



Habit formation and strategic interactions: A new gain from trade?



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HIGHLIGHTS

- Two periods and one country duopoly model are proposed.
- A foreign firm enters the market at the second period at a given trade cost.
- Representative consumer's utility function displays habit formation.
- There can be a pro-competitive effect before trade liberalization.
- Welfare depends on the strength of habit formation and on the productivity of firms.

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ABSTRACT

A two-period duopoly model of trade with habit formation displays a “pre-entry pro-competitive effect” and the standard pro-competitive effect once trade is effective. Both effects are driven in a different way by transport cost. A trade liberalization affects ambiguously welfare.

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1. Introduction

In most of the trade literature with an oligopolistic setting, the inverse demand function relates the demand and price at a given period. However, there are many cases where the utility – and thus, the price – is non-time-separable. Many psychological studies show that individuals increase their utility of many products and characteristics just by consuming them repeatedly.¹ This is the case for food, cultural goods, high-tech products and so on (Becker and Murphy, 1988; Driskill and McCafferty, 2001). This paper develops a duopoly model of trade and explores the implications of habit formation.

2. The model

We consider a single market that operates for two periods $t = 1, 2$ with complete and perfect information. In the first period, a

home firm is a monopolist on its own market and in the second period, a country opens to trade at a trade cost τ that allows the entry of a foreign firm and the two firms compete *à la Cournot*. Then, the domestic firm is present in the domestic market in both periods and produces the output x_t , and the foreign firm produces the good y_2 selling in the second period. Without loss of generality, the home firm's marginal cost of production is normalized to zero and the foreign firm's marginal cost is an increasing function of trade cost $c = c(\tau)$ with $c' \geq 0$ everywhere between $[0; \tau^p]$, with τ^p the prohibitive transport cost. So, c represents the relative productivity of the entrant and $c(0)$, the marginal cost at zero trade cost, can possibly be negative, meaning that the foreign entrant is more productive than the incumbent.

The representative consumer's utility $U_t(\cdot)$, $t = 1, 2$ displays habit formation in the second period.² An increase of x_1 raises the utility provided by x_2 and the strength of this process is captured

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¹ For a literature overview, see Bornstein (1989).

² While forming consumption plans in $t = 1$, domestic consumers do not take the impact that this choice has on the utility of period 2 into account.

by δ . There is no storage technology and no credit market.

$$U_1(x_1) = x_1 - \frac{1}{2}x_1^2$$

$$U_2(x_1, x_2, y_2) = (x_2 + y_2) - \frac{1}{2}(x_2 + y_2)^2 + \delta x_1 x_2.$$

Assumption 1. $0 \leq \delta < 1$.

Given standard budget constraints, the inverse demand function for x_1 is $p_1 = 1 - x_1$ and the prices for x_2 and y_2 are respectively³:

$$p_2 = 1 - (x_2 + y_2) + \delta x_1$$

$$p_2^* = 1 - (x_2 + y_2).$$

Assumption 2. In order to ensure that consumers have strictly positive consumption for all goods offered in each period, we restrict the interval of $c(\tau)$:

$$c(\tau) \in \left] -(1 + \delta); \frac{6 - 3\delta - 4\delta^2}{4(3 - \delta^2)} \right[, \quad \forall \tau \in [0; \tau^p[.$$

2.1. Autarky

Before moving to trade equilibrium, let us examine the equilibria at both periods without the foreign firm's entry.

Solving by backward induction, the maximization problem of the home firm at the first period is:

$$\max_{x_1} \pi_{d1}^A = [1 - x_1]x_1 + [1 - x_2(x_1) + \delta x_1]x_2(x_1)$$

$$\text{with } x_2^A(x_1) = \frac{1 + \delta x_1}{2}$$

which yields the following solution:

$$x_1^A = x_2^A = \frac{1}{2 - \delta}.$$

Unsurprisingly, the quantity sold at the first period is an increasing function of δ , which represents the intensity of habit formation. As x_2 is increasing in x_1 , the home firm chooses x_1 at a higher level than if it was simply maximizing profit period per period.

2.2. Trade openness

Now let us move on to the study of trade equilibrium. Solving by backward induction, we first express the optimal quantities sold by each firm in the second period as functions of x_1 . We denote by the subscript $i = d, f$ the domestic and foreign firm respectively. Profits can be written as:

$$\pi_{d2} = p_2 x_2$$

$$\pi_{f2} = (p_2^* - c(\tau))y_2.$$

First order conditions $\frac{\partial \pi_{d2}}{\partial x_2} = \frac{\partial \pi_{f2}}{\partial y_2} = 0$ yield the following solutions:

$$x_2(x_1) = \frac{1 + c(\tau) + 2\delta x_1}{3} \quad y_2(x_1) = \frac{1 - 2c(\tau) - \delta x_1}{3}.$$

Under perfect information, the home firm knows that x_2 and y_2 are respectively increasing and decreasing functions of the output x_1 . Thus, strategic interactions clearly appear in the first period. The home firm anticipates the foreign firm's entry and adjusts its first period output in order to maximize its inter-temporal profit. In this sense, x_1 can be seen as an investment made in the first period by

the domestic firm in order to deter or to accommodate the foreign firm's entry, depending on their relative productivity.

$$\max_{x_1} \pi_{d1} = [p_1(x_1)]x_1 + [p_2(x_1, x_2(x_1), y(x_1))]x_2(x_1)$$

$$\Leftrightarrow x_1 = \frac{9 + 4\delta(1 + c(\tau))}{2(9 - 4\delta^2)}.$$

Thus, the productivity of the foreign firm impacts the first period equilibrium even though the home firm is a monopolist. This result comes from the habit formation that introduces a strategic choice in order to capture market shares or to extract rent from existing consumers. All else equal, the higher δ , the bigger the market share of domestic firm in the second period. Thus, with a strong habit formation structure, the incumbent has incentives to raise x_1 . This can be connected to "home market effect" that establishes a link between market share and pro-competitive effect (see Helpman and Krugman, 1985).

2.3. Pro-competitive effect(s)

Since trade has an impact on both x_1 and x_2 , there are possibly two different pro-competitive effects. A "pre-entry pro-competitive effect" measured by the difference between x_1^A and x_1 and the "standard pro-competitive effect" that captures the direct impact of entry on output in the second period (comparison of total output in the second period between the autarkic and trade equilibria).

The comparison between x_1^A and x_1 shows that trade has an impact on the domestic firm's strategy before liberalization. The home firm anticipates the entry of the foreign firm. Depending on the relative productivity of the entrant, this can result in a lower or higher price in comparison with the autarkic benchmark. The pre-entry pro-competitive effect occurs if the following condition holds⁴:

$$x_1 > x_1^A \Leftrightarrow c(\tau) > c^* = \frac{1 - 4\delta}{4(2 - \delta)}.$$

Contrary to Brander (1981) who deals only with what we call the "standard pro-competitive effect" here, the pre-entry pro-competitive effect is decreasing in the relative productivity of the foreign competitor. If the domestic firm's productivity is sufficiently high, it can lower its price in order to capture a market share before foreign entry. If its productivity is too low instead, it exploits its monopoly position by increasing the first period price (i.e. by lowering x_1). As c is an increasing function of τ , a low trade cost can lead to a higher price in the first period.

Proposition 1. *The pre-entry pro-competitive effect depends positively on the productivity of the incumbent firm, the transport cost and the strength of habit formation and depends negatively on the entrant's productivity.*

In the second period, both prices p_2 and p_2^* are positively correlated to $c(\tau)$. Thus, as in Brander (1981), the more competitive the entrant, the higher the standard pro-competitive effect. Hence, $c(\tau)$ has an ambiguous overall effect on the market structure as it tends to lower the price of the first period and to raise both second period prices.

Proposition 2. *The conditions under which the outcome in the first period is more competitive (high $c(\tau)$) yield to a less competitive environment in the second period.*

Note that in the case where there is a pre-entry pro-competitive effect, trade liberalization causes a fall in prices through two channels: through entry itself in the second period, but also through the threat of entry in the first period. Both effects are driven in a different way by τ , there is *a priori* a non-determined effect on welfare.

³ Budget constraints: $p_1 x_1 \leq I$ for the first period and $p_2 x_2 + p_2^* y_2 \leq I$ for the second period, with I the consumer's income in each period.

⁴ Note that $\frac{\partial c^*}{\partial \delta} < 0, \forall \delta \in [0; 1[$.

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