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Research Note

Customer Loyalty Programs: Are They Profitable?

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Loyalty programs are very common in practice. Many researchers have worked at understanding the impact of loyalty programs on market competition and the mechanism behind it. Interestingly, almost all of the studies have explored a symmetric equilibrium where both of the competing firms offer a loyalty program. To our knowledge, the extant literature has not investigated in-depth whether asymmetric equilibrium can exist where only one firm chooses to offer a loyalty program and the other firm chooses to compete via lowering prices. Such a question is important because some markets do support such asymmetric equilibriums with respect to loyalty programs. Also, the existence of asymmetric equilibrium shows that a loyalty program need not be profitable for some firms.

In this paper, we use a game-theoretic framework to investigate specific types of customer loyalty programs that provide benefit to loyal customers in the form of discount over market prices. The model considers consumer switching and includes two types of consumer heterogeneity. The first type of heterogeneity concerns the differences between customers with respect to their liking for loyalty programs, and the second type concerns the differences among the loyalty program members with respect to their ability to collect enough loyalty points to redeem loyalty rewards. By analyzing a duopoly market, we find that both symmetric equilibrium (i.e., where both competing firms offer the loyalty program) and asymmetric equilibrium (i.e., where one firm alone offers the loyalty program) can be sustained. The paper explores conditions for the existence of these two equilibriums.

Key words: loyalty program; asymmetric equilibrium; customer heterogeneity; Hotelling's model
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1. Introduction

More and more companies are focusing on consumer loyalty to enhance long-term profitability (Jain and Singh 2002). To enhance consumer loyalty, companies adopt many strategies, and the most popular among them is the loyalty program. Hotels, airlines, department stores, drugstores, gasoline stations, grocery stores, mass merchandisers, and specialty apparel stores, all have adopted loyalty programs. However, it is not clear whether loyalty programs are, in spite of their widespread use, profitable in all cases. Some researchers argue that they are profitable (e.g., Reichheld and Teal 1996) whereas others take the opposite stand (e.g., Dowling and Uncles 1997). Recent research by Villenueva et al. (2007) shows that a firm would be better off looking at short-term period-by-period profit maximization instead of long-term profit maximization obtainable through initiatives such as loyalty programs. Thus, it is not clear whether loyalty programs really bring in more profits to the firms.

Another stream of research uses a game-theoretic approach and analyzes the market equilibrium conditions that enable competing firms to offer loyalty programs (e.g., Klemperer 1995, Kim et al. 2001, Caminal and Matutes 1990, Von Weizsacker 1984). A common finding is that loyalty programs sustain in equilibrium because they reduce market competition by introducing consumer-switching costs. However, it is interesting to note that all of these studies focus on a market where both of the competing firms offer loyalty programs. For example, Kim et al. (2001, p. 104) wrote: "Because the two firms are the same in all aspects, we limit our attention to a pure-strategy symmetric equilibrium … .”

In contrast, we focus on *asymmetric equilibrium* where we ask the question: Can equilibrium exist where one firm finds it profitable to refrain from offering the loyalty program even though its competing firm offers one? While a loyalty program could generate more profits through making consumers loyal, why could not a competing firm compete better with a low-price strategy? The low-price strategy has been found to be successful to combat other positioning strategies such as high quality, high service, etc. Why can’t a firm use it to combat a competitor’s loyalty program too? This paper is an attempt to answer this question.

Now, why is our research question important? First, to our knowledge, this issue has not been investigated despite the popularity of a low-price strategy in practice. Second, we observe markets where some firms offer loyalty programs while others do not.[1] What makes some of the firms refrain from offering loyalty program?

In this paper, we investigate a specific type of loyalty program where the loyalty benefit is provided in the form of some percentage reduction in prevailing market prices of the product. There are numerous examples of such programs all over the world. Some of them are Borders,[2] childcare.net, Troon Rewards Program for golfers, MobileCom in Jordan, and Ennia Lingerie of the United Kingdom. Furthermore, this type of reward program includes as a subset the situation when firms offer “free” product, which is a standard form of loyalty reward in many industries including hotels and airlines.

The analysis is set in a competitive situation consisting of two firms, each having the ability to launch a loyalty program after considering the expected reaction of the competitor. We analyze whether one or both of the firms would offer a loyalty program in equilibrium and the conditions under which a specific equilibrium might happen. Our approach builds on previous research (Desai 2001, Kim et al. 2001, Iyer and Soberman 2000, Caminal and Matutes 1990).

Essentially, a firm with a loyalty program makes a promise to offer a future discount under certain conditions. Our results show that the competing firm could offer a certain discount in the current period to mitigate the impact of the loyalty program’s future promise. Thus, an asymmetric equilibrium could exist if firms differentiate in their discount offer across the purchase occasions.

[1] Some low-cost airlines may not offer a loyalty program like those offered by the major airlines. The same may be true for certain classes of hotels.

[2] For more information, see http://www.publishersweekly.com/article/CA6308993.html.

The rest of this paper is arranged as follows. Section 2 presents the model formulation, the analyses, and the results. Section 3 ends with a summary and discussion of the results.

2. Model

The market is served by two firms, A and B. As espoused in the Hotelling model (Iyer and Soberman 2000), the marketplace is assumed to be linear, with the two firms located at its two ends (i.e., one at each end) and the consumers situated uniformly along the unit dimensional line. A consumer’s choice of a firm depends on three factors: prices at the two firms, the loyalty program (if offered by one or both of the two firms), and the distance between the consumer and the two firms.[3] Our model development is basically similar to what has been used in the extant literature (e.g., Caminal and Matutes 1990) with some unique features. As assumed in the extant literature, we consider the operation of a loyalty program in two periods. In the first period, a consumer buying a firm’s product becomes a potential loyal consumer, and in the second period she makes enough purchases so as to become eligible for the loyalty reward. We assume that in each period the market size is the same and is 1 unit.[4]

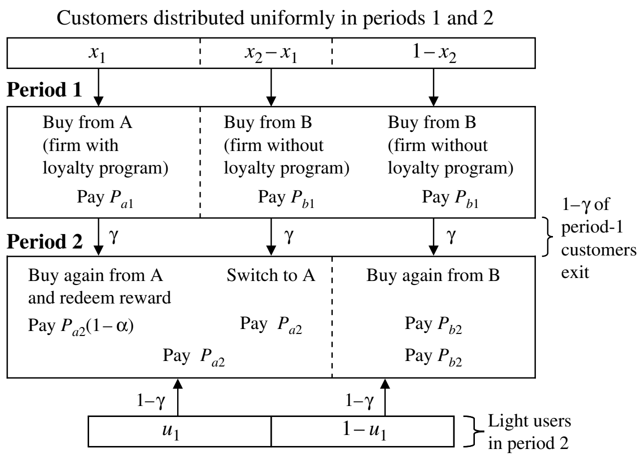
A unique feature of our model is that every consumer who purchases in period 1 has a γ probability of buying again in period 2. If a consumer does buy again in period 2 and makes the purchase in both of the periods from the same firm offering the loyalty program, she would receive the loyalty reward. However, if she fails to make the purchase in period 2, or if she chooses the firm with no loyalty program for both the periods, or if she switches firms in the second period, then she would not receive the reward. Note that the first period choice of every consumer is affected by the possibility that she *might* buy in period 2 with probability γ. This parameter plays a key role through modeling the uncertainty in the ability of consumers to achieve loyalty reward despite joining the loyalty program. Clearly, γ will be different across product categories. In a given category, its actual value will depend on factors such as income and the rate and level of consumption.

Thus, at the end of period 2 we would see in aggregate that γ fraction of period-1 buyers bought in both the periods and that $(1-\gamma)$ fraction bought in period 1

[3] Note that the distance between the consumer and a firm captures all other costs (i.e., factors other than the prices and the loyalty program) incurred by the consumer in buying the product. These are generally called the traveling costs.

[4] This is to ensure that our results are not affected by market expansion or contraction but only by the competitive strategies deployed by the two firms.

Figure 1 Customer Flow Diagram



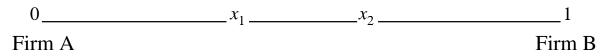
but failed to buy in period 2. Because we assume a market size of 1 in each period, a new cohort of consumers comes into the market in period 2 to fill the "missing" $(1-\gamma)$ fraction. These new cohort of consumers do not bother about the loyalty program because they buy only in period 2. We call the new cohort coming in period 2 as "light users."[5] A flow diagram of the consumer choice process is presented in Figure 1.

2.1. Solving the Model

We first consider the case where firm A offers the loyalty program and B does not, i.e., the *asymmetric* case. Before we solve the model, we need to discuss two more key features of our model.

Loyalty Reward. If a consumer buys from A and repeat buys from A in period 2, he will get a loyalty reward of $\alpha * P_{a2}$, where P_{a2} is the price at firm A in period 2 and α is the percentage discount in prevailing market price at firm A, where $0 \le \alpha \le 1$. Therefore, his net price for purchase is $(1-\alpha)\ P_{a2}$ in the second period.[6] We assume that α is predetermined (i.e., exogenous).[7]

Switching in Second Period. In general, of all the consumers, those located "close" to a firm are most likely to buy from the same firm in both of the periods because of low traveling costs. So, if at all switching takes place, it would be by the consumers located somewhere near the middle section of the linear market. Consider the following figure:



Consumers in $[0, x_1)$ would buy from A in both the periods, consumers in $(x_2, 1]$ would buy from B in both the periods, and consumers in (x_1, x_2) are potential switchers. How would they switch? Will they switch from A in period 1 to B in period 2, or from B to A? Suppose this segment had bought from A in the first period. In the second period, they would get a loyalty reward if they buy from A and get no reward if they buy from B, and hence they are not likely to switch to B unless B offers a deep price reduction. Suppose they had bought from B in the first period—the possibility of switching is higher because of the absence of loyalty reward in B. In other words, consumers in (x_1, x_2) represent only those switching from B (in period 1) to A (in period 2). The online technical appendix (provided in the e-companion)[8] provides appendix proof that customer switching will happen from firm B to firm A only.[9]

Therefore, the model considers three segments in the market: customers located in $[0, x_1]$ buy from A in both the periods, customers in (x_1, x_2) buy from B in period 1 and from A in period 2, and customers in $(x_2, 1]$ buy from B in both periods.[10]

The total two-period profit functions of firms A and B are as follows.

$$\begin{aligned}\text{Total profits to A} &= [\text{profits to A in period 1}] \\ &\quad + [\text{profits to A in period 2}] \\ &= [P_{a1}x_1] + [P_{a2}(1-\alpha)\gamma x_1 \\ &\quad + P_{a2}\gamma(x_2-x_1) + P_{a2}u_1(1-\gamma)], \quad (1)\end{aligned}$$

where P_{a1} and P_{a2} are the first- and second-period prices, respectively, of firm A. The letter u_1 represents

[5] Typically, researchers exogenously assume that a certain fraction of the market buys in both periods (e.g., Kim et al. 2001). Our formulation enables us to accommodate those customers who would sign up for the loyalty reward but end up *not buying* in period 2.

[6] Although researchers typically use an absolute value for reward, we believe that the percentage-off reward is also very common in the market. Several examples of such loyalty programs are provided in the introduction section.

[7] Although the model would be richer if we make α endogenous in our analysis, we nevertheless get interesting insights by treating it as exogenous. Furthermore in order to treat it as endogenous we might have to include other factors such as the cost of providing the loyalty program, spare capacity available with the firms, etc., which are beyond the scope of the current paper. Therefore, we keep this for our future research. For now, we let α be exogenous.

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

[9] The e-companion (§D) provides an analytical proof to show that (x_1, x_2) cannot represent switching from A to B in equilibrium. Proof that switching from A to B cannot happen with or without the presence of a B-to-A switching segment is also provided. The e-companion further shows that switching will happen from B to A.

[10] To our knowledge, this paper is the first to explicitly accommodate consumer switching in such a framework. Researchers have assumed either no switching (Klemperer 1995) or a symmetric market share of 0.5 (Kim et al. 2001, Caminal and Matutes 1990) primarily because their focus was on the symmetric case of both firms offering loyalty programs.

the proportion of light users who purchase from A in period 2. Similarly,

$$\begin{aligned}
&\text{Total profits to B}\\
&\quad=[\text{profit to B in period 1}]\\
&\qquad+[\text{profits to B in the period 2}]\\
&\quad=[P_{b1}(1-x_2)+P_{b1}(x_2-x_1)]\\
&\qquad+[P_{b2}\gamma(1-x_2)+P_{b2}(1-\gamma)(1-u_1)]\\
&\quad=[P_{b1}(1-x_1)]+[P_{b2}\gamma(1-x_2)+P_{b2}(1-\gamma)(1-u_1)]. \quad (2)
\end{aligned}$$

We seek a subgame perfect Nash equilibrium solution to this game. We solve it by the backward induction method; i.e., we solve first the second-period optimization problem and then solve the whole game in period 1 at that optimal point. In line with this, we keep x_1, x_2, and the first-period prices as given, and we solve the period-2 optimization problem for firms A and B. Following that, we go to period 1 and solve the entire game. A schematic diagram of the whole procedure and the detailed steps are given in Figure 1.

The expressions for the equilibrium profits of A and B thus obtained are provided in the e-companion. We represent them as follows:

$$\text{Equilibrium optimal profits to A} = \Pi_a^*(Asym) \quad (3)$$

$$\text{Equilibrium optimal profits to B} = \Pi_b^*(Asym). \quad (4)$$

We now compare the results from the asymmetric case to other possibilities.

2.2. Comparison with Other Cases

To show the existence of asymmetric equilibrium, we need to compare the firms' equilibrium profits in the asymmetric case (i.e., $\Pi_a^*(Asym)$ and $\Pi_b^*(Asym)$ in Equations (3) and (4)) with two cases, namely, (i) profits in the symmetric case where both A and B offer the program and (ii) profits in the symmetric case where neither A nor B offers the program. Let us consider the case of "both offering the program" first.

2.2.1. Both Offer a Loyalty Program. The optimal equilibrium profits and prices are expected to be symmetric, implying that $x_2 = x_1$, i.e., there will be no switching in period 2.

The total profit of A in both periods after substituting $x_2 = x_1$ in Equation (1) is

$$\Pi_a = P_{a1}x_1 + \gamma P_{a2}(1-\alpha)x_1 + (1-\gamma)u_1 P_{a2}. \quad (5)$$

The profit of A in period 2 is $[P_{a2}(1-\alpha)\gamma x_1 + P_{a2}u_1(1-\gamma)]$ where the first term refers to the profit from those who bought from A in both the periods, the second term refers to the profit from the light users in period 2, and u_1 is the proportion of light users who purchase from A in period 2.[11]

Similarly, the total profit of B in both periods is

$$\begin{aligned}
\Pi_b = (1-x_1)P_{b1} + \gamma P_{b2}(1-\alpha)(1-x_1)\\
+(1-\gamma)(1-u_1)P_{b2}. \quad (6)
\end{aligned}$$

The profit of B in period 2 is $[P_{b2}\gamma(1-\alpha)(1-x_1) + P_{b2}(1-\gamma)(1-u_1)]$, where the first term refers to the profit from those who bought from B in both periods, and the second term refers to profit from the light users in period 2.

We follow the same backward induction procedure to solve this game as we did in the asymmetric equilibrium case. The details are provided in the e-companion. The equilibrium prices, market shares, and profits obtained are

$$P_{a2}^* = P_{b2}^* = \frac{2(1-\gamma\alpha)}{1-\gamma}, \quad (7)$$

$$P_{a1}^* = P_{b1}^* = \tfrac{4}{3}\gamma\alpha + \tfrac{2}{3}\gamma + 2, \quad (8)$$

$$x_1^* = u_1^* = \tfrac{1}{2},$$

$$\begin{aligned}
\Pi_a^*(Sym) &= \Pi_b^*(Sym)\\
&= \frac{-2\gamma^2\alpha - 2\gamma + 3\gamma^2\alpha^2 - 4\gamma\alpha + 6 - \gamma^2}{3(1-\gamma)}. \quad (9)
\end{aligned}$$

Now let us consider the case of "neither offers the program."

2.2.2. Neither Offers a Loyalty Program. Researchers have argued that the absence of a loyalty program should imply that the firms would compete with each other in each period independent of a the implications in other periods (Kim et al. 2001). We follow the same tradition and assume that without a loyalty program the game reduces to two firms competing with each other in two periods independently. It is then easy to show that, in our framework, the optimal prices and profits would become

$$P_{a1}^* = P_{a2}^* = P_{b1}^* = P_{b2}^* = 2, \quad (10)$$

$$\textit{Profits to A} = \textit{Profits to B} = 2. \quad (11)$$

Now we address the main objective of this paper, which is to explore the existence of asymmetric equilibrium in the market.

[11] $u_1 = 0.5 + (P_{b2} - P_{a2})/4$ is obtained by applying the Hotelling model's framework to the light users (i.e., new cohort in period 2).

2.3. Existence of an Asymmetric Equilibrium

In order to prove the existence of an asymmetric equilibrium, we need to show that (i) profits to A when it alone offers the program are higher than its profits when neither firm offers the program and (ii) profits to B when A alone offers the program are higher than profits to B when both offer programs. In other words, we need to have

$$\Pi_a^*(Asym) > 2, \tag{12}$$

$$\Pi_b^*(Asym) > \Pi_b^*(Sym). \tag{13}$$

If (12) and (13) are both satisfied then we have the asymmetric equilibrium of A alone offering the loyalty program. This depends obviously on two parameters, α and γ. An analytical solution, if it exists, is difficult to obtain because the profit expressions are polynomial in both of the parameters. However, note that we are interested only in showing the *existence* of asymmetric equilibrium, and hence we can resort to proving it through numerical analysis. Such an analysis has to consider the entire range of the parameter space to find a solution. In our framework, both α and γ are bounded in the (0, 1) interval, which implies that we need to search over the [0, 1] square space. Therefore, we numerically search for conditions that support asymmetric equilibrium in this space of parameter values.

Consider the values of α and γ from 0.1 to 0.8 in increments of 0.01.[12] Table 1 shows that for all of these values of the parameters the inequality (12) holds true. Therefore, for these values of the model parameters *firm A will offer a loyalty program when B does not offer one*.

Let us rewrite the expression (13) and focus on the difference in the profit to B when A alone offers the program and the profit to B when both offer programs. In other words, we want to explore whether:

$$\Pi_b^*(Asym) - \Pi_b^*(Sym) > 0. \tag{14}$$

We again use the same values of α and γ as earlier (Table 1) and check whether (14) holds true. Results are shown in Table 2. We produce only those cells pertaining to increments of 0.1 although results extend to finer increments as well. As shown in the table, *both asymmetric* (*positive values; only firm A offers loyalty program*) *and symmetric* (*negative values; both firms offer loyalty program*) *equilibriums exist* depending on the values of the model parameters. We found that in general the asymmetric equilibrium prevails when either or both of the parameters α and γ is in the high value range. This is the main finding in the paper.

[12] Beyond 0.8, the functions are not well behaving and hence we ignored that region.

Table 1 **Values of Equilibrium Profit of A When It Offers a Loyalty Program and B Does Not Offer One (Evaluated for Different Values of γ and α)**

	α							
γ	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8
0.1	2.104	2.097	2.090	2.083	2.076	2.069	2.063	2.056
0.2	2.234	2.218	2.203	2.189	2.175	2.162	2.149	2.137
0.3	2.401	2.375	2.351	2.328	2.307	2.288	2.270	2.254
0.4	2.624	2.585	2.550	2.518	2.490	2.465	2.444	2.425
0.5	2.937	2.881	2.833	2.791	2.755	2.726	2.702	2.684
0.6	3.407	3.328	3.262	3.208	3.166	3.133	3.111	3.097
0.7	4.192	4.079	3.989	3.921	3.873	3.841	3.825	3.823
0.8	5.767	5.595	3.989	5.392	5.343	5.320	5.319	5.340

2.4. Asymmetric Equilibrium: Rationale

Suppose that firm A offers a loyalty program with α at 0.3, i.e., a 30% discount on the repeat purchase for those who buy from A again in the second period. The question is: What would its competing firm, B, do? Firm B could offer either (1) a similar program with a period-2 discount or (2) a price-off in period 1's purchase to influence the choice upfront to mitigate the impact of the loyalty program.

First we have to realize that the 30% discount offer on period-2 purchase will be useful for a period-1 customer if and only if she buys again in the second period. However, in our model, there is no certainty but only a probability (or intention) that she would be in the market in period 2 also. This intention is given by the parameter γ. If the intention is weak, firm B would be better off making a similar period-2 discount *promise* because there is a high probability that it might not actually incur the expense (because γ is low) but at the same time would make itself attractive to the customer. Hence, one can see that, by the same token, both firms would offer the loyalty program if the intention is weak.

Table 2 **Positive Values Show Asymmetric Equilibrium for Different Values of γ and α**

	α							
γ	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8
0.1	−0.026	−0.018	−0.011	−0.003	**0.004**	**0.012**	**0.019**	**0.027**
0.2	−0.049	−0.032	−0.014	**0.003**	**0.02**	**0.037**	**0.054**	**0.07**
0.3	−0.069	−0.039	−0.009	**0.021**	**0.051**	**0.081**	**0.11**	**0.14**
0.4	−0.085	−0.037	**0.011**	**0.059**	**0.107**	**0.154**	**0.202**	**0.249**
0.5	−0.093	−0.02	**0.054**	**0.128**	**0.202**	**0.276**	**0.35**	**0.423**
0.6	−0.089	**0.023**	**0.137**	**0.252**	**0.369**	**0.485**	**0.602**	**0.717**
0.7	−0.06	**0.119**	**0.304**	**0.494**	**0.687**	**0.881**	**1.074**	**1.263**
0.8	**0.032**	**0.355**	**0.699**	**1.056**	**1.421**	**1.784**	**2.137**	**2.475**

Notes. Values were obtained from expression (14). Negative values in the table show symmetric equilibrium where both A and B offer the program, and positive values (shown in boldface) show asymmetric equilibrium for the respective values of α and γ.

However, if the intention is strong (γ is high), such a promise will have high probability of making firm B incur the loyalty reward expenses in period 2. And there will be no difference between the two firms, and this symmetry will make them more competitive overall. In such a case, firm B could offer a price-off in the first period in place of the promise of a period-2 discount. If the price-off is strong enough, the customers located near the "middle of the market" would be attracted to firm B because for them the choice is between strong-and-certain price-off in first period and strong-but-uncertain discount in period 2. Of course, the customers located near firm A would still prefer A, and customers located near firm B would enjoy a surplus choosing B.

What would firm A think? It would be happy to "lose" the middle market customers because B, which just made a discount in period 1, would not fight again on price in period 2, and this would enable firm A to charge a higher price in period 2 (i.e., higher than a price if firm B also offered the program). In a sense, by this asymmetric strategic positioning, the firms have segmented the market on "time" dimension, wherein firm A offers the discount in period 2 while firm B offers it in period 1. Because customers have a high intention of buying in both the periods both firms would be better off avoiding direct competition in a given period.

Thus, whereas a low γ supports a symmetric equilibrium of both offering the program, a high γ supports an asymmetric equilibrium. How high should γ be to support the asymmetric equilibrium? This is determined by the period-2 discount promised, i.e., α. If the discount promised is high then the expenses expected to be incurred in period 2 by such a promise is high, and firm B would find it better to resort to price-off in period 1 even if γ is not that high. Said otherwise, a high α would enable even a lower γ to support the asymmetric equilibrium.

Thus, the rationale for the asymmetric equilibrium is to let the firms have an enhanced price level and profits through segmenting the market across the purchase occasions. The driving force behind this result is our new parameter γ, which represents the uncertainty, i.e., the probability that a customer goes to the market in period 2 also. This uncertainty enables the firms to take opposite stands with respect to the timing of the discount offer.

3. Conclusions and Directions for Future Research

In this paper, we studied the impact of loyalty programs on firm profitability and market competition and asked the following specific question. Would a market support an equilibrium wherein one firm offers the loyalty program and the other firm competes through a low-pricing strategy? We found the answer in the affirmative. If the customers buying in the first period have a high-enough probability of being a customer again in the second period, then it would be profitable for the firms to take different positions in the market, where one firm offers the program and the other resorts to low price as the competitive strategy. This asymmetric equilibrium enables the firms to create segmentation across the purchase occasions and thereby earn higher profits for both.

Although other researchers have analyzed asymmetric equilibrium in various markets (e.g., Desai and Purohit 2004 find asymmetric equilibrium in the context of price haggling in a competitive environment), to our knowledge this paper is the first to focus on asymmetric equilibrium in the context of loyalty programs. The papers in the extant literature focus on analyzing the properties of a market where both firms offer loyalty programs. Asymmetric equilibrium is important to analyze because some markets exhibit such a pattern.

Our analysis brings in additional contributions from a modeling perspective as well. In our model formulation, we account for two types of consumer heterogeneity, namely, the differences among the consumers with respect to their inherent attraction towards loyalty programs and the differences among the loyal consumers with respect to their uncertainty to purchase again in the second period. Considered from a different angle, this uncertainty reflects the inability to accumulate enough loyalty points to redeem the loyalty rewards. This type of heterogeneity has not been included in the analysis in the extant literature. Because this uncertainty actually exists in the marketplace, including its effect on the loyalty programs makes our analysis more appealing. Finally, the model formulation also includes a segment of customers who switch to the competing firm. Note that most of the papers in the extant literature assume no switching or assume directly a symmetric equilibrium implying no switching in turn. We believe that our overall investigation of the impact of the loyalty program complements and adds to the past work in this area, such as that of Kim et al. (2001) and Caminal and Matutes (1990), and thus builds upon past work.

Although we show the existence of both asymmetric and symmetric equilibrium, there are issues that require more research. First, a key use of the loyalty program is to collect information on customers and use those data to target consumer promotions. This has not been explored in the game-theoretic part of the literature on loyalty programs. Second, one could make the loyalty discount percentage (i.e., α in our model) endogenous, build a cost structure to the program, and ask what optimal percentage would a firm offer in an asymmetric equilibrium and in a symmetric equilibrium. In this case, however, it is important to realize that other important factors, such as the spare capacity of firms and the fixed cost associated with loyalty programs that could impact the profitability of these programs and market competition, have to be considered. Finally, one could investigate the impact of different types of simultaneous loyalty programs on firm profitability and market competition.

4. Electronic Companion

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

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