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Dynamic pricing in customer markets with switching costs

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ABSTRACT

In a dynamic competitive environment, switching costs have two effects. First, they increase the market power of a seller with locked-in customers. Second, they increase competition for new customers. I provide conditions under which switching costs decrease or increase equilibrium prices. Taken together, the results suggest that, if markets are very competitive to begin with, then switching costs make them even more competitive; whereas if markets are not very competitive to begin with, then switching costs make them even less competitive. In the above statements, by "competitive" I mean a market that is close to a symmetric duopoly or one where sales take place with high frequency.

1. Introduction

Buyers (firms or final consumers) frequently must pay a cost in order to switch from their current supplier to a different supplier. These costs suggest some interesting questions: are markets more or less competitive in the presence of switching costs? Are prices higher or lower under switching costs? How do seller profits and consumer surplus vary as switching costs increase?

Empirical evidence regarding these questions is ambiguous: although most studies suggest that switching costs lead to higher prices, there is also evidence to the contrary. This ambiguity is mirrored by the theoretical literature: some papers provide sufficient conditions such that switching costs make markets less competitive, while others predict the opposite effect.

In this paper, I develop an analytical framework that, while fairly parsimonious, is flexible enough (and largely functional form independent) to encompass several possibilities, including pro- and anti-competitive effects of switching costs. In developing and analyzing this framework, I hope to provide intuition for some of the main effects of switching costs on market competition and reconcile apparently divergent results in the literature.

Although fairly general in several dimensions, I restrict my analysis to the case when sellers can discriminate between locked-in and not locked-in consumers.[3] This is a reasonable approximation for the workings of many intermediate goods

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[3] Throughout the paper I will use both the terms "locked-in" and "attached."

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markets — from aircraft to ready-mixed concrete — where sales contracts are typically tailored to each customer and their purchase history is known. These are frequently referred to as *customer markets* (thus the paper's title).[4]

Focusing the analysis on customer markets has two advantages. First, much of the previous research has centered on markets with many buyers and sellers who cannot discriminate between buyers, thus excluding an important class of examples (especially in intermediate goods markets). Second, the analysis of competition for a single buyer allows me to consider a fairly general dynamic framework, thus avoiding many of the limitations of the previous research on the topic.

Most of the prior economics literature, especially the early literature, solved some variation of a simple two-period model (see Section 2.3.1 in Farrell and Klemperer, 2007). The equilibrium of this game typically involves a bargain-then-ripoff pattern: in the second period, the seller takes advantage of a locked-in consumer and sets a high price (ripoff). Anticipating this second-period profit, and having to compete against rival sellers, the first-period price is correspondingly lowered (bargain). One limitation of two-period models is that potentially they distort the relative importance of bargains and ripoffs. In particular, considering the nature of many practical applications, two-period models unrealistically create game-beginning and game-ending effects. To address this problem, I consider an infinite-period model where the state variable indicates the seller to which a given consumer is currently attached.

The core section of the paper, Section 3, deals with the central research question in the switching costs literature: whether switching costs decrease or increase market competitiveness. In a two-period model, the answer is: lower-price bargains in the first period and higher-price ripoffs in the second period. The dynamic counterpart to the bargain-then-ripoff pattern is given by two corresponding effects on a seller's dynamic pricing incentives: the harvesting effect (sellers with locked-in customers are able to price higher without losing much demand) and the investment effect (sellers without locked-in customers are eager to cut prices in order to attract new customers).

The harvesting and investment effects work in opposite directions in terms of market average price. Which effect dominates? Conventional wisdom and the received economics literature suggest that the harvesting effect dominates (Farrell and Klemperer, 2007). However, as I mentioned earlier, recent research casts doubt on this assertion.[5] In Section 3, I attempt to clarify the issue by providing conditions under which switching costs decrease or increase equilibrium prices. The bottom line is that, if markets are very competitive to begin with, then switching costs make them even more competitive; whereas if markets are not very competitive to begin with, then switching costs make them even less competitive. In the above statements, by "competitive" I mean a market where each firm has approximately the same probability of attracting each given customer; or one where the discount factor is very high, so that the competition for future customers is relatively more important than revenues from current customers. In other words, in very competitive markets the investment effect dominates, whereas in non-competitive markets the harvesting effect dominates.

In Section 4, I consider a series of additional results regarding entry barriers, profits and welfare, and customer recognition. In Section 5, I discuss various possible extensions. Along the way, I try to relate my framework to the previous literature, thus organizing the literature's main themes around a single analytical framework. (For this reason, I omit a systematic literature review in the present section.) Finally, Section 6 concludes the paper.

2. Model and preliminary results

Consider an industry where two sellers compete over an infinite number of periods for sales to n infinitely lived buyers. Sellers' discount the future according to discount factor $\delta \in (0,1)$, buyers according to $\beta \in (0,1)$. Each buyer's valuation for firm i's product is given by $\alpha + \xi_i$, where α is a constant and $\xi_j = -\xi_i$, that is, ξ_i is the relative preference for firm i's product.[6] I assume that the buyer's outside option is worth $-\infty$, so the market is "covered" (that is, the buyer always chooses one of the firms).[7] I also assume that ξ_i is iid across periods. (Later in the paper I depart from this assumption, considering the alternative where relative preferences evolve according to an auto-regressive process.)

An important assumption throughout the paper is that sellers are able to discriminate between locked-in and not locked-in buyers (that is, buyers who are locked in to the rival seller). Without further loss of generality, I hereafter focus on the sellers' competition for a particular buyer. (A seller's total market share and total value can then be determined by simple aggregation over all buyers.)

Within each period, the timing is as follows: First nature generates ξ_{it}. Next sellers simultaneously set prices p_{it}. Then the buyer chooses one of the sellers. Finally, period payoffs are received: assuming production costs are zero, seller i receives p_{it} if a sale is made and zero otherwise.[8] The buyer receives $\alpha + \xi_{it} - p_{it} - I_t s$, where I_t an indicator variable:

[4] The assumption that sellers can discriminate between locked-in and not-locked-in consumers also applies to final good products such as magazine subscriptions and bank accounts (Klemperer, 1995, suggests many other examples).

[5] The idea that the effects of switching costs can be pro-competitive is not novel. See for example von Weizsacker (1984) and Klemperer (1987a, 1987b) for seminal contributions and Cabral and Villas-Boas (2005) for a reinterpretation of some of those results. Recent research has explored the competitive effects of switching costs in an infinite-period context.

[6] An alternative way of modeling preferences would be to assume the preference for firm i's product is given by ζ_i, distributed according to cdf $\Phi(\zeta_i)$, and then define $\xi_i \equiv \zeta_i - \zeta_j$.

[7] Alternatively, I can assume that the outside option is zero and that α is high enough that one of the products is chosen with probability 1. However, for this alternative interpretation to work, the $s \to \infty$ limit results must implicitly assume a sequence of values $\alpha(s)$.

[8] Alternatively, I could assume that both sellers have the same production cost, in which case prices should be interpreted as margins above cost.