Exclusive territories in the presence of upstream competition

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Abstract

This paper investigates the effects of exclusive territories in the presence of upstream competition. We consider the vertical dealings among two upstream firms and four downstream firms and find that exclusive territories may be more beneficial for consumers and more harmful for producers than Cournot competition without exclusive territories. Moreover, social welfare is enhanced by imposing exclusive territories when the transport cost is not too low.

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1. Introduction

Exclusive territories (hereafter, ET) is one of the measures used to enforce vertical restraints. By imposing ET, upstream firms can eliminate the intrabrand competition among downstream firms. Many authors have explored the economic theory of ET and have shown interesting results (e.g., Mathewson and Winter (1984, 1994), Rey and Tirole (1986), Alexander and Reiffen (1995), and Boyd (1996)).

This paper investigates the effects of exclusive territories in the presence of competition among upstream firms. We show that ET may be more beneficial for consumers and more harmful for producers as compared with conventional theory of ET.

Our paper closely relates to Matsumura (2003). However, his model eliminates the competition among upstream firms. Such a setting is too restrictive to analyze the real world, for example, the setting of Japanese automobile dealers or newspaper distributors in which ET is widely used. In contrast, we consider two upstream firms and four downstream firms.[1] Therefore, our model involves competition at the upstream level. While Matsumura (2003) uses the circular-city spatial model, we consider two separate markets. However, the difference is not significant. We show that some of Matsumura's results do not hold if competition among upstream firms is introduced.

2. Analysis

We consider two upstream firms (firms A and B) and four downstream firms (firms 1, 2, 3, and 4). Let us assume that firm A sells an intermediate goods to firms 1 and 2 while firm B sells the goods to firms 3 and 4. We consider two separate markets (markets 1 and 2); firms 1 and 3 are located in market 1, and firms 2 and 4 are located in market 2. Firms A and B impose a two-part tariff on each downstream firm. Thus, if a downstream firm buys quantity Q, it must pay $F + Qw$, where F is a franchise fee and w is a wholesale price. We assume a constant marginal production cost for firms A and B and normalize it to zero. Therefore, since each upstream firm sells to two downstream firms, the profit of each upstream firm is $2F + Qw$ when the quantity sold is Q.

Downstream firms must purchase one intermediate good to produce one final good, and they compete in the Cournot fashion in both markets. We assume a linear demand function $P(Q) = a - q$ where a is a positive constant and q denotes the total sales in the market, which is the same for both markets. Without loss of generality, we assume that the production cost of downstream firms only comprises the payment made to the upstream firm. Furthermore, we assume that the final goods are homogeneous. In the

[1] Rey and Stiglitz (1995) and Mycielski, et al. (2000) treat competition among upstream level, but they do not consider the transport cost.

first stage, upstream firms determine their wholesale price and franchise fee; in the second stage, downstream firms compete *à la* Cournot.

2.1. Exclusive territories

First, we consider ET. Firms 1 and 3 sell their final goods only in market 1, and firms 2 and 4 sell their goods only in market 2. The profit functions of firms A and B are $\Pi_A = w_A(q_1^1 + q_2^2) + 2F_A$ and $\Pi_B = w_B(q_3^1 + q_4^2) + 2F_B$, respectively, where w_i is the wholesale price imposed by firm i, q_i^j is the quantity sold to the downstream firm i in market j, and F_i is the franchise fee imposed by firm i.

The profits of downstream firms are $\pi_1 = (P^1 - w_A)q_1^1 - F_A$, $\pi_2 = (P^2 - w_A)q_2^2 - F_A$, $\pi_3 = (P^1 - w_B)q_3^1 - F_B$, and $\pi_4 = (P^2 - w_B)q_4^2 - F_B$,respectively, where π_i is the profit of firm i and P^j is the price in market j. Following Matsumura (2003), we consider that firm A (firm B) sets F_A (F_B) such that $\pi_1 = \pi_2 = 0$ ($\pi_3 = \pi_4 = 0$).[2] Then, the routine calculations yield

$$w_i = -\frac{a}{4} - \frac{w_j}{4}, \left(for\ i, j = A, B, and\ i \neq j\right). \tag{1}$$

(1) suggests that an increase in the wholesale price leads to a decrease in the rival's wholesale price. The logic is as follows. A rise in the wholesale price decreases the sales of the corresponding downstream firms, and hence, the rival downstream firms, which compete in the Cournot fashion, attempt to increase their sales. Therefore, an increase in the wholesale price leads to a decrease in the rival's wholesale price.[3]

Then, from (1), we obtain the equilibrium wholesale price:

$$w_A = w_B = -\frac{a}{5}. \tag{2}$$

(2) suggests that upstream firms set the wholesale price lower than the marginal production costs.[4] This may appear curious; however, in our model, upstream firms can completely siphon off the profits of downstream firms.[5] Therefore, the equilibrium strategy would be for upstream firms to allow downstream firms to sell more of their

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[2] We assume that firms 1 and 2 (firms 3 and 4) can contract only with firm A (firm B).
[3] See Nariu and Watanabe (2005).
[4] We do not assume free disposal, i.e., downstream firms can buy intermediate goods only as needed.
[5] In an upstream monopoly such Matsumura (2003), the equilibrium wholesale price with ET is zero.

final goods and, subsequently, extract the profits by imposing the franchise fee.

Social welfare (W) is defined by sum of consumer surplus and upstream firms' profits. Note that the downstream firms' profits are zero in equilibrium. Then, we get

$$P^1 = P^2 = \frac{a}{5} \left(\equiv P^E \right) \tag{3}$$

$$\Pi_A = \Pi_B = \frac{4}{25} a^2 \left(\equiv \Pi^E \right) \tag{4}$$

$$W = \frac{24}{25} a^2 \left(\equiv W^E \right). \tag{5}$$

2.2. Cournot competition without ET

In this section, we consider Cournot competition without ET. We denote this situation by "CC." Under CC, downstream firms can provide the final goods in both markets. By incurring the transport cost "t," they can sell beyond their respective markets. Note that we assume $0 < t \leq 6a/17$ because when $t > 6a/17$, the straightforward calculations yield $q_1^2 = q_2^1 = q_3^2 = q_4^1 < 0$. The upstream firms' profits are $\Pi_A = w_A(q_1^1 + q_1^2 + q_2^1 + q_2^2) + 2F_A$ and $\Pi_B = w_B(q_3^1 + q_3^2 + q_4^1 + q_4^2) + 2F_B$, respectively, and the profits of four downstream firms are $\pi_1 = (P^1 - w_A)q_1^1 + (P^2 - w_A - t)q_1^2 - F_A$, $\pi_2 = (P^1 - w_A - t)q_{2A}^1 + (P^2 - w_A)q_2^2 - F$, $\pi_3 = (P^1 - w_B)q_3^1 + (P^2 - w_B - t)q_3^2 - F$, and $\pi_4 = (P^1 - w_B - t)q_4^1 + (P^2 - w_B)q_4^2 - F_B$, respectively.

The routine calculations yield

$$w_A = w_B = \frac{-2a + t}{28}. \tag{6}$$

Note that downstream firms cannot sell their goods beyond their respective markets when $t = 6a/17$; that is similar to the situation under ET. (6) shows that the wholesale price rises with t. This is because a rise in t can soften competition.

The further calculations yield the following equilibrium values:

$$P^1 = P^2 = \frac{a}{7} + \frac{3t}{7} \left(\equiv P^C \right) \tag{7}$$

$$\Pi_A = \Pi_B = \frac{12a^2 - 12at + 101t^2}{98} \left(\equiv \Pi^C \right) \tag{8}$$

$$W = \frac{48a^2 - 48at + 110t^2}{49} \left(\equiv W^C \right). \tag{9}$$

2.3. Exclusive territories vs. Cournot competition

Let us present the main results. First, we compare the price of the final goods under ET with that under CC. From (3) and (7), we get

$$P^E - P^C = \frac{2a}{35} - \frac{3t}{7}. \tag{10}$$

From (10), we observe that the sign of $P^E - P^C$ depends on t. Figure 1, which horizontally expresses the value of t, indicates this relationship. It shows that the larger the transport cost incurred by the firms, the higher is the price under CC. In particular, when $t > 2a/15$, the final goods under CC fetch a higher price than those under ET although the CC regime is more competitive than ET regime. Thus, consumers suffer larger losses under CC than under ET. This result is summarized in the following proposition.

Proposition 1. *The price under CC is higher than that under ET if and only if the transport cost is larger than 2a/15, and thus consumers are better off by imposing ET under that situation.*

This result is not derived from Matsumura (2003) which treats upstream monopoly. The logic is as follows. CC provides greater competition-enhancing effects than ET. Therefore, under CC, the price determined by the four downstream firms in each market is lower than that determined under ET, provided t is sufficiently small. However, a large t offsets the competition-enhancing effects on price. Consequently, CC leads to a higher price.

Next, we consider the profits of upstream firms. From (4) and (8), we obtain

$$\Pi^E - \Pi^C = \frac{92a^2 + 300at - 2525t^2}{2450}. \tag{11}$$

From (11) we find that $\Pi^E > \Pi^C$ holds if and only if $0 < t < 2a\left(15 + 14\sqrt{13}\right)/505$. Therefore, upstream firms can extract more profits under CC. We summarize this result in the following proposition.

Proposition 2. *The upstream firms' profits under CC are higher than those under ET if and only if the transport cost is larger than* $2a\left(15 + 14\sqrt{13}\right)/505$*, and thus upstream firms are worse off by imposing ET under that situation.*

This proposition is also not derived from Matsumura (2003). Figures 1 and 2 depict the relationship between t and the profits of upstream firms. The figures indicate that when the transport cost exceeds the threshold value, the higher the transport cost incurred by the firms, the higher the profits earned by upstream firms. This relationship is clarified by Lahiri and Ono (1988), who show that domestic welfare improves with a reduction in the outputs of firms that are rather inferior. The reduction of the inferior firms' outputs increases the outputs of superior firms, and thus, this reduction economizes the transport cost. Then, the effects of the cost improvement compensate the economic deterioration resulting from the restraint of competition, provided the superior firms have sufficient advantages with regard to the costs. In this paper, an increase in t reduces the outputs of inferior firms; therefore, an increase in t is beneficial for upstream firms.

Why are upstream firms better off under CC when the transport cost is high? From (2) and (6), we know that the wholesale price under CC is higher than that under ET. This is because upstream firms tend to avoid selling large quantities at the downstream level. In comparison with ET, Cournot competition among the four downstream firms in each market is rather competitive for upstream firms. However, under a large t, upstream firms can soften the competition while maintaining a high wholesale price.

Finally, we compare social welfare. From (5) and (9), we obtain

$$W^E - W^C = \frac{-2\left(12a^2 - 600at + 1375t^2\right)}{1225} \tag{12}$$

(12) suggests that $W^E - W^C$ is positive if and only if $2a\left(30 - 7\sqrt{15}\right)/275 < t < 6a/17$. Thus, we can state that:

Proposition 3. *Social welfare under ET is higher than that under CC if and only if the transport cost is larger than* $2a\left(30 - 7\sqrt{15}\right)/275$.

Fig. 3 indicates the relationship between social welfare and the transport cost. From this result, we find that ET enhances social welfare even if the transport cost is fairly small. Note that, however, both producer and consumer surplus are better off by ET only when $2a/15 < t < 2a\left(15 + 14\sqrt{13}\right)/505$ (See fig. 1.). This finding is quite different from the result of Matsumura (2003).

3. Concluding remarks

We have shown that in the situation where the transport cost is so high that downstream firms cannot sell their goods beyond their respective markets, the economic effects differ from the situation under ET. It is well-known that ET could be beneficial for consumers because it might reform the distribution system. We believe that the findings in this paper shed light on the other aspects of consumer-benefiting ET.

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Figures

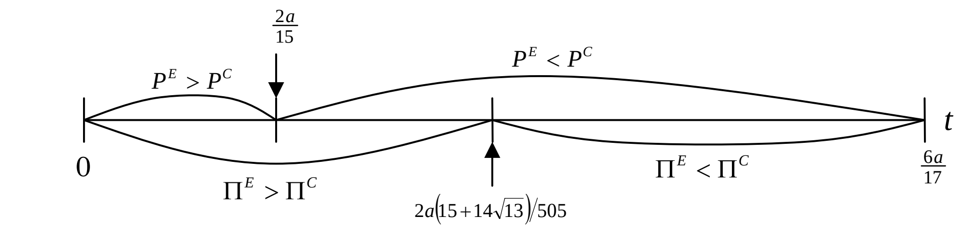

Fig. 1: Relationship between t and the price (profit)

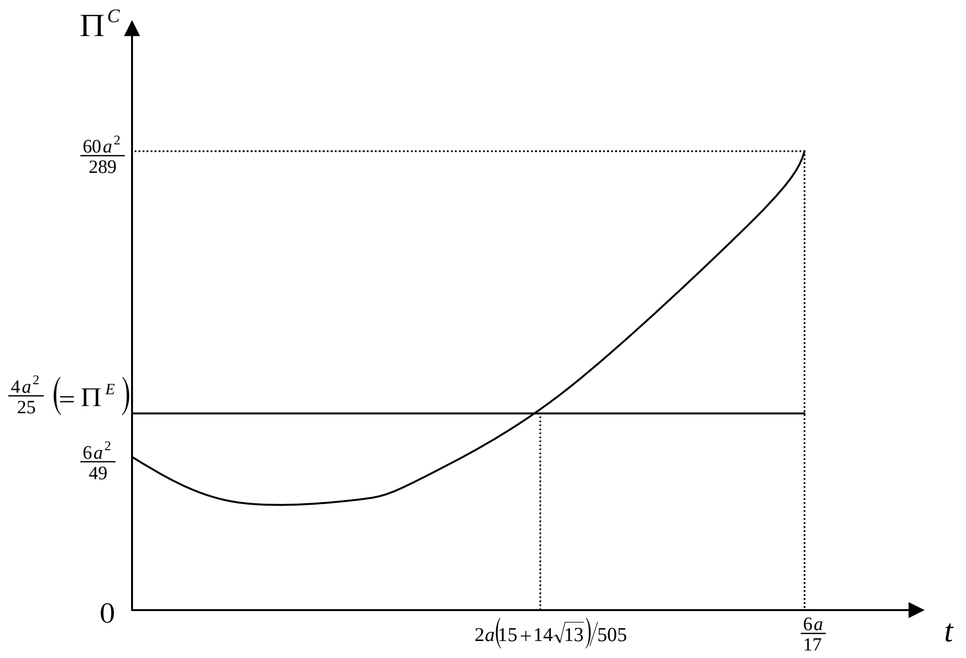

Fig. 2: Relationship between t and the profit

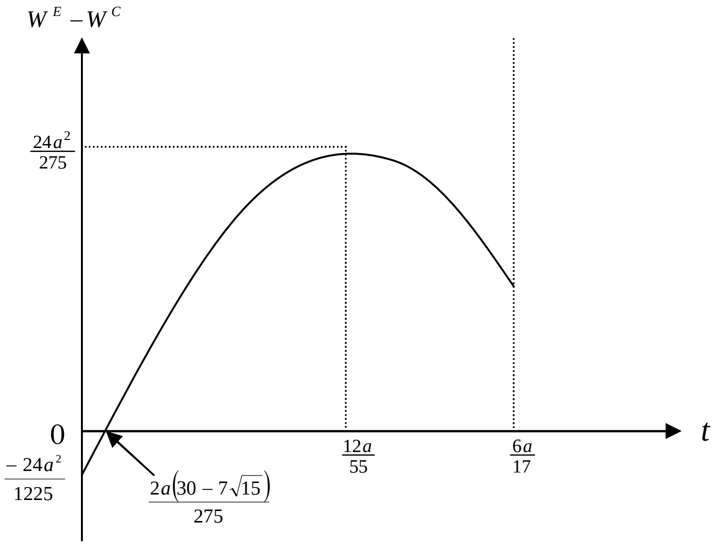

Fig. 3. Relationship between t and social welfare