**Behavior-Based Pricing: An Analysis of the Impact of Anticipated Regret**

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**Abstract**

Traditional behavior-based pricing (BBP) literature suggests that firms should offer lower prices to incentivize new customers to switch. However, at the time of switch, customers are often uncertain about their true needs or valuations of the product. Accordingly, they may experience repeat-purchase or switch-purchase regret, depending on whether they have bought a product from the same brand or switched to another brand. This paper investigates the impact of customers’ anticipated regret on firms’ BBP strategy and profits. Contrary to prior research which generally shows that firms performing BBP yield lower profits, we find that firms’ profits can increase or decrease in the presence of anticipated regret. When customers’ anticipated regret is sufficiently strong, firms can benefit from performing BBP. In addition, we find that firms have to change their traditional BBP strategy from rewarding new customers to rewarding repeat customers when repeat-purchase regret is sufficiently high.

*Key words*: behavior-based pricing; behavioral economics; game theory; repeat-purchase regret; switch-purchase regret

## 1. Introduction

Firms can collect customers’ purchase history by using a wide range of technologies such as Internet cookies, IP addresses, customer-relationship management systems and so on (Chung, 2020; Gao et al., 2020; Kannan and Kopalle, 2001; Li, 2021; Li and Jain, 2016; Li et al., 2020). From customers’ purchase history data, firms can identify customers who purchased from them before, and divide them into repeat customers and new customers. This enables the firms to practice behavior-based pricing (BBP). BBP is a type of price discrimination practice which involves offering differentiated prices for repeat and new customers. BBP is a common practice in a wide range of industries (Fudenberg and Tirole, 2000; Fudenberg and Villas-Boas, 2006) such as the phone, Internet, and insurance markets that often offer discounts for new customers to switch (Li and Jain, 2016).

However, customers are often uncertain about their true needs when they make a purchase though different pricing strategies employed by the firm. As a result, customers may sometimes experience ex post regret about their purchase decisions when they notice a mismatch between the product and their preferences. In general, there are two distinct types of regret in the context of BBP, depending on whether the regret is the result of repeat-purchasing an old product or switching to a new brand (Inman and Zeelenberg, 2002). We refer to the former as “repeat-purchase regret”, where a consumer purchased the same brand but later found that she could have gained a higher utility if she had purchased the other brand. By contrast, we refer to the latter as “switch-purchase regret”, where a consumer switched to another brand, but later found that she could have been better off had she bought the same brand.

The ex-ante purchasing decisions of customers may be significantly affected by the behavior of customers who anticipate possible ex post regret (Jiang et al., 2017; Zou et al., 2020). Given the ubiquity of anticipated regret in customers’ purchase decision making, firms have taken some measures to address customers’ concern. For example, Kodak has launched a campaign, requesting consumers “to consider how they would feel if they bought a cheap film and their pictures did not meet their expectations.” (Nasiry and Popescu, 2012). Similarly, Intel has launched the “Rewind Regret” commercial (Intel, 2014) to invoke customers’ potential regret that they might experience if they do not buy Intel’s new products. These indicate that firms also believe that anticipated regret is impactful on customers’ buying behavior and proper measures shall be taken. However, there is currently very limited research that has investigated how firms perform BBP and pricing decisions when customers exhibit anticipated regret. Further, the impact of anticipated regret on BBP pricing and firm profits is unclear. The aim of this article is to fill the aforementioned research gaps. Specifically, the following research questions are proposed: 1) What are the effects of anticipated regret on customers’ behavior and firms’ prices? 2) Does anticipated regret decrease or increase firms’ profits? Answers to these questions can guide firms to improve their pricing decisions, and identify the conditions that firms should reward their current customers or new customers.

To address these questions, we build a two-period dynamic pricing model that incorporates customers’ anticipated regret and investigate how it impact firms’ BBP strategies. Customers with heterogeneous valuations are uniformly distributed on a Hotelling line. In the first period, customers reveal their preferences to a particular firm by making purchase decisions. In the second period, a firm can recognize if a customer purchased from itself or a competitor based on customers’ purchase history. Consequently, firms could offer different prices to repeat and new customers based on this information. We model anticipated regret by considering that customers would anticipate regret in their decision and therefore could adjust their current decision on whether to make a repeat purchase or switch in the first period. In the second period, customers who remain in the same firm may experience repeat-purchase regret whereas customers who switch to a new firm may experience switch-purchase regret. Thereafter, we analyze how the degree of the anticipated regret affects consumers’ purchases decisions and firms’ BBP pricing strategy. In addition, we also investigate the impact of regret concerns on firms’ profits.

The remainder of this paper is organized as follows. In the next section, we review the previous work. In Section 3, we introduce the model setup. In Section 4, we present the main model and analysis. In particular, we investigate how regret impact firms’ BBP strategy. In Section 5, we extend the main model in several aspects. Theoretical and managerial contributions are summarized in Section 6. Section 7 concludes the paper with directions for future search. We conclude with managerial implications and directions for future research in Section 6. All proofs are provided in the Appendix.

## 2. Literature review

This research is built on several streams of literature, as reviewed below.

## 2.1. Behavior-based pricing

Our work is closely related to research on BBP (see Fudenberg and Villas-Boas (2006) for a comprehensive review). We contribute to this literature in the following ways. First, research has investigated how firms should price discriminate between repeat and new customers. Much of the BBP literature suggests that firms should charge higher prices to their current customers than to new customers. Therefore, incentivizing customers to switch is always an optimal strategy for firms (Chen, 1997). Researchers have extended the BBP model to examine conditions under which firms should reward repeat customers rather than attract new customers. For instance, firms can reward repeat customers if they have lower switching costs (Zhang, 2011), are sufficiently heterogeneous and have stochastic preferences (Shin and Sudhir, 2010), when products are vertically differentiated (Rhee and Thomadsen, 2017), or when higher-quality product features or service are offered (Li, 2021). Chen and Pearcy (2010) find that firms’ pricing strategy is contingent on customers’ preference dependence between periods. When the dependence is small, firms should reward repeat customers whereas when the dependence is large, firms should entice customers to switch. The current research extends this stream of research by incorporating customers’ anticipated regret into BBP analysis. Specifically, the research investigates how customers’ anticipated regret affect firms’ BBP strategy for new and repeat customers.

Second, one common finding in the BBP literature is that firms’ profits with BBP implementation are lower than those without BBP implementation. Therefore, firms should not perform BBP even when performing BBP is costless. The finding is supported by two explanations. First, customers can strategically postpone their purchase decisions for lower price offered to new customers in the second period. Second, when all firms use BBP to poach new customers, competition intensifies which will reduce firms’ total profits. Existing research has also found the conditions which firms can profit from BBP, such as when customers have heterogeneous demand and changing preferences (Shin and Sudhir, 2010), customers with peer-induced fairness concerns (Li and Jain, 2016), competing products are vertically differentiated (Rhee and Thomadsen, 2017) or quality differentiated (Jing, 2017), channel members invest in BBP at the same time (Li, 2018), consumer valuation is low, or consumers are sufficiently averse to loss on match quality when consumer valuation is high (Amaldoss and He, 2019). Wang et al. (2020) examine the strategic interaction between upstream contract choices and downstream pricing mechanisms (with and without BBP) within a supply chain with two vertically differentiated products. They find that selling low-quality product will make the adoption of BBP harmful to supply chain channel members, whereas supply chain channel members can benefit from BBP when high-quality product is sold when certain conditions are satisfied. Zhang et al. (2021) study the impact of customers’ uncertainty about product quality on firms’ BBP and customer acquisition and retention dynamics. We contribute to this stream of literature by considering customers’ anticipated regret, and more importantly, by linking the regret to customers’ purchase decisions in the second period. Thus, customers would anticipate repeat purchase regret and switching purchase regret when making purchase decisions in the second period, which could have a positive or negative impact on the firms’ profit. Consistent with this stream of research, we also consider whether the firms can profit from performing BBP.

## 2.2. Customers’ anticipated regret behavior

This research builds on the empirical and experimental evidence that customers may regret their previous purchase decisions (Kahneman and Tversky, 1983; Landman, 1987). Specifically, this research contributes to the stream of literature on customers’ anticipated regret and implicates both customers’ choices and firms’ decisions. For example, Nasiry and Popescu (2012) investigate the effect of anticipated regret in the context of advance selling. According to the study, advance purchase may trigger action regret whereas delay purchase may cause inaction regret. The study shows how firms should optimally respond to customer regret and also identifies the conditions which the firms should not advance sell. Diecidue and Rudi (2012) also study dynamic purchase decisions in the context of forward purchase and spot purchase, and find that customers are more likely to buy forward when they are more averse to hesitator regret. Further, customers would delay their purchase decisions when customers are more averse to buyer regret. This stream of literature examines sales and pricing decisions in an advance selling context. By contrast, we investigate the impacts of customers anticipated regret on price discrimination.

Another stream of literature studies the influences of customer regret on price competition, quality innovation, and product-line decisions. Jiang et al. (2017) examine the impact of customers’ anticipated regret in a market, in which an incumbent firm faces an entrant that offers an improved product with a new feature. They show that firms’ profits can either increase or decrease. In addition, product innovation can either be fostered or hindered in the presence of anticipated regret. Zou et al. (2020) consider two types of customers’ regret in the context of quality-differentiated products, and show that these two types of regret have different effects on firms’ product-line decisions. In particular, over-purchase regret lowers the firm’s profit whereas under-purchase regret can benefit the firm if consumers’ over-purchase regret is weak. Yang et al. (2021) investigate the impact of anticipated regret on the remanufacturing strategies of an original equipment manufacturer (OEM) and identify the conditions under which the OEM should remind customers to pay attention to anticipated regret. In this research, we also consider price competition between firms when consumers have regret concerns. However, contrary to existing studies, the goal of this research is to investigate the impact of customer regret on firms’ pricing strategies between current and new customers. Thus, paying customer to stay or switch under the effects of anticipated regret is the main contribution of this research.

The stream of literature that considers two-period dynamic pricing with anticipated regret customers also relates to our research. Kuang and Ng (2018) consider a firm selling two substitutable products over two periods, and investigate the impact of valuation uncertainty and customers’ anticipated regret on customers’ purchasing decisions, firms’ prices and pricing strategy. They show that firms may need to lower the first period selling price in response to customers’ anticipated regret behavior, and price commitment pricing strategy dominates dynamic pricing strategy. Similar to their study, we also build a two-period model that incorporates customers’ anticipated regret. However, we consider competition between two horizontally differentiated firms selling nondurable products. Further, we also consider the impact of customers’ anticipated regret behavior in the second period on the firms’ first period pricing strategy. By contrast, we show that firms can either increase or decrease first-period sales prices in anticipation of customers’ regret behavior.

## 2.3. Switching cost

Our research also relates to the stream of literature on switching cost (see Klemperer (1995) for a comprehensive review, and Farrell and Klemperer (2007) for extended surveys). A switching cost occurs due to a customer’s desire for compatibility between his current and previous purchase. Such cost might be physical, informational, artificially created, and even psychological (Klemperer, 1995). Dubé et al. (2009) find that equilibrium prices fall with switching costs, which challenged conventional wisdom that switching cost causes markets to be less competitive. Keskin and Taskin (2015) investigate how switching cost affect a cloud computing firm’s pricing strategies. Cabral (2016) finds that switching cost can increase the market power of a seller over locked-in customers, and increase competition for new customers. Nan et al. (2019) analyze a cloud service provider’s optimal pricing strategy in an incumbent entrant setting where users face upgrade cost and switching cost. Our research differs from this stream of research by focusing on customers’ anticipated regret on firms’ pricing strategy, which in turn affects consumers’ switching decision and firms’ profits. We further extend our model by considering switching cost to verify the robustness of our results.

## 3. Model formulation and assumptions

We consider a two-period model of a duopoly in which horizontally differentiated firms, A and B, sell a product with a base value, . Without loss of generality, we assume that the value of  is sufficiently high so that all customers in a market make a purchase. Customers are uniformly distributed on a Hotelling line with range, and both firms are located at the opposite ends of a linear city. The firms are symmetric and the marginal cost of producing a product is normalized to zero. All notations used in this paper are summarized in Table 1.

Table 1. Notations

|  |  |
| --- | --- |
| Parameters | |
|  | Customers’ base value for the product which is sufficiently high so that the market is fully covered. |
|  | Transportation cost when the consumer experiences a mismatch dis-utility. |
|  | A customer’s location on the line. |
|  | The location of the marginal customer who is indifferent between buying from firm A and firm B in the first period. |
|  | The location of the marginal customer who is indifferent between buying from firm A and switching to buy from firm B. |
|  | The location of the marginal consumer who is indifferent between switching to firm A and staying with firm B. |
|  | Customers’ switching-purchase regret. |
|  | Customers’ repeat-purchase regret. |
|  | Customers’ expectation about firm A’s poaching prices in the second period. |
|  | Customers’ expectation about firm B’s poaching prices in the second period. |
|  | Firms’ discount factor. |
|  | Customers’ discount factor. |
|  | Switching cost. |
|  | Firm A’s profit in the second period. |
|  | Firm B’s profit in the second period. |
|  | Firm A’s total profit in the two periods. |
|  | Firm B’s total profit in the two periods. |
| Decision variables | |
|  | Sales price offered by firm A. |
|  | Sales price offered by firm B. |
| Subscripts |  |
|  | Prices charged to repeat customers. |
|  | Prices charged to new customers. |

Customers purchase at most one unit of product in a period, and their location on the line represents the ideal product for them. Let  represents the transportation cost when the consumer experiences a mismatch dis-utility. A customer’s location on the line is denoted by . Therefore, the utility that a customer at  consumes product A at price  is , and the utility that a customer purchases from firm B at price  is .

In the first period, the two firms simultaneously set prices denoted by  and , and customers make purchase decisions between the two firms. In the second period, the two firms can differentiate between their own or competitor’s customers based on customers’ purchase history in the first period, and can offer different prices to repeat and new customers. The different prices charged to repeat and new customers are public information, and both respective customer groups know that they are offered with different prices (Li, 2018, 2021; Li and Jain, 2016; Wang et al., 2020). Prices charged to repeat customers are denoted by  and , and prices charged to new consumers are denoted by  and , respectively. Customers would anticipate potential post-purchase regret when making their purchase decisions in the second period, and encounter different pricing strategies from firms which encourage them to switch. At the time of the purchase in the second period, customers are uncertain in their valuations of the competitor’s product. For example, a customer who switches to the other brand may later find that the new brand is not as good as the previous brand. Consequently, she will experience regret for not making a repeat-purchase of the previous brand. Similarly, a customer who makes a repeat purchase of the same brand may later find positive comments from those who have switched to new brand. Thereafter, she may also experience regret for not switching to the new brand. Customers’ regret experience happens ex post while their purchase decision is ex ante optimal. Therefore, customers who make purchase decisions in the second period would anticipate the disutility from anticipated potential post-purchase regret.

Consistent with the literature, we shall use linear regret term in the customer utility function to model customers’ anticipated regret (Syam et al., 2008). We use  to denote the customers’ switching-purchase regret, and  to denote the customers’ repeat-purchase regret (Jiang et al., 2017). Note that the parameters of customers’ anticipated regret (i.e.,  and ) are uncorrelated with the parameter  though they both can lead to a mismatch dis-utility. To focus solely on the impact of anticipated regret, we first assume that firms and consumers do not discount their second-period payoff, and there are no switching costs. However, in Section 5, we will incorporate discount factor and switching costs into the model.

Before proceeding, we present the equilibrium without BBP (i.e. no price discrimination between existing and new customers) as a benchmark to measure against the effects of BBP and anticipated regret. In that case, the two-period game without BBP becomes a recurrence of a static game. Then, the problem solved in the first period also applies to the second period. In the first period, the location of a marginal customer who is indifferent from between buying from firm A and firm B is .  can be obtained from . Then, we have . The profit for the two firms is  and . The equilibrium results can be obtained by solving the first-order condition of the two profit functions. We summarize the equilibrium of the model in Proposition 1.

**Proposition 1 (Equilibrium without BBP).** Without BBP, each of the two firms serves half of the market and simultaneously charges a price of  in each period. The two firms’ total profits over the two periods are .

Proposition 1 shows that, in the case without BBP implementation, the price charged by the two firms is only affected by customers’ transportation cost when they incur a mismatch dis-utility as the two-period game becomes a recurrence of a static game. Besides, the market is divided equally between the two firms and each firm serves half of the market.

## 4. Main model: Behavior recognition and anticipated regret

For situations where firms perform BBP and consider customers’ anticipated regret, we can solve the two-period game backwards.

### 4.1. Characterization of Equilibrium

*The second period*. In the second period, customers’ purchase history is available for firms. Firms equipped with such data have incentives to charge different prices to repeat and new customers. In general, firms would offer lower prices to new customers which encourage customers to switch. However, customers would experience the disutility from anticipated potential post-purchase regret when making purchase decisions in the second period. Figure 1 depicts customers’ choice patterns over the two periods. In equilibrium, high-valuation customers located near the two firms would make repeat purchase, whereas low-valuation customers located near the center would switch to the other firm.

Figure 1 Customer choices in periods 1 and 2

Let  denote the location of the marginal customer who is indifferent between buying from firm A at price  and switching to buy from firm B at price . Customers with anticipated regret would consider the possibility of repeat-purchase regret and switch-purchase regret when making purchase decisions. Therefore, the customer located at  is characterized as follows:

 (1)

The left-hand side (LHS) is the utility of buying from firm A at the price  as a repeat customer. Repeat customers would experience repeat-purchase regret after repurchasing the product from same brand but ex post find that they would have gained a higher utility if they had switched to the other brand, and the magnitude of such regret is . The parameter represents the strength of repeat-purchase regret with range . If , repeat-purchase regret does not exist and influence customers’ purchase decision. For now, we assume that all customers are homogeneous in repeat-purchase regret, but we will investigate how firms’ strategy changes with respect to varying degree of repeat-purchase regret.

The right-hand side (RHS) is the utility of switching to firm B to buy product B at price . If customers regret their switching purchase decisions, they would experience switch-purchase regret, and the magnitude of such disutility is . We also assume that all customers are homogeneous in switch-purchase regret with range .

From (1), it follows that

 (2)

If, repeat-purchase regret and switch-purchase regret concerns are absent and customers’ consumption utility is not affected by both types of regret.  would be reduced to , which is the same as the conventional BBP model. We can see that if other parameters remain unchanged,  shifts  to the left; i.e., the direct effect of repeat-purchase regret is to encourage more customers to switch. However,  shifts  to the right, and the direct effect of switch-purchase regret is to encourage more customers to stay. Besides,  and  also affect the repeat and new customers’ purchase prices. Therefore, the total impact of  and  on staying or switching will also rely on how anticipated regret affect firms’ optimal pricing strategies, which in turn affect their decision to stay or switch. We will examine the overall total effect of anticipated regret on customers’ staying or switching decision after solving for the optimal prices.

Similarly, let  denotes the location of the marginal consumer who is indifferent between switching to firm A and staying with firm B. Thus, we have

 (3)

 (4)

The two firms’ second-period profits consist of profits generated by selling to repeat and new customers. Hence, the profit functions for the two firms in the second period are

 (5)

 (6)

The second-period sales prices are , , , .

*The first period*. The marginal consumer located at  is indifferent between buying from firm A and firm B in the first period. This customer will rationally take his switching choice in the second period into consideration. Therefore, customers’ purchase decision in the first period is not only determined by the sales prices in the first period, but also determined by the poaching prices they will expect in the second period. Let  and  denote customers’ expectation about firms’ poaching prices in the second period. We can write that

 (7)

By rational-expectation conditions, i.e., , and , we have

 (8)

The two firms set prices  and  to maximize the total profits over the two periods. Hence, the profit functions of the two firms are

 (9)

 (10)

The equilibrium outcome can be obtained by solving first-order conditions with respect to  and . Proposition 2 summarizes the pure-strategy equilibrium outcomes.

**Proposition 2 (Equilibrium with BBP and anticipated regret).** When the two firms invest in BBP and customers have anticipated regret, the first-period sales prices are , repeat-customer retail sales prices are , and new-customer retail sales prices are . The two firms’ total profits are The marginal customers are at , , .

### 4.2. Structural Results and Comparative Statics

In this section, we analyze the properties and market dynamics with respect to the key parameters such as repeat-purchase regret and switch-purchase regret. We only analyze the results from firm A’s perspective, since the equilibrium results for the two firms are symmetric. In order to untangle the impacts of repeat-purchase regret and switch-purchase regret, we investigate three different cases: (1) ; (2) ; and (3) .

**4.2. 1. Case of** 

This case arises from the situation in which customers may have mediocre experience with their current product and hence are more averse to repeat purchase regret. We first analyze the impacts of the repeat-purchase regret on firms’ second period pricing strategies, customers’ switching behaviors and firms’ second period profits. To avoid trivial discussions, in the following, we assume that.

**Proposition 3 (Paying customers to switch or stay).** Prices charged to existing and new customers are related as follows: under the condition, while under the condition.

Proposition 3 indicates an important implication of this research, that is, paying customers to switch may not always hold when customers have anticipated repeat-purchase regret. Much of the BBP literature suggests that firms should always reward new customers with lower prices to elicit switching behavior. However, our results suggest that firms should reward repeat purchase customers when customers’ repeat-purchase regret concerns are sufficiently high. The two firms should maintain their traditional policy of rewarding new customers with lower prices when customers’ repeat-purchase regret is small. However, when customers’ repeat-purchase regret becomes large, firms should reward existing customers. This is because customers’ repeat-purchase regret concerns decrease customers’ utility of buying the same brand over the two periods. To mitigate the negative impact of repeat-purchase regret, firms should lower the prices charged to existing customers and increase the prices charged to new customers.

**Proposition 4 (Second-period pricing and switching).** As customers become more averse to repeat-purchase regret (i.e.,  increases), second-period prices charged to repeat customers should decrease whereas prices charged to new customers should increase. As  increases, more customers will switch.

Intuition suggests that customers’ repeat-purchase regret concerns constrain the degree to which firms can charge current customers, and increase the degree to which firms can charge new customers. This intuition is valid. Any high prices charged to existing customers further decreases existing customers’ willingness to buy from the same firm. Firms have to lower the prices charged to existing customers and raise the prices charged to new customers in order to mitigate the negative impact of price discrimination. As customers’ repeat-purchase regret becomes stronger, firms have to change their current pricing strategy and offer lower prices to existing customers.

Firms’ traditional BBP strategy is to charge new customers at a price lower than repeat customers. The rational of this pricing strategy is to encourage customers to switch. Anticipating customers’ aversion to repeat purchase regret, firms have to change their pricing strategy from rewarding new customers to rewarding current customers. However, the strategy of decreasing prices cannot prevent existing customers from switching to the other firm. The marginal customer who was indifferent between staying and switching, but with repeat-purchase concerns would prefer to switch because the utility of staying decreases with repeat-purchase regret concerns. Repeat-purchase regret comes from the plain or mediocre experience of the existing products. Therefore, customers would anticipate a possible mediocre experience from repurchasing the existing product even though they are uncertain about the valuation of the product from the other firm and they can pay lower prices for the same product. The savings obtained from buying the same product at a lower price cannot outweigh the disutility of repeat-purchase regret that encourages switching. As a result, stronger repeat-purchase regret concerns would cause more customers to switch to another firm, even though they have to pay higher prices for the switch.

The two firms’ second period profits are a U-shape curve with respect to repeat-purchase regret, . However,  ranges from  to .

**Proposition 5 (Second-period profits).** The two firms’ second-period profits and customers’ repeat-purchase regret are related as follows: (1) the two firms’ second period profits first decrease and then increase with customers’ regret concerns if , the two firms’ second period profits decrease under the condition , and the two firms’ second period profits increase under the condition ; and (2) the two firms’ second period profits decrease with repeat-purchase regret if .

One common finding in the BBP literature is that a firm applying BBP would charge lower prices and earn less profits in the second period than in the case without applying BBP (Fudenberg and Tirole (2000); Zhang (2011)). By contrast, according to Proposition 5, customers’ repeat-purchase regret concerns can either increase or decrease firms’ profits in the second period. Proposition 5 shows that the impacts of customers’ repeat-purchase regret on firms’ profits in the second period are highly dependent on the relationship between  and .  represents customers transportation cost or the mismatch dis-utility when customers purchase a product that is not ideal. The two firms’ second period profits first decrease and then increase with customers’ regret if  is small. From Proposition 3, firms’ poaching prices should be lower than repeat-customer prices when , while firms would change their pricing strategies to offer lower prices to existing customer when customers’ repeat-purchase regret is sufficiently high (i.e., ). This implicates that firms can benefit from rewarding repeat customers when customers have repeat-purchase regret concerns and customers’ transportation cost is small. Traditional BBP pricing strategy of offering lower prices to new customers to elicit switching may not be an optimal strategy for firms when customers have anticipated repeat-purchase regret. Further, rewarding old customers by offering them lower prices to retain them can increase firms’ profits when customers’ repeat-purchase regret is strong. However, when the dis-utility is large, the two firms’ second period profits decrease with customers’ repeat-purchase regret.

The impacts of repeat-purchase regret on first-period profits are the same as those on first-period prices. Hence, we only analyze the monotonity of first-period prices with respect to repeat-purchase regret.

**Proposition 6 (First-period prices).** First-period prices and customers’ repeat-purchase regret concerns are related as follows: (1) first-period prices increase with customers’ repeat-purchase regret if ; (2) first-period prices first decrease and then increase with customers’ repeat-purchase regret if , first-period prices decrease under the condition , and first-period prices increase under the condition ; and (3) first-period prices decrease with customers’ repeat-purchase regret concerns if .

While much of the BBP literature suggests that firms should charge higher prices in the first period to offset profits loss in the second period because of implementing BBP (Li and Jain (2016); Li et al. (2020)), this strategy still holds only under the condition when firms’ second-period profits decrease with customers’ repeat-purchase regret. However, when the firms’ second-period profits increase with customers’ repeat-purchase regret concerns, firms do not need decrease their first-period prices to increase profits. Further, from Proposition 6, we show that first-period prices increase with customers’ repeat-purchase regret when transportation cost is small. Whereas when the transportation cost is large, first-period prices decrease with customers’ repeat-purchase regret. When transportation cost is moderate, first-period prices can either decrease or increase with customers’ repeat-purchase regret.

**Proposition 7 (Total profits).** The two firms’ total profits and customers’ repeat-purchase regret concerns are related as follows: (1) the two firms’ total profits increase with customers’ repeat-purchase regret if ; (2) the two firms’ total profits first decrease and then increase with customers’ repeat-purchase regret if , the two firms’ total profits decrease under the condition , and the two firms’ total profits increase under the condition ; and (3) the two firms’ total profits decrease with customers’ repeat-purchase regret concerns if .

Customers’ repeat-purchase regret does not necessarily decrease firms’ total profits over the two periods. Firms can benefit from retaining those customers when their dis-utility linked with the products is small. However, when customers’ transportation cost is high, customers’ repeat-purchase regret can decrease firms’ profits. Firms’ total profits are closely related to their first-period and second-period price strategies in response to customers’ repeat-purchase regret. In the previous analysis, we have analyzed how firms’ pricing strategies change in the two periods. Hence, we omit the discussion in the section.

In the following, we analyze whether firms can benefit from retaining customers with repeat-purchase regret. We compare the firms’ total profits between the scenario with and without BBP. Since the impacts of customers’ repeat-purchase regret on firms’ total profits depend on the relationship between customers’ valuation of the products and transportation cost, we investigate three different cases: (1) , (2) , and (3) .

**Proposition 8 (with BBP VS without BBP).** Firms’ total profits with and without BBP are related as follows: (1) if , firms’ total profits with BBP exceed that without BBP when customers’ repeat-purchase regret is sufficiently strong; and (2) if   , firms’ total profits with BBP are lower than firms’ total profits .

The existing literature normally shows that firms’ total profits with BBP are lower than that without BBP. There are also some research suggesting that firms can benefit from investing BBP when some conditions are fulfilled. Hence, firms’ pricing strategies are situational on context. In general, firms’ have to offer lower prices in the second period to attract the competitor’s customers who have weaker preferences (i.e. bad experience with using its product), which weakens firms’ ability to extract surplus from these customers. As a result, firms’ profits from performing BBP are lower than profits without BBP. However, situations are completely different in certain context, e.g., customers with fairness concerns. Firms offer different prices to new and existing customers and charge higher prices on customers who have bought their product in the first period. However, customers may feel unfair if they have to pay higher prices which causes firms to decrease price differences charged to new and existing customers. Consequently, fewer customers would switch, allowing firms to benefit from implementing BBP.

Here, we show that when customers have repeat-purchase regret, the two firms could either benefit or not benefit from BBP. If customers’ transportation cost for the product is small, the two firms’ total profits with BBP are higher than that without BBP. The results follow from the discussions in the two periods. On the one hand, firms’ profits in the second period first decrease and then increase with respect to customers’ repeat-purchase regret when  is small. In addition, when firms change their rewarding strategy from rewarding new customers to rewarding old customers, firms’ second period profits increase with customers’ repeat-purchase regret. Firms’ pricing strategy which accounts for customers’ repeat-purchase regret can strengthen firms’ ability to extract surplus from their high-valuation customers and soften price competition. On the other hand, customers’ repeat-purchase regret concerns can also increase firms’ profits in the first period when the transportation cost is small. The increase in the first period’s profits can offset the decrease in firms’ second period profits which increases the total profits of both firms. By contrast, if customers’ transportation cost for the product is large, firms cannot benefit from performing BBP. The two firms’ total profits over the two periods decrease when customers’ transportation cost for the product is large. Therefore, firms cannot benefit from performing BBP when customers who have repeat-purchase regret also face large dis-utility when the products are not ideal. To better understand Proposition 8, we conduct a numerical example. The numerical results are shown in Figure 2. In Figure 2, we set  with , , and , respectively.



Figure 2 Profits vary with repeat-purchase regret

**4.2.2. Case of** 

This case arises from the situation in which customers had very positive experience linked to the old product or if they are more uncertain about the other brand and hence are more averse to switch purchase regret. In this part, we analyze the impacts of switch-purchase regret on firms’ pricing strategy, second period profits, first period profits and firms’ total profits over the two periods.

**Proposition 9 (Paying customers to switch or paying customers to stay).** When customers have switch-purchase regret, prices charged to new customers should always be lower than prices charged to old customers. Thus, paying customers to switch is always an optimal pricing strategy for firms.

Switch-purchase regret corresponds to the situation in which customers had a very positive experience linked to using the old products which makes them more reluctant to make switch purchase decisions. To entice the competitor’s customers to switch, firms should maintain their current rewarding strategy, and offer lower prices for new customers. In the previous analysis, we show that firms should offer lower prices to existing customers than to new customers when repeat-purchase regret concerns are large. By contrast, we show that firms serving customers with switch-purchase regret concerns should not change their traditional pricing strategy, and offer lower prices for new customers.

**Proposition 10 (Second-period pricing and switching).** As customers become more averse to switch-purchase (i.e.,  increases), second-period prices charged to repeat customers should increase whereas prices charged to new customers should decrease. As  increases, fewer customers switch.

Customers reveal their preferences through their first-period purchase decisions. For a firm, customers who bought its products in the first period have stronger preferences, while those who had not bought the products have weaker preferences for its product. In order to attract those customers with weaker preferences, firms have to offer them lower prices. Customers with switch-purchase regret would become more uncertain about the other brand and averse to making wrong switching purchase decisions in the second period, especially when their past experience linked to using the old product is very positive. To mitigate such effects, firms have to further lower prices charged to new customers. High-valuation customers (i.e. customers who have very positive experiences with using the old product in the first period), who make repeat purchase in the second period, do not have switch-purchase regret concerns. This can strengthen firms’ ability to extract surplus from them. Therefore, switch-purchase regret influences firms to further decrease their prices charged to new customers and increase prices charged to old customers.

In equilibrium, new customers pay lower prices than repeat customers for the product. When customers are more concerned about switch-purchase regret, new customers would pay much lower prices for the product. The positive effect of the firms’ pricing strategy is to encourage customers to switch. In general, price is the most important factor that impact customers’ purchase decisions, and when the poaching prices are sufficiently low, many existing customers would switch. However, in addition to this positive effect, opposing effects exist. Switch-purchase regret concerns reduce the incentives to switch to a competitor due to customers’ uncertainty about the new products and their positive experience from using the existing products. These uncertainties make repurchasing the same product more acceptable and switching less desirable. In this regard, customers’ switch-purchase regret concerns outweigh the incentives provided firms to encourage switching. As a result, strong customers’ switch-purchase regret concerns lead to more customers staying with the current firm even though they have to pay higher prices.

**Proposition 11(Second-period profits).** As customers become more concerned about switch-purchase regret (i.e.,  increases), second-period profits increase.

To understand this result, we need to understand the impact of customers’ switch-purchase regret concerns on firms’ pricing strategies. On the one hand,  causes firms to charge lower prices to attract new customers. This would decrease firms’ profits in the second period. On the other hand, an increase in  also causes firms to charge higher prices to repeat customers. This increases firms’ second period profits. In addition, as shown in Proposition 10, fewer customers switch as customers become more concerned about switch-purchase regret, and more customers would remain as repeat customers. Thus, decrease in the price for new customers is offset by the increase in price for repeat customers. A larger segment of existing customers will choose to repurchase the product from the same firm as  increases. Therefore, firms’ overall profits in the second period increase as  increases.

We only analyze the impact of switch-purchase regret on firms’ prices in the first period since the monotonity of first period profits with respect to switch-purchase regret is very similar to the impact of switch-purchase regret on firms’ prices in the first period.

**Proposition 12 (First-period prices).** First-period prices and customers’ switch-purchase regret are related as follows: (1) first-period prices first decrease and then increase with customers’ switch-purchase regret concerns if , they decrease under the condition , and they increase under the condition ; and (2) first-period prices increase with customers’ switch-purchase regret if .

The result, therefore, shows that customers’ switch-purchase regret not only increases firms’ second period profits, but also increase firms’ profits in the first period. The firms’ profits in the first period increase because of the increase in the firms’ prices in the first period. In a dynamic setting, firms have to increase first period prices to increase first period profits if they have profits loss in the second period. Firms anticipating customers’ switch-purchase regret concerns can strategically change their pricing strategies in response to customers’ behavior. However, we show that firms’ profits in the second period increase with customers’ switch-purchase regret concerns. From Proposition 10, we show that prices charged to new customers decrease with customers’ switch-purchase regret whereas prices charged to repeat customers increase with customers’ switch-purchase regret. Such pricing strategy requires firms to decrease first period prices when customers’ switch-purchase regret and transportation costs are small, and increase first period prices when customers’ switch-purchase regret is large.

**Proposition 13 (Total profits).** The two firms’ total profits and customers’ switch-purchase regret concerns are related as follows: (1) the two firms’ total profits first decrease and then increase with switch-purchase regret if , the two firms’ total profits decrease under the condition , and the two firms’ total profits increase under the condition ; and (2) the two firms’ total profits increase with switch-purchase regret concerns if .

When transportation cost is small, both firms’ total profits first decrease and then increase with customers’ switch-purchase regret concerns. When transportation cost is large, both firms’ total profits increase with customers’ switch-purchase regret. This result follows from discussions in the two separate periods. On the one hand, customers’ switch-purchase regret increases firms’ profits in the second period by increasing prices charged to repeat customers and reducing prices charged to new customers. On the other hand, customers’ switch-purchase regret can either increase or decrease firms’ first period profits. The firms’ first period profits first increase and then decrease with customers’ switch-purchase regret when transportation cost is small. However, when transportation cost is large, firms’ profits in the first period increase with customers’ switch-purchase regret. Therefore, both firms’ total profits experience similar changes with respect to customers’ switch-purchase regret concerns.

In the following, we analyze firms’ profits with BBP and without BBP under the impact of customers’ switch-purchase regret concerns. Firms’ total profits over the two periods can increase or decrease with respect to , but this does not affect firms’ overall pricing strategy. The conclusion is summarized in Proposition 14.

**Proposition 14 (with BBP VS without BBP).** Firms’ total profits with BBP exceed firms’ total profits without BBP when customers’ switch-purchase regret is sufficiently strong.

Previous research shows that firms serving customers with repeat-purchase regret may not benefit from investing BBP when transportation cost is sufficiently high. By contrast, we show that firms can benefit from performing BBP when serving customers with switch-purchase regret. On the negative side, the effect of switch-purchase regret is to make firms decrease prices charged to new customers. Poaching new customers by reducing prices weakens firms’ ability to extract surplus and decrease firms’ profits. On the positive side, firms increase prices charged to repeat customers when they have switch-purchase regret, which can increase firms’ profits obtained from repeat customers. In addition, as customers become more concerned about switch-purchase regret, fewer customers will switch. Fewer switch causes more customers to remain as repeat customers and they would pay higher prices for the same products. This can increase firms’ profits because firms can extract more surpluses from those customers who have high valuation of the product from using them in the first period. The positive outweighs the negative. As a result, firms’ total profits with BBP exceed that without BBP when customers’ switch-purchase regret concerns are sufficiently strong. We use a numerical example with  to better illustrate the results (see Figure 3). In Figure 3,  and , respectively.



Figure 3 Profits vary with switch-purchase regret

**4.2. 3. Case of** 

So far, we know that customers’ anticipated regret can have both positive and negative effects on firms’ profits depending on whether customers are more averse to repeat-purchase regret or switch-purchase regret. In the following, we analyze the joint effects of  and  on firms’ total profits. The effects of  and  on firms’ prices and profits in the first and second periods are very similar with Case of , and Case of . Hence, we only analyze the joint effect of  and  on firms’ total profits. The next Proposition investigates whether the two firms can benefit from investing BBP when customers exhibit repeat-purchase and switch-purchase regret simultaneously.

**Proposition 15 (with BBP VS without BBP).** If transportation cost for the product is small, then performing BBP is the optimal strategy when both regrets have the opposite values, e.g. repeat-purchase regret is large while switch-purchase regret is small. If transportation cost for the product is large, then firms can benefit from BBP when repeat-purchase regret is small and switch-purchase regret is sufficiently strong.

Figure 4 plots firms’ total profits with BBP and without BBP when  is small and large (i.e.,  and ), respectively. When customers’ repeat-purchase and switch-purchase regret are both sufficiently strong, it is obvious that firms should not implement BBP regardless of the transportation cost. When one of the regret concerns is large and the other is small, firms can benefit from BBP. From Proposition 8 and Proposition 14, we show that firms’ total profits with BBP exceed firms’ total profits without BBP when customers’ repeat-purchase regret is sufficiently strong or when customers’ switch-purchase regret concerns is sufficiently strong. However, when both regrets coexist and are sufficiently strong, firms cannot benefit from implementing BBP. Both regrets can increase firms’ total profits independently. However, their combined effect decreases firms’ total profits.

Figure 4 Profits vary with repeat-purchase regret and switch-purchase regret

## 5. Extensions

In this section, we relax some assumptions in the main model to verify the robustness of our results. In the main model, we assume that customers and firms do not discount their future payoff. In Section 5.1, we incorporate firm and customer patience into consideration. In Section 5.2, we consider customers’ switching cost.

### 5.1. Discount factor

It is reasonable to assume that firms and customers did not discount their future pay-off when the time distance between the periods is short. In the main model, customers strategically anticipate their future possible regret when making purchase decisions, and firms strategically set pricing strategy by taking customers’ regret concerns into consideration. We relax our assumption in the main model and further consider how firm and customer patience affect firms’ and customers’ decisions. Let  denote firms’ and customers’ discount factor, which represents how much firms or customers weigh second period utility in their first period decisions. The more strategic are firms or customers, the higher are . When , firms and customers are myopic. Firms’ and customers’ discount factor only affect their first period decisions, and the second period results obtained in the main model shall continue to hold. Therefore, we only analyze how firm and customer discount factor affect their first period decisions.

**Proposition 16.** Customer patience increases first period prices, while firm patience can either increase or decrease first period prices. When , firm patience does not affect first period prices.

Proposition 16 shows that firm and customer patience have completely different effect on first period prices. Customer patience can induce firms to increase their first period prices while firm patience can either increase or decrease firms first period prices. As customers become more patient, customers put higher weight on the purchase decisions and profits in the second period. Firms that offer lower prices to new customers cause customers to anticipate that they would receive a good deal in the second period which can increase their willingness to pay in the first period. Therefore, first period prices increase as customers become more patient.

Existing research shows that firm patience can also increase first period prices (Li, 2021). This is because high prices in the first period would lead to lower market share in the first period, which subsequently reduce profits in the second period. A firm which does not obtain larger market share would decrease second period prices to attract more customers from the competitor. This intensifies competition in the second period and decreases firms’ profits in this period. Therefore, firms strategically increase their first period sales prices to obtain lower market share in the first period when anticipating this effect.

We also show that firm patience can either increase or decrease firms’ first period prices. From previous analysis, we show that customers’ repeat-purchase and switch-purchase regret can both have a negative or positive effect on firms’ second period profits. Hence, firms serving these customers have to strategically consider customers’ regret when adjusting their first period prices.

### 5.2. Switching cost

Switching cost may incur when customers purchase the product from another firm. Such cost may come from physical learning cost or psychological losses linked with switching (Klemperer, 1995). We use  with range to denote customers switching cost. In this case, customer located at  becomes

 (11)

 (12)

The marginal customer located at  can be expressed by using similar method. We solve the main models and equilibrium outcomes which are presented in Appendix.

Customers who have regrets also incur switching costs when switching. Our analysis shows that switching costs complement firms’ pricing strategy on customers with switch-purchase regret concerns. Specifically, firms could further increase prices charged to repeat customers and decrease prices charged to new customers when they are facing switching costs. This would offer customers who have switch-purchase regret a better deal when they switch. Similar to serving customers with switch-purchase regret, switching cost further provides opportunities for firms to increase their profits in the second period. However, it is also useful to note the several distinctions between the impacts of switch-purchase regret and switching costs. Switch-purchase regret can either increase or decrease firms’ prices in the first period which highly depend on transportation cost. However, switching costs will always influence firms to decrease prices in the first period. This is because with switching costs, firms can charge higher prices from repeat customers. Offering lower prices in the first period causes more customers to be locked-in as firms’ old customers, and firms can later exploit them by charging them higher prices in the second period. Firms may need to adjust prices in response to customers’ different switching costs. All in all, switching costs do not affect our main results presented in the Propositions and these Propositions continue to hold.

## 6. Theoretical and managerial implications

Our research offers new insights on some management questions. First, we show that firms performing BBP do not necessarily yield lower profits. Profits can increase or decrease with customers’ anticipated regret. In other words, anticipated regret has a nonmonotonic impact on profits. The nonmonotonic relationship can be explained by–customers’ differing level of averseness to repeat-purchase regret and switch-purchase regret. Second, we show that firms should alter their BBP strategy in accordance with the anticipated regret exhibited by customers. Firms should reward existing customers by offering them lower prices when customers’ repeat-purchase regret concerns are sufficiently strong. Similarly, when customers have switch-purchase regret concerns, firms should continue charging lower prices to new customers. Finally, we find that the total profits for firms’ performing BBP exceed those without performing BBP only when one of the regrets is strong and the other is weak. In addition, the interaction of the two types of regret can have different effects on firms’ pricing strategy and profits.

The results of this research provide managerial guidance for firms serving customers with anticipated regret concerns. Anticipated regret can have a nonmonotonic effect on firms’ pricing and profits. Such nonmonotonic effect is caused by the varying degree of customers’ averseness to repeat-purchase regret or switch-purchase regret. Therefore, firms should take customers’ anticipated regret concerns into consideration when deciding which customer group should be rewarded or designing marketing campaigns focusing on influencing anticipated regret concerns to customers to maximize their profits.

## 7. Conclusion

The objective of this research is to understand how customers’ anticipated regret concerns influence firms’ BBP. Customers’ anticipated regret concerns are well-documented customer behaviors in the marketing literature. In general, firms should charge lower prices to new customers and higher prices to repeat customers when they have access to customers’ purchase history and exercise price discrimination. Such pricing strategy encourages customers to switch. However, customers are uncertain about their true needs and their valuations of the product before making a switch. Such uncertainty can only be realized after purchasing the product. Therefore, firms should consider customers’ anticipated regret concerns when performing BBP. Our analysis offers insights into firms’ BBP by accounting for two different types of anticipated regret: repeat-purchase regret and switch-purchase regret. Our analysis also addresses several questions that are of managerial significance.

Our analyses show that customers’ repeat-purchase regret and switch-purchase regret concerns have important implications on the firms’ pricing strategy and firms’ total profits. We analyze three different cases in order to untangle the impacts of repeat-purchase regret and switch-purchase regret. We find differing effects of repeat-purchase regret and switch-purchase regret on firms’ pricing strategy, customers’ behavior and firms’ profits.

First, switch-purchase regret concerns cause firms to maintain their current pricing strategy whereas repeat-purchase regret concerns cause firms to change their current pricing strategy. As customers become more averse to repeat-purchase regret, firms have to offer lower prices to repeat customers to retain them rather than offer lower prices to new customers to induce them to switch. Therefore, from the firms’ perspective, incentivizing customers to switch when they have switch-purchase regret concerns, while when customers exhibit repeat-purchase regret concerns, and incentivizing repeat customers to stay when they exhibit repeat-purchase regret is considered the optimal pricing strategy for firms.

Second, more customers switch as repeat-purchase regret increases whereas more customers stay when switch-purchase regret increases. This finding holds even after firms have adjusted their pricing strategy to consider customers’ anticipated regret. Charging lower prices to customers with repeat-purchase regret cannot induce them to stay. Similarly, switch-purchase regret concerns customers would choose to make repeat purchases even that would result in paying higher prices.

Third, when customers have repeat-purchase regret, both firms can only benefit from BBP when transportation cost for the product is small and the regret sufficiently strong. However, the firms can always benefit from BBP when customers have switch-purchase regret and it is sufficiently strong. Firms’ pricing strategy is not affected by transportation cost.

We also investigate the joint effects of repeat-purchase regret and switch-purchase regret on firms’ total profits. We find that anticipated regret can strengthen or weaken competition, which in turn can increase or decrease firms’ total profits. The two firms can benefit from performing BBP when some specific conditions are satisfied. We finally extend our model by considering discount factor and switching cost and find that the key results we obtained in the main model continue to hold, which verified the robustness of our results.

There are some limitations in this research that deserve future considerations. Firstly, we assumed that all customers were homogeneous in repeat-purchase and switch-purchase regret in initial model setting, though the impact of varying degree of repeat-purchase and switch-purchase regret on firms’ pricing strategy was investigated in the following analytical process. Therefore, a discussion of the heterogeneity of customers’ anticipated regret in initial model setting will be a promising direction for future research. Secondly, we only considered a one-echelon supply chain where the companies sell product to customers directly. In fact, multi-echelon supply chain prevails in practice. Hence, a discussion that strategically integrates supply chain channels with customers’ anticipated regret will be a possible future research direction. Finally, when customers’ anticipated regret is integrated into a multi-echelon supply chain, profit distribution among supply chain members considering the bargaining power of supply chain members shall be further addressed (Zhong et al., 2020).

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## Appendix A

*Proof of Proposition 1*

*Proof.* Without BBP, the two-period game is just a replication of a static game. Let denote customers’ indifference between purchasing A and purchasing B in each period. We can write that





The two firms profit functions are





By solving first order conditions, we have the equilibrium outcomes, , and . The two firms’ total profits over the two periods are .

*Proof of Proposition 2*

In equilibrium, we solve the two-period game backwards.

*The Second Period*. In the second period, let denote customers indifference between staying with firm A and switching to firm B, and denote customers indifference between switching to firm A and staying with firm B. We can write that





And 



The profit functions of the two firms in the second period are





First order conditions give the second period sales prices , , , .

*The first period.* The marginal customer located at  makes a first-period purchase to maximize total utilities over two periods. In this period, customers would rationally anticipate firms’ second period poaching prices. Therefore, customers purchase decisions are not only affected by the sales prices in this period, but also switching prices they would face in the second period. We can write that



By rational-expectation conditions, i.e.,, and , we have



The profit functions of the two firms in the two periods are





First order conditions give the equilibrium outcomes: ,. Substituting ,, we have, ,,,

*Proof of Proposition 3*

Before proving Proposition 3, we first summarize the equilibrium results in the case of. Since the equilibrium results for the two firms are symmetric, we only analyze from firm A’s perspective. In the case of , the two firms’ optimal decisions can be simplified as follows:

,, ，, , ,, .

To investigate firms’ pricing strategy i.e. paying customers to switch or paying customers to stay, we need to compare the prices charged to repeat and new customers, we have



To solve the roots of , we have or .  ranges from to. Based on the roots, it is easy to prove Proposition 3.

*Proof of Proposition 4*

We analyze the impact of  on firms’ second period prices and switching behavior. Taking the first-order derivative with respect to, we have







Hence, as  increases, prices charged to repeat customers decrease whereas prices charged to new customers increase. More customers switch as customers become more averse to repeat-purchase regret.

*Proof of Proposition 5*

To investigate the impact of  on firms’ second period profits, we have



To solve the first order conditions, we have or. It is difficult to analyze the monotonic of  with respect to . Therefore, we have the second order derivative of , we have . if ,while if . We assumed that with range. Hence,  increase with under the condition , and , and . Since , then always exist. We analyze the monotonic of with respect to by considering the following scenarios: (1) if , then under the condition , and decrease with ; (2) if , then decrease with under the condition , and increase with under the condition .

Proofs of Proposition 6, Proposition 7, and Proposition 8 are similar to that of Proposition 5, so we omit the proving process.

*Proof of Proposition 9*

Before proving Proposition 9, we first summarize the equilibrium results in the case of. We also analyze from firm A’s perspective. In the case of, the two firms’ optimal decisions can be simplified as follows:

,, ，, , ,, .

To investigate firms’ pricing strategy i.e. paying customers to switch or paying customers to stay, we need to compare the prices charged to old and new customers, we have



Hence, firms should always charge a higher price to old customers and offer a lower price to new customers.

*Proof of Proposition 10*

We analyze the impact of on firms’ second period prices and switching behavior. Taking the first-order derivative with respect to , we have







Hence, as increases, prices charged to repeat customers increase whereas prices charged to new customers decrease. Fewer customers switch as customers become more averse to switch-purchase regret.

*Proof of Proposition 11*

To investigate the impact of  on firms’ second period profits, we have



To solve the first order conditions, we have or. It is difficult to analyze the monotonic of  with respect to . Therefore, we have the second order derivative of , we have . If , then . If, then. We assumed that with range. Hence, increase with under the condition , and , and . It is easy to prove that . Therefore, the firms’ second period prices increase as increases.

Proofs of Proposition 12, Proposition 13, Proposition 14, and Proposition 15 are similar to that of Proposition 11, so we omit the proving process.

## Appendix B: Analysis of Extensions

### B-5.1Discount factor

Firm and consumer strategic behavior only affects its first period decisions, so outcomes pertaining to the second period in Proposition 2 continue to hold.

The indifferent consumer at  is





The total profits are





First order conditions give the equilibrium outcome: , 

The impact of on first period prices can be seen from below:





Hence, the firms’ first period prices increase with customer patience, while firm patience can either increase or decrease firms’ first period prices and when , firms’ first period prices do not affected by firm patience.

### B-5.2 Switching cost

When customers who switch face a switching cost , where , the marginal customer located at in the second period are





and





The second period profits are





The second-period sales prices are , , , 

The indifferent consumer at is





The total profits are





First order conditions give the equilibrium outcome: , , , . The marginal consumers are at , ,.

The impact of on prices and profits can be seen from below:

 ,,, .

From the first order derivative, it is easy to prove that the switching cost just enhance the impacts of switch-purchase regret on firms’ pricing strategy.

This completes the proof.