E C O N O M I C S B U L L E T I N

Switching costs and the impact of trade liberalization

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Abstract

This paper considers a two-period model of market entry with horizontally differentiated products and switching costs. Conditions that are conducive to a competitive environment in the second period are shown to yield a less competitive outcome in the first period. That is, when the marginal cost of a foreign entrant is relatively low, the first-period output of a domestic monopolist is relatively low as well.

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1 Introduction

The proliferation of trade liberalization through both economic integration (e.g., the European Union) and preferential trade agreements (e.g., NAFTA) has spawned a vast literature on the implications of trade liberalization. In particular, in a single-period setting, pro-competitive gains from trade due to foreign firms' entry into the domestic market have been studied extensively.[1] It is well known that the entry of a cost-competitive (i.e., low marginal cost) foreign firm yields a highly competitive outcome. As yet, however, little attention has been paid to the implications of trade liberalization in the context of products with switching costs.

In a model with switching costs, it is more costly for consumers (or wholesalers) to buy from one producer in one period and from another producer in the next.[2] In the context of trade liberalization, switching costs include transaction and information costs for import wholesalers.[3] Important transaction costs result from differences in languages and customs. If a wholesaler has been buying a good (e.g., steel) from a domestic firm and decides instead to buy from a foreign firm, then the wholesaler must hire new personnel that are familiar with that country's language and customs. Another transaction cost is that of negotiating a contract or agreement with the new supplier. Contracting costs with a new foreign supplier are usually higher than contracting costs with a domestic supplier. Switching costs are thus an important factor in any industry in which the product passes through a wholesaler's hands.[4]

Although the vitality of industries characterized by switching costs is closely related to trade liberalization, the literature on trade liberalization is almost exclusively focused on products without switching costs. Since the role of switching costs is amplified in the globalized world, it seems important to explore the impact of liberalization in the trade of products with switching

[1] See, for example, Brander (1981), Markusen (1981).

[2] See Klemperer (1987a, 1987b).

[3] See To (1994) for discussion.

[4] See Klemperer (1995) for surveys of the relevant literature. For the strategic export policy context, see To (1994).

costs.

As its primary contribution, this paper examines how trade liberalization (i.e., the entry of a foreign firm into the domestic market) affects the behavior of a domestic monopolist in the presence of switching costs. For these purposes I construct a simple two-period market-entrance model with switching costs. It will be shown that a competitive environment in the second period caused by a foreign entrant's relatively low marginal costs is associated with a less competitive outcome in the first period because the domestic monopolist will produce less. The results differ from those obtained in standard single-period models of trade liberalization in that the inclusion of switching costs drastically changes the impact of trade liberalization.

2 The model

Consider a two-period market-entrance game with horizontally differentiated products and switching costs. Consumers in the domestic market are uniformly located on the interval $[0, 1]$. Consumers incur a transportation cost of one per unit of distance. In the first period, the domestic monopolist, which is located at 0 (we call this Firm 0), is already in the market. Firm 0 chooses a price (p_0^1) and collects the first period's profits. At the beginning of the second period, trade is liberalized and a foreign firm, which is located at 1 (we call this Firm 1), enters the domestic market. Subsequently, firms simultaneously set prices (p_0^2 and p_1^2), realize their profits, and the game ends. We assume no discounting.

The model follows Klemperer (1987a) and To (1994) closely in regard to the implementation of switching costs. In each period, consumers have reservation value r and a perfectly inelastic demand for one unit of the good.[5] Assume that, after a consumer has purchased from one supplier, it is too costly to switch to another supplier. This assumption is made to ensure that demand curves are smooth. At the end of the first period, mass $v \in (0, 1]$ of uniformly and randomly chosen consumers leaves the market and is replaced by new consumers. A consumer that leaves the market in the second period

[5] Considerations are restricted to cases in which $r < 2$.

does not incur any costs and gets a second-period payoff of zero. The turnover rate serves as a substitute measure for the magnitude of switching costs – a high rate of turnovers implies that switching costs are small, on average.

Firms have no fixed costs and constant marginal costs. Firm 0's marginal costs are normalized to zero, while c represents Firm 1's marginal costs. As is usual when solving for sub-game perfect equilibria, the analysis begins with the second period.

2.1 The Second Period

In the second period, consumers minimize their second-period costs given that they are either locked into Firm 0 or that they are new consumers with no previous ties. First consider the v new consumers. If new consumer i buys from Firm 0, i's total cost is Firm 0's price plus i' s transportation cost: $p_2^0 + i$. Similarly, i's cost of buying from Firm 1 is $p_2^1 + (1 - i)$. New consumer i will buy from Firm 0 when the cost of buying from Firm 0 is less than the cost of buying from Firm 1. Let $\hat{i}$ be the new consumer who is indifferent between buying from Firm 0 and Firm 1: $\hat{i} = 1/2 + (p_2^1 - p_2^0)/2$. For any $i < \hat{i}$, consumer i will buy from Firm 0 and for any $i > \hat{i}$, consumer i will buy from Firm 1, hence Firm 0 sells to $v\hat{i}$ new consumers and Firm 1 sells to $v(1 - \hat{i})$ new consumers.

Now consider the $1 - v$ old consumers. All old consumers purchase from Firm 0 as long as the price plus the transportation cost is no greater than the reservation value: Firm 0 sells to mass $(1 - v)q_1$ of old consumers, where q_1 represents Firm 0's output in the first period.

Firm 0's second-period demand is equal to the sum of the mass of the new consumers who buy from Firm 0 and the mass of the remaining old consumers who bought from Firm 0 in the first period.[6] Firm 0's demand is:

$$q_2^0 = \frac{1}{2} + \frac{1 - v}{2}(2q_1 - 1) + \frac{v}{2}(p_2^1 - p_2^0). \tag{1}$$

[6] Following Klemperer (1987a, 1987c), I assume that Firm 0 cannot price discriminate against its repeat customers.

Firm 1's demand is:

$$q_2^1 = \frac{v}{2} - \frac{v}{2}(p_2^1 - p_2^0). \tag{2}$$

Firms maximize second-period profits through the choice of prices, given the market coverage of Firm 0 from the first-period. Both firms' second-period profits are:

$$\begin{aligned} \pi_2^0 &= p_2^0 q_2^0, & (3)\\ \pi_2^1 &= (p_2^1 - c) q_2^1. & (4) \end{aligned}$$

Using (1) through (4) to get firm j's first order condition and then solving yields both firms' reaction functions:

$$\begin{aligned} p_2^0 &= \frac{1}{2v} + \frac{2(1-v)}{3v}(2q_1 - 1) + \frac{p_2^1}{2}, & (5)\\ p_2^1 &= \frac{1 + p_2^0 + c}{2}. & (6) \end{aligned}$$

Computing the intersection of the reaction functions yields second-period prices:

$$\begin{aligned} p_2^0 &= \frac{2}{3v}\left(1 + (1-v)(2q-1) + \frac{v(1+c)}{2}\right), & (7)\\ p_2^1 &= \frac{1}{3v}\left(1 + (1-v)(2q-1) + 2v(1+c)\right). & (8) \end{aligned}$$

Second-period outputs become:

$$\begin{aligned} q_2^0 &= \frac{1}{3v}\left(1 + (1-v)(2q-1) + \frac{v(1+c)}{2}\right), & (9)\\ q_2^1 &= \frac{1}{3v}(1 + (1-v)(2q-1) + 2v(1+c)). & (10) \end{aligned}$$

Firm 0's second-period profit becomes:

$$\pi_2^0 = p_2^0 q_2^0 = \frac{2}{9v}\left(1 + (1-v)(2q_1 - 1) + \frac{v(1+c)}{2}\right)^2. \tag{11}$$

2.2 The First Period

To simplify the analysis, let us assume that, in the first-period, consumers purchase from Firm 0 as long as the price plus the transportation cost is no greater than the reservation value. This implies that $p_1 + q_1 = r$ holds. Thus, Firm 0's first-period profit becomes:

$$\pi_1^0 = p_1 q_1 = (r - q_1)q_1. \tag{12}$$

Firm 0 maximizes the total profit through the choice of its first-period price, p_1, knowing how its first-period choice will affect decisions and profits in the future. Firm 0's total profit is:

$$\pi^0 = \pi_1^0 + \pi_2^0. \tag{13}$$

Substituting (11) and (12) into (13) and maximizing yields the first-period equilibrium output:

$$q_1 = \frac{r + \alpha\beta}{2(1 - \alpha(1 - v))}, \tag{14}$$

where

$$\alpha = \frac{8(1-v)}{9v}, \quad \beta = \frac{v(3+c)}{2}.$$

Note that the sign of the denominator becomes positive if $v > \hat{v} \equiv [25 - (369)^{1/2}]/16 \approx 0.362$ holds. Equation (14) implies the interesting impact of trade liberalization in the presence of switching costs.

Proposition: *Suppose that the turnover rate is in the range of* $\hat{v} \leq v \leq 1$. *As the foreign entrant's marginal costs become higher, the domestic monopolist's first-period output increases.*

In other words, given that the turnover rate is sufficiently large, the more cost-competitive the foreign entrant is, the lower the incentive to capture consumers in the first period [i.e., $(dq_1/dc) > 0$]. This result differs from those obtained in trade models without switching costs. In those models, trade with cost-competitive foreign firms makes the market more competitive. In this model with switching costs, however, the promise of competitive market

conditions in the future period makes the current period less competitive. The principle involved is that, since the motivation to capture consumers in the first period is to shift profits away from the foreign entrant in the second period, a less-competitive domestic firm (which has a lower incentive to shift profits) will choose a lower output level in the first period.[7]

3 Concusions

In a two-period market-entry model with switching costs, it has been shown that conditions that cause a more competitive environment in the second period (i.e., relatively low marginal costs for a foreign entrant) yields a less competitive outcome in the first period. The interaction between trade liberalization and firm behavior in the presence of switching costs is crucial: if the magnitude of turnover rate is substantial, some of the pro-competitive gains from trade liberalization in the future period must be offset by a less-competitive outcome in the current period.

References

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[4] Klemperer, P. (1987b) 'Market with Consumer Switching Costs,' *Quarterly Journal of Economics,* Vol. 102, pp. 375–394.

[7] A related argument can be found in the strategic trade policy literature. See, for example, Collie and de Meza (2003).

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