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Undesirable Competition

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Abstract: It is generally believed that higher competition benefits consumers, and encourage the antitrust authorities to foster competition. We show that this view can be misleading in the presence of welfare-maximising nationalised firms. Using a simple model with a nationalised firm, we show that entry of private profit-maximising firms makes consumers worse off compared to nationalised monopoly. Entry increases profit of the incumbent firm, industry profit and social welfare at the expense of the consumers. Our result is important for competition policy.

Key Words: Competition; Consumer surplus; Nationalised firm

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1. Introduction

It is generally believed that higher competition benefits consumers¹ (Metzenbaum, 1993, Gans, 2005 and Hausman and Lebtog, 2007), and encourage the antitrust authorities to foster competition. We show that this view can be misleading in the presence of welfare-maximising nationalised firms. Using a simple model with a nationalised firm, we show that entry of private profit-maximising firms makes consumers worse off compared to nationalised monopoly. Entry increases profit of the incumbent firm, industry profit and social welfare at the expense of the consumers. Our result is important for competition policy.

Nationalised or state-owned firms in industries, such as airline, rail, telecommunication, electricity, natural gas, banking, insurances, health care, broadcasting and education, are very common in many developing, developed and transitional economies.² Although many of these industries were initially characterised by entry restrictions on private firms, several countries such as India, Taiwan and Japan relaxed entry regulation in recent years. Hence, a proper account for the effects of competition in industries with nationalised firms deserves attention. While the existence of nationalised firms is viewed as an indirect regulatory mechanism (Cremer et al., 1989 and De Fraja and Delbono, 1989), we show that the effect of competition on consumers is non-trivial and may go against the consumers.

¹ Promotion of consumer welfare is the common goal of consumer protection and competition policies. The document by the U.S. Department of Justice says “Consumers benefit from competition through lower prices and better products and services” (http://www.justice.gov/atr/public/div_stats/211491.htm).

² Among the developed countries, nationalised firms are more prominent in Europe, Canada and Japan. They are less prominent in the USA, yet present in industries such as packaging and overnight-delivery (Ishida and Matsushima, 2009).

2. The model and the results

2.1. Nationalised monopoly

Consider monopoly of a welfare-maximising nationalised firm (called firm 1) that produces with a constant marginal cost of production $c > 0$. Assume that the inverse market demand function is $P(q)$ with $P' < 0$ and $P'' \leq 0$, where P is price and q is the total output.

Firm 1 produces output to maximise welfare of the economy, which is sum of the industry profit and consumer surplus. Hence, firm 1 determines output to maximise the following expression:

$$\text{Max}_{q^m} \int_0^{q^m} P(q) dq - cq^m . \quad (1)$$

The equilibrium output is given by

$$P^m = c , \quad (2)$$

implying zero profit of firm 1 under nationalised monopoly.

2.2. Entry of private profit-maximising firms

Now consider entry of n private profit-maximising firms, each of them produces at the marginal cost of production d , with $d < c$ and d is assumed to be zero for simplicity.

We assume that the outputs of the firms are homogeneous.

We consider the following game under entry. At stage 1, the nationalised firm (firm 1) determines output to maximise welfare. At stage 2, all private firms choose outputs simultaneously. We solve the game through backward induction.

At least two justifications can be given for the above game structure. First justification comes from the empirical side. As mentioned in Fjell and Heywood

(2002), many industries such as telecommunications, electricity and postal services are dominated by former nationalised firms with a first mover advantage, thus justifying the role of the nationalised firm as a Stackelberg leader and the private profit-maximising firms as Stackelberg followers. Second justification comes from the theoretical side. It follows from Pal (1998), Jacques (2004) and Lu (2007) that, in our analysis, an observable delay game of Hamilton and Slutsky (1990) will create an equilibrium where the nationalised firm and the private firms behave like a Stackelberg leader and Stackelberg followers respectively.³

Now determine the equilibrium outputs of the firms under entry. The i th private firm determines output to maximise the following expression:

$$\underset{q_i}{\text{Max}} P(q)q_i, \quad i = 2, 3, \dots, n+1. \quad (3)$$

The equilibrium output of the i th follower is given by

$$P + q_i P' = 0, \quad i = 2, 3, \dots, n+1. \quad (4)$$

Due to the symmetry of the private firms, the nationalised firm (firm 1) maximises the following expression to determine output:

$$\underset{q_1}{\text{Max}} \int_0^{q_1+nq_i} P(q) - cq_1. \quad (5)$$

The equilibrium output of firm 1 is given by

$$P(1+n\frac{\partial q_i}{\partial q_1}) = c, \quad (6)$$

where $\frac{\partial q_i}{\partial q_1} = -\frac{P' + q_i P''}{(n+1)P' + nq_i P''} < 0$.

³ See De Fraja and Delbono (1989) for an earlier work on Stackelberg competition in a mixed oligopoly.

The total output under entry is given by $P(1+n\frac{\partial q_i}{\partial q_1})+n(P+q_iP')=c$ or

$$P(1+n\frac{\partial q_i}{\partial q_1})=c, \quad (7)$$

since $P+q_iP'=0$.

Since $\frac{\partial q_i}{\partial q_1} < 0$, (2) and (6) show that entry of the profit-maximising firms

reduces the equilibrium output of firm 1. Since it follows from (7) that the equilibrium P is greater than c , the equilibrium price is lower under nationalised monopoly than under entry with Stackelberg competition. Hence, competition makes the consumers worse off if the nationalised firm behaves like a Stackelberg leader. Since $P > c$ in (7), it also implies that the profit of the nationalised firm is positive under entry while it is zero under nationalised monopoly. Hence, entry increases profit of the incumbent nationalised firm.

It is intuitive to argue that entry increases welfare compared to nationalised monopoly. Under entry, the welfare-maximising nationalised firm could increase welfare compared to nationalised monopoly by choosing its monopoly output, while the profit-maximising firms chose respective positive outputs. Since the equilibrium output of the nationalised firm under entry is different from its monopoly output, it is trivial that the equilibrium welfare under entry is higher compared to the situation where the nationalised firm produces its monopoly output under entry. Hence, it is immediate that entry increases welfare compared to nationalised monopoly. Higher welfare under entry compared to nationalised monopoly is created at the expense of the consumers.

The following proposition summarises the above discussion.

Proposition 1: *If $c > 0$, entry by private profit-maximising firms behaving like Stackelberg followers, (i) reduces output of the nationalised firm, (ii) increases profit of the nationalised firm, (iii) reduces consumer surplus, and (iv) increases welfare of the economy, compared to nationalised monopoly.*

Considering all profit-maximising firms, Pal and Sarkar (2001) and Mukherjee and Zhao (2009) show that entry of a firm can raise the profits of some incumbents by stealing market shares from other incumbents. In contrast, entry in our analysis increases profit of the incumbent nationalised firm in the absence of other incumbents. Lower total output under entry is responsible for our result.

2.2. An example

Now we provide an example with a linear demand function, $P = a - q$, for the above analysis.

Straightforward calculation shows that, under nationalised monopoly, the equilibrium output of firm 1, price of the product, profit of firm 1 and welfare are respectively $q^m = a - c$, $P^m = c$, $\pi_1^m = 0$ and $W^m = \frac{(a - c)^2}{2}$.

Now consider entry of n profit-maximising firms. It is easy to check that if firm 1 and the entrants behave like a Stackelberg leader and Stackelberg followers, the equilibrium output of firm 1, the equilibrium output of the i th entrant, the total output of the firms, price of the product, profit of firm 1, profit of the i th entrant and welfare

are respectively $q_1^s = a - c(n+1)^2$, $q_i^s = c(n+1)$, $q^s = a - c(n+1)$, $P^s = c(n+1)$,
 $\pi_1^s = cn(a - c(n+1)^2)$, $\pi_i^s = c^2n(n+1)^2$ and $W^s = \frac{a^2 - 2ac + c^2(n+1)^2}{2}$.

The comparison of the equilibrium values under nationalised monopoly and entry confirms Proposition 1.

2.3. The implications of Stackelberg competition

It is important to note that the leadership behaviour of firm 1 under entry is important for our result. To show it, consider the situation where firms 1 and the profit-maximising firms produce like Cournot oligopolists under entry.

Under Cournot competition, firm 1 and the i th private firm maximise the following expressions respectively:

$$\text{Max}_{q_1} \int_0^{q_1+nq_i} P(q) - cq_1 \quad (8)$$

$$\text{Max}_{q_i} P(q)q_i, \quad i = 2, 3, \dots, n+1. \quad (9)$$

The equilibrium outputs are given by

$$P = c \quad (10)$$

$$P + q_i P' = 0, \quad i = 2, 3, \dots, n+1. \quad (11)$$

The total output is given by $P + n(P + q_i P') = c$ or

$$P = c, \quad (12)$$

since $P + q_i P' = 0$.

The total output, price of the product and the profit of firm 1 are the same under nationalised monopoly and Cournot competition under entry. Since the cost efficient entrants produce positive outputs while the total output remains the same

under nationalised monopoly and entry, entry increases welfare compared to nationalised monopoly by saving the cost of production. Thus, it shows that Stackelberg competition under entry is important for Proposition 1.

Our example with the linear demand curve, $P = a - q$, shows that, under Cournot competition, the equilibrium output of firm 1, the equilibrium output of the i th entrant, total equilibrium outputs of the firms, price of the product, profit of firm 1, profit of the i th entrant and welfare are respectively $q_1^c = a - c(n+1)$, $q_i^c = c$, $q^c = a - c$, $P^c = c$, $\pi_1^c = 0$, $\pi_i^c = c^2$ and $W^c = \frac{(a-c)^2 + 2c^2n}{2}$. Hence, under Cournot competition, entry does not affect the profit of firm 1 and consumer surplus but it increases welfare compared to nationalised monopoly.

The reason for our result showing $P^m = P^c < P^s$ follows easily from Figure 1.

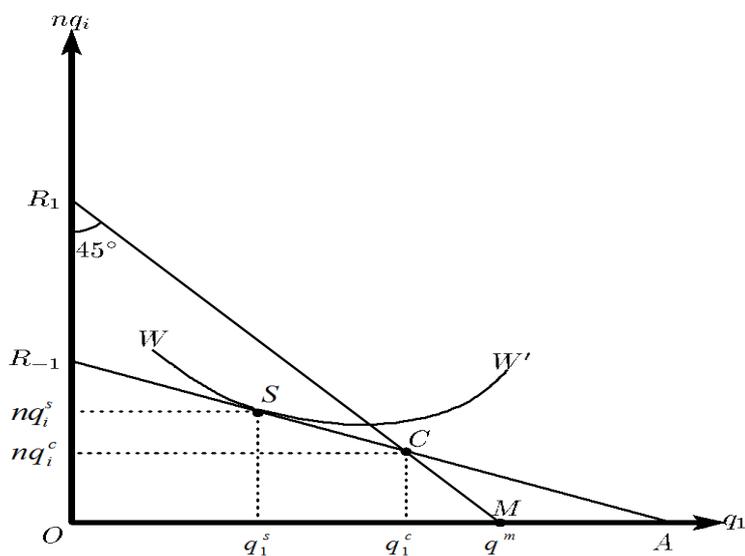


Figure 1: Comparison of nationalised monopoly, Cournot and Stackelberg

The reaction curves of firm 1 and the profit-maximising firms taken together are drawn as R_1M and $R_{-1}A$, respectively. The intersection of these curves, C , represents

Cournot equilibrium, whereas the intersection of R_1M and the horizontal axis shows the output under nationalised monopoly. It follows from (10) that the slope of the nationalised firm's reaction curve with respect to the total outputs of the profit-maximising firms is -1 . Hence, if there is Cournot competition under entry, output reduction by the nationalised firm is matched by the increase in the total outputs of the profit-maximising firms. Hence, entry does not change total outputs and consumer surplus compared to nationalised monopoly.

However, Stackelberg equilibrium in Figure 1 is denoted as S , where the iso-welfare function WW' is tangent to $R_{-1}A$.⁴ Since the absolute slope of $R_{-1}A$ (i.e., the reaction function of the profit-maximising firms taken together) is less than 1 , the output reduction by the nationalised firm is larger than an increase in the total outputs of the profit-maximising firms. Hence, the total output reduces when the product-market competition under entry changes from Cournot to Stackelberg. Thus, we get $P^m = P^c < P^s$.

3. Conclusion

In contrast to the general belief that higher competition makes the consumers better off, we show that entry of profit-maximising firms makes the consumers worse off in the presence of a nationalised firm behaving like a Stackelberg leader under entry. Entry increases profit of the incumbent firm, industry profit and social welfare at the

⁴ The shape and properties of the iso-welfare function can be found easily from the welfare function

$$W = \int_0^{q_1+nq_i} P(q) - cq_1.$$

expense of the consumers. The antitrust authorities should be careful while considering entry in industries with nationalised firms.

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