COMPETING ACROSS DIFFERENT CHANNELS FOR PERSONALIZED SERVICE

Lei Wang
Operations and Information Management Department
School of Business, University of Connecticut
Storrs, CT 06269
lei.wang@business.uconn.edu

Abstract

Previously, personalized service was provided by traditional channel. Now, they are available online by using web channel. Some unique features of a web channel make it different from a traditional channel. Previous research has studied the competition between a web channel and a traditional channel from various angles. In this paper, we develop a model to examine the impact of switching costs and customer heterogeneity on the competition between an online fitness service provider and a brick-and-mortar fitness club which are all forward looking. Fitness service is used for illustration purpose. Our model can be generalized to all types of the personalized service. Contrary to previous research, switching costs in our model are asymmetric between two firms. We present a two-period game based on the well-established Hotelling model of the market. In order to maximize their profits, both the online fitness service provider and the fitness club offer different prices to their own customers and customers who switch from its rival. The results show that, in the case that firms are forward looking but customers are myopic, no matter it is the online firm or the traditional firm, if it has marginal cost advantage, then the impact of switching cost can be neglected, and the firm with marginal cost advantage should always take the “pay to switch” strategy in order to maximize its total profit. Otherwise, if marginal cost advantage does not exist, firms have to choose their pricing strategy based on their marginal costs and switching costs. In the case that both the firms and customers are forward looking, the switching costs do play a role in the firm’s decision making. The optimal pricing strategies vary depending on both the switching costs and marginal costs.

Keywords: web channel, asymmetric switching cost, Hotelling model, customer heterogeneity
Introduction

Previously, firms have relied on traditional channels to develop their relationships with customers. With the rapid development of technology, the number, type, and function of web channels have been increasing over the last few years (Ba et al., 2010). The web, a technology-driven distribution channel, has some unique features that differentiate it from other traditional channels. These features are: customization, interactivity, multimedia abilities, global access unconstrained by time and space limitations, easy to access, and the ability to conduct transactions in real time (Viswanathan, 2005). Both businesses and customers benefit from this technology development.

Some services that can be provided face to face (more customized) traditionally are now being able to be provided online. In our paper, we define this group of services as personalized service. Some examples of these online services are fitness services (DailyBurn), financial planning services (Money Management, Ameriprise), legal services (LegalMarch, LegalZoom), and tutoring services (Tutor.com). The commonality among these services is that, traditionally, they are provided in a face-to-face way, but now, because of the development of technology, they can be provided online which is more convenient for the customer. In this paper, we focus on the fitness service, and study it as a representative of this group of personalized services.

In the past five years, the growth of traditional fitness facilities has slowed significantly, as have memberships in general, according to research from the International Health, Racquet and Sportsclub Association (IHRSA) (O'Rourke, 2011). Competition among fitness facilities has increased dramatically. Increasingly, alternative fitness offerings are creating options for consumers that don’t require monthly memberships or travel to a facility, such as online fitness providers. They entered the market to steal would-be weight losers from their bricks-and-mortar competitors (Mullman, 2010). Tony wells, the chief marketing officer at 24-Hour Fitness, says “Fitness isn’t just what happens when you are inside a gym” (Mullman, 2010). Jon Belmonte, chief media officer at Active Network, said “we believe studying the trends in what we are calling “social fitness” is worthwhile. It will help us and our partners to better understand the wants and needs of our extensive user base.” (Business Wire, 2011)

Analysts largely agree that because only 18% of U.S. adults go to a health club on a regular basis, it is possible that the online programs may help to expand the potential customer pools for health clubs by selling new customers on a more-active lifestyle (Mullman, 2010). Although no definitive research proves that traditional health club is being directly affected by alternative fitness options, it is clearly a trend to watch. It is unclear as of yet whether users will find that social aspect as satisfying as a health club, but, from the industry perspective, it is surely a good thing to have cheaper competitors in the market. Therefore, the traditional brick-and-mortar club needs to consider its competition not only with other traditional clubs, but also with these alternative fitness offerings.

As the industry rolls into 2011, more and more club operators are trying to incorporate the low-price model. However, instead of lowering prices to try to compete with the low-priced health clubs, DeCaire (2011) suggests that the local health clubs should raise their prices. According to an IHRSA's research manager (2011), “consumers were very price-sensitive with respect to health club membership dues.” It is obvious that the fitness clubs face the dilemma that whether they should charge high price or low price, since customers are very price-sensitive. Life Time Fitness, one of two publicly held chains, saw membership rolls increase during the third quarter, but the average “in center” revenue per membership declined by $104 during that time, meaning members are paying their dues but cutting back on personal training and other goods and services sold at the gym (Mullman, 2010). Therefore, finding the right price for their membership dues is not a trivial question for the traditional fitness clubs.

If you cannot afford a personal trainer in a gym, you can get enough exercise and nutrition information by surfing on the internet. The convenience and social support of surfing for fitness guidance online can make it as effective as working with a trainer in person (Bush, 2011). In this paper, we consider a web channel that delivers fitness services. The web channel and the traditional fitness club compete on their personal training counseling service. The benefits provided by a traditional fitness club can be two-fold: one, it provides fitness equipment, and two, it provides personal trainers who can advise on a suitable fitness plan for each customer. In contrast, an online fitness website can provide a fitness trainer and online tracking tools to track a customer's progress, but cannot provide training facilities. In our paper,
we focus on the competition between online and traditional fitness clubs with respect to the personal training services only. It is possible that the provision of online fitness services could induce customers to switch from traditional gyms, substituting equipment-based fitness activities with outdoor activities such as biking, running or walking. A customer who has been using a traditional gym and its in-house personal trainers could switch to an online fitness service and take up outdoor exercises (or work on a treadmill at home). Therefore, while at first glance online and offline fitness services don’t appear to be direct competitors, they could end up competing for customers who needs fitness counseling service. This may be reflected in the stagnating enrollment numbers for traditional fitness clubs (O’Rourke, 2011).

There is a growing body of research that studies competition between firms using web channels. However, most of this research analyzes web channels in isolation, focusing largely on their efficiency-enhancing features. Moreover, Bakos (1997) mentions that other salient features of electronic markets, such as switching costs, are crucial for their strategic analysis. Viswanathan (2005) studies the impact of network externalities and switching costs on the cross competition between different channels. Hitt & Frei (2002) prove that customer heterogeneity has a great impact on a firm’s profitability when they adopt different distribution channels.

For the personalized service, switching costs and customer heterogeneity are two crucial factors that impact service providers’ pricing choices to maximize their profits. Compared to switching from traditional channel to web channel, customers face a different switching cost when they switch from the web channel to the traditional channel. Previous marketing research has shown that there are differences between customers who choose a web channel and those who use a traditional channel (Hitt and Frei, 2002). As for fitness, different people have different exercise habits. Therefore, when we study the online fitness industry, switching costs and customer heterogeneity are two factors that must be considered.

Marketing research also studies price discrimination, which means that it is possible for a firm to charge one price to its loyal customers and a different price to customers who prefer its rivals’ products or service when all else are equal. Chen (1997) is the first one to study this price discrimination problem. He studies the case of “paying customer to switch”, which is also called “customer poaching” in Fudenberg & Tirole’s paper (2000). Instead of “paying customer to switch”, “paying customer to stay” is another possible strategy. Shaffer & Zhang (2000) study both of these two strategies when the demand of each firm and the switching cost are asymmetric.

Little research has been done on the competition across different channels after considering both customer heterogeneity and the asymmetric switching costs. The objective of this paper is to fill this gap by examining how an online service provider could position itself to maximize profits in light of its competition with traditional service providers using the online fitness industry as a special case. We build a two-period game model to study the competition between two firms that provide substitutable service. One firm uses a traditional channel, and the other uses a web channel. The two firms have to decide on how much they should charge to their rivals’ customers and how much they should charge to their own customers in order to maximize their total profits.

Therefore, the research questions addressed in this paper are:

- Given asymmetric switching cost and customer heterogeneity, how does indirect competition between firms using different marketing channels affect their pricing strategies to their own customers and customers who switch from its rival?

- Given three pricing strategies that are available for two firms: charging the same price to all its customers, charging lower price to its own customers, and charging lower price to customers who switch from its rival, which strategy is more profitable for an online firm? And which one is more profitable for the traditional firm?

The paper is organized as follows. First, we discuss the related literature in the second section. In the third section, detailed information is provided on how the two-period game model has been set up. The fourth section focuses on the model solving process for the two cases. We get several propositions from the results and show them in the graphs. The conclusion and suggestions for future extensions are provided in the last section.
Literature Review

Different cost function

The costs involved in providing services through traditional and web channels are different. Shapiro and Varian (1999) have argued that the cost structure of the web channel has the characteristic of large fixed cost but low marginal cost. On the other hand, the traditional channel has the characteristic of a large variable cost.

Most work on the profitability of web channel investment has emphasized potential cost savings through improved communication and coordination (Malone et al., 1987), or simply substitution of relatively fixed cost information technology assets for the variable cost of human interaction. Other research considered how revenues might be enhanced with web channels through price discrimination, product differentiation, or competitive advantages created by network effects (Clemons et al., 2002). Therefore, we need to pay attention to the difference in cost functions when we analyze the competition between these two channels.

Customer heterogeneity

Some research has focused on the issue of customer heterogeneity. In previous studies, customer characteristics have been treated as fixed or hypothesized not to vary between web and traditional channels. Hitt & Frei (2002) systematically examine how customer characteristics and behavior differ between traditional and web channels. Their results show that customers who use web channels are different in many ways from customers who use traditional distribution channels.

Customer characteristics and profitability might be different in web channels. Some of the customer characteristics can translate into differences in customer behaviors and, ultimately, have effect on profitability. An online channel may have direct effects on customer behavior that lead to greater firm profitability (Hitt and Frei, 2002).

Price discrimination

Price discrimination is used to segment customers based on their willingness to pay different prices (Mehra et al., 2010). Chen (1997) studies the “pay to switch” strategy and finds out that both firms and customers are worse if firms adopt the price discrimination. Instead of only focusing on the “pay to switch” strategy, Shaffer & Zhang (2000) also study the “pay to stay” strategy. They find that it may be more profitable for firms if they charge a lower price to its own customers and price discrimination can lead to lower prices to all customers. Instead of analyzing which strategy a firm should choose, Shin & Sudhir (2010) study when a firm should offer a lower price to its own customers rather than to the competitor’s customers. Sundararajan (2004) finds that if a firm can price-discriminate, it is always optimal for them to choose a strictly lower level of technology-based protection in a market with digital piracy.

Switching costs

The ability to retain and lock-in customers in the face of competition is major concern for online businesses (Chen and Hitt, 2002). Zhou & Zhu (2006) study the platform battle with lock-in strategy, and find out conditions under which the lock-in strategy can benefit or hurt platform providers. Promotion and reward programs are two other widely used methods to develop customer loyalty and lock in customers (Kim et al., 2001). Sun (2005) uses a dynamic structure model to study the promotion effect on a endogenous consumption. Raju et al. (1990) analyze how brand loyalty determines the optimal price promotional strategies used by firms in a competitive setting. Therefore, one more factor that is particularly important in the context of competition is switching costs, which are incurred by customers who switch from one firm’s product or service to other firms’. A rich stream of economic literature has focused on the impact of switching costs. Klemperer (1987 a, b) finds
that in the presence of switching costs, gaining market share becomes the goal of corporate strategy. Farrell & Shapiro (1988) analyze a duopolistic competitive model in the presence of customer switching costs and find that switching costs may encourage entry by new firms. These papers all assume that switching costs are exogenous. Researchers also study the impact of switching costs when they are endogenous (Demirhan et al., 2007).

Switching costs have been analyzed in the business as well as in the economics literature. Chen & Hitt (2002) develop an approach for measuring the magnitudes of switching costs and brand loyalty for online service providers. Viswanathan (2005) studies the impact of network externalities and switching costs on the competition across different distribution channels. Demirhan et al. (2007) investigate the impact of switching costs on IT investment strategies of firms. Mehra et al. (2010) analyze the impact of switching costs when competitive upgrade discount pricing is used.

In those studies, switching costs are taken as a given and same for both firms. The researchers just analyze the impact of them. However, in our study, the switching costs are asymmetric between two firms. In other words, switching cost from Firm A to Firm B is different from switching cost from Firm B to Firm A. Switching costs will not be taken as same, and simply analyzed for its effect. This is the major difference between our study and previous studies on switching costs.

Viswanathan's (2005) work is the most relevant paper. The author considered three types of firms and two types of customer, and assumed that online and traditional channels differ in just their channel flexibilities. In his paper, each firm sells a commodity product, but differentiates itself from its rivals by leveraging the characteristics of its own channel and innovating on the features of the buying experience associated with the products to offer different value propositions. The set of possible differentiated value propositions in each channel is modeled by representing the channel characteristics by a unit circle, and a firm’s choice of channel-related value proposition determines its location on the circle. As for switching costs, they assume that there are no switching costs in the traditional channel and switching costs incur between firms within a channel.

Our work is different in the following way. First, in our paper, we consider two types of firms, the online firm and the traditional firm. Each firm sells the similar fitness counseling services. As for switching costs, we assume that switching costs incur between firms across the two channels. Second, instead of assuming switching costs are the same for every customer, in our paper, we assume that people who switch from the online firm to traditional firm has a different switching cost compared to people who switch the other way.

Model

In this paper, the fitness service is just used for illustration purpose. Our model applies to each type of the personalized service, not just for fitness service. Therefore, our model does not account for the special characteristics of fitness clubs. Our model is based on the famous Hotelling model of the market (Hotelling, 1929). The market is characterized by customers who are uniformly distributed along a straight line of unit length in terms of their requirement and tastes. All the customers are utility maximizers and assumed to have a high reservation price, \( R \), in comparison with their total costs. High reservation prices ensure that customers always purchase a unit of service.

Customers are horizontally differentiated on the Hotelling line, it means customers do not have an agreement on which firm provides a better fitness counseling service. They will face a “fit” cost if a service does not perfectly match their requirement. We assume this cost is \( c \) and it is proportional to the distance between the location of the customer and the service being offered.

There are two already established firms in the market. At here, “already established” means they have been running for some time. Firm A is an online fitness provider. Firm B is a traditional gym. We assume that they provide the same fitness counseling services which have the same quality, so that firms can only compete on price, not quality, to maximize their profits. The marginal cost for Firm A’s is \( m_A \), and the marginal cost for Firm B is \( m_B \). Usually online firms have different marginal costs than traditional firm, therefore we assume that \( m_A \neq m_B \).
There are two periods in this model. In each period, both Firm A and Firm B provide fitness counseling service to their customers. At the beginning of each period, they simultaneously choose their pricing strategy. Firm A and Firm B are forward looking and they maximize their total profits from both periods. At the end of the first period, Firm A’s market share is \( \theta \) and Firm B’s market share is \((1-\theta)\).

At the beginning of the second period, Firm A offers \( P_{A2} \) to customers who stay with it in the second period and \( P_{AB} \) to customers who switch from Firm B. Similarly, Firm B offers \( P_{B2} \) to customers who stay with it in the second period, and \( P_{BA} \) to customers who switch from Firm A. We denote that there are \( \psi_A \) percentage of Firm A’s customers who switch to Firm B, and \( \psi_B \) percentage of Firm B’s customers who switch to Firm A. Therefore, at the end of the second period, four segments of customers exist in the market. The first segment (AC) indicates the customers who stay with Firm A; the second one (\( \psi_A \theta \)) indicates Firm A’s customers who switched to Firm B; the third one (\( \psi_B \ (1-\theta) \)) indicates Firm B’s customers who switched to Firm A; and the last one (DB) indicates customers who stay with Firm B.

Switching costs incur when customers switch from Firm A to Firm B or vice versa at the beginning of the second period. Switching costs are considered asymmetric. For Firm A’s customers, their switching cost to Firm B is \( S_{AB} \), and Firm B’s customers’ switching cost to Firm A is \( S_{BA} \). Customers who stay in the same firm have the same switching costs. Because the switching costs for people who switch from online fitness provider to the real gym is different from the switching costs for people who switch from the real gym to the online fitness provider, we assume that \( S_{AB} \neq S_{BA} \).

The notation for the basic model is shown in Table 1, for \( i, j = A, B \) and \( k = 1, 2 \).

<table>
<thead>
<tr>
<th>Table 1. Summary of the notations</th>
</tr>
</thead>
<tbody>
<tr>
<td>( c )</td>
</tr>
<tr>
<td>( \theta )</td>
</tr>
<tr>
<td>( P_{ik} )</td>
</tr>
<tr>
<td>( P_{ij} )</td>
</tr>
<tr>
<td>( m_i )</td>
</tr>
<tr>
<td>( S_{ij} )</td>
</tr>
<tr>
<td>( \psi_i )</td>
</tr>
<tr>
<td>( \pi_{ik} )</td>
</tr>
<tr>
<td>( \pi_i )</td>
</tr>
</tbody>
</table>
**Part one: firms are forward looking, but customers are myopic**

We assume that firms are forward looking, therefore, we first solve the second period and then solve for the first period. At the beginning of the second stage, Firm A offers $P_{A2}$ to customers who stay with it in the second period, and $P_{AB}$ to customers who switch from Firm B. At point C in Figure 1, an individual customer from Firm A’s is indifferent between Firm A and Firm B if:

$$P_{A2} + c(\theta - \psi_A, \theta) = P_{BA} + S_{AB} + c(1 - \theta + \psi_A, \theta)$$

Solving this equation, we get:

$$\psi_A = \frac{-c + 2c\theta + P_{A2} - P_{BA} - S_{AB}}{2c\theta} \quad (1)$$

Similarly, at point D in Figure 1, an individual customer from Firm B’s is indifferent between Firm B and Firm A if:

$$P_{AB} + S_{BA} + c(\theta + \psi_B (1-\theta)) = P_{B2} + c(1 - \theta - \psi_B (1-\theta))$$

Solving this equation, we get:

$$\psi_B = \frac{-c + 2c\theta + P_{AB} - P_{B2} - S_{BA}}{2c(-1+\theta)} \quad (2)$$

The profits for Firm A and Firm B in the second period are, respectively:

$$\pi_{A2} = P_{A2} \left( \theta - \psi_A, \theta \right) + P_{AB} \psi_B (1 - \theta) - m_A \left( \theta - \psi_A, \theta + \psi_B (1 - \theta) \right)$$

$$\pi_{B2} = P_{B2} (1 - \theta - \psi_B (1 - \theta)) + P_{BA} \psi_A (1 - \theta - \psi_B (1 - \theta)) + \psi_A, \theta$$

Therefore, in the second stage, Firm A and Firm B are trying to find a pair $(P_{A2}^*, P_{AB}^*)$, and $(P_{B2}^*, P_{BA}^*)$ to maximize their $\pi_{A2}$ and $\pi_{B2}$.

Solving the first order conditions, we get the following unique solutions which also satisfy the second order conditions:

$$P_{A2}^* = \frac{1}{3} \left( c + 2c\theta + 2m_A + m_B + S_{AB} \right) \quad (3)$$

$$P_{AB}^* = \frac{1}{3} \left( 3c - 4c\theta + 2m_A + m_B - S_{BA} \right) \quad (4)$$

$$P_{B2}^* = \frac{1}{3} \left( 3c - 2c\theta + m_A + 2m_B + S_{BA} \right) \quad (5)$$

$$P_{BA}^* = \frac{1}{3} \left( -c + 4c\theta + m_A + 2m_B - S_{AB} \right) \quad (6)$$

From these optimal solutions, we can obtain that all these prices are functions of switching costs, marginal costs, “fit” costs, and the first period market share.

The previous part described the second period of a two-period market in which second-period switching costs are created by first-period sales. We now consider the first period, in which consumers are not attached to any particular firm. In the first period, a myopic customer is indifferent between Firm A and Firm B if:
We find:

\[
\theta = \frac{c - P_{A1} + P_{B1}}{2c}
\]  

(7)

In the first period, Firm A and Firm B choose their first-period pricing strategy \((P_{A1} \text{ and } P_{B1})\) to maximize their total profits. We assume that the discounted rate is one. The total profits for Firm A and Firm B for both periods are:

\[
\pi_A = (P_{A1} - m_A)\theta + \pi_{A2}
\]

\[
\pi_B = (P_{B1} - m_B)(1 - \theta) + \pi_{B2}
\]

After solving the first order conditions:

\[
\frac{\partial \pi_A}{\partial P_{A1}} = 0, \quad \frac{\partial \pi_B}{\partial P_{B1}} = 0
\]

We find the optimal solutions for \(P_{A1}\) and \(P_{B1}\) which also satisfy the second order conditions:

\[
P_{A1}^* = \frac{1}{21}(21c + 18m_A + 3m_B - 4S_{AB} - 10S_{BA})
\]

\[
P_{B1}^* = \frac{1}{21}(21c + 3m_A + 18m_B - 10S_{AB} - 4S_{BA})
\]

We substitute these two optimal prices into equation (7) and get the market share at the maximum profits is:

\[
\theta = \frac{7c - 5m_A + 5m_B - 2S_{AB} + 2S_{BA}}{14c}
\]

Then, we substitute this market share to the equations (3)-(6), and get the optimal pricing strategies for Firm A and Firm B in the second period:

\[
P_{A2}^* = \frac{1}{21}(14c + 9m_A + 12m_B + 5S_{AB} + 2S_{BA})
\]

\[
P_{B2}^* = \frac{1}{21}(7c + 24m_A - 3m_B + 4S_{AB} - 11S_{BA})
\]

\[
P_{BA}^* = \frac{1}{21}(14c + 12m_A + 9m_B + 2S_{AB} + 5S_{BA})
\]

\[
P_{BA}^* = \frac{1}{21}(7c - 3m_A + 24m_B - 11S_{AB} + 4S_{BA})
\]

We know that \(\psi_A\) and \(\psi_B\) are proportions, which means they can only get value from [0, 1]. Therefore, we substitute these optimal pricing strategies and the market share into equation (1) and (2) to get the boundaries for \(m_A, m_B, S_{AB}\), and \(S_{BA}\):
We therefore have:

**Proposition 1:** There exists a unique Nash equilibrium in the mature market under price discrimination when firms are forward looking but customers are myopic. In this equilibrium, each firm’s prices are depending on customers’ “fit” cost, its own switching cost and marginal cost, and also its rival’s switching cost and marginal cost.

**Proposition 2:** when \( m_A \leq m_B \), Firm A can always charge a higher price to its customers who stay with it in the second period and a lower price to customers who switch from Firm B. But when \( m_A > m_B \), depending on different relationships between \( m_A, m_B, S_{AB}, \) and \( S_{BA} \), Firm A can choose different pricing strategies to maximize its total profit. Similarly, for Firm B, when \( m_A \geq m_B \), pay to switch is always a dominant strategy for Firm B. But when \( m_A < m_B \), depending on different relationships between \( m_A, m_B, S_{AB}, \) and \( S_{BA} \), Firm B has to choose different pricing strategies to maximize its total profit.

In the second period, for Firm A, the price difference between its own customers and the customers who switch from Firm B is:

\[
P_{A2} - P_{AB} = \frac{1}{21} (7c - 15m_A + 15m_B + S_{AB} + 13S_{BA})
\]

From this equation, we can observe that if \( m_A \leq m_B \), because \( S_{AB} \) and \( S_{BA} \) are always positive, the difference between \( P_{A2} \) and \( P_{AB} \) is always positive (\( P_{A2} - P_{AB} > 0 \)). It shows that in the second period, Firm A can always charge a higher price to its loyal customers and offer a lower price to attract Firm B’s customers to switch to Firm A. In other words, Firm A can always use “pay to switch” strategy to attract its rival’s customers and increase its own profit. Why is this strategy profitable for the Firm A? That is because, when two firms provide the same service, Firm A could enlarge its market share by inducing more Firm B’s customers to switch. Furthermore, when \( S_{BA} \) increases, which means it is getting harder and harder for Firm B’s customers to switch to Firm A, Firm A has to give a bigger discount to customers who switch from Firm B.

But if \( m_A > m_B \), we can obtain that (1) when \( S_{AB} + 13S_{BA} = 15m_A - 15m_B - 7c \), \( P_{A2} \) equals to \( P_{AB} \), which means Firm A should charge same price to its loyal customers and customers who switch from its rival. (2) When \( S_{AB} + 13S_{BA} > 15m_A - 15m_B - 7c \), \( P_{A2} \) is greater than \( P_{AB} \), which means Firm A should charge higher price to its loyal customers than customers who switch from its rival. (3) When \( S_{AB} + 13S_{BA} < 15m_A - 15m_B - 7c \), \( P_{A2} \) is smaller than \( P_{AB} \), which means Firm A should charge lower price to its loyal customers compared to customers who switch from its rival. Similar analysis can be applied to Firm B. The optimal pricing strategies for Firm A and Firm B given different \( m_A, m_B, S_{AB}, \) and \( S_{BA} \) are summarized in table 2 and table 3.
Table 2. Optimal pricing strategies for Firm A

<table>
<thead>
<tr>
<th>Pricing Strategy</th>
<th>$m_A \leq m_B$</th>
<th>$m_A &gt; m_B$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Charge the same price to all customers</td>
<td>$S_{AB} + 13S_{BA} = 15(m_A - m_B) - 7c$</td>
<td>$S_{AB} + 13S_{BA} &gt; 15(m_A - m_B) - 7c$</td>
</tr>
<tr>
<td>Pay to switch</td>
<td>$m_A \leq m_B$</td>
<td>$S_{AB} + 13S_{BA} &lt; 15(m_A - m_B) - 7c$</td>
</tr>
<tr>
<td>Pay to stay</td>
<td>$S_{AB} + 13S_{BA} &gt; 15(m_A - m_B) - 7c$</td>
<td>$m_A &gt; m_B$</td>
</tr>
</tbody>
</table>

Table 3. Optimal pricing strategies for Firm B

<table>
<thead>
<tr>
<th>Pricing Strategy</th>
<th>$m_A &lt; m_B$</th>
<th>$m_A \geq m_B$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Charge the same price to all customers</td>
<td>$13S_{AB} + S_{BA} = 15(m_B - m_A) - 7c$</td>
<td>$m_A \geq m_B$</td>
</tr>
<tr>
<td>Pay to switch</td>
<td>$13S_{AB} + S_{BA} &gt; 15(m_B - m_A) - 7c$</td>
<td>$m_A \geq m_B$</td>
</tr>
<tr>
<td>Pay to stay</td>
<td>$13S_{AB} + S_{BA} &lt; 15(m_B - m_A) - 7c$</td>
<td>$m_A \geq m_B$</td>
</tr>
</tbody>
</table>

From the above tables, it is clear that for both the online firm and traditional firm, when its own marginal cost is lower than or equal to its competitor’s marginal cost, it is possible for them to generate more revenue than its competitor. Furthermore, they could always use this part of revenue to offer a lower price to its competitor’s customers in order to induce them switch and enlarge the firm’s market share. In other words, “pay to switch” is always optimal for the firm. But if the firm’s own marginal cost is higher than its competitor’s marginal cost, “pay to switch” pricing strategy is not always optimal. A firm has to choose its pricing strategy based on the relationships between not only its own marginal cost and switching cost, but also its competitor’s marginal cost and switching cost. In order to show the results in a more clear way, we put the results for Firm A and B into the following graphs.

![Figure 2. Optimal Pricing Strategy for Firm A](image)

![Figure 3. Optimal Pricing Strategy for Firm B](image)
The implication of above results is that the ability to charge different prices is the key to these results, since it enables each firm to charge different prices to its loyal customers and the customers switching from its competitors. Depending on the actual values of \( m_A, m_B, S_{AB}, \) and \( S_{BA} \), the online firm and the traditional firm can choose different pricing strategies so as to maximize their profits, like “charging the same price”, “pay to switch”, or “pay to stay”. The common intuition for why a firm should always choose the “pay to switch” strategy is that, in doing so, it can generate profitable incremental sales without giving up any profit margin on its own customers. Shaffer & Zhang (2000) found that “pay to switch” is optimal when demand is symmetric and “pay to stay” is optimal when demand is asymmetric. The results in our study demonstrate that, no matter it is the online firm or the traditional firm, when its marginal cost is lower than or equal to its competitors’ marginal cost, switching costs do not affect the online and traditional firms’ pricing decisions. The two firms should always choose “pay to switch” strategy and offer its competitor’s customers a lower price. The impact of switching costs on the firms’ profits can be neglected. But if a firm does not have the marginal cost advantage, then switching costs do play a role in the manager’s pricing strategy decision. The manager should choose different pricing strategies based on its own marginal cost and switching cost and its competitor’s marginal cost and switching cost.

**Part two: both firms and customers are forward looking**

Now we consider that firms and customers are all forward looking, therefore, the results we get from the second period should remain the same. The assumption that customers are forward looking will only affect the results for the first period. Therefore, \( P_{A2}^*, P_{AB}^*, P_{B2}^* \) and \( P_{BA}^* \) for the second period are same as equations (3)-(6).

In the first period, a forward looking customer is indifferent between Firm A and Firm B if:

\[
P_{A1} + c\theta + P_{BA} + c(1-\theta) + S_{AB} = P_{B1} + c\theta + P_{AB} + c(1-\theta) + S_{BA}
\]

Solving this equation, we have:

\[
\theta = \frac{4c + m_A - m_B - 3P_{A1} + 3P_{B1} - 2S_{AB} + 2S_{BA}}{8c}
\]  

In the first period, Firm A and Firm B choose their first-period pricing strategies \( (P_{A1}, P_{B1}) \) to maximize their total profits. We assume that the discounted rate is one. The total profits for Firm A and Firm B for both periods are:

\[
\pi_A = (P_{A1} - m_A)\theta + \pi_{A2}
\]

\[
\pi_B = (P_{B1} - m_B)(1-\theta) + \pi_{B2}
\]

After solving the first order conditions, we find the optimal solutions for \( P_{A1}^* \) and \( P_{B1}^* \) which also satisfy the second order conditions:

\[
P_{A1}^* = \frac{1}{12} (16c + 9m_A + 3m_B - 4S_{AB} - 4S_{BA})
\]

\[
P_{B1}^* = \frac{1}{12} (16c + 3m_A + 9m_B - 4S_{AB} - 4S_{BA})
\]

We substitute these two optimal prices in period one into equation (10) and get the market share at the maximum profits is:

\[
\theta = \frac{8c - m_A + m_B - 4S_{AB} + 4S_{BA}}{16c}
\]
Then, we substitute this market share in first period to the equations (3)-(6), and get the optimal pricing strategies for Firm A and Firm B in the second period:

\[
P_{A2}^* = \frac{1}{24} (15m_A + 9m_B + 4(4c + S_{AB} + S_{BA}))
\]

\[
P_{AB}^* = \frac{1}{12} (9m_A + 3m_B + 4(c + S_{AB} - 2S_{BA}))
\]

\[
P_{B2}^* = \frac{1}{12} (3m_A + 9m_B + 4(c - 2S_{AB} + S_{BA}))
\]

Similarly, we get the boundary for \(m_A, m_B, S_{AB}, \) and \(S_{BA}\):

\[
0 \leq \frac{2}{3} - \frac{8(c - m_A + m_B + S_{AB})}{3(8c - m_A + m_B - 4S_{AB} + 4S_{BA})} \leq 1 \tag{11}
\]

\[
0 \leq \frac{-6m_A + 6m_B + 8(c + S_{AB} - 2S_{BA})}{3(8c + m_A - m_B + 4S_{AB} - 4S_{BA})} \leq 1 \tag{12}
\]

When both firms and customers are forward looking, we therefore have:

Proposition 3: There exists a unique Nash equilibrium in the mature market under price discrimination when both firms and customers are forward looking. In this equilibrium, each firm’s prices are depending on customers’ “fit” cost, its own switching cost and marginal cost, and also its rival’s switching cost and marginal cost.

Proposition 4: Depending on different relationships between \(m_A, m_B, S_{AB}, \) and \(S_{BA}\), Firm A and Firm B have to choose different pricing strategies to maximize their total profits.

In the second period, for Firm A, the price difference between its own customers and the customers who switch from Firm B is:

\[
P_{A2} - P_{AB} = \frac{1}{24} (8c - 3m_A + 3m_B - 4S_{AB} + 20S_{BA})
\]

From this equation, we can obtain that (1) when \(-4S_{AB} + 20S_{BA} = 3(m_A - m_B) - 8c\), \(P_{A2}\) equals to \(P_{AB}\), which means Firm A should charge same price to its loyal customers and customers who switch from its rival. (2) When \(-4S_{AB} + 20S_{BA} > 3(m_A - m_B) - 8c\), \(P_{A2}\) is greater than \(P_{AB}\), which means Firm A should charge higher price to its loyal customers than customers who switch from its rival. (3) when \(-4S_{AB} + 20S_{BA} < 3(m_A - m_B) - 8c\), \(P_{A2}\) is smaller than \(P_{AB}\), which means Firm A should charge lower price to its loyal customers compared to customers who switch from its rival. In the similar vein as above, one may find the optimal pricing strategy for Firm B. The optimal pricing strategies for Firm A and Firm B given different \(m_A, m_B, S_{AB}, \) and \(S_{BA}\) are summarized in table 4.
Table 4. Optimal pricing strategies for Firm A and Firm B

<table>
<thead>
<tr>
<th>Pricing Strategy</th>
<th>Firm A</th>
<th>Firm B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Charge the same price to all</td>
<td>(-4S_{AB} + 20S_{BA} = 3(m_A - m_B) - 8c)</td>
<td>(20S_{AB} - 4S_{BA} = 3(m_B - m_A) - 8c)</td>
</tr>
<tr>
<td>customers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pay to switch</td>
<td>(-4S_{AB} + 20S_{BA} &gt; 3(m_A - m_B) - 8c)</td>
<td>(20S_{AB} - 4S_{BA} &gt; 3(m_B - m_A) - 8c)</td>
</tr>
<tr>
<td>Pay to stay</td>
<td>(-4S_{AB} + 20S_{BA} &lt; 3(m_A - m_B) - 8c)</td>
<td>(20S_{AB} - 4S_{BA} &gt; 3(m_B - m_A) - 8c)</td>
</tr>
</tbody>
</table>

From this table, we observe that, based on different combinations of marginal costs and switching costs, firms should choose different pricing strategies to maximize their profits. The reason for this result is that customers are forward looking in the first period. If customers are forward looking, when they make purchasing decisions at the beginning of the first period, they will consider their utilities not only from the first period but also the second period. Switching costs may reduce the firms’ profits because forward-looking customers realize in the first period that they will be saddled with higher prices in the second period. Consequently, the firm must lower its price in the first period because of customers’ willingness to pay less for the service. Switching costs may also increase the affinity of the current customers of a firm to stay with that firm in the long run. Therefore, when the customers are forward looking, the impact of switching costs cannot be neglected and firms have to take into account its impacts when they make decisions on their pricing strategies.

Given the results in proposition 3 and 4, the online firm and the traditional firm should choose different pricing strategies based on the actual values of their switching costs and marginal costs. In the case that both firms and customers are forward looking, the results for the second period remain the same. But for the first period, since customers are also forward looking, when they make decisions, they not only consider the first period, but also the second period. In line with standard economic theory, forward-looking customers are assumed to form expectations about the firms’ second-period pricing behavior (including the fact that firms can price-discriminate in the second period), which are realized in equilibrium. Therefore, in the first period, customers will recognize any incentive of either firm to deviate in the second period and adjust their buying decisions according to either firm’s expected pricing strategies. The optimal pricing strategies for this case (where customers as well as firms are forward-looking) change a lot compared to the case where only the firms are forward looking. Under the assumption that both firms and customers are forward looking, the dominant strategies for each firm exist and vary depending on different pricing strategies according to their switching costs and marginal costs.

Conclusion

Nowadays, an increasing number of firms have been adopted the web channel to provide their services (Hitt and Frei, 2002). Firms have to face the competition not only within differentiated channels, but also across channels. The choice to use a web channel could influence a firm’s competitive actions, which have been found to influence the firm’s performance and profitability (Chi et al., 2008). However, little research has been done on this indirect competition when both the customer heterogeneity and asymmetric switching cost have been considered. In this paper, we studied the competition across different channels on personalized service. Fitness counseling service was used for illustration purpose. Our model was about the fitness counseling service between an online fitness provider and a brick-and-mortar fitness club. Two scenarios have been addressed in this paper. The first one is that firms are
strategic but customers are myopic, and the second one is that both the firms and customers are strategic. A two-stage model has been proposed to analyze the effect of customer heterogeneity and asymmetric switching cost on firms’ pricing strategy.

The two assumptions that we made in this paper were: first, the marginal costs for the online firm and traditional gym are different; second, the switching cost from the online firm to the traditional gym is different with the switching cost from the traditional gym to the online firm. In other words, the switching costs between these two firms are asymmetric. In the case that firms are strategic but customers are myopic, no matter it is the online firm or the traditional firm, if one of them has the marginal cost advantage, which means its marginal cost is lower or equal to its competitor’s marginal cost, it can always charge higher price to its loyal customers, which means the “pay to switch” strategy is always the optimal pricing strategy for it. But if marginal cost advantage does not exist, optimal pricing strategies for these two firms depend on the value of their marginal cost and switching costs. Therefore, the managerial implication of our finding is that firms should always offer lower price to its competitors’ customers if they have marginal cost advantage, and they can ignore the impact of the switching costs. Otherwise, when they make decisions on their pricing strategies, they have to consider both the marginal costs and switching cost. In the other scenario where both the firms and customers are strategic, there is no such marginal cost advantage existing for the online firm and traditional gym. Firms have to choose their pricing strategies based on the value of their marginal costs and switching costs.

In this paper, we only considered the effect of customer heterogeneity and asymmetric switching costs on the competition between the web channel and traditional channel. There are still some other factors we would like to consider in the future work. One possibility is the effect of network externality. Friends form some small communities or networks on these online fitness websites to motive each other, therefore, it would be very interesting to study the effect of network externality. Another possibility is the time effect on the switching cost. When customers get more and more involved in these online fitness websites, as time increases, their switching costs should also increase. Therefore, another interesting extension is to analyze how time change can affect customers’ switching costs.

Acknowledgements

The author would like to thank Jan Stallaert, Ramesh Sankaranarayanan, anonymous reviewers and the associate editor for helpful comments on earlier drafts of this paper.

References


