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The Long-Term Impact of Loyalty Programs on Consumer Purchase Behavior and Loyalty

Despite the prevalent use of loyalty programs, there is limited evidence on the long-term effects of such programs, and their effectiveness is not well established. The current research examines the long-term impact of a loyalty program on consumers' usage levels and their exclusive loyalty to the firm. Using longitudinal data from a convenience store franchise, the study shows that consumers who were heavy buyers at the beginning of a loyalty program were most likely to claim their qualified rewards, but the program did not prompt them to change their purchase behavior. In contrast, consumers whose initial patronage levels were low or moderate gradually purchased more and became more loyal to the firm. For light buyers, the loyalty program broadened their relationship with the firm into other business areas. The findings suggest a need to consider consumer idiosyncrasies when studying loyalty programs and illustrate consumers' cocreation of value in the marketing process.

As an important component of firms' customer relationship management (CRM) strategy, loyalty programs aim to increase customer loyalty by rewarding customers for doing business with the firm. Through these programs, firms can potentially gain more repeat business and, at the same time, obtain rich consumer data that aid future CRM efforts. Since American Airlines launched the first contemporary loyalty program in 1981, loyalty programs have blossomed and now span various industries, including retail, travel, and financial industries. It is estimated that more than half of U.S. adults are enrolled in at least one loyalty program (Kivetz and Simonson 2003).

Despite the prevalent use of loyalty programs, their effectiveness is not well understood (Bolton, Kannan, and Bramlett 2000). Some researchers question the value of loyalty programs. For example, Dowling (2002) suggests that loyalty programs do not necessarily foster loyalty and are not cost effective and that the proliferation of loyalty programs is a hype or a "me-too" scheme. Conversely, some recent studies show that loyalty programs have a positive impact on consumers' repatronage decisions and their share of wallet (e.g., Lewis 2004; Verhoef 2003). With limited empirical validations, the debate on whether loyalty programs are truly effective continues. The divergent views suggest a need to understand these programs better. This is also of strategic importance because such programs are costly investments and require a firm's long-term commitment. It is vital for managers to know whether and how these programs work before they take the plunge.

This research contributes to a better understanding of loyalty programs in three ways. First, although evidence about the effectiveness of loyalty programs has begun to accumulate recently, the field is still underdeveloped, and a clear picture has yet to emerge. Addressing this issue, Bolton, Kannan, and Bramlett (2000, p. 28) suggest that "to determine the long-term efficacy of a loyalty rewards program, a company must quantify the program's influence on future purchase behavior (e.g., usage levels)." The current research responds to the suggestion by quantifying on a large scale the effectiveness of a loyalty program in the convenience store industry. The key research question is whether loyalty programs change consumers' patronage levels and exclusive loyalty to the firm. These outcomes are important to study because they are directly related to consumer profitability and the financial success of a loyalty program.

Second, this research examines consumers' longitudinal behavior change after they join a loyalty program. Given the long-term orientation of loyalty programs and their transformation of single purchases into multiperiod decisions (Kopalle and Neslin 2003), it is natural that their effectiveness should be examined longitudinally. Methodologically, studying loyalty programs over time alleviates self-selection bias. Because loyalty program members may already be frequent customers who are more likely to find the program attractive, simply comparing the behavior of loyalty program members with that of nonmembers cannot establish a conclusive causal relationship (Leenheer et al. 2003). Thus, examining dynamic behavior change is more powerful than cross-sectional studies of behavior at a certain point in time (Verhoef 2003). However, relatively few published empirical studies have examined longitudinal loyalty program effects, especially from the perspective of

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continuous loyalty programs. This leaves a gap in the understanding of the true effects of such programs. A recent study by Lewis (2004) has advanced this area by examining dynamic postreward effects on consumer behavior in the context of a continuous loyalty program. The current research extends this work by studying the general effects of such a loyalty program on long-term purchase behavior change.

Third, this research studies how the idiosyncrasies of individual consumers influence behavior changes that occur after they join a loyalty program. Previous research has shown that the idiosyncratic fit of an individual with a loyalty program can influence his or her likelihood of joining the program (Kivetz and Simonson 2002). However, it is not clear whether such effects would carry over to how these consumers change their purchase patterns after program enrollment. Adding to the limited set of individual idiosyncrasies that have been examined in the literature, the current research explores how consumers with different initial usage levels change their behavior to maximize the benefits they receive from a loyalty program.

Are Loyalty Programs Effective?

Definition

Loyalty program. In this article, a "loyalty program" is defined as a program that allows consumers to accumulate free rewards when they make repeated purchases with a firm. Such a program rarely benefits consumers in one purchase but is intended to foster customer loyalty over time. Thus, promotions that work as "one-shot deals," such as instant scratch cards, are not considered loyalty programs here. This exclusion is appropriate because these one-time promotions do not create the same customer lock-in as true loyalty programs (Sharp and Sharp 1997).

Consumer loyalty. This research adopts Oliver's (1999, p. 34) definition of consumer loyalty as "a deeply held commitment to rebuy or repatronize a preferred product/service consistently in the future." According to Oliver, consumer loyalty can occur at four different levels: cognitive, affective, conative, and behavioral. Although all four facets of consumer loyalty are important, the current research focuses on behavioral loyalty. This aspect of consumer loyalty has not been thoroughly examined in previous research, even though it has a direct impact on a firm's bottom line and facilitates the assessment of loyalty program profitability (and, relatedly, the decision to invest in such a program or to expand or terminate an existing program).

Loyalty Programs and Value Enhancement

Loyalty programs are often considered value-sharing instruments and can enhance consumers' perceptions of what a firm has to offer (Bolton, Kannan, and Bramlett 2000; Yi and Jeon 2003). This value enhancement function is important because the ability to provide superior value is instrumental to customer relationship initiation and retention (Sirdeshmukh, Singh, and Sabol 2002; Woodruff 1997). Indeed, enhanced value perception is considered a necessary condition to a loyalty program's success (O'Brien and Jones 1995).

Loyalty programs provide value to consumers in two stages. In the first stage, program points are issued to consumers at the time of purchase. Although these points have no practical value until they are redeemed, recent studies show that they have important psychological meaning to consumers (Hsee et al. 2003; Van Osselaer, Alba, and Manchanda 2004). The psychological benefit increases the transaction utility of a purchase (Thaler 1985) and, subsequently, the overall value perception of doing business with the firm. Because consumers can later redeem points for free rewards, point accumulation creates an anticipation of positive future events, which increases consumers' likelihood of staying in the relationship (Lemon, White, and Winer 2002).

In the redemption stage, consumers receive both psychological and economic benefits from a loyalty program. The free reward functions as a positive reinforcement of consumers' purchase behavior and conditions them to continue doing business with the firm (Sheth and Parvatiyar 1995). Psychologically, giving free rewards to customers shows the firm's appreciation and personal recognition of its customers. This sense of being important can enhance consumers' overall sense of well-being and deepen their relationship with the firm (Bitner 1995; Gwinner, Gremler, and Bitner 1998). Some researchers suggest that there are other psychological benefits as well, such as the opportunity to indulge in guilt-free luxuries (Kivetz and Simonson 2002) and a sense of participation (Dowling and Uncles 1997), which may be especially appropriate for brands that do not carry this belongingness (Oliver 1999). All these psychological and economic benefits translate into an attractive value proposition from the firm.

Loyalty Programs and Relationship Commitment

Beyond the need for superior value, a necessary condition for any relationship to develop is the commitment of both parties in the relationship (Morgan and Hunt 1994). Given a wide variety of choices and a low switching barrier, it is easy for today's consumers to switch among different firms. This poses significant threats to customer relationships because consumers are not likely to commit to a single brand or firm. Loyalty programs can alleviate this lack of commitment and reduce customer defection by raising switching costs. Because loyalty programs reward customers for their repeated patronage, consumers tend to focus their purchases in one program to maximize the benefits they receive (Sharp and Sharp 1997). Such vested interests in a program make it difficult for competitors to entice customers away from a firm. Using game-theoretic models, Kim, Shi, and Srinivasan (2001) demonstrate that such a competitive barrier benefits the firm and results in higher prices in the marketplace. This is especially true for high-variety-seeking products and services (Zhang, Krishna, and Dhar 2000).

Loyalty programs not only help build customer commitment but also demonstrate a firm's commitment. It is often costly for firms to initiate and maintain a loyalty program. It requires extensive efforts to manage point records and reward issuance. After such a program is in place, it is usually difficult to terminate it without risking the loss of con-

sumers' goodwill. Although a loyalty program brings real cost to the business, it also shows the firm's commitment to establishing a long-term relationship with its customers. Such a commitment and demonstration of goodwill can further deepen the relationship between the firm and its customers.

Empirical Evidence of the Effectiveness of Loyalty Programs

Lab and field studies have examined whether loyalty programs indeed positively affect consumers. Although both types of research are important, this section focuses on empirical examinations of real loyalty programs based on actual consumer behavior because they are most closely related to the current research. Existing studies in this area can be classified into three categories depending on the comparison base on which conclusions are drawn.

Comparison across competitors. The first group of studies quantifies the impact of loyalty programs by comparing them across multiple firms. The focal variables are usually market share or share of wallet. Using consumer panel data of grocery purchases, both Mägi (2003) and Leenheer and colleagues (2003) find mixed support for the positive effects of loyalty programs on share of wallet. Leenheer and colleagues' study reveals increased share of wallet for four of seven programs and offers support for the use of accumulated rewards (as opposed to price discounts) in loyalty programs. Mägi finds that loyalty program membership increases a consumer's share of wallet and store visit and decreases shares for competitors. However, this is supported only at the chain level, not at the store level. Focusing on the airline industry, both Kopalle and Neslin (2003) and Nako (1992) conclude that frequent-flier programs enhance the value of an airline's products and increase consumer demand for airlines that offer such programs.

Within this same category of research but focusing on a different behavioral variable, Sharp and Sharp (1997) investigate the impact of Australia's Fly Buys program by comparing observed purchase frequencies with the Dirichlet baseline and find only a weak improvement in repeat-purchase behavior for most stores. Using a similar approach, Meyer-Waarden and Benavent (2006) find only mixed effects of the loyalty programs offered by several French grocery retailers. Because members of the Fly Buys program can earn loyalty points across stores, it can be argued that such a multistore loyalty program fosters loyalty toward the program rather than toward any particular store and may even encourage consumers to divide their loyalty among multiple firms (Dowling and Uncles 1997). This limits the generalizability of the findings. Moreover, rewards offered by the Fly Buys program (free air travel or lodging) are unrelated to actions consumers need to take (patronizing retail stores) to accumulate points. Recent research suggests that this type of program may elicit reactance from consumers and reduce their intrinsic motivation to engage in the original purchase activities (Kivetz 2005).

Comparison across consumers. The second type of existing research compares the behavior of loyalty program members with that of nonmembers to identify the impact of loyalty programs. Both Verhoef (2003) and Bolton, Kannan,

and Bramlett (2000) examine the effectiveness of loyalty programs in the financial industry. Verhoef finds that participation in an insurance firm's loyalty program makes consumers more likely to stay with the firm and encourages them to expand their business with the firm. Bolton, Kannan, and Bramlett offer a more in-depth examination of this issue by studying the moderating effect of a credit card firm's loyalty program on the relationship between consumers' service experiences and their subsequent behavior. They find that program members weigh negative experiences less in their repatronage decisions than nonmembers. This is consistent with the proposition that loyalty programs form competitive barriers between firms and allow firms to enjoy their customers more exclusively. Bolton, Kannan, and Bramlett do not find a significant main effect of loyalty program membership on customer retention, but their results show that loyalty program members used their credit cards more than nonmembers.

As mentioned previously, studies comparing loyalty program member and nonmember behavior are subject to self-selection bias. That is, the differences between members and nonmembers may exist before the program rather than being a result of the program. This makes it difficult to establish the direction of the causal relationship, prompting researchers to suggest the appropriateness of studying dynamic behavior change instead (Lewis 2004; Verhoef 2003).

Comparison across time. The third category of studies remedies self-selection bias by studying the same consumers' behavior across time. A majority of these studies focus on short-term loyalty programs. A typical setting is an N-week turkey/ham supermarket reward program in which consumers need to spend over a set amount each week for N weeks to receive a free turkey or ham (e.g., Lal and Bell 2003; Taylor and Neslin 2005). Studies find general support for such programs in terms of increased spending levels. Drèze and Hoch (1998) further conclude that a loyalty program targeting a specific product category not only increases spending in the focal product category but also increases store traffic and overall spending in all categories.

When studying behavior changes over time, researchers suggest two types of effects: a short-term point pressure effect and a long-term rewarded behavior effect (Taylor and Neslin 2005). The point pressure effect represents a temporary shock in spending as consumers increase their purchase levels to qualify for a reward, analogous to the artificial increase in sales during a promotion. Drawing on the goal-gradient hypothesis, Kivetz, Urminsky, and Zheng (2006) find that this point pressure effect increases as consumers get closer to a reward, resulting in purchase acceleration. However, they also find that after the reward is obtained, the positive change in behavior dissipates, similar to the sales dip after a promotion. In contrast, the rewarded behavior effect refers to long-term sustained purchase increase, which can be a result of factors such as appreciation of the reward received and stronger loyalty toward the firm.

These two effects manifest differently in short-term and continuous loyalty programs (e.g., frequent-flier programs). Short-term programs are analogous to sales promotion and signify firms' temporary commitment. They create a pri-

marily point pressure effect due to the programs' novelty and a clear time line and goal. Conversely, continuous loyalty programs represent firms' long-term commitment and are analogous to everyday low price. Although they may be novel at first and consumers may experience point pressure each time they get close to a reward, the long-term effects of such programs are mainly the rewarded behavior type.

Empirical findings on the effects of continuous loyalty programs across time are more sparse. Allaway and colleagues (2006) offer an indirect examination of longitudinal effects by segmenting retail loyalty program members according to their behavior. They find that the program positively affects only a small portion of consumers. Lewis (2004) examines the loyalty program of an online retailer and finds that the level of reward received in a prior period positively affects the probability of making larger-sized transactions in the current period. Note that focusing on postreward effects presents two limitations. First, it creates a recursive relationship because the level of reward a consumer receives in one period is itself contingent on the consumer's behavior change. As a result, a higher-level purchase in subsequent periods may simply be a continuation of the previous positive reaction to the loyalty program rather than a result of higher-level rewards received in prior periods. Second, postreward effects capture only one type of loyalty program effects. The point pressure research discussed previously suggests that behavior changes can occur not only after but also before the receipt of a reward (Kivetz, Urminsky, and Zheng 2006; Taylor and Neslin 2005). There are also subtler aspects of a loyalty program, such as a sense of belongingness (Dowling and Uncle 1997) and the perception of effort advantage (Kivetz and Simonson 2003). Because consumers can earn free rewards only infrequently in most programs, their behavior changes are typically driven by these subtler effects.

Summary

The empirical studies reviewed here provide mixed support for loyalty programs, and there is still much controversy over whether the loyalty program is an appealing marketing tool (Leenheer et al. 2003; Shugan 2005). The foregoing analysis reveals the need to address two issues. First, given the future orientation of loyalty programs, it is necessary to integrate a long-term focus into the research of these programs. This need is supported by the finding that CRM efforts often do not produce obvious short-term gains but rather should be assessed in the long run (Anderson, Fornell, and Lehmann 1994). Most of the longitudinal studies reviewed focus on loyalty programs that ran only for a short period. Lewis's (2004) study is the only one that systematically examines the dynamic effects of a continuous loyalty program. However, as discussed previously, its focus on postreward effects represents an incomplete view of loyalty program effects. Future longitudinal research should extend Lewis's research to include more general effects of continuous loyalty programs.

Second, not all consumers respond to loyalty programs in the same way, because the appeal of a program can differ among consumers, depending on factors such as current usage levels and perception of effort advantage (Kim, Shi,

and Srinivasan 2001; Kivetz and Simonson 2003). These individual differences may have contributed to the mixed findings in the literature. A few studies reviewed have begun to examine the moderating effects of individual characteristics (Lal and Bell 2003; Lewis 2004; Taylor and Neslin 2005). However, the operationalization of some of these variables limits their managerial relevance. The purchase-level tiers in Lal and Bell's (2003) study were based on the same time span (i.e., the entire analysis period) as the focal variables, and the reward redemption in Taylor and Neslin's (2005) study occurred after the focal variables. Although these variables are useful in assessing the success of a short-term loyalty program after it is run, they provide limited foresight for continuous loyalty programs. For a continuous program, knowledge of preexisting differences among consumers early on in the program will provide more meaningful managerial implications and better guidance on the design and management of such a program. Lewis (2004) studied one such preexisting difference—namely, demographics. This should be extended to include other a priori individual differences that may influence consumers' reactions to a loyalty program.

Research Hypotheses

Overview

The current research aims to answer three questions: (1) How do consumers change their usage levels after joining a loyalty program? (2) Does the program make consumers more loyal over time? and (3) How do consumers with different initial spending levels respond differently to the program? These research questions specifically tackle the two issues raised in the literature review. Because the purpose of loyalty programs often is to increase the loyalty and value contribution of consumers, it is important to know whether this goal is fulfilled. This study examines how consumers gradually adapt their purchase behavior across an extended time span after their initial enrollment in a long-term loyalty program. As discussed previously, the implications of short-term versus long-term loyalty programs are different, and so far, dynamic studies of the latter have been far more sparse and inconclusive. This research contributes to a better understanding in this area. By capturing program effects through the movement of time, this research extends Lewis's (2004) findings to include more general effects of a loyalty program and enables a firm to predict the path its consumers will take after joining such a program.

This research also examines how a loyalty program affects consumers differently by examining the moderating effect of consumers' existing usage levels. It is of strategic importance to examine the responses of consumers with different initial usage levels because their value contributions to a firm vary and can either increase or dilute the firm's profitability (Dowling and Uncles 1997; Reinartz and Kumar 2000). Marketing researchers have suggested that usage level is an important consideration in loyalty program design and effects (Bolton, Kannan, and Bramlett 2000; Dowling and Uncle 1997). However, this premise has not been subject to much empirical scrutiny. Although Lal and Bell (2003) incorporate usage levels, they operationalize the

variable as total spending during the entire course of a short-term loyalty program, which, as mentioned previously, provides limited foresight for the management of a continuous loyalty program. This research remedies this by using consumers' spending levels during an initialization period. The following section considers how different tiers of consumers change their usage levels and exclusive loyalty over time.

Impact of Loyalty Programs on Usage Levels

Most loyalty programs are designed to encourage increased usage of a firm's products or services. In general, the more a consumer buys, the more rewards he or she is likely to earn. Thus, loyalty programs create an expectancy of positive outcomes associated with making a purchase (Vroom 1964). When consumers realize that their purchase behavior is instrumental in achieving a positive outcome, they will be more likely to engage in the behavior (Latham and Locke 1991). From an operant conditioning point of view (Skinner 1953), rewards from loyalty programs serve as the conditioning stimulus to sustain desired behavior. In support of these views, empirical studies show that rewards can direct behavior and increase task performance (Eisenberger and Rhoades 2001; Strohmetz et al. 2002). Thus, it is expected that loyalty programs will positively affect consumers' usage levels, which leads to the first hypothesis:

> H_1: Consumers gradually increase their usage level after joining a loyalty program.

In this research, consumers' usage levels are captured by two variables: purchase frequency and transaction size. Purchase frequency is considered an important predictor of consumers' status with a firm (Schmittlein, Morrison, and Colombo 1987; Venkatesan and Kumar 2003) and has been used in the past as an indicator of loyalty program success (Bolton, Kannan, and Bramlett 2000; Sharp and Sharp 1997). However, transaction size has rarely been included in previous studies. Because consumers can maximize rewards by increasing how much they spend in a transaction and because this amount is an essential part of their value contribution to the firm, it is important to include transaction size in the study of loyalty programs.

Although usage levels can be measured as the total amount a consumer spends, studying purchase frequency and transaction size separately is deemed to be more appropriate for two reasons. First, purchase frequency and transaction size have different implications for a firm. With high fulfillment costs per order (e.g., due to payment processing or shipping costs), basket size is an important determinant of the firm's profit margin. In comparison, for a firm in which recency of purchase is an important predictor of future behavior, purchase frequency may be a more critical business factor. Studying purchase frequency and size separately is more in line with such firms' strategies. Second, reflecting the strategic difference between purchase frequency and transaction size, some loyalty programs reward consumers for frequency (e.g., rewarding a set number of points for each purchase), and others encourage larger purchases (e.g., by setting a minimum transaction size). Differentiating between purchase frequency and transaction size

allows for a more accurate assessment of these programs' effects.[1] Methodwise, studying individual transaction size instead of total spending increases the power of the analysis and reduces aggregation bias. It also allows for the assessment of exclusive loyalty using the relationship between transaction size and interpurchase time, as is demonstrated subsequently.

Moderating Effect of Initial Usage Level

The extent to which consumers increase their spending because of the incentives can depend on their initial usage levels. In the only existing research that has studied the moderating effects of consumer usage levels on loyalty program impact, Lal and Bell (2003) find the least behavior change among the heaviest spenders and more significant changes among low and moderate spenders. The current study extends these findings to continuous loyalty programs, in which sustained behavior change, rather than temporary shock, is more likely to be the goal. Furthermore, unlike Lal and Bell, who segment consumers according to their spending levels during the entire duration of a program, this research uses consumers' usage levels at the beginning of the program, thus increasing the predictive usefulness of the findings.

Two considerations underlie how different consumer segments may respond differently to the same loyalty program. First, depending on consumers' existing usage levels, a loyalty program may be appealing to various degrees. If a consumer buys little from the firm, he or she will need to wait a long time for a reward. Thus, the consumer may not consider the program relevant. In contrast, heavy and moderate buyers have an effort advantage over light buyers because they do not need to work that hard or to wait that long for the rewards (Kivetz and Simonson 2003). This effort advantage can enhance the perceived fit and attractiveness of the loyalty program to such consumers. Although the idiosyncratic fit theory has been confirmed on consumers' intention to join a loyalty program, it may continue to influence consumers after program enrollment, especially for moderate buyers. For heavy buyers, this influence of effort advantage on purchase behavior is more ambiguous. The reward literature suggests that when rewards do not offer enough challenge to task performance, they lack the motivational effect to induce behavior change (Eisenberger and Rhoades 2001). Because heavy buyers already obtain rewards easily at the current purchase level, they will have less incentive to increase their efforts.

The second consideration in studying initial usage level as a moderator is the ultimate limit of a consumer's demand for a product or service, such as how much he or she travels (Dowling and Uncles 1997). Motivation notwithstanding, consumers will raise their usage level only if it is below their consumption limit. Consequently, this creates a ceiling effect that is most likely to affect frequent buyers

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[1]Although the particular loyalty program studied in this article issues reward points based on the amount consumers spend at the store, studying purchase frequency and transaction size separately helps establish baseline effects of the program on these two variables, with which future studies of other types of loyalty programs can be compared.

because they already consume heavily (Lal and Bell 2003). Together, these considerations suggest that moderate buyers should experience the greatest change in usage levels because they perceive effort advantage and higher relevance of the program but are not as likely to be subject to the ceiling effect as heavy buyers. This leads to the following hypothesis:

> H₂: Moderate buyers' usage levels increase faster than those of heavy and light buyers after loyalty program enrollment.

Impact of Loyalty Programs on Consumer Loyalty

A main advantage of loyalty programs is their ability to increase switching cost (Kim, Shi, and Srinivasan 2001). When consumers join a loyalty program, to accumulate rewards more quickly, they are likely to concentrate their purchases on one firm, such as booking all flights through one airline. Furthermore, because loyalty program members tend to overlook negative experiences with the firm and are less likely to compare the firm with competitors (Bolton, Kannan, and Bramlett 2000), they are more likely to buy exclusively from the firm.

In the long run, the increase in switching costs has important implications for customer loyalty. First, the longer a consumer has been in a program, the more vested interests he or she will have in the program, and the more the consumer will have at stake if he or she were to leave the firm. This creates a long-term customer lock-in (Sharp and Sharp 1997). Second, higher switching costs mean that loyalty program members are less likely to have extended experience with competitors, further reducing their ability to weigh competitor comparison in their decisions (Bolton, Kannan, and Bramlett 2000). Consequently, consumers are expected to become more loyal after joining a loyalty program, which leads to the next hypothesis:

> H₃: A firm's loyalty program members become more loyal to the firm over time.

Similar to the change in usage levels, a loyalty program can influence different consumers' loyalty levels differently. At one end of the continuum, light buyers may not be motivated to become more loyal to a firm, because the loyalty program is not highly attractive to them. At the other end, heavy buyers already can enjoy frequent rewards and thus do not have a strong incentive to change their behavior. Again, moderate buyers are the most attractive target. These consumers perceive enough relevance and benefits from the program to change their purchase behavior and shift their purchases to one firm. This leads to the following hypotheses:

> H₄: Moderate buyers' loyalty levels increase faster than those of heavy and light buyers after loyalty program enrollment.

Data and Methodology

The Data

The data used in this study came from a convenience store chain's loyalty program. For the purpose of confidentiality, the name of the firm is not disclosed here. The loyalty program allows consumers to earn points for every dollar they spend at the store. Tiers of rewards, such as a bottle of soda, are related to the total number of points accumulated. The program rewards consumers an average of $1 in free products/services for every $100 spent (i.e., 1% reward ratio), with higher-tier rewards carrying a higher reward ratio. Consumers need to enroll in the program to earn free rewards, but program membership is free.

A random sample of 1000 consumers was extracted from the program using two criteria: (1) The consumer joined the loyalty program in its first year of operation, and (2) the consumer made at least two purchases. The latter constraint ensures that there are meaningful data for every consumer. The data cover purchases during the first two years of the program, which started in March 2002. Altogether, the sample made 42,788 purchases. The number of purchases made by a consumer ranged from 2 to 369, with a median of 25. The median transaction size was $13.75.

Modeling Purchase Frequency

Consumers' purchase frequency is modeled as Equation 1, where Frequency_{im} is the number of transactions by consumer i in month m and Month_{im} is the number of months consumer i has been in the loyalty program at month m. Logarithmic transformation of Month_{im} is used to accommodate the notion that purchase frequency is unlikely to increase forever and will gradually reach a maximum point that reflects consumption limit.[2] The model has a dummy variable LastMonth_{im}, which is set to 1 if month m is the last month of transaction by consumer i and 0 if not. This variable is included because relationship marketing literature shows that consumers tend to reduce their purchase frequency at the end of a relationship (Venkatesan and Kumar 2003). Thus, it is necessary to control for the effect of the last month's purchases when studying the trend in purchase frequency. To allow for temporary inactivity, LastMonth_{im} is set to 1 only if a consumer's previous purchase occurred at least three months before the end of the analysis period.

$$(1) \qquad \text{Frequency}_{im} = \alpha_{i0} + \alpha_{i1}\text{Log}(\text{Month}_{im})$$
$$+ \alpha_{i2}\text{LastMonth}_{im} + \varepsilon_{im}.$$

Two-level hierarchical linear modeling (HLM) is used to estimate the parameters in the model. Compared with tra-

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[2]Although analysis of supermarket purchase data often uses week as the time unit of analysis, month is chosen as the independent variable here for three reasons. First, convenience store purchases occur less frequently than supermarket shopping; industry data show that 68% of consumers shop at convenience stores about or less than once a week (Chanil 2004). This causes the number of data points in weekly intervals to be too small and produces a disproportionate number of zero frequencies, which can skew the results. Second, behavior changes due to a loyalty program are not expected to happen overnight, and using month as the independent variable allows for a reasonable time interval to observe visible behavior changes. Third, the convenience store chain regularly makes decisions on a monthly basis, which renders monthly analysis meaningful from a practical point of view.

ditional linear regression, HLM has two advantages. First, it does not require independent observations, as is often assumed in traditional regression. This accommodation of nonindependent observations is important here because the purchase frequencies for a consumer are likely to be correlated across time. Second, HLM allows the model coefficients at lower levels to be randomly distributed, thus accommodating individual heterogeneity. Explanatory variables can be included at higher levels to explain such heterogeneity.

In the purchase frequency model, the regression coefficients in Equation 1 for an individual consumer are assumed to be normally distributed across the sample, and the expected parameter values for each individual consumer depend on whether the consumer is a light, moderate, or heavy buyer. Equations 2–4 show the second-level equations used:

(2) $\quad \alpha_{i0} = \beta_0 + \beta_1 LightBuyer_i + \beta_2 HeavyBuyer_i + \mu_{i0}$,

(3) $\quad \alpha_{i1} = \beta_3 + \beta_4 LightBuyer_i + \beta_5 HeavyBuyer_i + \mu_{i1}$, and

(4) $\quad \alpha_{i2} = \beta_6 + \beta_7 LightBuyer_i + \beta_8 HeavyBuyer_i + \mu_{i2}$,

where $LightBuyer_i$ and $HeavyBuyer_i$ are two dummy variables indicating light and heavy buyers, respectively. Appendix A explains in detail how these and other variables were operationalized.

To interpret the coefficients in the equations, Equations 2–4 can be substituted into Equation 1, which produces the following:

(5) $\quad Frequency_{im} = \beta_0 + \beta_1 LightBuyer_i + \beta_2 HeavyBuyer_i$

$$+ \beta_3 Log(Month_{im})$$

$$+ \beta_4 Log(Month_{im}) \times LightBuyer_i$$

$$+ \beta_5 Log(Month_{im}) \times HeavyBuyer_i$$

$$+ \beta_6 LastMonth_{im}$$

$$+ \beta_7 LastMonth_{im} \times LightBuyer_i$$

$$+ \beta_8 LastMonth_{im} \times HeavyBuyer_i$$

$$+ \mu_{i1} Log(Month_{im}) + \mu_{i2} LastMonth_{im} + \upsilon_{im},$$

where $\upsilon_{im} = \varepsilon_{im} + \mu_{i0}$ represents random error. The intercept β_0 shows the expected purchase frequency of a moderate buyer during the first month of the program (when $Log[Month_{im}] = 0$), the coefficients for the $LightBuyer_i$ and $HeavyBuyer_i$ dummy variables (β_1 and β_2) represent the differences in these consumers' initial purchase frequency compared with that of moderate buyers, and β_3 is a key parameter that corresponds to the longitudinal effect of the program on moderate buyers' purchase frequency. The change in behavior due to $Month_{im}$ is $\beta_3 \times \log(Month_{im}/ Month_{im} - 1)$. Because consumers' purchase frequencies are hypothesized to increase as a result of the program, β_3 should be positive. The rate of purchase frequency growth gradually slows down as $Month_{im}$ increases and $\log(Month_{im}/Month_{im} - 1)$ becomes smaller and eventually approaches zero.

The terms β_4 and β_5 represent the differential effects of the loyalty program on light buyers and heavy buyers in comparison with moderate buyers. According to H_2, both light and heavy buyers are not expected to increase their usage levels as quickly. This implies a negative value for both β_4 and β_5. The coefficient for the LastMonth dummy variable, β_6, indicates how much purchase frequency decreases during a consumer's last month in the relationship. The $\mu_{i1}Log(Month_{im})$ and $\mu_{i2}LastMonth_{im}$ terms represent the unexplained individual heterogeneity in purchase frequency change over time and during the consumer's last month as a customer.

Modeling Transaction Size and Exclusive Loyalty

Traditionally, researchers have evaluated consumers' loyalty to a brand or store through their brand-switching behavior. In reality, however, a firm often does not have information on its customers' purchases other than those related to its own products. To solve this problem, this research adopts an approach similar to that of Boatwright, Borle, and Kadane (2003) that examines the relationship between interpurchase time and transaction size. The basic premise for this approach is that interpurchase time and transaction size should have a proportional relationship for regularly purchased products. For the same consumer, the longer he or she waits before making a purchase, the more he or she will need to buy in that shopping trip. For example, if a consumer who normally buys groceries once a week must wait for two weeks instead, he or she will likely need to buy twice the amount. If the consumer is loyal to one store, this proportional relationship should be strong. However, if the consumer frequents multiple stores, the observed purchases from a single store are not likely to reflect such a systematic relationship.

Mathematically, a three-level HLM (see Appendix B) is used to model loyalty and transaction size. First, the amount consumer i spent in the kth transaction in quarter j ($Size_{ijk}$) is modeled as a function of the elapsed time since the previous transaction, or interpurchase time (IPT_{ijk}). As discussed previously, with exclusive loyalty, the expected value of ρ_{ij1} should be close to 1.[3] If little loyalty exists, ρ_{ij1} should be

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[3]Assuming constant total demand from the consumer and perfect loyalty to the store, there should be a proportional relationship between interpurchase time and transaction size. In other words, if interpurchase time is doubled and two shopping trips are combined into one, the amount spent in the trip should also double. Mathematically, according to Equation B1, if the interpurchase time changes by a factor of α, the new transaction size ($NewSize_{ijk}$) will be $\exp[\rho_{ij0} + \rho_{ij1}\log(\alpha \times IPT_{ijk}) + \varsigma_{ijk}]$. Thus, $NewSize_{ijk}/Size_{ijk} = \alpha^{\rho}_{ij1}$. In a perfectly proportional relationship, $NewSize_{ijk}/Size_{ijk}$ should be equal to α, which means that ρ_{ij1} should be equal to 1. If a consumer is totally disloyal or if total demand is unstable, the change in interpurchase time may have no impact on transaction size at all, and ρ_{ij1} will be equal to 0. This does not mean that ρ_{ij1} is bound between 0 and 1. Mathematically, ρ_{ij1} can be larger than 1 or smaller than 0. If ρ_{ij1} is larger than 1—for example, if it equals 2—doubling interpurchase time will result in the quadrupling of transaction size. Although such situations may exist, logically, it is more likely to be the exception rather than the norm. It is also possible for ρ_{ij1} to be negative, which sug-

close to 0. At the second level, the Level 1 intercept and slope are assumed to depend on the quarter in which the transaction occurred ($Quarter_{ij}$). Here, the unit of quarter instead of month is used to accommodate consumers with lower purchase frequencies and to ensure more accurate estimates based on a stable trend. At the third level, consumer heterogeneity is captured by allowing Level 2 parameters to depend on a consumer's initial usage tier.

Equation B8 in Appendix B combines all three levels of equations. For transaction size change due to the loyalty program, the relevant parameters are λ_0–λ_5. The parameters λ_0, λ_1, and λ_2 are related to the intercept term in Equation B8, which reveals consumers' baseline transaction sizes at the beginning of the program, assuming daily transactions (i.e., IPT = 1), and the parameters λ_3–λ_5 have to do with the changes in transaction size over time for different segments of consumers. Specifically, λ_3 refers to the changes in moderate buyers' transaction size because of the loyalty program, and λ_4 and λ_5 indicate the moderating effect of initial usage levels on the change in transaction size.

For consumer loyalty, the parameters of central interest are λ_6–λ_{11}. The parameters λ_6–λ_8 show the loyalty of the three consumer segments during the first quarter in the program. The parameters λ_9–λ_{11} reflect the longitudinal change in consumer loyalty. As H_3 predicts, consumer loyalty should rise after program enrollment. Thus, λ_9 should be positive, reflecting the increase in loyalty for moderate buyers. In contrast, λ_{10} and λ_{11} should be negative, indicating the slower increase in loyalty for light and heavy buyers. Note that though convenience store purchases occur less regularly than supermarket purchases, industry statistics show that many consumers shop at convenience stores consistently and extensively (General Electric Capital Franchise Finance Corporation 2001). In addition, the store chain from which the data were obtained sells both fuel and convenience store items. The regular nature of fuel purchase adds regularity to the sample's purchases. Mathematically, the model is estimated with entire quarters of transactions, which helps smooth out the randomness in purchase patterns and makes the comparison across time meaningful.

Data Analysis Overview

Both the purchase frequency model and the loyalty/transaction size model were fitted using HLM6. The standard HLM assumes that higher-level units (in this case, consumers) are drawn from the same population, which implies homogeneous error variance at Level 1. This assumption may not be realistic here, because different segments of consumers may behave differently. To accommodate such considerations, the assumption can be relaxed to allow for heterogeneous Level 1 error variance and to include predictor variables to explain the heterogeneity (Raudenbush and Bryk 2002). Thus, two specifications were fit for each of

the main models, one with homogeneous variance and the other with heterogeneous variance. Given the previous discussion on the effects of initial usage levels, the two dummy variables for consumer tiers ($HeavyBuyer_i$ and $LightBuyer_i$) were used to explain Level 1 error variance. The results show that the heterogeneous variance specification outperformed the homogeneous variance specification for both models, suggesting the existence of heterogeneous error variance at Level 1. However, the parameter estimates from the two specifications did not differ substantively from each other. The results are based on heterogeneous error variance specification.

Results

Change in Purchase Frequency

The maximum likelihood estimates of the purchase frequency model and its goodness of fit appear in Table 1. The HLM does not produce an R-square as in traditional regression. However, it yields a deviance statistic, which equals –2 times the value of the log-likelihood function and can be used to evaluate alternative models (Raudenbush and Bryk 2002). As Table 1 shows, compared with an unconditional model that does not have any explanatory variables, the proposed purchase frequency model shows a significantly better fit ($\chi^2 = 2170.58$, $p < .001$).

Recall that the model intercept represents expected purchase frequency of moderate buyers during the first month, which was 2.59 times ($p < .001$). The coefficients for the LightBuyer and HeavyBuyer dummy variables (β_1 and β_2) indicate the differences in these consumers' initial purchase frequencies compared with moderate buyers. Thus, they serve as a check of the correct classification of consumers. Consistent with their segmentation, light buyers' initial purchase frequency was .93 times lower than that of moderate buyers ($p < .001$), and the average initial frequency for heavy buyers was 3.00 times higher ($p < .001$).

H_1 and H_2 predict that consumers' purchase frequencies will gradually increase and that this increase will be fastest for moderate buyers. The results show a positive coefficient for Log(Month) ($\beta_3 = .26$, $p = .002$), suggesting that moderate buyers purchased more frequently over time. At the end of the two years, the average purchase frequency for moderate buyers was 4.42 times, nearly doubling their initial frequency. Consistent with H_2, the increase in purchase frequency for moderate buyers was significantly higher than that for heavy buyers ($\beta_5 = -.32$, $p = .008$). The combined effect of Log(Month) for heavy buyers was nonsignificant ($\beta_3 + \beta_5 = -.05$, $p = .48$), suggesting an unchanged purchase frequency for these consumers. This is further confirmed by the finding that heavy buyers' average frequency at the end of the period (5.68 times) was virtually unchanged from the initial frequency. The combined effect of Log(Month) for light buyers was .34. Contrary to H_2, the Log(Month) $\times$ LightBuyer interaction was nonsignificant, indicating that light buyers showed the same level of increase in purchase frequency as moderate buyers. Their purchase frequency more than doubled to 3.73 times at the end of the period. These increases in purchase frequency by light and moder-

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gests that an increase in interpurchase time results in a decrease in transaction size. Again, this is likely to be an exception to what is usually observed in the marketplace, given that purchases occur relatively often.

TABLE 1
Model Results

	Purchase Frequency Model	Loyalty/Transaction Size Model	Reward Claim Model
Intercept	2.59*** (.13)	1.43*** (.04)	.32*** (.03)
LightBuyer	−.93*** (.18)	−.48*** (.09)	−.17*** (.04)
HeavyBuyer	3.00*** (.20)	.38*** (.07)	.25*** (.04)
Log(Month)	.26*** (.08)	—	—
Log(Month) × LightBuyer	.08n.s. (.11)	—	—
Log(Month) × HeavyBuyer	−.32*** (.12)	—	—
LastMonth	−1.21*** (.19)	—	—
LastMonth × LightBuyer	.46* (.26)	—	—
LastMonth × HeavyBuyer	−1.12*** (.36)	—	—
Log(Quarter)	—	.16** (.07)	.13*** (.02)
Log(Quarter) × LightBuyer	—	.07** (.03)	.01n.s. (.03)
Log(Quarter) × HeavyBuyer	—	−.14*** (.05)	−.06** (.03)
Log(IPT)	—	.15*** (.03)	—
Log(IPT) × LightBuyer	—	−.05** (.02)	—
Log(IPT) × HeavyBuyer	—	.21*** (.08)	—
Log(IPT) × Log(Quarter)	—	.10*** (.04)	—
Log(IPT) × Log(Quarter) × LightBuyer	—	.03* (.02)	—
Log(IPT) × Log(Quarter) × HeavyBuyer	—	−.09*** (.02)	—
Deviance (−2 log-likelihood)	50,393.27	110,393.08	9684.30
χ^2	2170.58***	711.67***	475.60***
d.f.	16	22	10

*$p \leq .10$.
**$p \leq .05$.
***$p \leq .01$.

Notes: The numbers in parentheses are standard errors of the estimates. The chi-square statistic compares the deviance of the estimated model with an unconditional model that does not contain predictor variables at any of the levels. n.s. = not statistically significant.

ate buyers are especially impressive in light of industry statistics showing that more than two-thirds of shoppers frequent convenient stores about or less than once a week (Chanil 2004). In other words, after two years, most of the sample became the top third of all convenience store shoppers in terms of purchase frequency.

Figure 1, Panel A, displays the observed average purchase frequencies of the three consumer segments for each month. For both light and moderate buyers, the most visible jump in purchase frequency occurred within three months of joining the loyalty program. These higher frequencies sustained and steadily increased at a slower pace after the first three months. In contrast, heavy buyers' purchase frequency remained mostly flat during the analysis period. Paired comparison tests suggest that at the end of the two years, there was still a significant difference in observed purchase frequencies between light buyers and heavy buyers (t = −1.99, p = .05). However, there was no significant difference between light and moderate buyers or between moderate and heavy buyers. Overall, H_1 and H_2 are partially supported for purchase frequency.

Change in Transaction Size

The loyalty/transaction size model showed a significantly better fit than an unconditional model (χ^2 = 711.67, p < .001). The model estimates appear in Table 1. Recall that the logarithmic transformation of transaction size is used in the model. Thus, the expected beginning daily transaction size by moderate buyers should be e^{λ_0}, and the baseline size for light and heavy buyers should be $\exp(\lambda_0 + \lambda_1)$ and $\exp(\lambda_0 + \lambda_2)$, respectively. The results show a baseline transaction size of $4.18 for moderate buyers (λ_0 = 1.43, p < .001). Consistent with their classifications, heavy buyers initially spent $1.93 more in a transaction than moderate buyers (λ_1 = .38, p < .001), and light buyers' initial daily transaction size was $1.59 less than moderate buyers (λ_2 = −.48, p < .001). The observed average transaction sizes for these consumers appear in Figure 1, Panel B.

Consistent with H_1, moderate buyers spent more in a transaction over time (λ_3 = .16, p = .03) and had an average observed transaction size of $20.11 at the end of the analysis period. Again, heavy buyers' transaction size did not increase as fast as moderate buyers' (λ_5 = −.14, p = .006), and the combined coefficient for Log(Quarter) was nonsignificant ($\lambda_3 + \lambda_5$ = .02, p = .76), suggesting that heavy buyers did not spend more in a purchase after they joined the loyalty program. Surprisingly, light buyers showed a faster increase in transaction size than moderate buyers (λ_4 = .07, p = .03). Their average observed transaction size increased to $11.29 at the end. This contradicts H_2, which predicts a slower increase for light buyers. For all three segments, the average transaction size far exceeded the industry average of $7.60 per transaction (Chanil 2004).
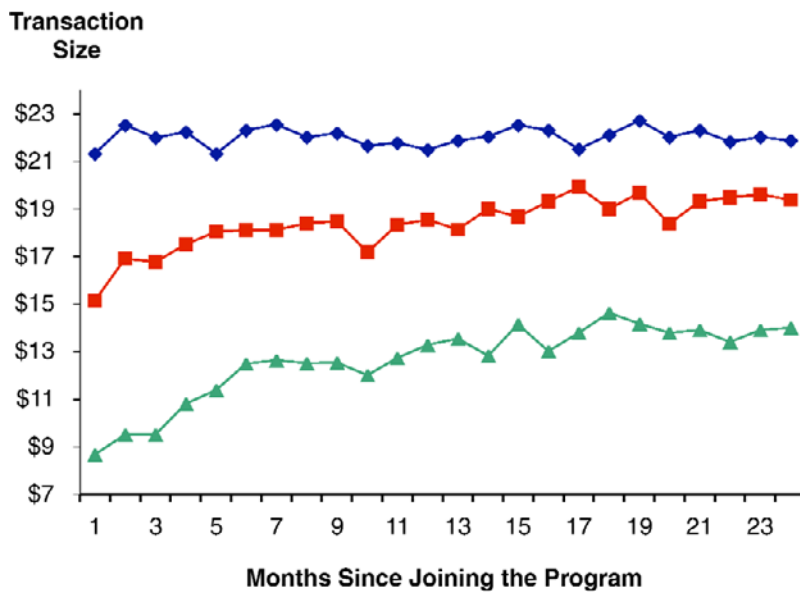
To explore further the source of light buyers' transaction size increase, an additional analysis was performed on their shopping basket composition. The convenience store chain

FIGURE 1
Observed Changes in Consumer Purchases

A: Observed Average Monthly Purchase Frequencies
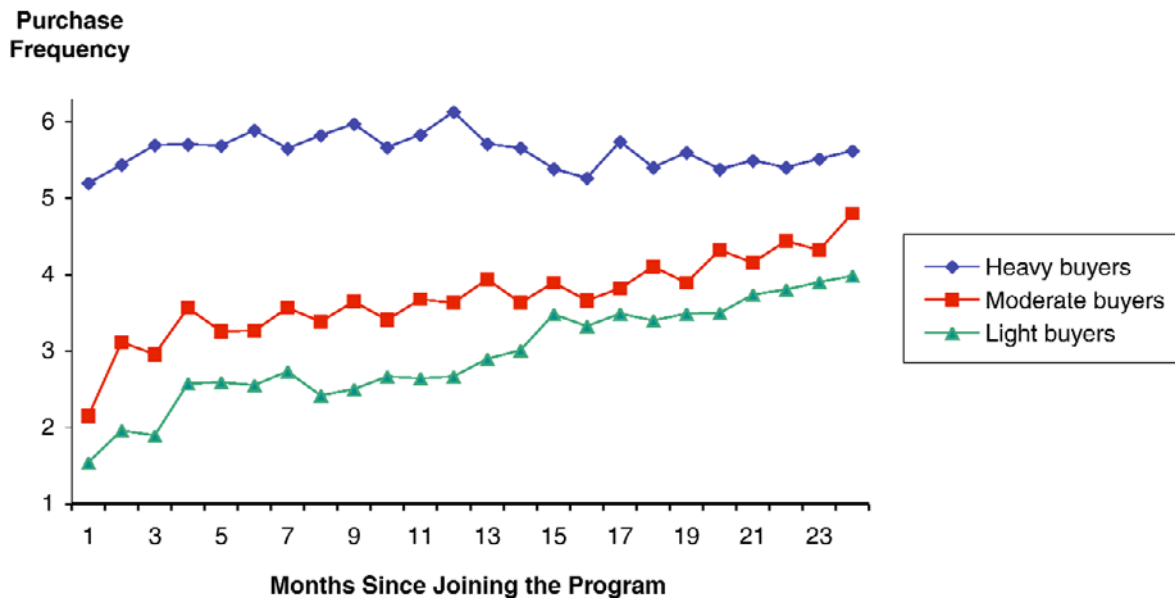
B: Observed Average Transaction Sizes

sells products in two major categories: fuel and store merchandise. During their first quarter in the program, only 26% of light buyers bought both fuel and store merchandise, and the other 74% bought only either fuel or store merchandise. By the end of the two years, the percentage of double-category buyers increased to 58%. The percentage of transactions that included both fuel and store merchan-

dise also increased from 20% to 40%. This inclusion of more product categories in one purchase explains why light buyers spent more in a transaction. Although these consumers may not initially experience a strong incentive in the loyalty program, they were able to diversify their purchases into more categories and thus make the program more attractive.

Exclusive Consumer Loyalty

Estimates related to consumer loyalty appear in Table 1. Recall that the more loyal a consumer is to the store, the closer the coefficient of $\text{Log}(\text{IPT}_{ijk})$ (hereinafter, "the loyalty parameter") should be to 1. At the beginning, the loyalty parameter for moderate buyers was .15 ($p < .001$), indicating relatively low loyalty. Light buyers were even less loyal, with the loyalty parameter lower by .05 ($p = .035$). Heavy buyers were most loyal among the three groups, with the loyalty parameter higher than that of moderate buyers by .21 ($p = .007$).

The dynamic change in the loyalty parameter is of central interest. As hypothesized, moderate buyers' loyalty increased significantly ($\lambda_9 = .10$, $p = .005$). Consistent with H_4, the increase in loyalty among heavy buyers was slower than that for moderate buyers ($\lambda_{11} = -.09$, $p < .001$). A nonsignificant combined coefficient for heavy buyers ($\lambda_9 + \lambda_{11} = .01$, $p = .99$) suggests that these consumers' loyalty levels did not change during the analysis period. Conversely, light buyers experienced a larger increase in exclusive loyalty than moderate buyers ($\lambda_{10} = .03$, $p = .07$). This contradicts H_4, which predicts that moderate buyers will experience a faster increase in loyalty than light buyers. Overall, H_4 is only partially supported.

Alternative Explanations

Learning Effect

An alternative explanation for the findings is that light buyers may be new customers who learn to spend more over time as they become more familiar with the store. In contrast, heavy buyers may already be long-term loyal customers and do not experience the same incremental learning. Thus, the differences among the consumer segments may be due to a learning effect rather than different reactions to the loyalty program. To rule this out, consumers' reward redemption was examined. For this program, to receive a reward, consumers needed to request a certificate from the store, which could then be redeemed for the reward. In reality, only some consumers will make the effort to request their reward certificates (Lal and Bell 2003). Because all three consumer segments were exposed to the loyalty program at the same time, there is no learning advantage on reward claim for any segment, and thus any systematic differences should truly reflect their diverse responses to the program. Existing research shows that reward redemption tends to be the highest among heavy buyers (Lal and Bell 2003). The following analysis retests such findings and examines longitudinal change in reward redemption behavior of loyalty program members, which has yet to be answered by existing research.

Similar to purchase frequency, consumers' reward claim behavior was modeled with a two-level HLM model, as shown in Equations 6–8. The main dependent variable is RCRate_{iq}, which is the number of reward certificates requested as a percentage of the rewards consumer i qualified for in the qth quarter. It is modeled as a function of a logarithm transformation of the corresponding quarter ($\text{Log}[\text{Quarter}_i]$). Here, the unit of quarter instead of month is used because of the relatively infrequent reward issuance. Again, the consumers' initial usage levels were entered as explanatory variables at the second level. Equation 9 shows the combined model:

(6) $\quad \text{RCRate}_{iq} = \gamma_{i0} + \gamma_{i1}\text{Log}(\text{Quarter}_{iq}) + \pi_{ij},$

(7) $\quad\quad \gamma_{i0} = \theta_0 + \theta_1\text{LightBuyer}_i + \theta_2\text{HeavyBuyer}_i + \tau_{i0},$

(8) $\quad\quad \gamma_{i1} = \theta_3 + \theta_4\text{LightBuyer}_i + \theta_5\text{HeavyBuyer}_i$

$\quad\quad\quad\quad + \tau_{i1},$ and

(9) $\quad \text{RCRate}_{iq} = \theta_0 + \theta_1\text{LightBuyer}_i + \theta_2\text{HeavyBuyer}_i$

$\quad\quad\quad + \theta_3\text{Log}(\text{Quarter}_{iq})$

$\quad\quad\quad + \theta_4\text{Log}(\text{Quarter}_{iq}) \times \text{LightBuyer}_i$

$\quad\quad\quad + \theta_5\text{Log}(\text{Quarter}_{iq}) \times \text{HeavyBuyer}_i$

$\quad\quad\quad + \tau_{i1}\text{Log}(\text{Quarter}_{iq}) + \tau_{i1} + \pi_{iq}.$

This two-level HLM model was estimated with heterogeneous error variance at Level 1, and the results appear in Table 1. The deviance of the model was 9684.30, showing a significantly better fit than an unconditional model ($\chi^2 = 475.60$, $p < .001$). The intercept estimate indicates that moderate buyers had an initial reward claim rate of 32.22% ($p < .001$). Consistent with Lal and Bell (2003), heavy buyers initially claimed 25.42% more of their rewards than moderate buyers ($p < .001$), and light buyers' initial reward claim rate was 16.71% lower than that of moderate buyers ($p < .001$). The results on the longitudinal change in consumers' reward claim behavior revealed notable patterns. In two years, moderate buyers' reward claim rate increased to 59.79% in the eighth quarter ($\theta_3 = .13$, $p < .001$). In contrast, heavy buyers' reward claim rate did not increase as fast ($\theta_4 = -.06$, $p = .029$). Light buyers showed the same level of increase in reward claim rate as moderate buyers ($\theta_5 = .01$, $p = .563$).

Because claiming a reward is an extra step that consumers need to take to reap the benefits of the loyalty program, their decision to do so reveals their level of interest in the loyalty program. Given their high spending levels and, thus, the ability to obtain many rewards, it is not surprising that heavy buyers had the highest interest in rewards. In the meantime, the faster increase in light and moderate buyers' reward claim rates shows a rising interest in the loyalty program from these consumers. As these consumers change their purchase behavior to make the loyalty program more "profitable" for them, they gradually become more invested and interested in the program. Higher reward claim rates further allow them to benefit more from the program, forming a virtuous cycle that provides more incentive for these consumers to become better customers. Because reward claim behavior is not subject to the same learning differences among consumer segments as purchase behavior, these findings support the conclusion that the change in behavior of the three segments was indeed a result of the loyalty program.

Consumer Attrition

Another alternative explanation for the current findings is consumer attrition. It is natural that some consumers would drop out during the two years. Because high-value consumers who consider the program attractive are more likely to stay, this creates a self-selection effect. Consequently, the trends found may be a result of a sample composition change toward a denser concentration of high-value consumers rather than a result of the program. To rule out this alternative account, the models were reestimated with only data from consumers who were still with the firm at the end of the two years. The model estimates appear in Table 2.

The patterns of findings from this active consumer group are similar to those from the entire sample. That is, light and moderate buyers exhibited positive change in purchase behavior/loyalty, whereas heavy buyers did not. Not surprisingly, the extent of change by light and moderate buyers was even more prominent in this active consumer group because they were likely to perceive the program as more valuable. In contrast, the heavy buyers in this group maintained the same "no-change" pattern, as the estimates from the entire sample suggest. Overall, after sample composition change was controlled for, the substantial findings still remain the same, suggesting that consumer attribution is not the reason for the findings.

Store-Level Trends

The trends discovered in this research may also be attributed to other factors concurrent with but unrelated to the loyalty program, such as sales promotion. The most desirable way to rule out such extraneous factors is to include non–loyalty program members as a control group and compare their behavior changes over the same period. Unfortunately, the firm does not track individual purchases of its non–loyalty program members, making data about such a control group unavailable. However, it records company-level total sales and overall number of transactions. This allows for the derivation of the total spending and number of transactions made by all non–loyalty program members as a whole. Although comparison of individual consumer behavior is still impossible with such data, it is possible to study the trends in all loyalty program members' versus nonmembers' purchase behavior as two aggregated units.

In the spirit of prior analysis of purchase frequency and transaction size, the trends in total number of transactions per month ($\text{TotalTransactions}_i$) and average transaction size by members versus nonmembers (AvgSize_i) are examined with the following regression equations:

$$(10) \quad \text{TotalTransactions}_i = a_0 + a_1 \text{Loyalty} + a_2 \text{Log}(\text{Month}_i) + a_3 \text{Log}(\text{Month}_i) \times \text{Loyalty} + \zeta, \text{ and}$$

$$(11) \quad \text{AvgSize}_i = b_0 + b_1 \text{Loyalty} + b_2 \text{Log}(\text{Month}_i) + b_3 \text{Log}(\text{Month}_i) \times \text{Loyalty} + \xi,$$

where Loyalty is a dummy variable that equals 1 for loyalty program member group and 0 for the nonmember group, and ζ and ξ are errors. Although these equations are not in hierarchical forms, they resemble prior models in that the dependent variables are also a function of the number of months since the start of the program (i.e., $\text{Log}[\text{Month}_i]$). If loyalty program members' behavior change was indeed due

TABLE 2
Model Estimates with Active Consumers Only

	Frequency Model	Loyalty/Transaction Size Model
Intercept	2.69*** (.22)	2.23*** (.08)
LightBuyer	−.95*** (.34)	−.62*** (.14)
HeavyBuyer	3.22*** (.30)	.32*** (.10)
Log(Month)	.55*** (.13)	—
Log(Month) × LightBuyer	.03[n.s.] (.20)	—
Log(Month) × HeavyBuyer	−.54*** (.18)	—
Log(Quarter)	—	.27*** (.04)
Log(Quarter) × LightBuyer	—	.05** (.02)
Log(Quarter) × HeavyBuyer	—	−.26*** (.05)
Log(IPT)	—	.22*** (.03)
Log(IPT) × LightBuyer	—	−.11** (.05)
Log(IPT) × HeavyBuyer	—	.14*** (.04)
Log(IPT) × Log(Quarter)	—	.17*** (.05)
Log(IPT) × Log(Quarter) × LightBuyer	—	.05* (.02)
Log(IPT) × Log(Quarter) × HeavyBuyer	—	−.15*** (.03)
Deviance (−2 log-likelihood)	31,261.72	80,786.44
χ^2	937.28***	425.33***
d.f.	9	22

*$p \leq .10$.
**$p \leq .05$.
***$p \leq .01$.
Notes: The numbers in parentheses are standard errors of the estimates. The chi-square statistic compares the deviance of the estimated model with an unconditional model that does not contain predictor variables at any of the levels. n.s. = not statistically significant.

to the program, there should be a larger increase in these consumers' purchases than in nonmembers' purchases. That is, the coefficients for the Loyalty $\times$ Log(Month$_i$) interaction term should be positive and significant. This was confirmed for both the number of transactions per month ($a_3 = 1.14$, $p < .001$) and the average transaction size ($b_3 = .83$, $p < .001$).[4]

Consistent with these results, the number of purchases that loyalty program members made increased from 4.98% to 8.11% of total transactions by the end of the two-year period. When this ratio is calculated for dollar sales, loyalty program members accounted for 73.66% of total sales at the beginning of the program, which increased to 88.91% after two years. In contrast with the transaction ratio, the dollar amount ratio suggests that these consumers spent much more in each transaction than nonmembers. Regression analysis with these two ratios as the dependent variables and Log(Month$_i$) as the independent variable showed significant, positive trends over time. Together, these findings suggest that loyalty program members exhibited more positive trends than nonmembers, providing further support that the program caused the purchase increase beyond other factors that may exist in the environment.

Conclusions

This research examines the impact of a loyalty program on consumers' purchase behavior over a two-year period. It extends prior studies by explicitly modeling the dynamic change in consumers' spending levels and their behavioral loyalty to the store. The results suggest that depending on consumers' initial usage levels, the loyalty program had different effects on their behavior. Consumers who were heavy buyers at the beginning of the program were most likely to claim the rewards they earned and thus benefited the most from the program. However, their spending levels and exclusive loyalty to the store did not increase over time. In contrast, the loyalty program had positive effects on both light and moderate buyers' purchase frequencies and transaction sizes, and it made these consumers more loyal to the store. The most visible change for these two segments occurred within three months of joining the program, and the growth continued at a steady but slower pace in the following months. At the end of the analysis period, these consumers' average purchase frequencies were not statistically different from that of an adjacent tier. This supports the argument that loyalty programs can accelerate consumers' loyalty life cycle and make them more profitable customers (O'Brien and Jones 1995).

The diverse responses from consumers suggest a need to consider consumer idiosyncrasies when assessing the impact of loyalty programs. By their very nature, loyalty programs are one-to-one programs. How much a consumer can benefit from such a program depends on his or her "investment" in the relationship with the firm. However, this one-to-one nature of loyalty programs has not been thoroughly examined in existing research. A surprising finding from the current research is that consumers who started with low usage levels changed their behavior as much as or more than moderate and heavy buyers. This contradicts the commonly held belief that light buyers are less-than-ideal targets for loyalty programs and that they will not perceive much value in the program (Dowling and Uncles 1997; O'Brien and Jones 1995). In the current case, the loyalty program did not initially appear very attractive to light buyers. However, these consumers diversified their purchases and branched into the firm's other service areas. By claiming a higher portion of rewards, they also gradually invested more efforts into the program. Through these measures, the opportunity for these consumers to benefit from the loyalty program increased, further motivating them to spend more and patronize the store more exclusively.

Limitations and Further Research

This study has several limitations that need to be addressed in further research. For example, this study examined loyalty program members' behavior without a control group of consumers who did not enroll in the program. Although the use of longitudinal data reduces the self-selection bias that often complicates cross-sectional analysis of loyalty programs (Leenheer et al. 2003), the lack of control leaves the possibility that extraneous factors produced the trends rather than the loyalty program, such as concurrent marketing activities or environmental factors. Although measures were taken to address several alternative explanations, they do not cover the full range of issues. A complete test of loyalty program effects is needed in the future, which should use longitudinal data from both loyalty program members and nonmembers. Such a comparison of trends between the two groups will reveal more precise loyalty program effects. More comprehensive tests of loyalty program effects should also go beyond spending levels and purchase timing to include brand choice (Gupta 1988) and attitudinal loyalty (Oliver 1999).

When interpreting the current findings, it is necessary to keep in mind that the results are bound by the context and structure of the program studied and thus may not generalize to other programs. In reality, the performance of different loyalty programs varies. It is important to understand why some programs achieve their goals whereas others fail to do so (Bolton, Kannan, and Bramlett 2000). Several factors are proposed in the literature, such as the effort required to earn rewards (Kivetz and Simonson 2002) and the convenience of participating in the program (O'Brien and Jones 1995). Further research should test how these and other factors can affect a program's effectiveness. Within a loyalty program, the effects of consumer self-segmentation also need to be examined. A particularly worthwhile topic is how reward redemption behavior interacts with purchase behavior to moderate the influence of a loyalty program. Existing studies have begun to examine this in the context

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[4]Note that the sample size for the regressions is small (24). Thus, the power of the analysis is limited. Furthermore, because of the lack of individual data for nonloyalty consumers, it is not possible to derive the loyalty parameter or to account for possible changes in sample composition over time for these consumers.

of short-term loyalty programs (Lal and Bell 2003; Taylor and Neslin 2005). However, more research is needed to study this issue in the context of continuous loyalty programs. At the firm level, the performance of a loyalty program may depend on the firm's other marketing activities, such as sales promotion. Future studies should examine the interaction between loyalty programs and other CRM techniques and marketing activities in enhancing consumers' relationships with a firm. Research in this area will provide theoretical and managerial guidance on formulating the most effective CRM strategy.

Another limitation of this research is the lack of competitive information. As a result, it relied on the proportional relationship between transaction size and interpurchase time to infer consumer loyalty. Although this is a useful way to assess loyalty when data are limited, it can be subject to other influences, such as stockpiling and cherry-picking behavior. The more irregular nature of convenience store purchases can also make the relationship more tenuous than it would be in more regular purchase scenarios. Thus, when competitive information is available, share of wallet is still a better way to assess consumer loyalty. Relatedly, further research should go beyond a single program to examine the market dynamism of loyalty programs because multiple firms often compete with one another through their loyalty programs. How does the introduction of new loyalty programs influence the effectiveness of existing programs? Does order of entry affect loyalty programs' performances? These are all important questions for further research.

Finally, this research used HLM to accommodate correlated observations within each consumer and estimated two separate models for transaction size and purchase frequency. However, because consumers may make purchase timing and quantity decisions simultaneously, the two models may actually be related models. As a result, modeling the two decisions separately can lead to inefficient and biased model estimates (Krishnamurthi and Raj 1988). The amount of bias depends on the degree of simultaneity between the two decisions and the level of correlation between the two models' error terms (Leeflang et al. 2000). This issue can be remedied in future studies through alternative modeling techniques, such as multivariate Tobit II models in a simultaneous equations approach (Kamakura and Wedel 2001; Leenheer et al. 2003).

Managerial Implications

The loyalty program is an important form of CRM strategy. It is costly to initiate and maintain and often requires a firm's long-term commitment. For many firms, a loyalty program is considered a defensive marketing mechanism, used to keep a core group of best customers from defecting. This is especially the case when competing loyalty programs are offered in the same market. Because the best customers often are already heavy buyers of a firm's products and services, the possibility of obtaining additional revenues from these consumers is low. Thus, when treated as a defensive strategy, loyalty programs are almost purely cost items used to prevent potential sales loss. In contrast to this traditional view, the results from the current research show

that light and moderate customers enrolled in the loyalty program increased their value contribution and accelerated their relationship life cycle with the firm, turning the program into much more than a passive loss-prevention instrument. These findings suggest a need for managers to expand their mentality toward loyalty programs beyond mere reactive tactics.

The additional sales from the light and moderate buyers in this study came from two sources: (1) concentration of purchases originally scattered at other firms and (2) expansion of the relationship with the firm into other business areas. These findings suggest a few prerequisites for the success of a loyalty program as a more active marketing tool. First, the lower spending among light and moderate users should be mainly due to polygamous loyalty (i.e., flying on multiple airlines) rather than insufficient need for the product/service category (i.e., infrequent need to travel). If most consumers are not spending much because of low absolute demand, a loyalty program is unlikely to have a significant impact. Second, the loyalty program structure should be set in such a way that it creates enough incentive for light and moderate buyers to strive for the rewards. In other words, the possibility of obtaining a reward should not be so remote that these consumers simply give up and dismiss the program as irrelevant to them. From this perspective, smaller but easier-to-achieve rewards are likely to be more effective than larger rewards that require a significant amount of effort. Finally, gaining additional sales through a loyalty program is more likely when a firm has multiple business areas that it can cross-sell to consumers, such as in the case of retail and financial industries. The availability of such additional venues for consumers to accumulate program points can make better use of consumers' creative minds and involve them in deeper, more extensive relationships with the firm.

Across consumer segments, a loyalty program redistributes revenues and costs among consumers. The eventual benefit of the program depends on the trade-off between the costs of rewards (a majority of which will be incurred as a result of heavy buyers, who will enjoy the free rewards without changing their behavior) and the increased profits from moderate and light buyers as they purchase more and become more loyal over time. In highly competitive markets in which loyalty programs are widely used (i.e., the airline industry), consumers may come to expect loyalty programs as a standard offering from each firm. When this happens, the cost of a loyalty program can become an essential cost of business, creating a competitive equilibrium in which consumers are redistributed among competing firms. The ultimate benefit for the firm is the ability to attract repeat business and to have more profitable loyal customers.

From an analytical standpoint, a loyalty program can produce rich data about customers, which should be used to enhance a firm's relationship marketing efforts. The variation in different consumer segments' responses to the loyalty program found here suggests a need to assess the effects of loyalty programs beyond overall sales impact. This research demonstrates a simple way of evaluating loy-

alty program effects using individual purchase data. The HLM method better accommodates heterogeneity and correlated observations than traditional regression, without incurring substantial execution costs. The models can also be easily adapted by adding other consumer variables, such as demographics, into the consumer-level equations.

As firms often have only internal transaction data, the exclusive loyalty model presented here can be useful in assessing consumers' behavioral loyalty using limited data. It is appropriate for situations in which consumer purchases occur frequently and only internal data are available, such as consumers' patronage choices at a supermarket. For such high-frequency purchases, retrospective self-report data tend to be highly inaccurate (Schacter 1999). The current model is easy to compute and does not require knowledge of where and to what extent consumers buy outside the firm, thus making it practical with minimal data or computational requirements. However, a precaution is that the loyalty parameter can be affected by extraneous factors, such as stockpiling and subsequent consumption rate change (Sun 2005). Thus, it should be used for product categories with relatively stable consumption. It is not suitable when the sample size is relatively small or the data time duration is relatively short.

Appendix A
Variable Operationalization

- *Purchase frequency (Frequency$_{im}$)*: Total number of purchases made by a consumer in a certain month. If consumer i did not purchase anything during month m but that month is not the last month of the relationship (see the subsequent explanation for the LastMonth$_{im}$ variable), Frequency$_{im}$ is set to 0 to indicate zero purchase frequency.
- *Transaction size (Size$_{ijk}$)*: Total dollar amount spent in a transaction.
- *Month (Month$_{ij}$, Month$_{im}$)*: Number of months since joining the loyalty program.
- *Quarter (Quarter$_{ij}$, Quarter$_{iq}$)*: Number of quarters since joining the loyalty program.
- *Consumer tiers (HeavyBuyer$_i$, LightBuyer$_i$)*: Classification of a consumer based on his or her total spending during the first month of the program. Consumers in the top, middle, and bottom thirds were classified as heavy, moderate, and light buyers, respectively.
- *Interpurchase time (IPT$_{ijk}$)*: Number of days between the prior purchase and the current purchase.
- *Last month in the program (LastMonth$_{im}$)*: A dummy variable indicating the last month of transactions a consumer made. This variable is set to 1 if (1) the previous transaction conducted by consumer i occurred in month m and (2) month m was at least three months before the end of the analysis period, offering a three-month lapse window before labeling a consumer as "dead." If consumer i made any purchase after month m or if month m is within three months of the end of the analysis period (to allow temporary inactivity), the LastMonth$_{im}$ variable is set to 0.
- *Reward claim rate (RCRate$_{iq}$)*: The percentage of rewards that consumer i claimed in the qth quarter; this equals the ratio of the number of reward certificates requested to the total number of rewards qualified for in that quarter.

Appendix B
Three-Level HLMs of Exclusive Consumer Loyalty

Level 1

(B1) $\quad Log(Size_{ijk}) = \rho_{ij0} + \rho_{ij1}Log(IPT_{ijk}) + \varsigma_{ijk}.$

Level 2

(B2) $\quad \rho_{ij0} = \phi_{i0} + \phi_{i1}Log(Quarter_{ij}) + \varpi_{ij0}$, and

(B3) $\quad \rho_{ij1} = \phi_{i2} + \phi_{i3}Log(Quarter_{ij}) + \varpi_{ij1}.$

Level 3

(B4) $\quad \phi_{i0} = \lambda_0 + \lambda_1 LightBuyer_i + \lambda_2 HeavyBuyer_i + \pi_{i0},$

(B5) $\quad \phi_{i1} = \lambda_3 + \lambda_4 LightBuyer_i + \lambda_5 HeavyBuyer_i + \pi_{i1},$

(B6) $\quad \phi_{i2} = \lambda_6 + \lambda_7 LightBuyer_i + \lambda_8 HeavyBuyer_i + \pi_{i2},$ and

(B7) $\quad \phi_{i3} = \lambda_9 + \lambda_{10} LightBuyer_i + \lambda_{11} HeavyBuyer_i + \pi_{i3}.$

Interpretive Equation (Combining All Levels into a Single Equation)

$$
\begin{aligned}
(B8) \quad Log(Size_{ijk}) = &\ \lambda_0 + \lambda_1 LightBuyer_i + \lambda_2 HeavyBuyer_i \\
&+ \lambda_3 Log(Quarter_{ij}) + \lambda_6 Log(IPT_{ijk}) \\
&+ \lambda_4 LightBuyer_i \times Log(Quarter_{ij}) \\
&+ \lambda_5 HeavyBuyer_i \times Log(Quarter_{ij}) \\
&+ \lambda_9 Log(Quarter_{ij}) \times Log(IPT_{ijk}) \\
&+ \lambda_7 LightBuyer_i \times Log(IPT_{ijk}) \\
&+ \lambda_8 HeavyBuyer_i \times Log(IPT_{ijk}) \\
&+ \lambda_{10} LightBuyer_i \times Log(Quarter_{ij}) \\
&\times Log(IPT_{ijk}) + \lambda_{11} HeavyBuyer_i \\
&\times Log(Quarter_{ij}) \times Log(IPT_{ijk}) \\
&+ [\pi_{i0} + \pi_{i1} Log(Quarter_{ij}) \\
&+ \pi_{i2} Log(IPT_{ijk}) \\
&+ \pi_{i3} Log(Quarter_{ij}) \times Log(IPT_{ijk}) \\
&+ \varpi_{ij1} Log(IPT_{ijk})] + (\varpi_{ij0} + \varsigma_{ijk}),
\end{aligned}
$$

where Size$_{ijk}$ is the dollar amount consumer i spent in the kth transaction during the jth quarter in the program, IPT$_{ijk}$ is the number of days since the previous transaction, LightBuyer$_i$ and HeavyBuyer$_i$ are dummy variables that indicate whether consumer i is a light buyer or a heavy buyer, Log(Quarter$_{ij}$) is the logarithm transformation of the jth quarter, $\pi_{i0} + \pi_{i1}Log(Quarter_{ij}) + \pi_{i2}Log(IPT_{ijk}) + \pi_{i3}Log(Quarter_{ij}) \times Log(IPT_{ijk}) + \varpi_{ij1}Log(IPT_{ijk})$ indicate the random effects of these variables that are not systematically accounted for by the fixed coefficients, and ϖ_{ij0} and ς_{ijk} are error terms.

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