To tier or not to tier: An analysis of multitier loyalty programs' optimality conditions☆

Amir Gandomi [a,*], Saeed Zolfaghari [b]

[a] Frank G. Zarb School of Business, Hofstra University, 1000 Fulton Ave, Hempstead, NY 11549, USA
[b] Department of Mechanical and Industrial Engineering, Ryerson University, 350 Victoria Street, Toronto, ON, Canada M5B 2K3

A B S T R A C T

We analyze the effectiveness of multitier customer loyalty programs (LPs), based on which more loyal members are rewarded with disproportionately higher benefits. We develop a theoretical model to address this essential, yet understudied, question: what are the conditions under which the multitier structure is optimal? We model an asymmetric duopoly market where one firm offers a three-tier LP and the other firm offers a lower price. In a multi-period setup, heterogeneous customers strategically evaluate their utility and decide where to buy. The utility is formulated in terms of the offered prices and the LP's design parameters, i.e., reward values and thresholds of different tiers. The marginal effect of utility components is captured by three sensitivity coefficients, namely reward, price, and distance sensitivity. The logit model is used to formulate customers' choice behavior. We use Markov chain to derive the distribution of customers' accumulated purchases and the expected revenue functions of the firms. By conducting a rigorous numerical study, we characterize the optimality conditions of the multitier structure. Our findings show that when the distance sensitivity is higher than the reward sensitivity, the multitier structure produces suboptimal revenues. We find that the characteristics of a firm's customers are more important than its competitor's pricing in driving the optimal design of the LP. Furthermore, our model explains two other common cases in practice: offering "buy-x-get-one-free" rewards and forgoing an LP altogether. Using the model, we formulate the optimality conditions of these two cases.

© 2017 Elsevier Ltd. All rights reserved.

1. Introduction

With an average of 29 memberships per household in the U.S. [4], loyalty programs (LPs) have emerged as the primary vehicle to generate return business. They are widely adopted by companies in various industries, including travel, financial services, and retail [22,23,26,51]. As of 2011, the perceived value of loyalty points issued in the U.S. is estimated at $48 billion per year [18]. American Airlines alone reported a frequent flyer liability of $2.8 billion at the end of 2014 [37]. To put this into perspective, this amount buys 30 Boeing 737 aircraft, increasing the American Airlines' active capacity by over 4% (calculated based on [1]).

Despite their ubiquity, the research on the effectiveness of LPs has produced equivocal results [14,20,27,33,44,51]. Whether adopting an LP influences customers' established behavior and attitude is still up for debate [9,32,34,40]. This is evident from customers'

low active participation rates—58% of the 3.3 billion LP memberships in the U.S. were inactive in 2014 [4]. Also, it is estimated that about one-third of rewards earned by active U.S. participants (a total of $16 billion or $205 per household) were never redeemed in 2011 [18]. Moreover, whether LPs increase a firm's long-term profitability is still a debated question [13,15,31,42,44]. Safeway Club Card, Club Nintendo, and Albertsons Preferred Card are some examples of LPs that have been discontinued recently, supporting the stance of skeptics.

The discrepancy in the literature can be partly attributed to the often overlooked link between the design and effectiveness of LPs. Various studies show that the effectiveness of an LP depends upon its design [5,6,24,29,49,50]. Therefore, the findings of studies on LPs may be overturned by adjusting their design parameters. This can be regarded as an important issue, considering that prior research on LPs have mostly evaluated one focal design [6]. In this paper, we develop a model to evaluate the relationship between the design and profitability of LPs.

The LP design is inherently multidimensional. A number of useful frameworks have been recently developed to characterize

different dimensions of LP design. Liu and Yang [31] identify three components: participation requirements (e.g., free versus fee-based membership), the point structure (e.g., tiered versus linear), and rewards (e.g., brand-related versus brand-unrelated rewards). McCall and Voorhees [33] propose a two-dimensional classification: the program structure (the number of tiers and the tier transition) and the reward structure (reward type, reward magnitude, reward frequency, and reward framing). Dorotic et al. [8] describe the LP design in terms of the program structure, rewards, and partnership (single-vendor versus partnership). A more recent framework proposed by Breugelmans et al. [6] comprises five dimensions: membership requirements, the program structure (frequency reward programs versus customer tier programs), the point structure (e.g., the number of tiers and the point issuance ratio), the reward structure (e.g., monetary versus non-monetary), and the program communication (e.g, automatic versus self-initiated communication of accumulated points).

A common design element in all classification frameworks is whether the program is structured in tiers, which, in the above frameworks, is captured either through the program structure [6,8,33] or the point structure [31]. With respect to this element, we classify LP designs into two distinct classes: linear programs and multitier programs. In linear programs, the marginal value of points is constant and does not depend on the customers' purchase history. While common in different sectors, this type of structure is particularly prevalent in financial services. For instance, the TD First Class Travel Visa Infinite Card offers 3 points for every dollar spent, and every 10,000 points can be redeemed for $50 towards travel purchases. This is equivalent to a reward of 1.5 cents per dollar spent, regardless of customers' spending level.

In contrast, multitier LPs offer disproportionately higher rewards to more loyal customers. In the literature, this structure is also referred to as hierarchical [10,12,49] and nonlinear [45]. In multitier LPs, the marginal value of points increases when customers' spending level exceeds certain threshold(s) [28,49]. Here, the notion of point "value" encompasses both types of benefits for elevated customers, i.e., economic-based benefits (e.g., discounts) and customization-based treatments (e.g., exclusive concierge services) [19,28]. Multitier programs are widely adopted in travel, casino, and gaming industries. Table 1 shows some examples of benefits to Fairmont President's Club members. Based on this multitier LP, customers in higher tiers earn both greater economic-based rewards (more miles per stay) and a wider array of customization-based services. Configured somewhat differently, the Fallsview Casino Player's Advantage Club (PAC) program, summarized in Table 1, provides the same point issuance and redemption ratio across different tiers. In this program, customers earn 1 point for every $20 played at slot machines and receive $10 cash for every 100 points, regardless of their membership level. The broader range of customization-based treatments in higher tiers, however, augments the marginal value of each point in those tiers.

Multitier LPs are significantly underexplored in marketing literature [6,27,28]. Table 2 presents a review of studies on multitier LPs. To the best of our knowledge, only Kopalle et al. [27] have examined the economic efficacy of multitier LPs. By analyzing data from a major hotel chain and using simulation, they conclude that the focal program contributes to higher revenues from both the price-oriented and the service-oriented segments of the market. Kopalle et al. [27] provide evidence that the incremental revenues are generated through both components of a multitier LP, namely, the frequency reward and the customer tier. They define the frequency reward as the benefits customers earn by redeeming points (e.g., free hotel stays or coupons). The customer tier

Table 1
Eligibility requirements and example benefits of two LPs.

LP design elements	Fairmont President's Club		
	Club	Premier	Platinum
Eligibility requirements	Enrolment	5 stays or 10 room nights per calendar year	10 stays or 30 room nights per calendar year
Rewards	500 miles per stay	750 miles per stay	1000 miles per stay
Private reception desk	✓	✓	✓
Personalized membership kit	–	✓	✓
Turndown service	–	–	✓
	Fallsview Casino Player's Advantage Club		
	Free	Gold	Platinum
Eligibility requirements	Enrolment	1000 Reward Points	5000 Reward Points
Cash-in rewards	$10 for every 100 points	$10 for every 100 points	$10 for every 100 points
Complimentary show tickets	✓	✓	✓
Monthly meal credits	–	Up to $100 Per Month	Up to $500 Per Month
Complimentary VIP self-parking	–	–	✓

component refers to special services offered to customers once they achieve a certain tier (e.g., late check-in or priority boarding). Noticeably, Kopalle et al.'s [27] distinction between the frequency reward and customer tier components is similar to our distinction between economic-based benefits and customization-based treatments.

In this paper, we address a critical, yet unexplored, question about the effectiveness of multitier LPs: under what conditions is the multitier design optimal? We use a theoretical model to evaluate the optimality conditions of a three-tier LP. The choice of the three-level design is due to its prevalence in practice. An important feature of our model is the inclusion of the points pressure effect, which refers to customers' accelerated purchases as they approach a tier threshold. Recent experimental and field research ascertain the existence of the points pressure effect in the context of LPs [25,27,35,48]. We capture this effect by including the customers' distance to the next tier in their utility function. A sensitivity coefficient is used as a proxy for the intensity of the points pressure effect. Our model also accounts for strategic customer behavior in a multi-period setting, an underrepresented factor in studies on the LP effectiveness [6]. We assume that customers are forward-looking, in the sense that they consider future outcomes in evaluating their utility in the current period (similar to [21,27,30,41]).

We model an asymmetric duopoly market where one firm offers a lower price and the competing firm responds by adopting a three-tier structure. In a multi-period framework, customers strategically decide where to buy. Their behavior is modeled using the binary logit model, where customers' utility formulation captures the point pressure effect. It is shown that the customers' accumulated purchases evolve according to a Markov chain. The transition probabilities of the Markov chain are used to formulate the firm's expected revenue function. The revenue function is optimized in terms of the multitier LP design parameters, i.e., the reward amounts and thresholds of different tiers. The model comprises four parameters, namely, the customers' sensitivity to price and rewards, the strength of points pressure effect, and the price-cut offered by the competing firm. By conducting a numerical experiment over a wide range of parameter values, we derive