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Customer Relationship Management in Competitive Environments:

The Positive Implications of a Short-term Focus

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Abstract

Researchers and business thought leaders have emphasized that firms must think and act with a long-term horizon when managing customer relationships. We demonstrate that, in contrast to this widely held view, profits in competitive environments may be maximized when firms ignore the future and instead maximize period-by-period profits from customers. Intuitively, while a long-term focus yields more loyal customers, it greatly increases short-term price competition to gain and keep customers. Consequently, overall firm profits and customer lifetime value may be lower when firms directly maximize multi-period profits from customers. Specifically, we analyze a model with segment-level pricing where firms in a duopoly can choose between period-by-period and multi-period profit maximization and demonstrate that, in many cases, a symmetric focus on period-by-period profit maximization emerges as the Pareto-dominant Nash equilibrium. We extend the model in two directions. First, we demonstrate that this superiority of the short-term focus endures even when a revenue expansion effect applies – that is, when customer loyalty leads to enhanced revenues. Second, we examine the case where customers are strategic and incorporate the long-term implications of their choices into their decision-making. Here we demonstrate that it may pay for firms to be myopic even as customers are strategic. The focus on multi-period surplus makes customers less price sensitive in to price variations at the early stage of the game. Consequently, the focus on maximizing period-by-period profits enables the firms to charge higher upfront prices and leverage this lower price sensitivity into higher profits. Overall, our results highlight the paradox that, when it comes to managing customer relationships in competitive environments, a short-term focus may constitute the optimal long-term strategy.

Keywords: Customer relationship management, Game theory, Short-term strategy, Long-term strategy, Competition.

1. INTRODUCTION

The need to shift from a transactional to a relational approach in managing customer relationships has frequently been highlighted in recent times (Blattberg and Deighton 1996; Blattberg, Getz, and Thomas 2001; Rust, Zeithaml, and Lemon 2000; Dwyer, Schurr, and Oh 1987). Managers have been urged to invest in customers in the short run to reap the benefits in the long run, and ultimately, to move beyond a focus on quarter- or year-end profits and towards the adoption of a long-term view of customer relationships. Anchoring this view is the notion that shareholder value is enhanced when the long-term profitability of customers is maximized (Gupta and Lehman 2003).

While the literature on managing customer relationships has been expanding, it has not sufficiently examined how the presence of competition moderates the management of customer relationships. We address that issue in this paper. We demonstrate that, to maximize the long-term value of customers, firms in a competitive environment may be better off focusing on maximizing period-by-period (i.e., short-term) profits. Stated differently, and somewhat paradoxically, a *short-term* focus may constitute the optimal *long-term* strategy in competitive environments.

To demonstrate this result, we develop an analytical model of segment-level pricing. Two firms compete over two periods for customers. Customers fall into two segments, depending on their preference for the product of one firm or the other. Customers choose firms during period one – these choices are a function of the prices offered by those firms. In period 2, customers again choose between firms – but, customers who bought from one firm in period 1 and shift to the other incur a switching cost. The switching cost is distributed over the customers in each segment. On the supply side, the firms engage in segment-level pricing. Each firm can each adopt one of two strategies. First, a firm could decide to maximize period-by-period profits – we term this the short-term or ST strategy. Under this strategy, the firm ignores the implications of customer behavior in period 2 when making pricing decisions in period 1. Alternatively, a firm could decide to maximize multi-period profits – we term this the long-term or LT strategy. Under this strategy, the firm's pricing decisions in period 1 are designed with foresight into how those prices will affect the future behavior of customers in period 2.

Our key findings are as follows. First, when the innate preference of each segment for its favored firm is strong, then both ST-ST and LT-LT constitute Nash equilibria. In addition, the asymmetric strategy pairings (ST-LT) also constitute equilibria. However, profits to each firm under ST-ST are strictly higher than those under LT-LT, and the profits of at least one firm under ST-ST is strictly higher than what it would obtain under any of the asymmetric strategy pairings. That is, a symmetric short-term focus (ST-ST) constitutes the Pareto-dominant equilibrium of the game. Though the short-term focus commonly encountered in the field has been criticized (Dekimpe and Hanssens 1995; Keil, Reibstein and Wittink 2001) our findings suggest that this short-term focus can yield some unexpected benefits in a marketing context. The central intuition is that competing firms that maximize multi-period profits are concerned about the "shadow of the future" when deciding on their strategies in the short run. These firms recognize that capturing customers in the short-term can yield long-term benefits. However, in the race to capture customers, these firms are unable to hold back from aggressively bidding for customers. As a consequence, the competing firms over-invest in gaining and keeping customers, and compete away their potential future profits. We demonstrate that, in contrast, period-by-period profit maximization dispels the shadow of the future and reduces the compulsion to engage in intense short-term price competition. Consequently, the firms' overall profits can be higher under ST-ST.

In contrast, when the innate preference of each segment for its favored firm is relatively weak, then LT-LT constitutes the sole Nash equilibrium. Interestingly, in this case, profits to each firm under ST-ST are higher than those under LT-LT. However, under ST-ST each firm has the incentive to shift to a long term strategy and improve on profits if the other firm adopts a short-term focus. Therefore, ST-ST does not constitute a Nash equilibrium. On the other hand, neither do any of the asymmetric strategy pairings. Intuitively, when the innate customer preferences for the firms are weak and firms adopt asymmetric strategies, the firm that adopts LT sharply increases its profits by charging a price that is only slightly lower than that of the firm that adopts ST. Because preferences are relatively weak, this small price differential is sufficient to capture customers from the segment which prefers the firm that adopts ST, thereby crimping its profits. This firm prefers to move to a long-term focus itself, and consequently, symmetric long-term strategies (LT-LT) constitute the sole Nash equilibrium.

In practice, managers and firms are often myopic on account of career concerns or pressures from external entities, including the stock market. First, managers may tend to make decisions that yield short-term gains at the expense of long-term interests of shareholders in order to boost their reputation and wages earlier (Narayanan 1985). Further, the natural time horizon of managers is short, with more than 40% of managers and senior executives expected to leave their jobs within two years (*Business Week*, June 6, 2002). Finally, there is enormous pressure from financial markets to deliver on quarter-by-quarter earnings and growth targets. Our analysis suggests that this much-criticized short-term focus that is widely prevalent in practice may be beneficial in the context of managing customer relationships.

We extend the basic model in three directions. First, scholars and practitioners have held that long lived customers may be more profitable because they spend more with the firm (i.e., a "revenue expansion" effect may occur). Ostensibly, cultivating customers with an eye on the future would be more profitable here. We demonstrate that this argument is not necessarily correct in a competitive environment. While this effect does enhance the proverbial pot of gold at the end of the rainbow, when competing firms are focused on the long-term, it also increases the intensity of short-run competition to gain and keep customers. Correspondingly, profits under ST-ST remain higher and counter to intuition, the superiority of the short-term focus may be enhanced in the presence of revenue expansion effects.[1]

Second, the customers in our basic model are myopic or "non-strategic" – they do not consider the impact of current purchase decisions on future firm behavior and prices. Strategic customers are less attracted by current price cuts if it raises the possibility that firms may extract greater surplus in the future; therefore, this should increase switching costs and reduce short-term price competition (e.g., Klemperer 1987a). We show that this moderation of short-term competition does not necessarily render the long-term approach optimal. In contrast, and somewhat surprisingly, we find that the parameter region under which ST-ST is the Pareto-dominant equilibrium *increases* when customers are strategic. Intuitively, ST-ST ceases to be an equilibrium when one of the firm finds it optimal to undercut the other's price and gain customers in the short-term. The objective of the firm that undercuts in reducing short-term profits is that, in the future, it can leverage the switching costs that are invoked for the customers it has captured to increase its overall (two period) profits. However, strategic customers are forward-looking and take into account this potential "lock-in" due to switching costs. These customers have to be sufficiently compensated for the lock-in effect in order to induce them to switch away from the preferred firm. Consequently, a firm that moves to LT from ST-ST has to offer a price that is even lower than that offered when customers are non-strategic. This erodes overall profits.

Third, we briefly consider a model with both revenue expansion effects and strategic customers. Here we find that this combination can work in tandem to enhance profits under both ST-ST and LT-LT.

However, the together they (a) substantially increase the parameter space within which ST-ST is the Pareto-dominant equilibrium, and (b) substantially enhance profits under ST-ST.

Research related to the issues we study can be found in both marketing and economics. A first stream of literature has examined how the size and behavior of loyal and switcher segments affect competitive outcomes (Narasimhan 1988, and Raju, Srinivasan and Lal 1990). In markets with switching that are characterized by a mixed strategy equilibrium, Narasimhan (1988) argued that the periodic discounts encountered in competitive marketplaces may be interpreted as prices that fall below the upper limit of the price distribution. Further research in this area has considered the impact of other strategic variables that engender customer loyalty, including service (McGahan and Ghemawat 1994) and reward programs (Kim, Shi and Srinivasan 2001).

A second stream of literature has focused on how switching costs influence competition (e.g., Shilony 1977, von Weizsacker 1984, Klemperer 1987a, 1987b, Farrell and Shapiro 1988; Padilla 1992, Padilla 1995, Taylor 2003, Villas-Boas 2004a). The buyer's perception of the effectiveness of the relationship with the seller can engender switching costs (Dwyer, Schurr and Oh, 1987). When firms compete over multiple periods and customers have switching costs only in the last period, such costs may lessen long-run competition because the "locked-in" customers are less price sensitive. When customers can foretell that the firm with the larger market share will charge higher future prices, they are less sensitive to early price differences. Hence, firms may compete less even in the first stage compared to an identical market without switching costs (Klemperer 1987b).

A third related stream of literature has examined the implications of targeted (or customized) coupons and prices (e.g., Chen 1997; Fudenberg and Tirole 2000; Kopalle and Neslin 2003; Shaffer and Zhang 1995). A key finding here is that one-to-one promotions and reward programs lead to a prisoner's dilemma where each firm's profits are reduced by the costs of couponing, and are therefore unprofitable. When a firm can correctly classify its own loyal customers and switchers only with a certain degree of probability, price competition is softened and targeted marketing can be profitable (Chen, Narasimhan, and Zhang 2001). Likewise, when firms are asymmetric, such promotions may reduce prices but yet be profitable on account of market share gains for the larger firm (Shaffer and Zhang 2002). Similarly,

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[1] Reinartz and Kumar (2000, 2002) discuss why loyal customers may not be profitable for other reasons.

reward programs are profitable when they expand the market rather than capture a competitor's market share (Kopalle and Neslin 2003).

In a general setting where firms that compete over an infinite horizon with overlapping generations of customers can target their own customers with a different price, the steady-state prices depend on three factors (Villas-Boas 1999). First, poaching of customers lowers prices. Second, customer patience sensitizes them to current prices in any period, thereby sharpening price competition and leading to lower prices. Finally, when firms recognize that owning a large customer base will lead to intense poaching in the future, short-term price competition is reduced. When new customers enter a market each period, some of whom did not buy in the previous period, a monopolist finds it optimal to have price cycles (Villas-Boas 2004b).

Against this backdrop, the key contributions of our work can be summarized as follows. First, this is the first attempt to formally model short-term versus long-term competition in markets with switching costs. Whereas the literature has examined the implications of switching costs in a competitive environment, the choice of the temporal dimension of competition as a strategic variable has not been formally studied. The contribution is particularly relevant in the context of the existing championship by both researchers and practitioners of a long-term focus in managing customer relationships. We demonstrate that, in many cases, a short-term focus may be optimal in competitive environments.

Second, we examine the implications of a revenue-expansion effects that accrues when customers patronize a firm for multiple periods. This effect, which should ostensibly enhance the profits of the firm, has been highlighted in the literature as a key reason for adopting a long-term focus towards managing customer relationships. We demonstrate that this reasoning also needs to be examined critically in competitive contexts. Specifically, we find that such revenue-enhancement effects take on the shade of the "pot of gold" at the end of the rainbow. The rush to capture this pot of gold further intensifies competition when firms are focused on the long-term. Consequently, the gap between firm profits under ST-ST and those under LT-LT increases in the presence of revenue-expansion effects—that is, the superiority of the short-term focus is enhanced.

Finally, whereas the existing literature on switching costs (particularly Klemperer 1987a, 1987b) demonstrates that higher switching costs leads to lower upfront competition, we demonstrate that this moderation of competition does not necessarily strengthen the case for adopting a long term focus. In fact, as explained earlier, the region under which a symmetric short-term focus is the Pareto-dominant equilibrium increases when customers are strategic.

From a practical perspective, our work also provides some timely insights for managers. Many firms are now investing in customer relationship management (CRM) software, and shifting to a long-term approach in managing their customer base. This shift is frequently encountered in corporate statements – for example, Sears Holdings Corp pledges “to build a long term trusting relationship with our customers” (CEO’s 2005 Statement to Shareholders). Firms like Enterprise Rent-A-Car and the Vanguard Group are building customer satisfaction scores into their compensation plans towards motivating their employees to focus on long-run relationships. Other firms, including Nike, Cisco and Land’s End, have invested substantially in demand chain intelligence solutions to identify their best customers and tailor their marketing efforts aimed at them. However, a recent survey suggests that less than half of the companies that made such investments are satisfied with the corresponding business returns (Kroeker 2005). Further, shifting to a long-term focus may call for significant alternations in existing business strategy and operational processes. Before undertaking such a shift, a rigorous examination of its implications for profits is in order. In this paper, we explicitly model and compare the profitability of short-term and long-term foci for firm profits in a competitive environment.

The basic model is presented in §2. The equilibria that result when each firm can choose between a LT and ST focus are analyzed in §3. Revenue expansion effects are examined in §4. The implications of strategic customers are examined in §5. We conclude with §6.

2. THE MODEL

We study competition over two periods in a duopoly. The owners (or top management) of the competing firms consider whether to focus their managers on maximizing period-by-period profits or multi-period profits from customers – these strategies are denoted by ST (short-term) and LT (long-term), respectively.[2] We assume that all production costs are zero. There are two segments of customers in the market, and the base utility that any customer obtains from purchasing within this product category is

[2] For example, the owners could enforce a short term focus by rotating managers between periods. Likewise, the owners could enforce a long term focus by keeping the same managers in charge of the customer base across time periods and adopting metrics related to multi-period customer behavior (e.g., loyalty-based metrics) to evaluate those managers. As

unity. However, customers in segment A prefer firm 1's product and customers in segment B prefer firm 2's product. In the first period, when customers in segment A purchase from firm 1 (at a price of p_1), their surplus for that period is $(1+k-p_1)$; and when they purchase from firm 2 (at a price of p_2), their surplus is $(1-p_2)$. Likewise, when customers in segment B purchase from firm 2, their surplus $(1+k-p_2)$; and when they purchase from firm 1, their surplus is $(1-p_1)$. Therefore, k captures the difference in customer preferences for the products of the two firms.[3]

A customer who purchases from a firm in period 1 will incur a switching cost s if she purchases from the other firm in period 2. We assume that the switching cost s is uniformly distributed over the interval, [0,1] in both segments A and B. Each firm sets two prices in each period, one for segment A and one for segment B. Each customer purchases one unit either from firm 1 or firm 2, depending on which gives her higher surplus.

At the outset of period 1, the owners of each firm simultaneously decide whether their managers adopt short-term, i.e., period-by-period, profit maximization (ST) or multi-period profit maximization (LT). To implement ST, the firm could switch the managers across periods – this ensures that the manager during period 1 has no interest in the outcomes of period 2. Once chosen, we assume that these contracts are not renegotiated and, consistent with the literature, that the kind of contract (LT or ST) offered by a firm to the manager is observable to the competitor (Fershtman and Judd 1987, Sklivas 1987). Alternatively, to signal credible commitment to the announced strategy, a firm (say firm 1) could make a public announcement that links period 1 and period 2 prices. Specifically, the concern is as follows. Firm 1 may announce an ST strategy (which would involve relatively high period 1 prices). However, once firm 2 has also announced ST, firm 1 could secretly negotiate with its manager to so that lower prices are offered in period 1 in line with the LT strategy. In the face of the higher price set by firm 2, this deviation by firm 1 would lead an influx of customers from segment B that prefers firm 2. However, for such deviation to be profitable, firm 1 must be able to charge sufficiently high prices to customers in segment B in period 2 in order to leverage the potential switching costs incurred by those customers. Therefore, a deviation from ST-ST would lead to a lower price in period 1 and a higher price

long as the mechanisms adopted by the owners invoke the desired time horizon for decision making, the precise nature of those mechanisms is not important in the context of the model.

in period 2 to customers in segment B than would otherwise be charged, i.e., there is a significant temporal variance in prices. By publicly committing to keep the period 2 price within a certain range of the period 1 price, firm 1 can send a credible signal of commitment to the short-term strategy.

Customers respond to the first period prices by choosing the firm they buy from – this sets up the opening scenario for period 2 in terms of customer-firm pairings. Since period 2 constitutes the final period, by definition, the firms revert to single-period profit maximization at the outset of period 2. To summarize, the game sequence is as follows:

Stage 1: Firms offer ST or LT contracts to the risk neutral managers. If a firm chooses ST, it chooses a different manager for each period. If necessary, to signal credible commitment, the firm makes a public announcement regarding the relationship between period 1 and period 2 prices.[4]

Stage 2: Managers choose period 1 prices (one for segment A and one for segment B) to maximize ST or LT profits, in line with the provided incentives. At this point, customers are assumed to be non-strategic, i.e., they make decisions that maximize utility during the current period and disregard the future. Therefore, given the offered prices, customers purchase from the firm that offers them the highest utility during period 1.

Stage 3: Managers choose period 2 prices, following which customers again choose between firms.

We begin our analysis by first solving for the ST-ST case, where managers in both firms maximize period-by-period profits. Given that the base utility of each product is unity, we will assume that the differential preference parameter $k<1$. This will also ensure interior solutions and positive utility for some customers in each segment in each period in all the strategy configurations discussed below.

2.1 ST-ST Case

In period 1, because customers in either segment can buy from either firm and there are no switching costs, firms engage in Bertrand competition for each segment. Firm 1 will offer a price of k for segment A while firm 2 will cut its price for segment A to 0. Similarly, firm 1 will price at 0 for segment B and firm 2 will price at k for segment B. In equilibrium:

[3] To avoid corner solutions we assume that the differential preference parameter $k<1$.

[4] The specific relationship between period 1 and period 2 prices that would be required to signal commitment would vary depending on whether revenue expansion effects are present and whether customers are strategic. In all these cases, however, a firm can commit to a specific relationship between period 1 and period 2 prices that would enable credible commitment.

$$
\begin{aligned}
p_{11}^{A} &= \pi_{11}^{A} = k;\;\; p_{21}^{A} = \pi_{21}^{A} = 0 \\
p_{11}^{B} &= \pi_{11}^{B} = 0;\;\; p_{21}^{B} = \pi_{21}^{B} = k \\
\pi_{11} &= \pi_{11}^{A} + \pi_{11}^{B} = k;\;\; \pi_{21} = \pi_{21}^{A} + \pi_{21}^{B} = k
\end{aligned} \tag{1}
$$

where p_{ij}^{m} (π_{ij}^{m}) is price (profit) of firm i $(i = 1,2)$ in period j $(j = 1,2)$ related to segment m $(m = A, B)$ and π_{ij} is the total profit accruing to firm i from both segments in period *j*. Simply stated, each firm leverages the differential preference parameter *k* to capture the segment that prefers it.

In period 2, the switching cost $\tilde{s}$ of the marginal customer in segment A who is indifferent between buying from firm 1 or firm 2 is determined by the expression below:

$$1 + k - p_{12}^{A} = 1 - \tilde{s} - p_{22}^{A} \tag{2}$$

Therefore:

$$\tilde{s} = p_{12}^{A} - p_{22}^{A} - k \tag{3}$$

Intuitively, those customers with a relatively low switching cost that satisfies $s \in [0, \tilde{s}]$ switch to firm 2 and the remaining customers with a relatively high switching cost that satisfies $s \in (\tilde{s}, 1]$ continue with firm 1. Consequently, from segment A, the demand for firm 2 is $\tilde{s}$ and that for firm 1 is $1 - \tilde{s}$. The profits that accrue to the two firms from segment A in period 2 are:

$$
\begin{aligned}
\pi_{12}^{A} &= p_{12}^{A}\left(1 + k - p_{12}^{A} + p_{22}^{A}\right) \\
\pi_{22}^{A} &= p_{22}^{A}\left(p_{12}^{A} - p_{22}^{A} - k\right)
\end{aligned} \tag{4}
$$

The first order conditions are derived by differentiating these profits with respect to the own prices and equating those differentials to zero. Solving the first order conditions, we obtain:

$$
\begin{aligned}
p_{12}^{A} &= \frac{2 + k}{3},\; p_{22}^{A} = \frac{1 - k}{3} \\
\pi_{12}^{A} &= \frac{(2 + k)^2}{9},\; \pi_{22}^{A} = \frac{(1 - k)^2}{9}
\end{aligned} \tag{5}
$$

Since the game is symmetric, we obtain the following outcomes for segment B:

$$
\begin{aligned}
p_{22}^{B} &= \frac{2 + k}{3},\; p_{12}^{B} = \frac{1 - k}{3} \\
\pi_{22}^{B} &= \frac{(2 + k)^2}{9},\; \pi_{12}^{B} = \frac{(1 - k)^2}{9}
\end{aligned} \tag{6}
$$

Adding the profits from segments A and B for each firm (from equations 5 and 6), the total period 2 profits of the firms are:

$$\pi_{12} = \pi_{22} = \pi_{12}^A + \pi_{12}^B = \frac{(2+k)^2}{9} + \frac{(1-k)^2}{9} \quad (7)$$

The total profits across periods 1 and 2 for each firm under ST-ST are (adding eqns. 1 and 7):

$$\pi_{ST-ST} = \pi_{11} + \pi_{12} = \pi_{21} + \pi_{22} = k + x + y \quad (8)$$

where:

$$x = \frac{(2+k)^2}{9};\ y = \frac{(1-k)^2}{9} \quad (9)$$

The term x in eqn. (9) is the period 2 of firm i from its high preference segment given that the segment purchased from firm i in period 1. Similarly, y is the period 2 profit of firm i from its low preference segment given that the segment did not purchase from firm i in period 1. Note that as the differential preference parameter k increases, both period 1 and period 2 profits to each firm increase. Therefore, total firm profits under ST-ST increase with k.

2.2 LT-LT Case

On account of Bertrand competition in period 1, firm 1 will obtain segment A and firm 2 will obtain segment B in equilibrium. Further, in equilibrium, firm 1's price for segment A will be higher than firm 2's price by k because segment A has a differential preference of k for firm 1's product. Firm 2's price will not be set lower than the level that makes the firm indifferent between obtaining or not obtaining segment A in period 1. Therefore:

$$p_{11}^A = p_{21}^A + k \quad (10)$$

We also have:

$$p_{21}^A + w = y \quad (11)$$

In eqn. (11), the left hand side is the total two-period profit to firm 2 (from segment A) if segment A bought from firm 2 in period 1. Here, define w as the period 2 profit of firm 2 from segment A (its low preference segment) if it obtains segment A in period 1. The right hand side of eqn. (11) is the total two-period profit to firm 2 from segment A if that segment did not buy from firm 2 in period 1. The intuition underlying eqn. (11) is as follows. Suppose firm 2 can push down its period 1 price to segment A (i.e., p_{21}^A) and obtain that segment in period 1. Then, it obtains a profit of w in period 2 from that segment – this profit would also capture the benefits of switching cost. However, firm 2 can also choose not to aggressively lower price to obtain segment A in period 1, in which case, it obtains a profits of *y* from that segment in period 2 (as detailed in eqn. 9). The argument captured in eqn. (11) is that firm 2 will not lower p_{21}^A below a certain threshold – instead, it could simply choose not to compete aggressively for segment A in period 1 and instead focus on the profits (*y*) obtained by capturing some fraction of that segment in period 2.

The two-period profits to the two firms from segment A are (with x and y as defined in eqn. 9):

$$\pi_1^A = p_{11}^A + x; \quad \pi_2^A = y \tag{12}$$

Next, with the objective of finding the value of *w*, we will solve for optimal pricing in period 2 of the game, under the assumption that firm 2 did capture segment A in period 1. Note that the switching cost ($\tilde{s}$) corresponding to the customer in segment A who is indifferent between purchasing from firms 1 and 2 in period 2 satisfies $1 + k - p_{12}^A - \tilde{s} = 1 - p_{22}^A$. This yields: $\tilde{s} = p_{22}^A - p_{12}^A + k$. Intuitively, customers from segment A with a relatively low switching cost that satisfies $s \in [0, \tilde{s}]$ switch to firm 1 and others with a relatively high switching cost that satisfies $s \in (\tilde{s}, 1]$ continue with firm 2. Consequently, from segment A, the demand for firm 1 is $\tilde{s}$ and that for firm 2 is $1 - \tilde{s}$. The profits that accrue to the two firms from segment A in period 2 are:

$$\begin{aligned} \pi_{22}^A &= p_{22}^A\left(1 - k - p_{22}^A + p_{12}^A\right) \\ \pi_{12}^A &= p_{12}^A\left(p_{22}^A - p_{12}^A + k\right) \end{aligned} \tag{13}$$

The first order conditions are derived by differentiating these profits with respect to the own prices and equating those differentials to zero. Solving the first order conditions, we obtain:

$$\begin{aligned} p_{22}^A &= \frac{2-k}{3};\ p_{12}^A = \frac{1+k}{3} \\ \pi_{22}^A &= \frac{(2-k)^2}{9};\ \pi_{12}^A = \frac{(1+k)^2}{9} \end{aligned} \tag{14}$$

Therefore:

$$w = \pi_{22}^A = \frac{(2-k)^2}{9} \tag{15}$$

From the above, we can also denote:

$$w' = \pi_{12}^A = \frac{(1+k)^2}{9} \tag{16}$$

Here, $w^{'}$ represents the period 2 profits of firm 1 from segment A (its high preference segment) *if* firm 2 obtains segment A in period 1. Summarizing these results:

$$\begin{aligned} p_{21}^{A} &= y - w = \frac{(1-k)^2}{9} - \frac{(2-k)^2}{9} \\ p_{11}^{A} = p_{21}^{A} + k &= y - w + k = \frac{(1-k)^2}{9} - \frac{(2-k)^2}{9} + k \\ \pi_1^A = p_1^A + x &= y - w + k + x = \frac{(1-k)^2}{9} - \frac{(2-k)^2}{9} + \frac{(2+k)^2}{9} + k \\ \pi_2^A &= y = \frac{(1-k)^2}{9} \end{aligned} \tag{17}$$

Note that, on account of symmetry, the total two-period profits of firm 1 from segment B (i.e., π_1^B) equal the total two-period profits of firm 2 from segment A (i.e., π_2^A). Therefore, the total profits of each firm from both segments under LT-LT are:

$$\begin{aligned} \pi_{LT-LT} &= \pi_1^A + \pi_1^B = \pi_1^A + \pi_2^A = k + 2y - w + x \\ &= \frac{2\,(1-k)^2}{9} - \frac{(2-k)^2}{9} + \frac{(2+k)^2}{9} + k \end{aligned} \tag{18}$$

Comparing firm profits under ST-ST (from eqn. 8) and LT-LT (from eqn. 18):

$$\pi_{ST-ST} = k + x + y > \pi_{LT-LT} = k + 2y - w + x \tag{19}$$

This is because $y = \frac{(1-k)^2}{9} < w = \frac{(2-k)^2}{9}$. That is, profits when both firms implement ST are higher than when both implement LT. We will return to this result after characterizing the equilibrium in §3.

2.3 LT-ST Case

When firm 1 adopts LT, the equilibrium outcomes related to segment A are identical to those under ST-ST. This is because firm 2, which adopts ST, will continue to price at zero to segment A in the ensuing Bertrand competition.

For segment B, the lowest price that firm 2 will set is 0. For customers in segment B to buy from firm 1, the following must hold: $1 - p_{11}^B \geq 1 + k - p_{21}^B$. That is, it must be that $p_{11}^B \leq -k$. Therefore, firm 1 will not price below $-k$. In addition, though, firm 1 will not price below $\hat{p}_{11}^B$, the price which makes the firm indifferent between (a) capturing segment B during period 1 so that it can leverage the switching costs that are incurred in switching to the competitor and obtain profits of *w* in period 2, and (b) leaving the segment to firm 2 in period 1 and focusing instead on the profits (*y*) obtained by capturing some fraction of that segment in period 2. Therefore:

$$p_{11}^{B} = \max\left(-k, \hat{p}_{11}^{B}\right) \tag{20}$$

where:

$$\hat{p}_{11}^{B} + w = y \Rightarrow \hat{p}_{11}^{B} = y - w \tag{21}$$

Note that here w is the profit to firm 1 from segment B in period 2 if it captured that segment in period 1, and y is the period 2 profit to firm 1 from segment B if it did not capture that segment in period 1. We discuss the two possible sub-cases below:

Sub-case 1: If $p_{11}^{B} = \hat{p}_{11}^{B} = \max\left(-k, \hat{p}_{11}^{B}\right)$, then firm 1 will not compete aggressively for segment B and firm 2 will capture that segment in period 1. This outcome results when the differential preference parameter *k* is relatively high:

$$\hat{p}_{11}^{B} = y - w \geq -k \quad \Rightarrow k \geq \frac{3}{11} \tag{22}$$

In this case:

$$\begin{aligned} \pi_{1}^{B} &= y \\ \pi_{21}^{B} &= \hat{p}_{11}^{B} + k = y - w + k \\ \pi_{22}^{B} &= x \end{aligned} \tag{23}$$

To gain intuition, note that if firm 1 prices at $\hat{p}_{11}^{B}$ to segment B (ST), firm 2 can price at $p_{21}^{B} = \hat{p}_{11}^{B} + k = y - w + k > 0$ and capture that segment. But the corresponding period 1 profits would be lower than under ST-ST because of the lower price required to retain the segment in the face of competition from firm 1. The term x (see eqn. 9) represents the period 2 profits of firm 2 from segment B given that the segment purchased from it in period 1 as well. Collating these results across periods:

$$\pi_{LT-ST} = \pi_{11}^{A} + \pi_{12}^{A} + \pi_{1}^{B} = k + x + y = \pi_{ST-ST} \tag{24}$$

$$\pi_{ST-LT} = \pi_{21}^{A} + \pi_{22}^{A} + \pi_{21}^{B} + \pi_{22}^{B} = 2y - w + k + x = \pi_{LT-LT} \tag{25}$$

Here, the competition for segment A is identical to that under ST-ST. Therefore, the expressions for π_{11}^{A}, π_{12}^{A}, π_{21}^{A}, and π_{22}^{A} are all drawn from eqn. (1). The expressions for π_{1}^{B}, π_{21}^{B}, and π_{22}^{B} are all drawn from eqn. (23).

Sub-case 2: If $p_{11}^{B} = -k = \max\left(-k, \hat{p}_{11}^{B}\right)$, then firm 1 will compete aggressively for segment B and capture that segment in period 1. For this to happen:

$$\hat{p}_{11}^{B} = -k > y - w \Rightarrow k < \frac{3}{11} \tag{26}$$

In this case:

$$\pi_{11}^{B} = -k;\ \pi_{12}^{B} = w;\ \pi_{21}^{B} = 0;\ \pi_{22}^{B} = w' \tag{27}$$

To gain intuition, note that here firm 1 prices at $-k$ and captures segment B (which prefers firm 2) in period 1, obtaining profits of $\pi_{11}^{B} = -k$. Consequently, it obtains profits of $\pi_{12}^{B} = w$ from that segment in period 2. This is consistent with the fact that a firm which captures the segment that does not prefer it in period 1 obtains profits of *w* from that segment in period 2 (see eqns.11 and 15). Likewise, firm 2 obtains zero profits from segment B in period 1 (since firm 1 captures it), but obtains profits of $\pi_{22}^{B} = w'$ from the segment in period 2. This is consistent with the fact that a firm obtains profits of w' from the segment that prefers it in period 2, if that segment was captured by the competitor in period 1 (see eqn.16). Collating these results across the two periods:

$$\begin{aligned} \pi_{LT-ST} &= \pi_{11}^{A} + \pi_{12}^{A} + \pi_{11}^{B} + \pi_{12}^{B} = k + x - k + w > \pi_{ST-ST} = k + x + y \\ \pi_{ST-LT} &= \pi_{21}^{A} + \pi_{22}^{A} + \pi_{21}^{B} + \pi_{22}^{B} = y + w' < \pi_{LT-LT} = k + 2y - w + x \end{aligned} \tag{28}$$

Here again, the competition for segment A is identical to that under ST-ST. Therefore, the expressions for $\pi_{11}^{A},\ \pi_{12}^{A},\ \pi_{21}^{A},$ and π_{22}^{A} are all drawn from eqn. (1). The expressions for $\pi_{11}^{B},\ \pi_{12}^{B}, \pi_{21}^{B},$ and π_{22}^{B} are all drawn from eqn. (27).

An insight that will anchor later discussions can be highlighted at this stage. Under LT-ST, when the differential preference parameter *k* is low (i.e., $k < 3/11$), firm 1 which engages in LT prices at $p_{11}^{B} = -k$ to segment B, which prefers firm 2, and captures that segment in period 1. To retain these customers, the managers of firm 2 would need to price below zero. But these managers, who operate under the ST strategy, are focused on period 1 profits alone at this stage. Therefore, they do not price below zero because that would imply negative profits for period 1. In contrast, for the managers of firm 1, who have a long-term outlook, pricing at $p_{11}^{B} = -k$ takes on the flavor of making an “investment” in segment B customers. This investment would enhance firm 1’s period 2 profits on account of the switching costs incurred by customers in segment B who decide to switch to firm 1. Having derived the relevant profits, we next consider the equilibria that emerge when firms can choose between ST and LT.

3. EQUILIBRIA IN SHORT-TERM AND LONG-TERM STRATEGIES

The payoff matrix that is relevant when firms choose between ST and LT is described in Figure 1. We consider the two cases demarcated earlier: $k \geq 3/11$ and $k < 3/11$.

	Firm 2: Strategy LT	**Firm 2: Strategy ST**
Firm 1: Strategy LT	$\left(\pi^{LT-LT}, \pi^{LT-LT}\right)$	$\left(\pi^{LT-ST}, \pi^{ST-LT}\right)$
Firm 1: Strategy ST	$\left(\pi^{ST-LT}, \pi^{LT-ST}\right)$	$\left(\pi^{ST-ST}, \pi^{ST-ST}\right)$

Figure 1**:** The payoff matrix

Proposition 1: *When* k *, the differential preference parameter, is greater than* $3/11$*, the symmetric strategy pairings (ST-ST and LT-LT), and the asymmetric strategy pairings (LT-ST and ST-LT) all constitute subgame-perfect Nash equilibria. However, ST-ST constitutes the Pareto-dominant Nash equilibrium.*

Proof: This involves a straightforward comparison of the analytical expressions of the profits across the cells. Profits corresponding to the LT-LT cell are described in eqn. (18). Profits corresponding to the ST-ST cell are described in eqn. (8). Profits corresponding to the asymmetric strategies (i.e., the ST-LT and LT-ST cells) are described in eqns. (24) and (25). While each of these four strategy pairings represents a Nash equilibrium, note that $\pi^{ST-ST} > \pi^{LT-LT}$. In addition, $\pi^{ST-ST} = \pi^{LT-ST}$ and $\pi^{ST-ST} > \pi^{ST-LT}$; this implies that a move from the (LT,ST) cell in the northeast corner of the payoff matrix to the (ST,ST) cell would not reduce firm 1's profits and would increase firm 2's profits. Symmetrically, a move from the (ST,LT) cell in the southwest corner of the payoff matrix to the (ST,ST) cell would not reduce firm 2's profits and would increase firm 1's profits. Therefore, (ST,ST) is the Pareto-dominant Nash equilibrium. ■

To aid intuition and provide a concrete basis for further discussion, a numerical evaluation of the analytical expressions for the profits in various cells for $k = 0.5 > (3/11)$ is provided in Figure 2.

	Firm 2: Strategy LT	Firm 2: Strategy ST
Firm 1: Strategy LT	$\pi^{LT-LT} = 1; \pi^{LT-LT} = 1$	$\pi^{LT-ST} = 1.22; \pi^{ST-LT} = 1$
Firm 1: Strategy ST	$\pi^{ST-LT} = 1; \pi^{LT-ST} = 1.22$	$\pi^{ST-ST} = 1.22; \pi^{ST-ST} = 1.22$

Figure 2**:** The payoff matrix (evaluated for *k* = 0.5)

All four cells of the payoff matrix represent subgame-perfect Nash equilibra. However, ST-ST represents the Pareto-optimal equilibrium. Two additional points are worth noting here. First, the asymmetric strategy pairings (ST-LT and LT-ST) would not survive an equilibrium refinement such as a Trembling Hand Perfect Equilibrium (THPE). Specifically, let there be a remote possibility that the firm that implements ST (under the LT-ST pairing) could tremble and implement LT instead of ST. Then, the profits of each firm under the resulting LT-LT strategy pairing (these profits equal 1 in Figure 2) would be lower than those obtained under ST-ST (these profits equal 1.22 in Figure 2). In the presence of such uncertainty, each firm would play ST. Therefore, the asymmetric strategy pairings would be ruled out in a THPE. Second, if firms were making simultaneous choices about their strategy, each firm will likely choose ST. This is because any choice of LT by a firm would yield the same profits as under ST-ST only if the other firm chose LT – if not, the firms would end up under the LT-LT strategy pairing which yields strictly lower profits to each firm than ST-ST.

Consider next the case where preferences for the firms by the two market segment are weak:

Proposition 2: *When* k *, the differential preference parameter, is less than* $3/11$*, LT-LT constitutes the sole subgame-perfect Nash equilibrium.*

Proof: This involves a straightforward comparison of the analytical expressions of the profits across the cells. Profits corresponding to the LT-LT cell are described in eqn. (18). Profits corresponding to the ST-ST cell are described in eqn. (8). Profits corresponding to the asymmetric strategies (i.e., the ST-LT and LT-ST cells) are described in eqns. (28). ■

To aid intuition, a numerical evaluation of the analytical expressions for the profits in various cells for $k = 0.15 < (3/11)$ is provided in Figure 3.

	Firm 2: Strategy LT	**Firm 2: Strategy ST**
Firm 1: Strategy LT	$\pi^{LT-LT} = 0.44; \pi^{LT-LT} = 0.44$	$\pi^{LT-ST} = 0.90; \pi^{ST-LT} = 0.23$
Firm 1: Strategy ST	$\pi^{ST-LT} = 0.23; \pi^{LT-ST} = 0.90$	$\pi^{ST-ST} = 0.74; \pi^{ST-ST} = 0.74$

Figure 3**:** The payoff matrix (evaluated for *k* = 0.15)

In this case, if both firms engage in period-by-period profit maximization (ST) they each obtain profits of 0.74, However, the incentive for one firm to shift to a long-term (LT) approach is high. This is because the firm that adopts LT not only competes strongly in period 1 for the segment that prefers the competitor, but also obtains it in equilibrium because preferences for the firms are weak. This increases the profits of the firm that shifts to LT (from 0.74 under ST-ST to 0.90 under LT-ST) and simultaneously depresses the profits of the firm that continues with ST (from 0.74 under ST-ST to 0.23). However, the asymmetric strategy pairing is not an equilibrium either. This is because, when one firm adopts LT, the other benefits in shifting from ST to LT itself. Consequently, LT-LT emerges as the sole Nash equilibrium. In this equilibrium, each firm retains the customers that prefer it in equilibrium but with lower profits than under ST-ST. Interestingly, firm profits under ST-ST are always higher than those under LT-LT in all conditions. This is formalized below:

Proposition 3: *Firm profits under ST-ST are higher than those under LT-LT in all cases.*

Proof: See eqn. (19). This involves a straightforward comparison of the analytical expressions of the profits in eqns. (8) and (18). ■

While ST-ST does not constitute an equilibrium in the sub-case where customer preferences for the firms are weak (i.e., $k < 3/11)$, it remains an interesting outcome for other reasons. As discussed at the outset of the paper, many firms in the current environment are locked into short-term profit maximization on account of pressures from the stock markets and the short-run career concerns of managers. Against this backdrop, scholars and practitioners have championed a move towards a long-term approach to managing customer relationships. Indeed, when one firm unilaterally moves to a long-term approach, it stands to benefit at the cost of its myopic competitors. However, when all competitors follow a long-term approach, the net effect is a dilution of profits across the board. The firms are more profitable when they all focus on the short-term.

To re-establish ST-ST as an equilibrium, though, firms require a level of foresight that is one level beyond what is assumed in the definition of the Nash equilibrium. Specifically, if conjectural variations are allowed into the picture, a firm will realize that a unilateral move from the ST-ST pairing to LT will not pay off once the competitor's reaction is taken into account. The competitor will respond by also shifting to LT, and both firms will make lower profits than under the resulting LT-LT strategy pairing than under ST-ST. The point of managerial import is that, if competitors currently share a short-term focus, a move to a long-term focus must be made with circumspection in every case.

Overall, our results so far suggest that, in managing customer relationships in a competitive environment, a short-term focus may be beneficial. Under a long-term focus, managers are more prone to making investments in customers, or, alternatively providing "sweeteners" that increase the likelihood of customers buying from them and then facing a switching cost in the second period. Managers operating in the LT-LT regime are open to such bribing because of the shadow of the future—they are pressured not to lose the customers during period 2. While the notion of investing in customers has frequently been supported in the popular press and the literature, the crucial point that we highlight is that, in competitive environments, it is likely that "overinvesting" may occur. Stated differently, managers who are focused on the future in a competitive environment are unable to hold back from giving customers a sweet deal that promotes loyalty—however, the resulting loyalty comes at a high cost. Firms may be better off when they induce managers to maximize period-by-period profits. At the least, our findings suggest that managers must be sensitive to the possibility that the lifetime value of customers may be maximized when managers focus on maximizing short-term profits, i.e., a *short-term* focus on customers may constitute the optimal *long-term* strategy under certain conditions.

So far, we have assumed that there are no specific benefits that accrue to firms on account of customer loyalty, other than the presence of switching costs. However, it has been argued that loyal customers may spend more with the firm, i.e., customer loyalty may engender a "revenue expansion" effect. Ostensibly, the case for a long-term strategy would be strengthened in the presence of revenue expansion effects. We examine this issue next.

4. AN EXTENSION: REVENUE EXPANSION EFFECTS

We now incorporate a revenue expansion effect into the basic model. Consistent with earlier assumptions, once a customer purchases from a firm in period 1, he will incur a switching cost s if he purchases from the other firm in period 2. Further, each customer purchases one unit in period 1 from the firm that yields a higher surplus. In period 2, the customer will purchase a quantity of $(1+\delta)$ rather than 1, *if* he purchases from the same firm as in period 1. Correspondingly, the utility obtained from purchasing from the same firm in period 2 increases. Specifically, we had earlier assumed that the relative utility obtained in period 2 by a customer in segment A purchasing from the firm (say, firm 1) that was also patronized in period 1 was: $1+k-p_{12}^{A}$. With revenue expansion effects, this utility is adjusted to: $(1+\delta)(1+k-p_{12}^{A})$. Correspondingly, the indifferent customer in period 2 is characterized by the switching cost that satisfies (compare with eqns. 2):

$$\begin{aligned}(1+\delta)(1+k-p_{12}^{A}) &= 1-\tilde{s}-p_{22}^{A} \\ \Rightarrow \tilde{s} &= -\delta+(1+\delta)\,p_{12}^{A}-p_{22}^{A}-(1+\delta)k\end{aligned} \tag{29}$$

As a technical assumption, we will constrain the differential preference parameter *k* for the revenue expansion case such that $k \in [0,(1-\delta)/(1+\delta)]$. This will ensure interior solutions. The same condition will also ensure complete market coverage because, when *k* lies in this range, customers in each segment will obtain a positive utility in each period from patronizing one or the other firm in all the strategy configurations discussed below. Under these conditions:

Proposition 4: *When* k *, the differential preference parameter, is such that:*

$$k > k_{threshold} = \frac{-11-2\delta(1+\delta)+\sqrt{121+4\delta(17+\delta(27+\delta(8+\delta)))}}{2\delta(2+\delta)} \tag{30}$$

the symmetric strategy pairings (ST-ST and LT-LT), and the asymmetric strategy pairings (LT-ST and ST-LT) all constitute subgame-perfect Nash equilibria. However, ST-ST constitutes the Pareto-dominant Nash equilibrium.

Proof: See Appendix A.

The value of $k_{threshold}$ in eqn. (30) is an increasing function of the revenue expansion parameter δ. That is, as the revenue expansion effect becomes stronger, the value of the differential preference parameter *k* must be higher for ST-ST to be the Pareto-dominant equilibrium. Intuitively, as *k* decreases, the tendency for a single firm to move from ST-ST to LT is high in the presence of a revenue expansion effect, because this firm can reap enhanced benefits in the future by capturing customers who prefer the competitor. To aid intuition, numerical evaluations of the analytical expressions for the profits in various cells for $\delta = 0.3$ and $k = 0.5 > k_{threshold} = 0.398$ are provided in Figure 4:

	Firm 2: Strategy LT	**Firm 2: Strategy ST**
Firm 1: Strategy LT	$\pi^{LT-LT} = 1.11; \pi^{LT-LT} = 1.11$	$\pi^{LT-ST} = 1.47; \pi^{ST-LT} = 1.11$
Firm 1: Strategy ST	$\pi^{ST-LT} = 1.11; \pi^{LT-ST} = 1.47$	$\pi^{ST-ST} = 1.47; \pi^{ST-ST} = 1.47$

***Figure 4*:** The payoff matrix (evaluated for δ =0.3 and *k* = 0.5)

All four cells of the payoff matrix in Figure 4 represent subgame-perfect Nash equilibra. However, ST-ST represents the Pareto-optimal equilibrium. Apart from the issue of Pareto-dominance, the arguments made earlier in favor of ST-ST emerging as the focal equilibrium continue to apply in this case as well.

Some interesting insights arise when the profits in Figure 2 are compared with those in Figure 4. Note that the only difference between these cases is that there is no revenue expansion effect at work in the profits related to Figure 2 (δ =0), whereas δ =0.3 for the profits described in Figure 4. First, across the board, profits in Figure 4 are higher than the corresponding profits in Figure 2. This is an "all boats rise with the tide" effect that is induced by revenue expansion.

Second, a more subtle difference is revealed when the percentage improvements in the ST-ST profits over the LT-LT profits are compared across the figures. In the absence of revenue expansion effects, profits under ST-ST are 22% higher than under LT-LT when *k*=0.5 (Figure 2). In contrast, when a revenue expansion effect is introduced (δ =0.3), then profits under ST-ST are 32.4% higher than those under LT-LT (Figure 4). Therefore, while revenue expansion increases all profits, it does so to a proportionately greater extent in the case of ST-ST. Surprisingly, revenue expansion effects that accrue on account of loyalty to the firm *increase* the attractiveness of the short-term approach to managing customer relationships. To explain this result, note that the loyalty-driven effect enhances the value of the proverbial pot of gold at the end of the rainbow. However, when managers adopt a long-term horizon and are aware of these potential rewards, they compete more intensively at the early stages of the game to attract the segment that prefers the competitor. Specifically, managers under LT-LT who expect enhanced future profits from capturing customers are willing to invest those profits towards trying to attract the segment that prefers the competitor. The competitor, in turn, reduces prices offered to the same segment and succeeds in retaining the segment (under the conditions that govern Proposition 4). But the reduced prices also lead to a drop in overall profits under LT-LT.

Next, we discuss the case where k is relatively low, and revenue expansion effects apply:

Proposition 5: *When* k *, the differential preference parameter, is such that:*

$$k < k_{threshold} = \frac{-11 - 2\delta(1+\delta) + \sqrt{121 + 4\delta(17 + \delta(27 + \delta(8+\delta)))}}{2\delta(2+\delta)} \tag{31}$$

LT-LT constitutes the sole subgame-perfect Nash equilibrium.

Proof: See Appendix A.

To aid intuition, numerical evaluations of the analytical expressions for the profits in various cells for $\delta = 0.3$ and $k = 0.15 < k_{threshold} = 0.398$ are provided in Figure 5:

	Firm 2: Strategy LT	**Firm 2: Strategy ST**
Firm 1: Strategy LT	$\pi^{LT-LT} = 0.39; \pi^{LT-LT} = 0.39$	$\pi^{LT-ST} = 1.21; \pi^{ST-LT} = 0.11$
Firm 1: Strategy ST	$\pi^{ST-LT} = 0.11; \pi^{LT-ST} = 1.21$	$\pi^{ST-ST} = 0.87; \pi^{ST-ST} = 0.87$

Figure 5**:** The payoff matrix (evaluated for δ =0.3 and k = 0.15)

Here, LT-LT is the sole equilibrium. Some interesting insights arise when the profits in Figure 5 are compared with those in Figure 3. Note that the only difference between these cases is that there is no revenue expansion effect at work in the profits related to Figure 3 (δ =0), whereas δ =0.3 for the profits described in Figure 5. First, unlike in the case of Proposition 4, here all boats do not rise with the tide on account of revenue expansion effects. Profits under ST-ST do increase because firms are able to capture the future benefits of the revenue expansion effect without any spillover in terms of increased upfront competition. However, profits under LT-LT *decrease* in the presence of revenue expansion effects (from 0.44 to 0.39). Intuitively, when preferences for segments are weak, the managers under LT-LT can seek to aggressively lower their prices in order to capture the competitor's customers – this increases competition in period 1 and leads to lower equilibrium prices. In addition, the prospect of the revenue expansion in period 2 exacerbates price competition in period 1, further depressing profits.[5]

Despite the high profits under ST-ST, it does not constitute an equilibrium here because, given that a firm adopts the ST strategy, it is highly rewarding for the competitor to shift to LT. Given that preferences of the segments are weak, this firm that moves to LT can cut prices only to a limited extent in period 1 and capture the customers in the segment that prefers firm 1. Note, though, that the competitor will also prefer to move to LT in this case. Note that profits under LT-LT are significantly lower than those under ST-ST – therefore, the arguments made in the base case for persisting with the ST-ST strategy pair if that represents the *status quo*, continue to apply here.

5. AN EXTENSION: STRATEGIC CUSTOMERS

We have assumed so far that the customers are non-strategic, that is, they choose firms in each period based solely on the offered prices during that period. In contrast, a strategic customer is forward-looking and assesses the total expected surplus across periods when choosing between firms in period 1. Customers expecting higher surplus in period 2 from staying with a firm would require to be compensated by even lower prices during period 1 by the competitor in order to get them to switch. Consider, for example, customers in segment A who are faced with prices of p_{11}^A and p_{21}^A in period 1 from firms 1 and 2, respectively. Before choosing to go with a specific firm in period 1, these customers will compare the total surplus obtained across two periods from choosing firm 1 and firm 2 at this stage:

$$1 + k - p_{11}^A + S_A < or > 1 - p_{21}^A + S_A^{'} \qquad (32)$$

[5] A comparison of profits reveals that profits under LT-LT when a revenue expansion effect applies (i.e., $\delta > 0$) are lower than those when it does not apply (i.e., $\delta = 0$) when $k < \left(\sqrt{40 + 24\delta + 3\delta^2}) - 4 - 3\delta\right) / (6 + 3\delta)$.

Here, S_A ($S_A^{'}$) is the period 2 surplus obtained from going with firm 1 (firm 2) in period 1. The remaining terms in expression (32) relate to period 1 surplus. As in the previous cases, we have distinct outcomes corresponding to the cases where the differential preference parameter is high or low:

Proposition 6: *When the differential preference parameter $k > 1/4$, the symmetric strategy pairings (ST-ST and LT-LT), and the asymmetric strategy pairings (LT-ST and ST-LT) all constitute subgame-perfect Nash equilibria. However, ST-ST constitutes the Pareto-dominant Nash equilibrium.*

Proof: See Appendix B.

To aid intuition, numerical evaluations of the analytical expressions for the profits in various cells for $k = 0.5 > k_{threshold} = 1/4$ are provided in Figure 6:

	Firm 2: Strategy LT	**Firm 2: Strategy ST**
Firm 1: Strategy LT	$\pi^{LT-LT} = 1.06; \pi^{LT-LT} = 1.06$	$\pi^{LT-ST} = 1.28; \pi^{ST-LT} = 1.06$
Firm 1: Strategy ST	$\pi^{ST-LT} = 1.06; \pi^{LT-ST} = 1.28$	$\pi^{ST-ST} = 1.28; \pi^{ST-ST} = 1.28$

***Figure 6*:** The payoff matrix (evaluated for strategic customers and *k* = 0.5)

Whereas all four cells of the payoff matrix in Figure 6 represent subgame-perfect Nash equilibra, ST-ST represents the Pareto-optimal equilibrium. To capture the implications of strategic customers, the profits in Figure 6 can be compared with those in Figure 2 (those profits correspond to the case where customers are non-strategic). First, profits in Figure 6 are higher across the board compared to Figure 2. Intuitively, strategic customers are less susceptible to being tempted by lower upfront prices – instead, they consider the long-term consequences of their choices. This moderates the incentive for the firms to attract customers through low upfront prices, thereby reducing price competition and enhancing profits. This effect is similar to that discussed by Klemperer (1987a).

Second, whereas the presence of strategic customers does reduce upfront competition, that does not imply that LT-LT is more likely to be the sole equilibrium. Interestingly, the parametric region where ST-ST is the Pareto-dominant equilibrium *expands* when customers are strategic ($k > 1/4$) compared to the case where customers are non-strategic ($k > 3/11$). Intuitively, it pays for firms to be myopic even as customers are strategic. The focus on multi-period surplus makes customers less price sensitive in period

1, and the focus on maximizing short-run profits enables the firms to charge higher upfront prices and leverage this lower price sensitivity into higher profits.

The following proposition describes the equilibrium with strategic customers when switching costs are low:

Proposition 7: *When the differential preference parameter* $k < 1/4$ *, LT-LT constitutes the sole subgame-perfect Nash equilibrium.*

Proof: See Appendix B.

To aid intuition, numerical evaluations of the analytical expressions for the profits in various cells for $k = 0.15 < k_{threshold} = 1/4$ are provided in Figure 7:

	Firm 2: Strategy LT	**Firm 2: Strategy ST**
Firm 1: Strategy LT	$\pi^{LT-LT} = 0.46; \pi^{LT-LT} = 0.46$	$\pi^{LT-ST} = 0.88; \pi^{ST-LT} = 0.23$
Firm 1: Strategy ST	$\pi^{ST-LT} = 0.23; \pi^{LT-ST} = 0.88$	$\pi^{ST-ST} = 0.76; \pi^{ST-ST} = 0.76$

Figure 7**:** The payoff matrix (evaluated for strategic customers and *k* = 0.15)

To demarcate the implications of forward-looking customers when segment preferences for the firms are weak, the profits in Figure 7 can be compared with the corresponding profits in Figure 3. First, profits are higher with strategic customers in both the symmetric strategy pairings (ST-ST and LT-LT), and consistent with all other cases, profits under ST-ST are higher than those under LT-LT. This reflects the reduced price competition in period 1 when customers are forward-looking and hence less sensitive to upfront differences in competitors' prices However, a firm that shifts to LT from ST-ST obtains lower profits (0.88 in Figure 7) when customers are strategic than when customers are non-strategic (0.90 in Figure 3). The intuition is that, ceteris paribus, this firm has to offer a lower price to attract the customers from the segment that prefers the competitor when those customers are strategic and care about the future compared to when those customers care only about the upfront price.

This last finding, that it can become less attractive for a firm to shift from ST-ST to LT when customers are strategic and segment preferences for firms are weak, leads to the following conjecture. Could it be that, in the presence of revenue expansion effects which strategic customers would take into account when deciding on firms in period 1, it would not pay for a firm to undertake the shift from ST-ST to LT-ST? That is, would the presence of strategic customers make it possible for ST-ST strategy pairing to constitute a Nash equilibrium even when *k* is low? Note that, in all the cases discusses so far, LT-LT typically constitutes the sole Nash equilibrium when *k* is low. To examine this conjecture, we evaluated firm profits for a model that incorporated *both* strategic customers and revenue expansion effects (to conserve space, proofs are not detailed in the paper). Those profits are detailed in Figure 8:

	Firm 2: Strategy LT	**Firm 2: Strategy ST**
Firm 1: Strategy LT	$\pi^{LT-LT} = 0.59; \pi^{LT-LT} = 0.59$	$\pi^{LT-ST} = 1.0;\ \pi^{ST-LT} = 0.11$
Firm 1: Strategy ST	$\pi^{ST-LT} = 0.11;\ \pi^{LT-ST} = 1.0$	$\pi^{ST-ST} = 1.08; \pi^{ST-ST} = 1.08$

Figure 8**:** The payoff matrix (evaluated for strategic customers, δ =0.3, and *k* = 0.15)

The profits described in Figure 8 indicate that the conjecture does hold. Specifically, both ST-ST and LT-LT constitute Nash equilibria even for a low *k*. A firm's profits are strictly lower when it shifts from ST-ST (profits here equal 1.08) to LT (profits here equal 1.0). Again, ST-ST is the Pareto-dominant equilibrium. To gain further intuition, the profits in Figure 8 can be compared with those in Figure 5, which correspond to the case where customers are non-strategic. Note that profits in the symmetric strategy pairings (ST-ST and LT-LT) are strictly higher when customers are strategic (1.08 and 0.59, respectively) than the corresponding profits when customers are non-strategic (0.87 and 0.39, respectively). These higher profits reflect the benefits of reduced upfront price competition when customers are strategic. However, π^{LT-ST} is lower when customers are strategic (profits equal 1.0) than when customers are non-strategic (profits here equal 1.21). Effectively, the incentive for one firm to shift from ST-ST to LT in order to capture additional customers and leverage the revenue expansion effects that incur in the future is weakened when customers are strategic. This is because strategic customers are less likely to be attracted by a low price when they know that they will end up paying more in the future. Stated differently, the positive implications of the short-term focus for the competing firms are amplified when customers are strategic.

Prior research has shown a monopolist is worse off with strategic customers (Villas-Boas 2004b). In contrast, our findings suggest that, in a competitive setting, firms may be better off when the customers are strategic, especially when the firms adopt a short-term profit maximization approach. Interestingly, profits for competing firms are highest when the firms can induce customers to think strategically, but themselves adopt period-by-period – rather than multiperiod – profit maximization objectives.

6. CONCLUSION

The view that firms must adopt a long-term approach towards managing customer relationships is gaining powerful momentum in the marketplace and in academia. We contribute to this growing literature on the management of customer relationships by examining how the concept of customer lifetime value maximization must be implemented in a competitive context. Our key finding is that customer lifetime value may be maximized in a competitive context when managers focus on maximizing period-by-period (or short-term) profits rather than multi-period (or long-term) profits from customers. Stated differently, and somewhat paradoxically, the correct long-term approach to customer relationships in competitive environments may involve period-by-period profit maximization.

A two-period model of a duopoly was first introduced. The market contained two customer segments, and the segments were endowed with differential preferences for the duopolists. If customers in a segment purchased from one seller in period 1, they would incur a switching cost in purchasing from the other seller in period 2. The switching cost was assumed to be uniformly distributed over the customers in each segment. Using this simple setup, total firm profits were derived for a game where each firm could choose to maximize either period-by-period profits (i.e., adopt a "short-term" focus) or multi-period profits (i.e., adopt a "long-term" focus). Conditions were derived under which (a) a symmetric short-term focus was the Pareto-dominant Nash equilibrium, and (b) a symmetric long-term focus was the Nash equilibrium. In particular, the symmetric short-term focus emerged as the Pareto-dominant Nash equilibrium when customer preferences for the sellers across the segments were relatively strong. Such a short-term focus enabled the firms to enhance profits by putting the brakes on the tendency to invest too heavily in the customers in search of future profits. That is, the short-term focus enhanced profits by dispelling the "shadow of the future."

Next, to accommodate a frequently highlighted benefit of retaining customers, each firm was allowed to capture additional revenues from customers who remained with the firm over multiple periods. However, the incorporation of such a revenue enhancement effect did not substantially alter the superiority of the short-term focus. In fact, we demonstrated that profits under a symmetric long-term focus (LT-LT) could decrease in the presence of revenue expansion effects. Intuitively, as the pot of gold at the end of the rainbow became bigger, the early competition to gain and keep customers to get at that pot of gold was more pronounced when firms focused on maximizing multi-period profits.

Finally, we extended the model to accommodate strategic customers. These forward-looking customers considered their future benefits associated with staying with a firm or switching to a competitor, while deciding on their current choice of seller. Whereas the presence of strategic customers typically muted upfront price competition, here again, we demonstrated that the short-term focus resulted in higher profits to the firms. In fact, in some cases, the advantage of the short-term focus was strengthened when customers were strategic.

From a managerial perspective, our findings suggest that decisions to reorient business processes towards managing customer relationships with a long-term horizon must be carefully evaluated in competitive business contexts. Specifically, managers must be alert for signs of increase in the intensity of short-term competition, and must rigorously evaluate the corresponding implications for the profitability of the customer base. Further, managers must approach the counterintuitive notion that period-by-period profit maximization may yield superior overall profits and higher customer lifetime value in competitive environments with an open mind. From a research perspective, our findings suggest that, at the least, informal arguments and formal models that support the superiority of a long-term focus with respect to customers are incomplete without addressing the corresponding competitive implications. We hope our findings catalyze further research in the area.

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APPENDIX A: REVENUE EXPANSION EFFECTS

Proofs of Proposition 4 and Proposition 5

We begin with an analysis of period 2 decisions.

A.1 Analysis of Period 2

Depending on the decisions of customers in period 1, there are four possible cases that need to be analyzed in period 2.

Case 1: Customers in Segment A purchase from firm 1 in period 1

In period 2, the switching cost $\tilde{s}$ for the marginal customer who is indifferent between buying from firm 1 or from firm 2 is determined by:

$$(1+\delta)(1+k-p_{12}^{A}) = 1-\tilde{s}-p_{22}^{A} \tag{a1}$$

Therefore,

$$\tilde{s} = (1+\delta)p_{12}^{A} - p_{22}^{A} - k^{'} \tag{a2}$$

where $k^{'} = \delta + (1+\delta)k$. We restrict $k^{'} < 1$ to avoid corner solutions.

The demand for firm 2 is $\tilde{s}$ and the demand for firm 1 is $(1+\delta)(1-\tilde{s})$. Therefore, the profits that accrue to the two firms from segment A when these customers purchase from firm 1 in period 1 are:

$$\begin{aligned} \pi_{12}^{A} &= p_{12}^{A}(1+\delta)\left[1+k^{'}-(1+\delta)p_{12}^{A}+p_{22}^{A}\right] \\ \pi_{22}^{A} &= p_{22}^{A}\left[(1+\delta)p_{12}^{A}-p_{22}^{A}-k^{'}\right] \end{aligned} \tag{a3}$$

Differentiating these profits with respect to own prices yields the relevant first order conditions. Solving these conditions, the following equilibrium outcomes for segment A are obtained:

$$p_{12}^{A} = \frac{2+k^{'}}{3(1+\delta)}, \quad p_{22}^{A} = \frac{1-k^{'}}{3} \tag{a4}$$

$$\pi_{12}^{A} = x = \frac{(2+k^{'})^2}{9}, \quad \pi_{22}^{A} = y = \frac{(1-k^{'})^2}{9} \tag{a5}$$

Here, $\pi_{12}^{A} = x$ are the period 2 profits of firm 1 from its high preference segment if that segment purchased from firm 1 in period 1. Likewise, $\pi_{22}^{A} = y$ are the period 2 profits of firm 2 from its low preference segment if that segment did not purchase from firm 2 in period 1. Note that the switching cost $\tilde{s}$ for the marginal customer who is indifferent between buying from firm 1 or from firm 2 is:

$$\tilde{s} = (1+\delta)p_{12}^{A} - p_{22}^{A} - k^{'} = \frac{1-k^{'}}{3} \tag{a6}$$

In period 1, each customer knows the distribution of switching costs in period 2, but does not know her exact switching cost. On experiencing the product purchased in period 1, customers realize their switching costs for period 2. The expected surplus of a customer in segment A is (we calculate the surplus here but will use the calculation only when we analyze the case of the strategic customer in Appendix B):

$$S_A = \int_{\tilde{s}}^{1} \left[1 + k^{'} - (1+\delta)p_{12}^{A}\right] ds + \int_{0}^{\tilde{s}} \left[1 - s - p_{22}^{A}\right] ds$$

$$= \int_{\frac{1-k^{'}}{3}}^{1} \left[1 + k^{'} - \frac{2+k^{'}}{3}\right] ds + \int_{0}^{\frac{1-k^{'}}{3}} \left[1 - s - \frac{1-k^{'}}{3}\right] ds \tag{a7}$$

Case 2: Customers in Segment B purchase from firm 2 in period 1

Because the game is symmetric to Case 1 above, we obtain the following outcomes:

$$p_{22}^{B} = \frac{2+k^{'}}{3},\ p_{12}^{B} = \frac{1-k^{'}}{3} \tag{a8}$$

$$\pi_{22}^{B} = x, \pi_{12}^{B} = y, S_B = S_A \tag{a9}$$

Case 3: Customers in Segment A purchase from firm 2 in period 1

In period 2, the switching cost $\tilde{s}$ for the marginal customer who is indifferent between buying from firm 1 or from firm 2, is determined by:

$$1 + k - \tilde{s} - p_{12}^{A} = (1+\delta)(1 - p_{22}^{A}) \tag{a10}$$

Therefore, the location of the indifferent customer is:

$$\tilde{s} = (1+\delta)p_{22}^{A} - p_{12}^{A} + k^{''} \tag{a11}$$

where

$$k^{''} = k - \delta \tag{a12}$$

Here, we restrict $k^{''} > -1$ to avoid corner solutions. The demand for firm 1 is $\tilde{s}$ and the demand for firm 2 is $(1+\delta)(1-\tilde{s})$. The profits of the two firms are denoted below:

$$\begin{aligned} \pi_{12}^{A} &= p_{12}^{A}\left[(1+\delta)p_{22}^{A} - p_{12}^{A} + k^{''}\right] \\ \pi_{22}^{A} &= (1+\delta)p_{22}^{A}\left[1 - k^{''} - (1+\delta)p_{22}^{A} + p_{12}^{A}\right] \end{aligned} \tag{a13}$$

Differentiating these profits with respect to own prices yields the relevant first order conditions. Solving these conditions, the following equilibrium outcomes for period 2 are obtained:

$$p_{22}^{A} = \frac{2-k^{"}}{3(1+\delta)},\ \ p_{12}^{A} = \frac{1+k^{"}}{3}$$
$$\pi_{22}^{A} = w = \frac{(2-k^{"})^2}{9},\ \ \pi_{12}^{A} = w^{'} = \frac{(1+k^{"})^2}{9} \tag{a14}$$

Here, w represents the period 2 profits of firm 2 from segment A (its low preference segment), if it captures segment A in period 1, and $w^{'}$ represents the period 2 profits of firm 1 from segment A (its high preference segment) if firm 2 captures segment A in period 1. After substitutions, the switching cost for the marginal customer is:

$$\tilde{s} = (1+\delta)p_{22}^{A} - p_{12}^{A} + k^{"} = \frac{1+k^{"}}{3} \tag{a15}$$

The expected surplus of a customer in segment A is:

$$S_{A}^{'} = \int_{0}^{\tilde{s}} \left[1+k-s-p_{12}^{A}\right]ds + \int_{\tilde{s}}^{1} \left[(1+\delta)(1-p_{22}^{A})\right]ds$$
$$= \int_{0}^{\frac{1+k^{"}}{3}} \left[1+k-s-\frac{1+k^{"}}{3}\right]ds + \int_{\frac{1+k^{"}}{3}}^{1} \left[(1+\delta)\left(1-\frac{2-k^{"}}{3}\right)\right]ds \tag{a16}$$

Case 4: Customers in Segment B purchase from firm 1 in period 1

This is symmetric to Case 3 above. Therefore:

$$p_{12}^{B} = \frac{2-k^{"}}{3(1+\delta)},\ \ p_{22}^{B} = \frac{1+k^{"}}{3}$$
$$\pi_{12}^{B} = w = \frac{(2-k^{"})^2}{9},\ \ \pi_{22}^{B} = w^{'} = \frac{(1+k^{"})^2}{9} \tag{a17}$$
$$S_{B}^{'} = S_{A}^{'}$$

This completes the analysis of period 2 under various period 1 outcomes. Applying backward induction, we now proceed to analyze firm decisions in period 1 – these decisions will depend on whether the firms adopt ST or LT strategies.

A.2 Analysis of Period 1.

ST-ST strategy pairing

In period 1, firms engage in Bertrand competition for each segment. Therefore, in equilibrium:

$$p_{11}^A = {\pi_{11}}^A = k,\ p_{21}^A = {\pi_{21}}^A = 0$$
$$p_{11}^B = {\pi_{11}}^B = 0,\ p_{21}^B = {\pi_{21}}^B = k \quad \text{(a18)}$$
$$\pi_{11} = {\pi_{11}}^A + {\pi_{11}}^B = k,\ \pi_{21} = {\pi_{21}}^A + {\pi_{21}}^B = k$$

where p_{11}^A is firm 1's price in period 1 for segment A, p_{21}^A is firm 2's price in period 1 for segment A, p_{11}^B is firm 1's price in period 1 for segment B, p_{21}^B is firm 2's price in period 1 for segment B, π_{11} is firm 1's profit in period 1 and π_{21} is firm 2's profit in period 1. Total firm profits under ST-ST are:

$$\pi_{ST-ST} = \pi_{11} + \pi_{12} = \pi_{11} + {\pi_{12}}^A + {\pi_{12}}^B = k + x + y \quad \text{(a19)}$$

where x and y are obtained from equation (a5) above.

LT-LT strategy pairing

On account of Bertrand competition in period 1, firm 1 will obtain segment A and firm 2 will obtain segment B in equilibrium. Further, in equilibrium, firm 1's price for segment A will be higher than firm 2's price by k because segment A has a differential preference of k for firm 1's product. Firm 2's price will not be set lower than the level that makes firm 2 indifferent between obtaining or not obtaining segment A in period 1. Therefore:

$$p_{11}^A = p_{21}^A + k \quad \text{(a20)}$$

We also have

$$p_{21}^A + w = y \quad \text{(a21)}$$

In eqn. (a21), the left hand side is the total two-period profit to firm 2 (from segment A) if segment A purchased from firm 2 in period 1. Here, w represents the period 2 profits of firm 2 from segment A (its low preference segment) if it obtains segment A in period 1. The right hand side of eqn. (a21) is the total two-period profit to firm 2 from segment A if that segment did not buy from firm 2 in period 1. The two-period profits to the two firms from segment A are (with x and y as defined in eqn. a5 above) are:

$$\pi_1^A = p_{11}^A + x$$
$$\pi_2^A = y \quad \text{(a22)}$$

Therefore, we have:

$$p_{21}^A = y - w,\ p_{11}^A = p_{21}^A + k = y - w + k$$
$$\pi_1^A = p_{11}^A + x = y - w + k + x,\ \pi_2^A = y \quad \text{(a23)}$$

and

$$\pi_{LT-LT} = \pi_1^A + \pi_1^B = \pi_1^A + \pi_2^A = k + 2y - w + x$$

$$< \pi_{ST-ST} = k + x + y \quad \text{(a24)}$$

This last inequality holds because $y = \frac{(1-\delta-k-\delta k)^2}{9} < w = \frac{(2-k+\delta)^2}{9}$.

LT-ST strategy pairing

When firm 1 adopts LT, the equilibrium outcomes related to segment A are identical to those in ST-ST case. This is because firm 2, which adopts ST, will continue to price at zero to segment A in the ensuing Bertrand competition. For segment B, firm 2's lowest price is zero. Therefore, firm 1 will not price below $-k$. In addition firm 1 will not price below $\hat{p}_{11}^B$, the price which makes the firm indifferent between obtaining this segment or not. Therefore:

$$p_{11}^B = \max(-k, \hat{p}_{11}^B) \quad \text{(a25)}$$

where,

$$\hat{p}_{11}^B + w = y \Rightarrow \hat{p}_{11}^B = y - w \quad \text{(a26)}$$

Sub-case 1: If $p_{11}^B = \hat{p}_{11}^B$, that is,

$$y - w > -k \quad \text{(a27)}$$

$$i.e., k > \frac{1}{4\delta + 2\delta^2}\left[(A)^{1/2} - 11 + 2\delta - 4\delta - 2\delta^2\right] \quad \text{(a28)}$$

where

$$A = 121 + 68\delta + 108\delta^2 + 32\delta^3 + 4\delta^4 \quad \text{(a29)}$$

then firm 1 will not compete aggressively for segment B and firm 2 will still capture that segment in period 1. In this case we have:

$$\pi_{12}^B = y$$
$$\pi_{21}^B = \hat{p}_{11}^B + k = y - w + k \quad \text{(a30)}$$
$$\pi_{22}^B = x$$

and,

$$\pi_{LT-ST} = \pi_{11}^A + \pi_{12}^A + \pi_1^B = k + x + y = \pi_{ST-ST} \quad \text{(a31)}$$

$$\pi_{ST-LT} = \pi_{21}^{A} + \pi_{22}^{A} + \pi_{21}^{B} + \pi_{22}^{B} = y + y - w + k + x = \pi_{LT-LT} \qquad \text{(a32)}$$

Note that this will hold for all k that satisfy eqn. (a28), i.e., when:

$$k > k_{threshold} = \frac{-11 - 2\delta(1+\delta) + \sqrt{121 + 4\delta(17 + \delta(27 + \delta(8+\delta)))}}{2\delta(2+\delta)} \qquad \text{(a33)}$$

Thus, as is evident from eqns. (a31) and (a32), the symmetric strategy pairings (ST-ST and LT-LT) and the asymmetric strategy pairings (LT-ST and ST-LT) all constitute subgame perfect Nash equilibria when condition in eqn. (a33) holds. However, as shown in eqn. (a24) $\pi_{ST-ST} > \pi_{lT-lT}$ and hence ST-ST is the Pareto-dominant Nash equilibrium. This proves Proposition 4. ■

Next, we consider the case where, in eqn (a25), $p_{11}^{B} = -k$, that is, $y - w \leq -k$. In this case, firm 1 will obtain segment B in period 1. The corresponding period 1 profits are:

$$\pi_{1}^{B} = -k + w, \pi_{21}^{B} = 0, \pi_{22}^{B} = w' \qquad \text{(a34)}$$

and,

$$\begin{aligned} \pi_{LT-ST} &= \pi_{11}^{A} + \pi_{12}^{A} + \pi_{1}^{B} = k + x - k + w > \pi_{ST-ST} = k + x + y \\ \pi_{ST-LT} &= \pi_{21}^{A} + \pi_{22}^{A} + \pi_{21}^{B} + \pi_{22}^{B} = y + w' < \pi_{LT-LT} = k + 2y - w + x \end{aligned} \qquad \text{(a35)}$$

Therefore, for

$$k < k_{threshold} = \frac{-11 - 2\delta(1+\delta) + \sqrt{121 + 4\delta(17 + \delta(27 + \delta(8+\delta)))}}{2\delta(2+\delta)} \qquad \text{(a36)}$$

LT-LT constitutes the sole subgame-perfect Nash equilibrium. This proves Proposition 5. ■

APPENDIX B: STRATEGIC CUSTOMERS

Proofs of Proposition 6 and Proposition 7

A strategic customer is forward looking and assesses the total expected surplus across periods when choosing between firms in period 1. Effectively, customers expecting a higher surplus in period 2 from staying with a firm would require to be compensated by even lower prices during period 1 by the competitor in order to get them to switch. We analyze the possible strategy pairings below.

ST-ST strategy pairing

In period 1, a customer in segment A will buy from firm 1 if and only if

$$1 + k - p_{11}^{A} + S_{A} \geq 1 - p_{21}^{A} + S_{A}^{'} \tag{a37}$$

Here, $S_A \left(S_A^{'}\right)$ is the customer's period 2 surplus obtained by going with firm 1 (firm 2) in period 1. The remaining terms in the expression relate to period 1 surplus. Firms engage in Bertrand competition for segment A. Denote:

$$\Delta = S_A - S_A^{'} \tag{a38}$$

where S_A and $S_A^{'}$ can be obtained from eqns. (a7) and (a16), by substituting $\delta = 0$. Specifically,

$$\Delta = S_A - S_A^{'} = \frac{1}{18}\left(k^2 + 10k - 11\right) + 1 - \left[\frac{1}{18}\left(k^2 + 8k - 11\right) + 1\right] = \frac{k}{9} \tag{a39}$$

Because customers are forward looking, firms need to accommodate this period 2 surplus when setting period 1 prices. We have in equilibrium:

$$\begin{gathered} p_{11}^{A} = k + \Delta,\ p_{21}^{A} = 0 \\ p_{11}^{B} = 0,\ p_{21}^{B} = k + \Delta \\ \pi_{11} = \pi_{21} = k + \Delta \end{gathered} \tag{a40}$$

Thus the total profit of each firm in the ST-ST case is:

$$\pi_{ST-ST} = \pi_{11} + \pi_{12} = k + \Delta + x + y \tag{a41}$$

LT-LT strategy pairing

In equilibrium, firm 1 will capture segment A in period 1 and firm 2 will capture segment B in period 1 in the ensuing Bertrand competition. In equilibrium, firm 1's price will be higher than firm 2's price by

$k+\Delta$, and firm 2's price will be the one that makes it indifferent between obtaining or not obtaining this segment in period 1. Therefore, we have:

$$\begin{aligned} p_{11}^{A} &= p_{21}^{A} + k + \Delta \\ p_{21}^{A} + w &= y \end{aligned} \qquad \text{(a42)}$$

and,

$$\begin{aligned} \pi_{1}^{A} &= p_{11}^{A} + x \\ \pi_{2}^{A} &= y \end{aligned} \qquad \text{(a43)}$$

where π_i^A is firm $i's$ total profit from segment A in both periods. Therefore, we have:

$$\begin{aligned} &p_{21}^{A} = y - w, \;\; p_{11}^{A} = p_{21}^{A} + k + \Delta = y - w + k + \Delta \\ &\pi_{1}^{A} = p_{11}^{A} + x = y - w + k + \Delta + x, \;\; \pi_{2}^{A} = y \end{aligned} \qquad \text{(a44)}$$

and,

$$\pi_{LT-LT} = \pi_1^A + \pi_1^B = \pi_1^A + \pi_2^A = k + \Delta + 2y - w + x < \pi_{ST-ST} = k + \Delta + x + y \qquad \text{(a45)}$$

This last inequality holds because, as can be seen from eqns. (9) and (15), $y < w$.

LT-ST strategy pairing

The equilibrium for segment A is the same as in the ST-ST case when firm 1 adopts LT. This is because firm 2 will continue to price at zero in this Bertrand competition. For segment B, firm 2's lowest price is zero. Therefore firm 1 will not price below ($-k-\Delta$). In addition, firm 1 will not price below $\hat{p}_{11}^B$, which makes it indifferent between obtaining this segment or not. Therefore:

$$p_{11}^{B} = \max\left(-k - \Delta, \hat{p}_{11}^{B}\right) \qquad \text{(a46)}$$

where,

$$\hat{p}_{11}^{B} + w = y \Rightarrow \hat{p}_{11}^{B} = y - w \qquad \text{(a47)}$$

If $p_{11}^B = \hat{p}_{11}^B$, that is, $y - w > -k - \Delta$, firm 2 will still obtain segment B. Substituting from eqns. (9), (15), and (a39) for y, w and Δ respectively, the condition $y - w > -k - \Delta$ simplifies to $k > (1/4)$. When this condition holds, we have:

$$\begin{aligned} \pi_{1}^{B} &= y \\ \pi_{21}^{B} &= \hat{p}_{11}^{B} + k + \Delta \\ \pi_{22}^{B} &= x \end{aligned} \qquad \text{(a48)}$$

and

$$\pi_{LT-ST} = \pi_{11}^{A} + \pi_{12}^{A} + \pi_{1}^{B} = k + \Delta + x + y = \pi_{ST-ST} \quad \text{(a49)}$$

$$\pi_{ST-LT} = \pi_{21}^{A} + \pi_{22}^{A} + \pi_{21}^{B} + \pi_{22}^{B} = y + y - w + k + \Delta + x = \pi_{LT-LT} \quad \text{(a50)}$$

Therefore, when $k > (1/4)$, the symmetric strategic pairings (ST-ST and LT-LT) and the asymmetric strategy pairings (LT-ST and ST-LT) all constitute subgame-perfect Nash equilibria. However, as can be seen by comparing eqns. (a49) and (a50), given that $y = \frac{(1-k)^2}{9} < w = \frac{(2-k)^2}{9}$, ST-ST is the Pareto-dominant Nash equilibrium. This proves Proposition 6. ■

Next, we consider the case where, in eqn. (a46), $p_{11}^{B} = -k - \Delta$. This holds when $y - w \leq -k - \Delta$ or $k < (1/4)$. In this case, firm 1 will obtain segment B in period 1. We have:

$$\begin{aligned} &\pi_{1}^{B} = -k - \Delta + w \\ &\pi_{21}^{B} = 0, \pi_{22}^{B} = w' \end{aligned} \quad \text{(a51)}$$

and:

$$\pi_{LT-ST} = \pi_{11}^{A} + \pi_{12}^{A} + \pi_{1}^{B} = k + x - k - \Delta + w > \pi_{ST-ST} = k + x + y \quad \text{(a52)}$$

$$\pi_{ST-LT} = \pi_{21}^{A} + \pi_{22}^{A} + \pi_{21}^{B} + \pi_{22}^{B} = y + w' < \pi_{LT-LT} = k + \Delta + 2y - w + x \quad \text{(a53)}$$

Therefore, for $k < (1/4)$, LT-LT constitutes the sole subgame-perfect Nash equilibrium. This proves Proposition 7. ■