Proceedings of the 2013 Winter Simulation Conference
R. Pasupathy, S.-H. Kim, A. Tolk, R. Hill, and M. E. Kuhl, eds.

DUOPOLY PRICE COMPETITION WITH SWITCHING COST AND BOUNDED RATIONAL CUSTOMERS

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ABSTRACT

We consider the model of duopoly price competition with switching cost and clients' bounded price perception. Firms optimize their prices by maximizing profits in the long– or short–term planning horizon. Customers demand exactly one unit of homogeneous product. Customers incur a switching cost, if they decide to change their current supplier. Moreover, customers are featured by bounded price perception, which results in making random errors, while trying to find the cheapest product. The aim of research is to evaluate customers' switching cost with respect to equilibrium price, which is calculated by simulation methods. We show that the influence of switching cost is conditioned on customers' price perception and firms' planning horizon in an interactive, nonlinear and non–monotonic fashion. We find out that the impact of switching cost differs substantially between short– and long–term planning horizon regime. Therefore, we identify the phase–transition driven by companies' discount factor.

1 INTRODUCTION

Switching cost is the cost incurred by a client each time he decides to change his supplier. Switching cost encompasses both monetary and non–monetary costs, which include: (1) behavioral status-quo effect and psychological inertia to continue buying from the same supplier, (2) cost of learning a new product through self–teaching or special training, (3) the risk associated with an unknown new product, (4) consequences of breaking a previously made long–term legal agreement, (5) sunk cost of durable goods and investment of complementary goods that cannot be recovered, (6) cost of search for new products and information about them, (7) individual loyalty to a brand or an induced by companies through loyalty programs, see (Farrell and Klemperer 2007).

The presence of switching cost is especially ubiquitous in modern informational societies and network economies due to: (1) low marginal cost and price of data transferring relative to switching cost, (2) massive data collecting of customer behaviour targeted at up–selling and cross–selling making customer less willing to switch, e.g. Amazon.com's recommendation system based on historical customer's purchases and (3) technological lock-in due to already made investments in hardware, software and learning, see (Shapiro and Varian 1999).

The existence of switching cost affects: (1) companies, whose success depends on taking advantage of switching cost, (2) customers, who face the risk of lock-in to a single supplier like in a monopoly competition and (3) antitrust agencies that regard the switching cost as the threat to the market competition.

The purpose of research is to evaluate the importance and influence of switching cost on equilibrium price in duopoly setting with bounded rational customers. Additionally, we distinguish two regimes of companies with short– and long–term planning horizon. We assess a switching cost conditioning on both client's bounded price perception and planning horizon regimes. Equilibrium prices are calculated by a simulation, since the problem is too complex to solve it analytically.

2 MODEL

The model features three distinctive elements: (1) exogenous customers' switching cost, (2) customers' bounded price perception and (3) two different planning horizons of companies. All these features influence the equilibrium price in an interactive and nonlinear fashion.

Switching cost (SC) and bounded rationality (δ) are featured in the following soft–max function denoting the probability of continuing to buy from a current supplier i: $s(\Delta p_i) = \frac{\exp(-\delta \Delta p_i)}{\exp(-\delta \Delta p_i)+\exp(-\delta SC)}$, where Δp_i denotes the difference in prices between firm i and the competing firm other than i.

Given the above customer's decision making process, we define companies' profit functions and use them as objective functions in an iterative best–response dynamics algorithm.

3 RESULTS

The obtained results of switching cost's influence on the price equilibrium depends heavily on company's planning horizon.

For an infinite planning horizon, i.e. discount factor equals zero, higher switching cost results in lower market price. The negative impact of switching cost on price equilibrium is due to the fact that higher switching cost results in higher sensitivity of stationary distribution of clients to changes in prices. Also higher price consciousness depresses the equilibrium price. The influence of both factors is illustrated on the left figure.

For a short planning horizon, i.e. discount factor going to infinity, higher switching cost results in higher market price, because companies are interested in an immediate profit and exploit their locked–in customers. The influence of customer's price consciousness is nonlinear and U–shaped. For low price consciousness clients are charged with a high price, since they don't pay much attention to the price difference due to a low price consciousness. As their price consciousness increases, companies lower prices making switching cost relatively more important with respect to a price. Additionally, higher price consciousness reinforces the importance of switching cost. As clients become more aware of their switching cost, they are more locked–in, competition deteriorates and companies set higher prices. Additionally, for some parameter space with both high switching cost (SC) and price consciousness (δ), no equilibrium states are identified, as can be seen on the right figure.

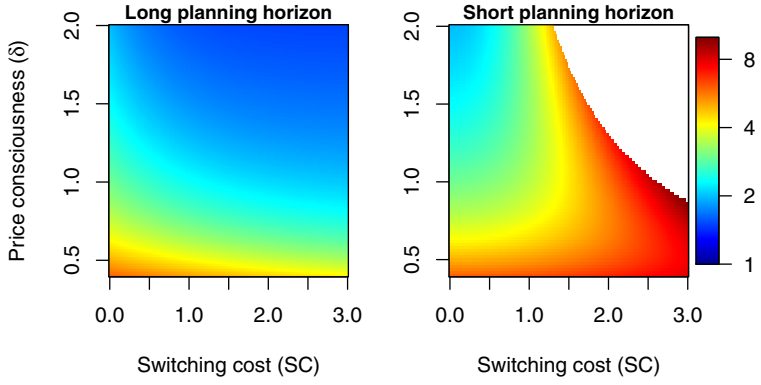

Figure 1: The influence of switching cost (SC) and price awareness (δ) on price equilibrium for long– and short–term planning horizon regime

Since the relationship between price equilibrium and switching cost is different between two planning horizon regimes, we conclude that there is a phase–transition driven by companies' discount factor. We find this critical discount factor, for which the phase–transition takes place.

References

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