(JA*Mrkt) + \delta dM_t + \gamma dB_t + u_{it}$$

The interaction of DTC advertising and detailing, detailing and journal advertising, and DTC advertising and journal advertising are denoted by *DTC*Detailing*, *Detailing*JA*, and *DTC*JA* respectively. The competitive intensity, *Comp*, is the total number of Rx and OTC competitors in the market at a given time. The number of years the product has been on the market is represented by *Mrkt*. To resolve the issue of multicollinearity, the interaction terms are mean centered. Again, *dM* denotes monthly dummy variables, dB_t represents brand dummy variables, and *u* is the error term.

Category Sales

The following model (Model 1 in Table 14) is used to examine category sales:

$$\Delta RxSalestotal_t = \beta_0 + \beta_1 \Delta totalDTC_t + \beta_2 \Delta totalDTC_{t-1} + \beta_3 \Delta totalDetailing_t + \beta_4 \Delta totalDetailing_{t-1} + \beta_5 \Delta totalJA_{it} + \beta_6 \Delta totalJA_{i,t-1} + u_t$$

where *RxSalestotal* is the total Rx retail sales, *totalDTC* denotes DTC advertising expenditures for all brands, *totalDetailing* denotes detailing expenditures for all

brands, and *totalJA* denotes journal advertising expenditures for all brands. We also examine the interaction effects of the promotional efforts by adding additional interaction terms. To resolve the issue of multicollinearity, the interaction terms are mean centered (Model 2 in Table 14):

$$\Delta RxSalestotal_t = \beta_0 + \beta_1 \Delta totalDTC_t + \beta_2 \Delta totalDTC_{t-1} + \beta_3 \Delta totalDetailing_t + \beta_4 \Delta totalDetailing_{t-1} + \beta_5 \Delta totalJA_{it} + \beta_6 \Delta totalJA_{i,t-1} + \beta_7 \Delta(totalDTC*totalDetailing) + \beta_8 \Delta(totalDetailing*totalJA) + \beta_9 \Delta(totalDTC*totalJA) + \delta dM_t + u_t$$

To test for serial autocorrelation, the residuals from the OLS regression were regressed against the lagged residual values. The coefficient was close to zero (β = -0.246), indicating that serial autocorrelation is not a major problem.

Results

Table 13 summarizes the results of the brand sales model[1]. Model 1 includes the effects of promotional variables, excluding interaction effects. Model 2 includes interaction effects of the promotional variables. Model 3 additionally includes the interaction of competitive intensity with the promotional variables. Model 4, which represents the full model, also includes the interaction of the promotional variables with the number of years the product has been on the market. Table 14 contains the results of the category sales model. Model 1 excludes interaction effects, while Model 2 includes interaction effects of the promotional variables.

H_3 and H_4 involve the impact of DTC advertising and detailing on brand and category sales. H_{3A} is partially supported. With regards to brand sales, we

see in Models 3 and 4 that DTC advertising does have a positive and significant impact on brand sales. DTC advertising is insignificant in Models 1 and 2. However, we do not see a significant impact of DTC advertising on category sales. We also find partial support for H_{1B}. Detailing is positive and significant in Models 1, 3, and 4 of the brand sales equations. Detailing also has a positive and significant impact on category sales.

H_4 concerns the interaction effects of DTC advertising, detailing, and journal advertising. While H_{4A} and H_{4B} are not supported, Models 2, 3 and 4 do provide support for H_{4C}, suggesting a positive and significant interaction effect between detailing and journal advertising. The coefficient for this interaction term is similar for each model ($\beta = 0.00197$, $\beta = 0.0021$, $\beta = 0.0020$, and $p < 0.01$ for Models 2, 3, and 4 respectively).

H_5 involves the interaction between competitive intensity and the promotional variables. The results provide support for H_{5A}, while H_{5B} and H_{5C} are not supported. Examining Models 3 and 4, we observe a negative and significant interaction between DTC advertising and competitive intensity ($\beta = -0.2021$ for Model 3 and $\beta = -0.208$ for Model 4, $p < 0.05$). Though not significant, the interaction of detailing and journal advertising with competitive intensity is also negative, as hypothesized.

H_6 concerns the interaction of the promotional variables with the number of years on the market. While H_{6A} and H_{6B} are not supported, Model 4

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[1] This analysis was additionally conducted excluding the months after patent expiration for Brands 1-5. However, the results do not change significantly.

demonstrates a positive and significant interaction effect between detailing and the number of years on the market ($\beta = 0.2024$, $p < 0.01$), providing support for H_{6C}.

Table 13: Brand Sales Model

	Model 1		Model 2		Model 3		Model 4	
Variable	β	**p value**	β	**p value**	β	**p value**	β	**p value**
DTC adv	0.153	0.112	0.360	0.156	0.510**	0.025	0.454*	0.072
DTC adv_{t-1}	-0.019	0.841	-0.016	0.872	-0.003	0.975	-0.016	0.869
Det	1.004***	0.0	0.439	0.150	1.131***	0.0	2.237***	0.0
Det_{t-1}	-1.144***	0.0	-1.196***	0.0	-1.229***	0.0	-1.241***	0.0
JA	-3.721*	0.057	-17.180***	0.0	-11.874***	0.006	-16.338***	0.001
JA_{t-1}	5.139***	0.008	5.500***	0.004	5.463***	0.005	4.764**	0.014
DTC*Det			$-7.69*10^{-6}$	0.724	$-9.85*10^{-6}$	0.652	$1.28*10^{-6}$	0.956
Det*JA			0.00197***	0.002	0.0021***	0.002	0.0020***	0.006
DTC*JA			-0.00031	0.266	-0.00024	0.403	-0.0002	0.525
DTC*Comp					-0.2021**	0.050	-0.208**	0.047
Det*Comp					-0.1071	0.403	-0.045	0.727
JA*Comp					-0.187	0.916	-0.1317	0.941
DTC*Mrkt							0.0019	0.947
Det*Mrkt							0.2024***	0.0
JA*Mrkt							-0.784	0.176
R-squared	0.303		0.309		0.312		0.320	
Adj. R-squared	0.290		0.294		0.296		0.302	

N = 1316; coefficients are unstandardized

DTC adv = Direct-to-Consumer advertising, Det = detailing, JA = journal advertising, Comp = number of competitors, Mrkt = years on the market

*** Significant at 1% level; ** Significant at 5% level; * Significant at 10% level

Table 14: Category Sales Model

	Model 1		Model 2	
Variable	**Coefficient**	**p value**	**Coefficient**	**p value**
DTC adv	0.208	0.599	0.143	0.815
DTC adv_{t-1}	-0.044	0.914	-0.090	0.824
Det	2.322***	0.005	2.629***	0.007
Det_{t-1}	-2.300***	0.001	-3.241***	0.001
JA	9.982	0.244	8.159	0.352
JA_{t-1}	-1.993	0.805	-0.679	0.935
DTC*Det			-0.0000174	0.673
Det*JA			-0.000377	0.219
DTC*JA			0.000467	0.522
R-squared	0.794		0.800	
Adj. R-squared	0.747		0.743	

N = 92; coefficients are unstandardized
DTC adv = Direct-to-Consumer advertising, Det = detailing, JA = journal advertising
*** Significant at 1% level

Discussion

The present study reveals interesting findings regarding the contribution to sales of various promotional efforts in the pharmaceutical industry. We find partial support for a positive and significant impact of DTC advertising on brand sales. It should be noted that previous studies have revealed conflicting results regarding the impact of DTC advertising on brand sales. Our results indicate that, when including certain moderator variables into the brand sales model, DTC advertising is positive and significant. However, the impact is small (β = 0.510 in Model 3; β= 0.454 in Model 4), suggesting that returns from DTC advertising investments are not substantial. These findings also highlight the complexity in the present analysis. It is difficult to draw generalized conclusions regarding the impact of DTC advertising on brand sales; most likely, the impact of DTC

advertising differs among categories and is dependent upon various contingency factors.

Surprisingly, we do not find a significant impact of DTC advertising on category sales. Perhaps this is due to the particular therapeutic category examined. For example, this result could be due to carryover effects of DTC advertising to the over-the-counter market. Perhaps DTC advertising of these Rx drugs (Brands 1-5) is enhancing over-the-counter sales, rather than Rx sales.

Consistent with previous literature, we do find partial support for a positive and significant impact of detailing on brand sales. The impact of detailing is greater compared to DTC advertising (for detailing, $\beta = 1.004$ in Model 1; $\beta = 1.131$ in Model 3; $\beta = 2.237$ in Model 4). This finding suggests that detailing generates a greater return on investment compared to DTC advertising.

Interestingly, we also note a negative and significant lagged effect of detailing. This could be due to a sampling effect. It is likely that pharmaceutical reps deliver samples to physicians during detailing visits. Often, physicians will provide new patients with drug samples to first observe a patient's response to the drug. If the patient responds positively to the drug, a prescription will then be given (during a later visit). Therefore, there may be an elapsed time period between the detailing visit and the writing of the prescription. Alternatively, if the patient does not respond well to the drug, a prescription will not be given, and no new sales will result.

Similarly, we find a positive and significant effect of detailing on category sales, with a negative and significant lagged effect. Detailing generates positive

returns to both brand sales, as well as sales of competitor drugs within the category. Although not formally included in the hypotheses, we do find a significant and negative impact of journal advertising and a significant and positive lagged effect of journal advertising. This suggests that the impact of this type of advertising is not observed immediately, but accumulates with time.

The results reveal a significant interaction effect for detailing and journal advertising with regards to brand sales. This particular interaction has not been examined in previous studies. Both these types of promotional efforts are directed toward physicians. This reveals the positive synergistic effect of advertising and personal selling to physicians. However, the effect is quite small (β = 0.00197 for Model 2; β = 0.0021 for Model 3; β = 0.0020 for Model 4).

We do not find significant interaction effects for DTC advertising and detailing as well as DTC advertising and journal advertising. These results are consistent with previous studies (Donohue and Berndt 2004; Iizuka and Jin 2005) who also find insignificant interaction effects. Consistent with Narayanan et al. (2004), insignificant interaction effects are found for the promotional variables with regards to category sales. Although it seems intuitive that promotional efforts directed at consumers (DTC advertising) and physicians (detailing and journal advertising) should have a significant synergistic effect, our study provides further evidence for the lack of such an effect.

This study also examines the contingency effects of competitive intensity and the number of years the product has been on the market. Results reveal a negative and significant (though small) interaction effect of DTC advertising and

competitive intensity (β = -0.2021 in Model 3; β = -0.208 in Model 4). This result is intuitive, suggesting that as the number of competitors in a category increase, the impact of DTC advertising on brand sales is hindered. It is possible that the more brand advertisements consumers are exposed to, the less likely they are to remember a particular brand name upon a visit to a physician. Pharmaceutical marketers agree that DTC advertising is "responsive to the competitive environment" (Lam 2004, p. 102).

The results also reveal a positive and significant (though small) interaction effect between detailing and the number of years on the market (β = 0.2024 in Model 4). This suggests that personal selling efforts continue to generate a positive and significant contribution to brand sales over the life of the product. The positive returns from this type of investment appear to have a continued impact, even in later stages of the brand's life cycle. This particular result is consistent with findings by Narayanan et al. (2005) who find that detailing has direct (persuasive) effects during later stages of the life cycle.

Both of these results have important implications for pharmaceutical managers. Overall, this suggests that DTC advertising investments should be dependent upon the level of competition in the category. If a brand is one of few in a particular category, DTC advertising may be a worthwhile investment. However, if there are several brands in a category, marketing investments should perhaps be devoted to other channels. It also appears that investments made in personal selling remain of value throughout the life of the brand, and managers should continuously dedicate funds to this particular effort.

Conclusion

Overall, the present study reveals a number of noteworthy findings. In general, we can conclude that the impact of pharmaceutical promotional efforts on brand sales is rather complex. Our results indicate that the effect of DTC advertising varies, and is likely dependent upon a number of contingencies. This is consistent with the notion that DTC advertising may work better for some brands and/or therapeutic categories (Lam 2004). Given the complex nature of this relationship, it is not surprising that previous studies have obtained conflicting results. Our results also indicate that DTC advertising may prove to be more beneficial in smaller categories with less competitors, compared to categories with a greater competitive intensity. This is suggested by the negative interaction between DTC advertising and the number of competitors within the category.

We also find detailing to have a positive impact on brand and therapeutic category sales. Additionally, detailing generates a greater return on investment compared to DTC advertising. This underscores the importance of the personal selling function in this industry. It is important to note that this type of promotional effort continues to generate positive returns as the drug product progresses through its life cycle. Also, we note the synergistic effect of detailing and journal advertising targeted to physicians.

Overall, it appears that promotional efforts directed towards physicians have a greater impact (ROI) compared to those directed towards consumers. Physicians, not consumers, are ultimately responsible for choice of drug (in the

Rx market). Therefore, pharmaceutical firms should focus their investments in these channels, particularly for competitive therapeutic categories. Although we have seen a large increase in spending on DTC advertising over the last decade, it may be fruitful for pharmaceutical firms to first obtain a better understanding of what brands and categories might actually benefit from such advertising before dedicating such investment.

ESSAY THREE: Market Entry Issues in the Pharmaceutical Industry

Introduction

A significant body of literature has accumulated in recent years surrounding the study of market pioneering, or first-mover, advantages. (See Kerin et al. (1992) for a review). The majority of this literature suggests that market pioneers, and occasionally early entrants, posses significant advantages over late market entrants (Kalyanaram et al. 1995; Lambkin 1988; Lieberman and Montgomery 1988). A number of empirical studies have substantiated the early entrant – market share relationship (Kalyanaram and Wittink 1994; Lambkin 1988; Parry and Bass 1989). While much of this research has focused on pioneering advantage, a lesser number of empirical studies have investigated how late entrants into a market can overcome the disadvantages they traditionally face, even though a number of industry cases exist in which late entrants were able to become market leaders. For example, in the pharmaceutical industry, Zantac surpassed sales of first entrant Tagamet as a result of a "shrewd, multifaceted marketing strategy" (p.25) and superior drug attributes (a more convenient dosing schedule and superior drug interaction profile) (Wright 1996). Schnaars (1994) offers numerous examples of later entrants who surpassed pioneers in a variety of product categories.

While much of the scholarly literature acknowledges multiple market pioneering advantages, Kerin et al. (1992) argue that a number of contingency effects can moderate the order of entry-competitive advantage relationship. They suggest that achieving and sustaining first mover advantage is rather complex,

and one must consider more than simple entry order effects. For example, Brown and Lattin (1994) show that a brand's length of time in the market can also lead to a greater market share advantage, while Huff and Robinson (1994) demonstrate that a greater lead time increases a pioneer's advantage. The type of product (incremental vs. really new) introduced into the market can also influence the level of the pioneer's success (Min et al. 2006). Szymanski et al. (1995) also propose a contingency perspective for examining the order of entry-market share relationship. A number of factors can affect new entry performance, such as the capabilities of the entrant firm as well as the strategy they employ (Gatignon et al. 1990).

We believe that exploring these contingency effects is important in gaining a better understanding of market pioneer vs. late entrant market dynamics. This can potentially provide insight into an equally important question: How do late entrants overcome the disadvantages they typically face to become market leaders? The present study addresses this particular question.

This research question is investigated in the context of the pharmaceutical industry utilizing panel data designed to uncover long-term effects. More specifically, we examine the effects of a late entrant drug product entry into two key markets in this industry: the over-the-counter (OTC) market as well as the prescription (Rx) market. This study focuses on one specific therapeutic category: gastrointestinal drugs. Proton pump inhibitors (a particular type of gastrointestinal drug used to treat acid reflux symptoms) are the second largest therapy class in the U.S., with prescription sales of $14.1 billion in 2007

(Longwell 2008). Over the last thirty years, nine drug products in this category have entered the Rx market. During this time, five of these products have switched to the OTC market as their patents have expired. The unique market dynamics occurring in the gastrointestinal therapeutic category across these two related markets over three decades allows us to examine a number of interesting market entry issues.

Our results indicate that late entrants can surpass incumbents to become market leaders; however, we find that this is accomplished via two different mechanisms in both markets (OTC and Rx). Furthermore, we show that entrance into the focal (OTC) market can have a secondary effect on a related (Rx) market. This unique secondary effect has not been readily acknowledged in the market entry literature. Our research has additional important implications in that we provide insight into the benefits derived from switching a drug product from Rx-to-OTC. Lastly, by examining product switching behaviors, our research highlights differences between physician and consumer choice characteristics.

Background

First Mover Advantages

First mover, or pioneering, advantages can accrue from a number of different mechanisms. Both economic and behavioral perspectives have been offered. The economic perspective suggests that various entry barriers contribute to such advantages, such as experience effects, reputational effects, technological leadership, and buyer switching costs, among others (Karakaya and Stahl 1989; Kerin et al. 1992; Lieberman and Montgomery 1988). Han et al.

(2001) suggest that entry barriers can provide value to incumbents by preventing new competitive entry as well as allowing a greater lead time to develop innovations. This suggests that late market entrants must expend significant efforts to overcome these entry barriers.

The behavioral perspective offers additional support for the pioneering advantage. Research in this area has shown that consumers generally have positive attitudes and positive perceptions toward pioneer brands (Alpert and Kamins 1995). A proposed mechanism for this effect is offered by Kardes and Kalyanaram (1992) who suggest that information that consumers learn about first entrants is perceived as novel and interesting, whereas information related to a later entrant is perceived as redundant. Therefore, information pertaining to the early entrant is more likely to be encoded into long-term memory, and repeated exposure to information will increase knowledge of the pioneering brand.

Carpenter and Nakamoto (1989) also argue that a pioneering advantage can arise from the process by which consumers learn about brands and form preferences. These authors suggest that an early entrant can significantly influence how attributes are valued, shifting an individual to favor the pioneer. Additionally, the pioneer can become strongly associated with the product category, becoming "the standard."

Nevertheless, there is evidence for late entrant advantages as well. Zhang and Markman (1998) show that later entrants with superior attributes can, under certain circumstances, come to be preferred over market pioneers. Late entrant advantages include: (1) "free-rider" effects on the investments of market

pioneers, (2) shifts in technology or consumer tastes, (3) capitalizing on pioneers' mistakes, (4) incumbent inertia, and (5) the ability to successfully influence and shape consumer preferences (Cho et al. 1998; Kerin et al. 1992; Lieberman and Montgomery 1988; Schoenecker and Cooper 1998). The ability to capitalize on these advantages may allow late entrants to achieve greater market share compared to incumbents.

In contrast to the pioneering advantage literature, fewer studies have examined how late entrants can effectively compete with incumbents to achieve marketplace success. Recent studies suggest that innovative product offerings and considerable resources may contribute to a late entrant's success in the market, essentially overcoming the disadvantages associated with late market entry (Shamsie et al. 2004; Shankar et al. 1998).

In the present study, we investigate if such firm-specific abilities (innovative products as well as marketing resources) can contribute to a late entrant's marketplace success. The next section provides background on the pharmaceutical industry, which provides a unique context for such inquiry. We then present our hypotheses, followed by the results and conclusions. We demonstrate that late entrants can indeed, via varying mechanisms, achieve market leadership. Additionally, we demonstrate that market entry can have both primary effects (on the market into which it enters) as well as secondary effects (on related markets).

The Pharmaceutical Industry

Our study explores a unique market entry situation – switching an existing drug product from Rx to over-the-counter upon patent expiration. This Rx-to-OTC switch marketing strategy is used by pharmaceutical companies in order to continue to generate sales (as an OTC version of the original Rx drug) once the patent on the drug product has expired, after which the branded drug faces competition from cheaper generic versions. Due to the limited patent life of pharmaceutical drug products, management of the brand life cycle is particularly crucial in this industry. Therefore, selling a drug product OTC can be a beneficial mechanism to continue to generate sales (and recoup investments made during the development phase) once the drug patent has expired. Potential OTC drug candidates include those that have demonstrated long-term safety profiles and that are used to treat mild ailments which are easy to diagnose by the consumer.

The Rx-to-OTC switch strategy has been increasingly used by manufacturers, particularly in therapeutic categories such as gastrointestinal and antihistamine drug products. US sales of OTC drugs are forecasted to be $29.3 billion in 2010, up from $13.7 billion in 1996 (Bradley 1999). Successful OTC brands can produce sales from $20 million to greater than $200 million per year (Mahecha 2006). Despite the popularity of this approach by pharmaceutical manufacturers to gain additional revenues from its branded products, few empirical studies have examined the Rx-to-OTC switch strategy.

This examination allows us to compare two different markets crucial to the pharmaceutical industry – the Rx and OTC markets. These two markets differ

significantly. For example, in the Rx market, consumers must first visit a physician and obtain a prescription before he/she can obtain the drug product. Therefore, physicians, not consumers, are responsible for the drug product choice. Conversely, in the OTC market, consumers can freely purchase the drug product without a prescription.

The types of promotional efforts conducted for Rx and OTC drugs differ as well. In the OTC market, consumers are the primary target of marketing efforts. The main type of promotional effort for OTC products is Direct-to-Consumer (DTC) advertising. However, in the Rx market, promotional efforts are geared toward both physicians and consumers. The primary promotional effort directed toward physicians is detailing, or personal selling conducted by pharmaceutical representatives. While DTC advertising is a form of mass advertising, detailing, which occurs at the individual level, involves a one-on-one interaction between the pharmaceutical representative and physician, and is a more targeted form of promotional effort.

This study provides the unique opportunity of comparing market entry effects in two distinct (Rx and OTC), yet important, markets. We are able, therefore, to gain insight into what factors play a role in achieving success in each market. Secondly, we are able to examine both the primary and secondary effects of a late entrant market entry into the OTC market. We additionally examine the differential impact of DTC advertising on sales in the Rx and OTC markets. This study also exposes differential choice behaviors among consumers

and physicians. Lastly, this investigation explores the value of the Rx-to-OTC switch marketing strategy.

Conceptual Development and Hypotheses

Examination of the Impact of Direct-to-Consumer Advertising in the Rx and OTC Markets

Few studies have directly compared the impact of DTC advertising in the Rx and OTC markets. Given the different purchasing situations in both markets, one might expect a differential impact of this type of advertising in each market. Ling et al (2002) examine the effects of DTC advertising on sales of OTC and Rx antiulcer and heartburn medications. They also examine interactions between Rx and OTC DTC advertising for a particular brand. They find that DTC marketing of OTC brands impact its own share in the OTC market. They also find that DTC marketing of Rx brands positively impacts the share of same-brand OTC products. Advertising of OTC products does not impact market shares of Rx products. Ling (1999) finds that DTC marketing of OTC brands has positive and long-lived impacts in the OTC market. Furthermore, OTC drugs have price elasticity similar to that for Rx drugs. This suggests that consumers may not be price sensitive and that brand loyalty may play a role in the sales of OTC drugs.

The overall purpose of DTC advertising is to generate awareness of a condition and/or specific drug among consumers. This is consistent with "hierarchy of effects" models (Lavidge and Steiner 1961) introduced in the early advertising literature. These models suggest that consumers experience a sequence of effects when exposed to an advertisement. The first step in this process is awareness of the product's existence. A series of steps are followed

(for example, Attention → Interest → Desire → Action) until the final 'action' step, purchase of the product.

In the case of DTC advertising in the pharmaceutical industry, the desired action by the consumer (in the case of Rx drugs) is a visit to the physician, since the consumer is not able to purchase the drug product directly. However, in the OTC market, the role of the physician is removed, and the consumer is directly responsible for purchasing the drug. Therefore, the intended effect of DTC advertising in the OTC market is for the consumer to advance through the hierarchy of effects sequence to the final step, purchase of the drug.

Clearly, the process consumers follow to obtain a drug product differs in the Rx and OTC markets. In the Rx market, the DTC advertisement may induce the consumer to visit his or her physician. However, the physician may or may not prescribe the drug whose advertisement the consumer was exposed to. In the OTC market, access to OTC drugs is much simpler; consumers need not obtain a prescription from a physician before obtaining a drug. Therefore, one might expect that DTC advertising has a greater impact on brand sales of OTC drugs vs. Rx drugs. H_7 thus states:

> H_7: The impact of DTC advertising on sales of over-the-counter drugs is positive and significant, while the impact of DTC advertising on sales of Rx drugs is insignificant in the GID therapeutic category.

Examination of the Impact of OTC and Rx Market Entry on Drug Sales

The over-the-counter switch phenomenon observed in the gastrointestinal therapeutic category allows us to examine how market entry affects sales of existing competitor drug products. We focus on two specific events. First, we

examine how the entry of a late entrant, previous Rx product (Prilosec OTC) into the over-the-counter drug market affects sales of existing OTC as well as Rx drugs. The effect on sales of existing OTC drugs is referred to as a "primary effect". The effect on sales in a related market (Rx) is referred to as a "secondary effect". Secondly, we investigate how the entry of a late entrant (Nexium) into the Rx market affects the sales of existing competitor Rx drugs. Table 2 provides an overview of the Rx and OTC market entry dates for the nine products in the gastrointestinal therapeutic category.

Late Entrant OTC Market Entry

We chose to examine the impact of a late entrant (Prilosec OTC) market entry on incumbent sales for several reasons. First, this Rx-to-OTC switch captured much attention due to the enhanced efficacy (as well as safety profile) of this drug compared to other over-the-counter remedies (Anonymous 2003; Nelson 2003), therefore providing a great benefit to those who suffer from heartburn and related gastrointestinal ailments. Prilosec OTC is in a class of drugs known as "proton-pump inhibitors," or PPI's. (Prevacid, Aciphex, Protonix, and Nexium are also PPI drugs). These drugs are generally thought to be more effective than other OTC drugs such as the "H_2 blocker" drugs Tagamet, Zantac, Pepcid, and Axid as well as antacid remedies. Prilosec OTC was the last drug product in the category to enter the OTC market. Therefore, we are able to examine the effect of this late market entry on sales of all other previous Rx-to-OTC switch products, which include Tagamet, Zantac, Pepcid, and Axid. We can

also examine the impact of this late entrant market entry on sales within a related market, the Rx market (Prevacid, Aciphex, Protonix, and Nexium).

Late Entrant Rx Market Entry

We additionally examine the effect of the entrance of a late entrant (AstraZenica's Nexium) into the Rx market. Like Prilosec OTC, the entry of Nexium into the market also received much attention, but was not without controversy (Baxter 2006; King 2004). The launch of Nexium was accompanied by a substantial marketing campaign (Bazell 2007), and some questioned the benefit of Nexium over the similar and significantly less expensive OTC product Prilosec, also manufactured by AstraZenica. Nexium did, however, show some improved efficacy over other Rx PPI drugs (Anonymous 2005; Anonymous 2006). Since Nexium is the most recent drug product in our category to enter the Rx market, our analysis allows us to examine competitive entry effects in this market.

Competitive Market Entry

The competitive effects of market entry are a vital area of examination in marketing strategy (Carpenter and Nakamoto 1990; Gatignon et al. 1990; Mahajan et al. 1993). A number of issues can be investigated, such as the impact of entry on incumbent sales, order of entry effects (i.e, first mover advantages, etc.), as well as market expansion effects. Several factors can affect the success of a product as it enters the market. One such factor is the timing of the product's entry into the market. Generally, it is believed that market pioneers accrue significant benefits compared to later entrants (Kerin et al. 1992;

Robinson 1988; Robinson and Fornell 1985; Robinson and Min 2002; Urban et al. 1986). Sources of advantage include, for example, technology leadership, a stronger relative marketing mix, direct cost savings compared to competitors, and consumer information advantages due to product experience (Lieberman and Montgomery 1988; Robinson and Fornell 1985). Urban et al. (1986) empirically demonstrate the inverse relationship between order of entry and market share. The benefits derived from early entrance into a market make it difficult for later entrants to capture a significant share of the market.

A limited number of recent studies suggest that late entrants into a market may be able to overcome the disadvantages traditionally associated with late market entry (Shamsie et al. 2004; Shankar et al. 1998). With the appropriate strategy, it may be possible for later entrants to effectively compete with market incumbents. Brands that demonstrate superior attributes or benefits to the consumer may offer advantages to the consumer not present in competing brands. Also, substantial marketing efforts may help later entrants effectively compete with existing firms (Carpenter and Nakamoto 1990; Cho et al. 1998; Golder and Tellis 1993; Schnaars 1994). Robinson and Fornell (1985) suggest that advertising can be viewed as a source of consumer information, and may induce switching for late-entrant brands. Green et al. (1995) suggest that a firm's early investments in R&D and marketing expenditures can affect the success of a product entry. They empirically demonstrate a link between a firm's relative investment in advertising during entry and long-term performance. These authors also show that the perceived value of the product can affect long-term

performance. Green and Ryans (1990) also find that the magnitude of marketing investment upon entry is positively associated with performance. Additionally, these authors find that later entry into a market allows firms to develop a product that is more suited to consumer needs and therefore is in a better competitive position. Bowman and Gatignon (1996) show that later entrants must demonstrate enhanced product quality and promotional efforts to compete with incumbents.

Empirical studies have found evidence for late entrant success given innovative product offerings and considerable promotional efforts. In their study of two prescription drugs, Bond and Lean (1977) found that later entrants whose products offered therapeutic novelty were able to achieve substantial sales volumes with significant promotional expenditures. Shankar et al. (1998) show that *innovative* late movers grow faster than the pioneer, slow its diffusion, and reduce its marketing mix effectiveness. Additionally, they have greater market potential compared to noninnovative late entrants. Shamsie et al. (2004) find empirical support for late entrant success provided that they offer high quality, innovative products and possess considerable resources. These studies suggest that, with a competitive marketing investment and product offering, late entrants into a market may be able to achieve success despite the disadvantages they encounter.

In the present study, we wish to explore the effects of late entrant (Prilosec OTC and Nexium) market entry on sales of incumbent drug products. The relevant literature suggests potentially different outcomes of these product

entries in terms of their levels of market success. Both drug products were last to enter the OTC and Rx markets, respectively, suggesting these drugs faced greater obstacles compared to their early entrant rivals. However, both products demonstrated enhanced therapeutic benefits over earlier drugs. In comparison to prescription drugs, the launch of Prilosec OTC offered easy access to an effective and safe drug without the requirement of a physician's prescription. In addition, Prilosec OTC's market entry was unique in that many consumers were familiar with the brand within the Rx market. Both market launches were supported by significant marketing and promotional investments, as can be seen in Figures 1 and 2. These figures demonstrate that within the first two years of the product launches of each drug, the promotional expenditures dedicated to these drug products were greater compared to competitors. Nexium was recently ranked as one of the top DTC-advertising-promoted brands (Yuan and Duckwitz 2002). With the launch of Nexium, AstraZenica had significant experience and familiarity with the marketplace due to its earlier launch of Prilosec in 1989, which can enhance market entry success (Green et al. 1995). Additionally, the launch of Prilosec OTC could have benefited from the brand familiarly accumulated during the time it competed in the Rx market (Kerin et al. 1996; Sullivan 1991). Given the superior product benefits offered by late entrants Prilosec and Nexium, as well as significant promotional investments associated with the market entry of each, we propose the following hypotheses:

> H_{8A}: The market entry of a late entrant, previous Rx product (Prilosec OTC) into the over-the-counter market will have a significant negative impact on sales of existing competitor OTC drugs.

H_{8B}: The market entry of a late entrant (Nexium) into the Rx market will have a significant negative impact on sales of existing competitor Rx drugs.

In addition to examining the primary effects of market entry of these two products, we also examine the secondary effects of Prilosec OTC market entry. That is, we explore the impact of Prilosec OTC's market entry on product sales in a related market – the Rx market. This provides further insight into the overall market dynamics upon entry into the OTC market.

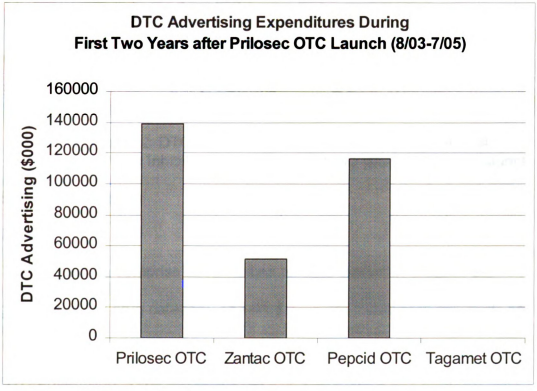

Figure 1: DTC Advertising expenditures during first two years of Prilosec OTC launch

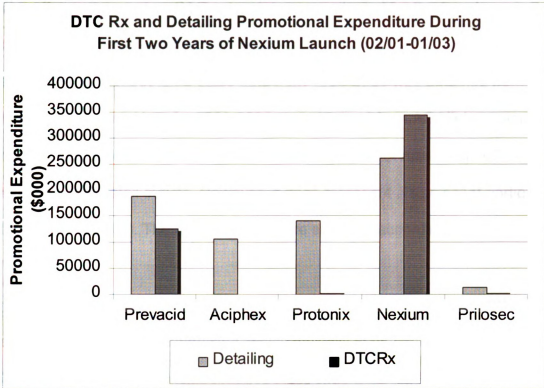

Figure 2: DTC Advertising and Detailing expenditures of Proton Pump Inhibitor drugs during first two years of Nexium launch

Empirical Analysis

Data

The data comprise observations on nine brands of drugs in the gastrointestinal drug category. The drug products included in this study are listed in Table 2. The data was obtained from various secondary sources.

DTC Advertising. Direct-to-consumer advertising data was obtained from TNS Media. This variable covers monthly advertising expenditures by brand from 1995-2006.

Total number of prescriptions written / Total retail prescription sales. This variable, obtained from Verispan, covers the number of prescriptions written as well as total prescription retail sales on a monthly basis from 1991-2006.

Over-the-counter sales. OTC sales data was collected for the five drugs in this category that have switched from Rx-to-OTC: Tagamet, Zantac, Pepcid, Axid, and Prilosec. Monthly OTC sales data from 1995-2001 was obtained from IMS Health. OTC sales data for 2002-2006 was obtained from AC Nielsen, and is categorized in 4-week time intervals. This data does not represent 100% of all available U.S. retail outlets. However, it does represent a significant portion of total sales (69.8%). The data was therefore adjusted accordingly.

Model

We employ OLS regression to test the hypotheses. Included in the model are the effects of DTC advertising, which typically is employed in both the Rx and OTC markets. We also include lagged independent variables to account for previous efforts impacting current period sales. The following model is used to examine the effects of DTC advertising on brand sales in the Rx market:

$$RxSales_{it} = \beta_0 + \beta_1 DTCRx_{it} + \beta_2 DTCRx_{i,t-1} + \delta dM_t + \gamma dB_t + c_i + u_{it}$$

where, for brand i, *DTCRx* denotes direct-to-consumer advertising expenditures for the Rx drug and *RxSales* denotes Rx retail sales. *dM* denotes monthly dummy variables, *dB* denotes brand dummy variables, c_i represents unobserved effects, and u_{it} is the error term.

The following model is used to examine the effects of DTC advertising on brand sales in the OTC market:

$$OTCSales_{it} = \beta_0 + \beta_1 DTCOTC_{it} + \beta_2 DTCOTC_{i,t-1} + \delta dM_t + \gamma dB_t + c_i + u_{it}$$

where, for brand i, *DTCOTC* denotes direct-to-consumer advertising expenditures for the OTC drug and *OTCSales* denotes over-the-counter sales.

dM denotes monthly dummy variables, *dB* denotes brand dummy variables, c_i represents unobserved effects, and u_{it} is the error term. To examine market entry effects, we include an additional dummy variable into the appropriate sales equation denoting the drug product entry date. For example, in order to examine the effects of Prilosec OTC market entry, we include a dummy variable that takes on the value of "0" before OTC market launch (Sep 2003) and "1" afterwards.

We account for time-constant unobserved effects in our analysis using a first differencing transformation (Wooldridge 2002). This transformation eliminates c_i, the unobserved effects. The following equations denote the appropriate models applying the first differencing transformation:

$$\Delta RxSales_{it} = \beta_0 + \beta_1 \Delta DTCRx_{it} + \beta_2 \Delta DTCRx_{i,t-1} + \delta dM_t + \gamma dB_t + u_{it}$$

$$\Delta OTCSales_{it} = \beta_0 + \beta_1 \Delta DTCOTC_{it} + \beta_2 \Delta DTCOTC_{i,t-1} + \delta dM_t + \gamma dB_t + u_{it}$$

Results

Examination of Effects of DTC Advertising in Rx vs. OTC markets

We see from Tables 15 and 16 that DTC advertising has a positive and significant (though small) impact on sales in the OTC market ($\beta = 0.520$, $p < 0.01$), while the impact is insignificant in the Rx market. These results support H_7. This suggests that the physician plays an important intermediary role in drug choice in the Rx market. DTC advertising seems to have a greater impact when the consumer is responsible for the choice of drug, as in the OTC market.

Table 15:
Results for Effect of Direct to Consumer Advertising on Sales
in the Over-the-Counter Market

Variable	Coefficient	p value
DTCOTC	0.520***	0.0
$DTCOTC_{t-1}$	0.185***	0.001

R-squared = 0.171; coefficients are unstandardized
*** Significant at 1% level

Table 16:
Results for Effect of Direct to Consumer Advertising on Sales
in the Rx Market

Variable	Coefficient	p value
DTCRx	0.143	0.210
$DTCRx_{t-1}$	-0.035	0.759

R-squared = 0.489; coefficients are unstandardized

Examination of Effects of Late Entrant (Prilosec OTC) Market Entry on Rx and OTC sales

$Hypothesis_{8A}$ examines the impact of the OTC market entry of a late entrant, previous Rx product (Prilosec OTC) on sales of other competitor OTC drugs. Prilosec OTC was a late entrant into the OTC gastrointestinal drug category. The market launch of this drug involved significant marketing efforts. Additionally, Prilosec OTC is considered to be therapeutically superior compared to other OTC drugs (Anonymous 2003; Nelson 2003). Therefore it is of interest to examine this late entrant's primary effects: that is, its impact on existing OTC drug sales. Surprisingly, the market entry of this late entrant did not have a significant impact on sales of competitor OTC drugs.[2] (See Table 17). Therefore, H_{8A} is not supported.

[2] A test of Granger causality was performed to ascertain the endogeneity of this event. A lack of such bias was obtained.

We also examined the secondary effects of Prilosec OTC market entry on sales of existing Rx drugs: Prevacid, Aciphex, Protonix, and Nexium. Although each of these drugs is within the same class (PPI's), a benefit of Prilosec OTC is that it offered consumers a simple-to-obtain alternative to existing Rx drugs, for which a prescription is necessary. Interestingly, we do observe a negative impact of Prilosec OTC market entry on sales of existing Rx drugs (β = -2544.7, $p<0.01$). This indicates that this late entrant market entry had a negative impact on sales in a related market – the Rx market. Specifically, the market entry of Prilosec OTC reduced sales of the existing Rx drugs by approximately $2,544,700 (per month). The results are presented in Table 18.

We further investigated the impact of Prilosec OTC market entry on Nexium sales only. Nexium is the 2nd generation follow-up drug to Prilosec. Both drugs are manufactured by the same firm, AstraZenica. These results are presented in Table 19. We do not observe a significant impact of Prilosec OTC market entry on Nexium sales. Therefore, this suggests that cannibalization did not occur in this case. The market entry of Prilosec OTC shifted sales away from competitor Rx drugs, but not own-firm Rx sales.

Table 17: Results for Effect of Prilosec OTC Launch on Competitor OTC Sales

Variable	Coefficient	p value
DTCOTC	0.492***	0.0
$DTCOTC_{t-1}$	0.101*	0.088
Prilosec OTC launch dummy variable	83.15	0.699

R-squared = 0.137; coefficients are unstandardized
*** Significant at 1% level
* Significant at 10% level

Table 18: Results for Effect of Prilosec OTC Launch on Rx Sales

Variable	Coefficient	p value
DTCRx	0.130	0.250
$DTCRx_{t-1}$	-0.049	0.664
Prilosec OTC launch dummy variable	-2544.7***	0.002

R-squared = 0.503; coefficients are unstandardized
*** Significant at 1% level

Table 19: Results for Effect of Prilosec OTC Launch on Rx Nexium Sales

Variable	Coefficient	p value
DTCRx	0.536***	0.009
$DTCRx_{t-1}$	-0.031	0.877
Prilosec OTC launch dummy variable	-3600.1	0.106

R-squared = 0.644; coefficients are unstandardized
*** Significant at 1% level

Interestingly, we find that Prilosec OTC market entry only impacted sales of competitor Rx drugs, but not competitor OTC drugs. This result is consistent with literature that states that Prilosec OTC did not erode sales of traditional antacids and histamine H_2 receptor antagonists (Tagamet, Zantac, Axid, and Pepcid). Prilosec OTC did, however, become the market leader in the OTC market. The market entry of this product enlarged the size of the OTC market by attracting previous Rx users to the OTC market (Mahecha 2006). (Figure 3 compares OTC sales of Prilosec to competitor products.) Prilosec OTC, although it was a late entrant into the market, was able to become the market leader, capturing approximately 50% market share shortly after entry. This was primarily via market expansion effects as well as by shifting sales from a related market – the Rx market. Also noteworthy is the observation that consumers did not switch

from existing OTC drugs to Prilosec OTC, even though Prilosec OTC is believed to be superior to these drugs (Anonymous 2003; Nelson 2003). This finding provides insight into consumer choice behavior. These results suggest that if consumers are satisfied with their existing medications, they may be unlikely to switch to a new drug with improved attributes.

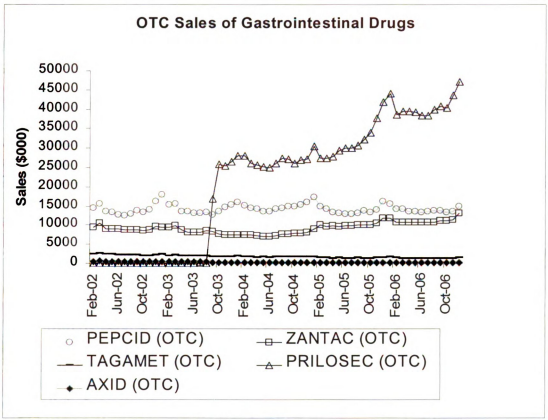

Figure 3: Over-the-counter sales of gastrointestinal drugs.

We also observe that Prilosec OTC launch did not affect sales of Nexium, the second generation follow up drug to Prilosec. In other words, cannibalization of AstraZenica's Rx drug, Nexium, did not occur in this case. This may be partly attributed to the sizeable marketing efforts by AstraZenica in promoting Nexium (Bazell 2007). We also make note that in the case of Nexium (see Table 19 for

results), the DTC advertising variable is significant ($\beta = 0.536$, $p<0.01$). We do not observe significant effects for DTC advertising across all Rx drugs. We do, however, find that DTC advertising did have a positive and significant impact on Nexium sales.

Examination of Effects of Late Entrant (Nexium) Market Entry on Rx sales

Hypothesis$_{8B}$ examines the impact of a late entrant (Nexium) market entry on sales of existing competitor Rx drugs (Prevacid, Aciphex, and Protonix). This late entrant product was promoted as being superior to the other PPI drugs in the market. Additionally, its launch was accompanied by substantial promotional efforts. The results indicate that the market entry of Nexium had a significant negative effect on sales of other PPI Rx drugs ($\beta = -2734.5$, $p<0.01$), supporting H_{8B}. The results are presented in Table 20. Sales of competitor Rx drugs decreased by $2,734,500 per month when Nexium entered the Rx market.

We observe that, in the Rx market case, physicians were willing to switch patients from existing Rx drugs to an improved drug, Nexium. This suggests that, compared to consumers, physicians may be more willing to consider drug product attributes when making prescribing choices. We also find that, when accompanied by substantial marketing efforts, an innovative late entrant into the Rx market is able to strongly compete with incumbents and become the market leader (see Figure 4 for PPI Rx drug sales). Within a few years of its entry into the Rx market, Nexium became the market leader capturing slightly over one-third market share.

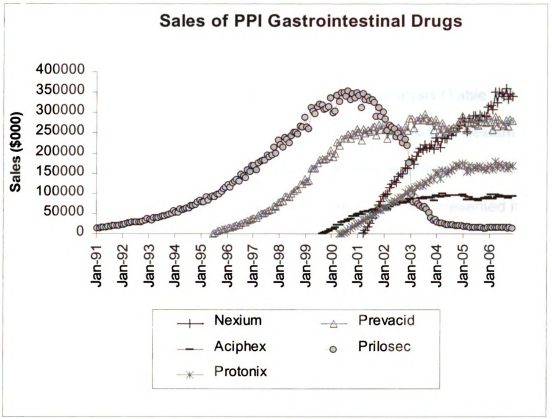

Figure 4: Sales of Proton Pump Inhibitor Rx Gastrointestinal Drugs

Table 20: Results for Effect of Nexium market entrance on competitor Rx sales

Variable	Coefficient	p value
DTCRx	-0.172	0.320
$DTCRx_{t-1}$	-0.230	0.183
Nexium launch dummy variable	-2734.5***	0.004

R-squared = 0.490; coefficients are unstandardized
*** Significant at 1% level

Contribution of Promotional Efforts to Sales

We contend that both late entrant (Prilosec OTC and Nexium) market entries were accompanied by substantial marketing efforts (Bazell 2007; Neff

2003). Figures 1 and 2 illustrate that their promotional efforts were greater than those of competitors during the products launches. We wish to further explore the impact of these marketing efforts on brand sales to further verify that these promotional efforts contributed to the performance of each product in their respective markets. We can observe from a previous analysis (Table 19) that DTC advertising efforts have a significant and positive impact on Nexium sales. Additionally, we investigate the impact of DTC advertising efforts on Prilosec OTC sales with only the Prilosec OTC brand. The results are presented in Table 21. We do indeed observe a positive and significant impact of DTC advertising on Prilosec OTC sales ($\beta = 0.747$, $p < 0.01$). Taken together, these results suggest that DTC advertising did positively impact sales of Prilosec OTC and Nexium. These marketing efforts likely contributed to the success of these late market entrants.

Table 21: Results for Effect of DTCOTC Advertising on Prilosec OTC sales

Variable	Coefficient	p value
DTCOTC	0.747***	0.0
$DTCOTC_{t-1}$	0.699***	0.001

R-squared = 0.632; coefficients are unstandardized
*** Significant at 1% level

Discussion

Although much of the marketing strategy literature suggests that market pioneers accrue significant advantages compared to market followers, additional research has shown that, in specific contexts, followers can overcome obstacles to effectively compete with market pioneers. Our study supports the notion that, with significant promotional investments and innovative product offerings, late

market entrants can achieve marketplace success. In our investigation, both products were able to become market leaders, even though each was last to enter its respective market.

We find that when Prilosec OTC entered the over-the-counter market, its entry had a market expansion effect resulting from previous Prilosec Rx users switching to Prilosec OTC. Prilosec OTC proceeded to gain approximately 50% of the market share within the OTC gastrointestinal drug category. Prilosec OTC did not significantly impact sales of other OTC drugs, but rather captured sales from previous Rx users. Its switch from the Rx market to the OTC market, however, did have a secondary effect in the Rx market. Prilosec OTC's market entry negatively impacted sales of existing competitor Rx drugs. Sales of Prilosec OTC's 2nd generation follow-up drug product, Nexium, were not significantly impacted. Prilosec OTC did indeed have a market stealing effect with respect to the Rx gastrointestinal market. Although Prilosec OTC was a late entrant, the substantial promotional efforts surrounding its launch allowed the drug to become a leader in the OTC market as well as capture sales from existing competitor Rx drugs. Additionally, noting that previous Prilosec Rx users switched to Prilosec OTC, it is likely that Prilosec OTC's success was partially attributed to familiarity with the brand name.

We also observe that Nexium, a late entrant into the Rx gastrointestinal market, was able secure its position as a market leader. We attribute this to successfully conveying the benefits the drug offered compared to competitors as well as a substantial marketing campaign accompanying it's launch. It is noted

that DTC advertising is positive and significant for Nexium ($\beta = 0.536$, $p<0.01$), yet when examined across all brands, DTC advertising does not appear to have a significant effect in the Rx market. This suggests that for Nexium, DTC advertising *did* have a positive impact on sales.

It is interesting to note that users of existing OTC drugs did not switch to Prilosec OTC, even though it was thought to be more effective compared to competitor OTC drugs (Anonymous 2003; Nelson 2003). (Prilosec is the only PPI available over-the-counter. These drugs are believed to be more effective than the competitor H_2 receptor antagonists as well as OTC antacids). This is particularly noteworthy since marketing efforts were targeted towards OTC antacids users more so than prescription switchers (Neff 2003). Yet we observe an opposite effect of its OTC market entry – previous Rx Prilosec users, rather than existing OTC drug users, contributed to its success in the OTC market upon launch.

This finding highlights an interesting observation regarding how consumers behave – consumers in the OTC market (where the physician is absent) are unlikely to switch to a new medication when their existing mode of treatment is satisfactory. However, in the Rx case, physicians are willing to switch patients when a more effective drug treatment is available, as was the case with late entrant Nexium. This suggests that perhaps consumers and physicians behave differently when making product choices. Additionally, we offer another explanation for this finding. As previously noted, the literature suggests that the ability to influence consumer preferences can help firms

compete with other players in the market (Carpenter and Nakamoto 1989; Kerin et al. 1992). Perhaps DTC advertising (the primary promotional effort in the OTC market) is ineffective in changing consumer preferences. However, detailing (the primary promotional effort in the Rx market) may be effective in its ability to change physician preferences. Perhaps pharmaceutical representatives were able to convince physicians that Nexium is superior to other Rx competitor drugs. This is reasonable, since DTC advertising is a form of mass advertising whereas detailing is a more personal, targeted, one-on-one form of communication. In comparison to DTC advertising, one might expect detailing efforts may be more effective in shaping and forming physician preferences.

An additional explanation may provide insight into why consumers did not switch brands in the OTC market, whereas in the Rx market sales of existing Rx brands were negatively impacted by the entrance of Nexium. Price may have played a role in consumers' decision-making in the OTC market, whereas in the Rx market this variable was of less importance. Previous studies suggest that physicians are characterized by limited price sensitivity (Gonul et al. 2001). To explore this possibility, we added price as a variable to our sales models, looking at only (i) Prilosec sales in the OTC market, and (ii) Nexium sales in the Rx market. (Prilosec OTC was priced higher than it's OTC competitors). We find that price is negative and significant for Prilosec OTC (β = -1141.2, $p<0.01$). Additionally, we find price to be insignificant for Nexium in the Rx market. This suggests that price does play a role in consumer choice in the OTC market, yet does not appear to factor into physician choice behavior in the Rx market. The

latter finding is likely due to the fact that insurance companies typically cover the majority of Rx drug costs.

Managerial Implications

Implications for Pharmaceutical Managers

These findings have significant implications for pharmaceutical marketing managers. Managers must be aware of the challenges they face when marketing to consumers vs. physicians. Our results indicate that consumers may be reluctant to switch to alternative medications when they are satisfied with their existing treatment, even if superior alternatives are available. Also perhaps DTC advertising is not entirely effective in influencing consumer preferences. Lastly, consumers in the OTC market may be fairly price sensitive.

When marketing to physicians, however, it is important to emphasize the superiority of their product over competitors. Physicians are concerned with providing the best treatment available to their patients. Our study underscores the importance of detailing efforts in the Rx market. Because of the personal, one-on-one nature of this type of promotional effort, detailing may be more effective compared to DTC advertising. Both the Rx and OTC markets require thoughtful examination in pursuit of achieving the optimal marketing mix strategy.

General Implications

In a general context, marketing managers must develop a suitable strategy when facing a late product market entry. Considerable marketing efforts may be required to effectively compete with market incumbents. Additionally, managers must identify the most effective mechanism in convincing consumers

of the benefits of their product over competitors. Different types of promotional efforts may vary in their levels of effectiveness. Late market entrants often face substantial hurdles, which may be overcome with the appropriate marketing strategy.

Conclusion

In the present study we examine the impact of late entrant market entry on sales of incumbent firms' competitor products. A unique context is chosen for this inquiry – the pharmaceutical industry. Specifically, we examine late market entry effects in two key market settings – the Rx and OTC markets. The idiosyncratic nature of these two distinct markets allows us to explore the contributing factors to marketplace success in each market. This study has a number of important implications that can be applied to other industries in addition to the pharmaceutical industry:

1. We observe that late entrants, in spite of the disadvantages they face given their late entry into the market, can indeed become market leaders. Innovative, superior product offerings as well as substantial marketing efforts likely contribute to this success. Another potential contributing factor is the product's name brand association.
2. Late entrant market entry can have primary effects (impact on sales of incumbent brands within the market it enters) separate from secondary effects (impact on sales of brands in a related market).
3. A late entrant can impact marketplace dynamics in various ways. Consistent with Mahajan et al (1993), we show that a new entrant into a

market can draw buyers away from incumbent brands and/or attract new consumers to the market, resulting in market expansion. Either or both strategies may be useful in aiding late entrants to effectively compete with incumbent firms.

With respect to the pharmaceutical industry, this study suggests that switching a drug from Rx-to-OTC upon patent expiration may be a worthwhile strategy to pursue. In the case of Prilosec, its switch to OTC was successful, as it was able to become the market leader in the OTC market by switching previous Rx users as well as by drawing sales away from existing competitor Rx brands. This allowed its manufacturer, AstraZenica, to continue to generate sales from this drug product, despite generic competition. The brand equity associated with the branded drug is likely a contributing factor to the success of the Rx-to-OTC switch strategy. In her historical comparison of Rx-to-OTC switches, author Laura A. Mahecha states "One wonders why some brands with the same active ingredients and indications, and similar market entry dates, can have such diverse outcomes and levels of success. In most cases, the answer lies in the marketing and branding strategies, and how they differed" (Mahecha 2006, p. 382).

The results of this study also suggest that DTC advertising has a greater impact on sales in the OTC market in comparison to the Rx market. In the OTC market, consumers are responsible for the choice of drug, whereas in the Rx market, physicians make the drug choice. Pharmaceutical firms should place a

greater emphasis on DTC advertising for OTC drugs compared to Rx drug products.

Our findings also suggest differential choice characteristics between physicians and consumers. In the Rx market, physicians may be more sensitive to product attributes compared to consumers in the OTC market. Or perhaps, detailing (in the Rx market) is more effective than DTC advertising (in the OTC market) in forming physician preferences, inducing physician switching behavior. This has a number of important implications for pharmaceutical managers in terms of leveraging the entire marketing mix variables with respect to both the Rx and OTC markets.

CONCLUSION

The uniqueness of the pharmaceutical industry provides ample opportunity to study a number of important and interesting marketing phenomena. The present study reveals a number of important insights as to the role of various promotional efforts in the pharmaceutical industry as well as market entry effects.

Existing research offers little assistance for pharmaceutical marketing executives as to how to optimally allocate limited resources. The results of this research provide such guidance. Rust et al claim (2004) that "(1) marketing managers need to optimize investment-level decisions and the allocation of resources across submarkets or customer segments to maximize profitability and that (2) interaction between different marketing-mix instruments could lead to differential allocation of resources across marketing channels" (p.84-85). The importance of this knowledge is further demonstrated by the following quotes from industry insiders:

- "Marketing teams are faced with high growth expectations despite flat budgets, and must demonstrate the value of every dollar spent" (Gascoigne 2006, p. 82).

- "Faced with the industry's increasing reliance on DTC to drive preference for the growing number of parity products, consumer marketers' biggest challenge – and opportunity – comes in leveraging the benefit of the whole marketing mix" (Breitstein 2004a, p.46).

- "Top of mind are how marketers can find better ways to target patients and improve the ROI of pharma's DTC spend (Breitstein 2002, p.119)

- "Both DTC advertising and professional promotions are here to stay, and companies must learn to successfully coordinate physician and patient messages" (Berman and Duboff 2003, p.84)

Essays 1 and 2 compare the various promotional efforts used in the pharmaceutical industry (Direct-to-Consumer advertising, as well as detailing and journal advertising, directed toward physicians). The results of these two studies highlight the positive impact of detailing on both brand as well as therapeutic category sales. We also find evidence for a greater return on investment from detailing (particularly during the maturity stage of the brand life cycle) compared to DTC advertising and journal advertising. Furthermore, results from both essays suggest that the positive impact of detailing continues to remain throughout the life cycle of the product.

Overall, there is scant evidence that DTC advertising significantly impacts sales in the Rx market. However, the relationship between DTC advertising and sales is rather complex. It appears that competitive intensity within a category is an important contingency variable when examining this relationship. The results suggest that as the number of competitors within a category increases, the impact is hindered. We can conclude that detailing seems to be a more valuable and worthwhile promotional mechanism compared to DTC advertising in the Rx market. However, in the OTC market, we do find evidence for a positive impact of DTC advertising. Therefore, this type of advertising should be used to a greater extent for OTC products compared to Rx products, particularly in highly competitive therapeutic categories.

The results from Essay 3 suggest that late entrants into a market can be successful (achieving market leadership) despite the challenges they face as late entrants. This can be accomplished with substantial marketing efforts as well as therapeutically superior products. We find that late entrants into both the OTC and Rx markets have a market-stealing effect on sales of competitor Rx drugs. Our results also suggest differential choice behaviors for consumers and physicians. It may be more difficult to induce consumers to switch products in the OTC market, compared to persuading physicians to switch in the Rx market. Lastly, we find that the Rx-to-OTC switch appears to be a profitable and worthwhile brand life cycle management strategy. Because pharmaceutical drug products have a limited patent life, pharmaceutical companies are continually attempting to extend sales beyond the patent life of the drug product. The Rx-to-OTC may be one such viable strategy.

Future studies examining different therapeutic categories are required to investigate category-specific contingency effects. For example, it is likely that DTC advertising is more effective for some therapeutic categories. Additionally, it would be of interest to examine the impact of different advertising media types (print, television, and radio) on sales. Lastly, examining the ROI of detailing, DTC advertising, and journal advertising over the brand life cycle for additional therapeutic categories would provide further insight into the variation on returns of these promotional efforts over the life cycle.

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