Rewards or Discount: Improving Fast Food Chain Operations

Motivation and problem statement: In today’s competitive marketplace, companies adopt various marketing strategies to attract customer demand. One commonly used strategy is price discounts. Discounts are ubiquitous in retail settings to attract customers and increase store traffic. A related strategy is the use of loyalty or rewards programs. Through a rewards program, customers earn reward points on past purchases and can use these points for future transactions. Rewards programs are often introduced to increase brand loyalty and encourage more frequent purchases. Prior research has extensively studied discounts and rewards programs on its own. However, there is a gap in understanding the joint effect of these two strategies on customers’ purchase behavior and the resulting profit for the retailer. In particular, do customers leverage both discounts and rewards programs simultaneously to maximally reduce the price paid? Or do customers tend to use one more regularly than the other? How does customers’ engagement in a rewards program affect their tendency to buy on discounts? Can we reliably predict market demand and estimate revenue when both strategies are adopted and customers repeatedly purchase from the retailer? In this paper, we leverage data from an established North American fast food chain to answer these questions and help the firm to better design its rewards program while also adopting price discounts in the meantime.

Although the marketing field has studied promotions and markdown management extensively, only until recently have researchers begun developing data-driven methods to analyze and optimize these strategies. Several papers have used a data-driven framework to empirically estimate how promotions shape demand in a grocery store setting and subsequently how to analytically design the optimal promotion program ([1-2]). Others also studied how consumers’ behavioral motives impact the practices of dynamic pricing and revenue management ([3-4]). However, promotions in a food service environment are different from promotions or markdowns in grocery and department store settings because food items are immediately consumed and cannot be stockpiled.

Similarly, several papers have studied how to define optimal policies for rewards programs using a data-driven approach, for example, by setting the expiration date of points [5] or setting reward levels in a loyalty program using social media [6], and by investigating how changes in the points’ value impact the retailer’s profitability [7]. In contrast, our paper focuses on the interplay
between the reward redemption behavior and discounted purchases of customers in a fast food chain setting.

**Contributions:** Our contributions are threefold. First, we empirically examine the joint effects of rewards program and price discounts on customer purchase behavior in a fast food chain setting. The use of an instrumental variable approach allows us to reliably estimate their joint impact on customer spent and hence, company profit. Second, leveraging the relationship between reward redemption and purchase on discount uncovered in our empirical analysis, we develop a parsimonious customer choice model to dynamically predict purchase behavior. Third, the customer choice model allows us to effectively evaluate alternative designs of the rewards program and quantify their impacts on profitability. Insights from this analysis are offered to the fast food chain company to help with current efforts on redesigning its rewards program.

**Data:** The data used in this research tracks detailed customer transactions at different stores of an established North American fast food chain. The dataset contains, at the customer level, detailed information regarding a customer’s history of purchase, details of each purchase including items bought, price paid, discounts applied (if any), and points earned or redeemed (if the customer has joined the rewards program and used his/her rewards card for the purchase). The data spans 248,390 unique customers (randomly selected from customers who interacted with the brand during the observation window) with 1,321,309 transactions between July 2013 and July 2015. Among these customers, around 10% own a rewards card (23,516 customers). These transactions occurred in a total of 4116 stores in the USA, and generated a total revenue of 5,838,519 USD, with an average discount of 0.25 USD being applied in each transaction.

**Methods and Results:** We present empirical evidence that establishes the joint impact of price discounts and rewards programs on customers’ purchase behavior. A descriptive analysis of the data shows that customers who redeem reward point more frequently tend to buy on discounts less often. We thus propose the hypothesis that a customer’s engagement in the rewards program reduces his or her tendency to leverage price discounts. To test this hypothesis, we use a linear model to quantify the impact of a customer’s participation in the rewards program on his or her usage of discounts in a purchase. However, as the customer’s decision to buy on discount and to use rewards for a purchase are both endogenous, they may be simultaneously affected by inherent
factors unobservable to us. We adopt an instrumental variable approach to account for this endogeneity. Panel data results support that higher intensity of rewards redemption results in lower usage of price discounts in a customer’s purchase, after controlling for customer and item characteristics at the individual customer and transaction level.

Motivated by this relationship between rewards redemption behavior and the propensity to buy on discount, we develop a parsimonious customer choice model to predict the customer’s purchase decision, including the choice of using rewards and buying on discount. Using customer-level data, our model analyzes different classes of customers based on their heterogeneous inter-temporal dynamics of redemption behavior and discounted purchases. This data-driven approach enables the firm to dynamically and accurately estimate demand based on the customer choice model as new transaction data are collected. Furthermore, we offer a set of analytics tools that allow the firm to effectively evaluate the demand and profit implications of alternative designs of its rewards program in the presence of prevalent price discounts adopted in its business.

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