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Abstract

When entry of the relatively inefficient firms is deterred due to fixed costs, leading to a monopoly of the relatively efficient firm, guaranteed production quota for the less efficient ones can increase consumers' surplus. In other words, restricting the output of more efficient firm helps to reduce the price compared to the monopoly level. If the emergence of monopoly is independent of the level of fixed costs of the inefficient competitors, monopoly is the more efficient outcome. This has relevance for the recent entry of China in WTO and the abolition of export quotas in textiles. This also qualifies the conventional wisdom in the trade policy literature that quantitative restrictions are necessarily anti-competitive. The optimal policy can be to keep in place a quota but allow it to be licensed to the more efficient exporter.

Key Words: Consumer surplus; Entry; Quota

JEL Classifications: F12; F13; D43; O24

Outline

Non-Technical Summary

China's entry into WTO has brought mixed reactions from the textile exporters in the developing world, particularly when the Multi–Fiber-Arrangement (MFA) is also being phased out. Other competing countries might be worried since China might affect their market shares significantly, both because it would henceforth enjoy the Most-Favored-Nation (MFN) status, and the quota protection provided by the MFA would no longer be there.

When entry of the relatively inefficient firms is deterred due to fixed costs, leading to a monopoly of the relatively efficient firm, guaranteed production quota for the less efficient ones can increase consumers' surplus. In other words, restricting the output of more efficient firm helps to reduce the price compared to the monopoly level. If the emergence of monopoly is independent of the level of fixed costs of the inefficient competitors, monopoly is the more efficient outcome. Thus, it has relevance for the recent entry of China in WTO and the abolition of export quotas in textiles. This also qualifies the conventional wisdom in the trade policy literature that quantitative restrictions are necessarily anti-competitive. The optimal policy can be to keep in place a quota but allow it to be licensed to the more efficient exporter.

1. Introduction

China's entry into WTO has brought mixed reactions from the textile exporters in the developing world, particularly when the Multi–Fiber-Arrangement (MFA) is also being phased out. Countries such as Bangladesh and Vietnam are worried that China will significantly affect their market shares, both because it will henceforth enjoy the Most-Favored-Nation (MFN) status, and the quota protection provided by the MFA will no longer be there. Such concerns are quite usual. But these should not perturb the consumers of textiles in the importing countries. If we ignore the import-competing production in rest of the world, and look at the interest of the consumers, the entry or exit in the market does not matter as long as the price comes down. If China is more efficient than other countries and the other countries fail to live up to the standard, Chinese monopoly should also be welcome to the consumers. Typically the monopoly price charged by China should be lower than the marginal cost of production in other countries. We start off from this benign argument and pose an interesting theoretical problem.

We show that if there is sufficiently large fixed cost of production that prevents relatively inefficient exporters from entering the market in the absence of any export quota, the consumers in the importing country can be worse- off without such a quota. So, protecting relatively inefficient exporters may actually make the consumers of the importing country better-off. However, if the entry barrier is due to a difference in the marginal cost, the consumers in the importing country are better off in absence of a quota. Whether the consumers in the importing country are better-off under a quota may depend on the type of industry, which can be characterized by the cost of fixed investment. For example, one is likely to observe higher fixed cost for the manufacturing industry, whereas it is less likely to be the case for the service sectors.

Hence, our findings have important implications for the abolition of MFA. It suggests that arrangements such as the MFA may not be bad for the consumers of textiles in the

developed countries if the exporting countries face a significant fixed cost, but do not differ that much in terms of their marginal costs of production.

Even if quota allows the technologically inefficient firm to enter the product market, the technologically inefficient firm will prefer to sub-contract the production of its quota to the efficient firm. Sub-contracting with the technologically efficient firm will help to save the cost of production, and thus it makes the firms better off. Therefore, even if the technologically efficient firm produces all the output, the presence of quota helps to eliminate monopoly of the technologically efficient firm, making the consumers of the importing country better-off.[1] As an alternative to sub-contracting, technology licensing by the technologically efficient firm to the technologically inefficient firm may also help to achieve the same outcome provided the licensing contract specifies the amount of output that could be produced through the licensed technology. Thus, our paper can also be related to the literature on international technology transfer.

Hence, our paper contributes to the general literature on strategic trade policy [e.g., Brander and Spencer (1983, 1985), Helpman and Krugman (1989), Jones and Takemori (1989), Krishna (1987, 1989), and Krugman (1994)], and more specifically to Kabiraj and Marjit (2003) and Mukherjee and Pennings (2005). Kabiraj and Marjit (2003) show that the government of an importing country may use the tariff policy to induce technology licensing for a technologically efficient foreign firm to a technologically inefficient domestic firm, thus making the consumers of the importing country better off. Mukherjee and Pennings (2005) extend this line of research and show that a monopolist has the incentive to license its technology to another firm in presence of strategic trade policy of the importing country. However, whether the technology will be licensed to a domestic firm or to a foreign firm, will depend on the cost of international technology transfer and whether the importing country

[1] In a recent paper, Choi and Marjit (2005) show that quota can be less restrictive than a tariff even in a competitive model.

commits to its tariff policy or not.[2]

The remainder of the paper is organized as follows. Section 2 describes the basic model and derives the results. Section 3 concludes.

2. Model

Consider an industry with two exporters, 1 and 2, of a homogeneous product and there is an importing country for this product. Let the demand function in the importing country be given by $p(q_1 + q_2)$, where q_1 and q_2 are the output levels of firm 1 and 2 respectively, with $p' < 0$ and $p' + q_i p'' < 0$, $i = 1,2$. To show the effects of quota on entry and market competition, we assume away any domestic competition in the importing country.

Assume that firm 1 is technologically superior to that of firm 2 and the firms have constant marginal costs of production. For simplicity, we assume that the marginal cost of firm 1 is zero, and the constant marginal cost of firm 2 is $c > 0$. However, each firm needs to incur a fixed cost of production, $F > 0$.

Let us consider that the institutional arrangement is preventing firm 1 from exporting its product, and, therefore, initially only firm 2 is exporting the product. The equilibrium monopoly price is denoted by $P_{m2} = \phi(c)$, and we assume that the operating profit (i.e., total revenue minus total variable cost) of firm 2 covers the fixed cost of production, i.e.,

$$\pi_2(c) > F . \qquad (1)$$

Now, assume that the institutional barrier on firm 1's export has been removed completely. This creates the threat of competition in the product market. Also, define $\tilde{c}$ as the level of marginal cost that equals the monopoly price charged by firm 1, P_{m1}, that is $\tilde{c} = P_{m1}$. It is easy to check that monopoly price decreases with lower marginal cost of production. Hence,

[2] One may refer to Saggi (2002) for a survey on international technology transfer.

$$P_{m1} < P_{m2}. \quad (2)$$

We consider the following game under competition. At stage 1, the firms decide simultaneously whether to produce (or enter) or not. If both firms decide to produce, at stage 2 they choose their output levels like Cournot duopolists. If, at stage 1, only one firm decides to produce, then, at stage 2, this firm produces like a monopolist. A firm will produce a positive output if it derives a non-negative (net) payoff. We solve the game through backward induction.

Let us first consider the situation of free trade. Given (2), the operating profit of firm 2 (i.e., total revenue minus total variable cost) is positive for all $c < \tilde{c}$. However, even if $c < \tilde{c}$, firm 2 will decide to produce provided its net profit is not negative, i.e.,

$$\pi_2(0, c) \geq F \quad (3)$$

where the first (second) argument in the profit function shows the marginal cost of firm 1 (firm 2).

Given that firm 2 finds it optimal to produce as a monopolist, it is trivial that firm 1 will also find it profitable to produce the product as a monopolist, i.e., $\pi_1(0) > F$. We further assume $\pi_1(0, c) > F$. This will generate a unique pure strategy equilibrium at stage 1.[3] So, we have

$$\pi_1(0) > \pi_1(0, c) > F \quad (4)$$

which implies that under free trade, firm 1 will always produce.

With the standard curvature restrictions on the demand function, it can be shown that $\frac{\partial \pi_2(0, c)}{\partial c} < 0$. Hence, assuming $\pi_2(0,0) > F$, we can find that there exists $\hat{c} \in (0, \tilde{c})$ such that

$$\pi_2(0, \hat{c}) = F. \quad (5)$$

[3] If $\pi_1(0, c) < F$, there will be two pure strategy equilibria, where either only firm 1 or only firm 2 will decide to produce, and one mixed strategy equilibrium. However, we avoid this situation, since it will not add anything to the main purpose of this paper.

Conditions (2), (3) and (5) imply that, given $F > 0$, firm 2 will not enter if $c \in (\hat{c}, \tilde{c})$.[4] Obviously, if $c > \tilde{c}$, firm 2 will not enter the market even if $F = 0$.

Then, we have the following proposition.

Proposition 1: *(a) If $c > \tilde{c}$, the equilibrium price will be $P_{m1} < P_{m2}$ for any values of $F \geq 0$. (b) Define duopoly price by P_d when both firms produce positive outputs and assume that $c \in (0, \tilde{c})$. Then the equilibrium price will be $P_d < P_{m1}$ for $c \in (0, \hat{c})$, and P_{m1} for $c \in (\hat{c}, \tilde{c})$.*

Proof: (a) Even if $F = 0$, the definition of $\tilde{c}$ implies that firm 2 does not find it profitable to produce even if firm 1 charges its monopoly price. Hence, for $c > \tilde{c}$, firm 1 charges P_{m1}, which is less than P_{m2} and provides firm 1 its maximal profit.

(b) If firm 1 produces as a monopolist, the first order condition (FOC) for profit maximization implies

$$p(q_{m1}) + q_{m1} p' = 0 \tag{6}$$

where q_{m1} as the monopoly output of firm 1.

Now, consider that both firms produce positive outputs, which can occur only if $c \in (0, \tilde{c})$. The optimal output levels of firm 1 and 2 will satisfy

$$p(q_d) + q_1 p' = 0 \tag{7}$$

and

$$p(q_d) + q_2 p' - c = 0 \tag{8}$$

where $q_d = q_1 + q_2$ is the total output produced under duopoly.

Adding (7) and (8) we get.

$$2p(q_d) + q_d p' - c = 0. \tag{9}$$

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[4] If $\pi_2(0,0) < F$, there will be two Nash equilibria for some values of c, where either only firm 1 or only firm 2 enters the market. Our assumption of $\pi_2(0,0) > F$ helps us to avoid this unnecessary complication by ensuring unique pure strategy Nash equilibrium for the market entry decision, and without loosing any insight for our analysis.

Since $p(q_d) > c$, subtraction of (6) from (9) implies

$$p(q_d) + q_d p'(q_d) < p(q_{m1}) + q_{m1} p'(q_{m1}). \quad (10)$$

Given that $p' + q_i p'' < 0$, $i = 1,2$, it is easy to see that the marginal revenue for the industry, which is $p(q_1 + q_2) + (q_1 + q_2)p'$, is negatively sloped. Hence, $q_d > q_{m1}$ and $P_d < P_{m1}$, if both firms produce in the market.

However, given the positive fixed cost of production, both firms produce positive output when $c \in (0, \hat{c})$. So, we have $P_d < P_{m1}$ for $c \in (0, \hat{c})$.

But, the positive fixed cost of production deters entry of firm 2 for $c \in (\hat{c}, \tilde{c})$, and this generates the equilibrium price P_{m1}. Q.E.D.

Given initially monopoly of firm 2, Proposition 1(a) tells that firm 1 is so much better than firm 2, that it will not deter entry of firm 2 even if there is no fixed of production. The entry of firm 1 certainly benefits the consumers in this situation. Proposition 1(b) shows that if firm1's cost efficiency is not large, both firms will produce in the market if the fixed cost of production does not prevent firm 2 from entering. Since, in this situation, the duopoly price is lower than firm1's monopoly price, consumers will be better off if the market structure is duopoly than monopoly of firm 1. However, if $c \in (\hat{c}, \tilde{c})$, free trade will not be able to ensure duopoly market structure, and firm 1 will be monopolist in this situation.

Let us now consider the policy option of the importing country. In particular, consider an export-quota assigned to firm 2 (the inefficient firm). Let $\overline{q_2}$ be the export-quota assigned to firm 2 such that the following condition holds

$$[p(q_1(\overline{q_2}) + \overline{q_2}) - c]\overline{q_2} = F. \quad (11)$$

With the standard tie-breaking assumption one can argue that if such $\overline{q_2}$ exists, the inefficient firm will enter the market. It should be noted that, to make entry of firm 2

profitable, $\overline{q_2}$ must be greater than firm 2's Cournot output when both firms produce in the market.

Note that setting such a policy is exactly similar to allow firm 2 to act as a Stackelberg leader. However, even with this quota, firm 2 will enter provided the net profit of firm 2 behaving as the Stackelberg leader (which is the maximal payoff firm 2 can earn, given that firm 1 produces in the market) covers the fixed cost of production, and we assume that this holds, i.e.,

$$\pi_{s2}(0, c) \geq F \ . \tag{12}$$

If (12) holds, it is easy to check that there exists $\overline{q_2}$ satisfying (11), the corresponding industry output will be $\overline{q_2} + q_1(\overline{q_2}) = \overline{q_s}$.

However, it should be clear that the importing country would impose a quota restriction provided that it makes the consumers better-off. The following proposition will show that it is indeed the case.

Proposition 2: *Let q_s denote the optimal industry output when firms 2 and 1 behave like Stackelberg leader and follower respectively. Then, $p(q_s) < p_{m1}$.*

Proof: Firm 1 maximizes the following objective function:

$$p(q_{s1} + q_{s2})q_{s1}. \tag{13}$$

The FOC for profit maximization for firm 1 implies

$$p + q_{s1}p' = 0 \ . \tag{14}$$

As a Stackelberg leader firm 2 maximizes

$$p(q_{s1}(q_{s2}) + q_{s2})q_{s2} - cq_{s2} \ . \tag{15}$$

FOC for profit maximization implies

$$p + q_{s2}p'(1 + \frac{dq_{s1}}{dq_{s2}}) - c = 0 \tag{16}$$

where $\frac{dq_{s1}}{dq_{s2}}$ is the slope of firm 1's reaction function, and standard calculation shows that

$$\frac{dq_{s1}}{dq_{s2}} = -\frac{(p' + q_{s1}p'')}{(2p' + q_{s1}p'')} < 0 \text{ and } \left|\frac{dq_{s1}}{dq_{s2}}\right| < 1.$$

Adding (14) and (16), we get the total output under Stackelberg competition that will satisfy

$$2p + q_s p' + q_s p' \frac{dq_{s1}}{dq_{s2}} - c = 0. \qquad (17)$$

Since $p(q_s) > c$, subtraction of (6) from (17) implies

$$p(q_s) + q_s p'(q_s)(1 + \frac{dq_{s1}}{dq_{s2}}) < p(q_{m1}) + q_{m1} p'(q_{m1}). \qquad (18)$$

Since the marginal revenue for the industry is negatively sloped, it follows from (18) that $q_s > q_{m1}$, and therefore, $P_s < P_{m1}$. Q.E.D.

The above proposition shows that the industry output under Stackelberg competition is greater than that of under monopoly, but it does not say whether the importing country will set the quota at firm 2's Stackelberg leadership output level. However, it should be clear from the slope of firm 1's reaction function that it is optimal for the importing country to set the amount of quota at that level. Since $\frac{dq_{s1}}{dq_{s2}} < 0$ and $\left|\frac{dq_{s1}}{dq_{s2}}\right| < 1$, although higher output of firm 2 reduces output of firm 1, the reduction of firm 1's output is lower than firm 2's higher output, and therefore, the industry output under Stackelberg equilibrium, with firm 2 being the leader, will go up.

Hence, the following result is immediate.

Proposition 3: *If condition (12) holds, the importing country will set the quota equal to firm 2's Stackelberg leader output.*

The above discussion shows that if free entry prevents relatively inferior firm from entering the market, an importing country might be better-off by imposing quota on the exporting firms. However, the above argument has assumed away any contracting between the firms. In fact, if contracting between the exporting firms is not costly, the firms will prefer to produce all the output under Stackelberg competition in firm 1, since it will help to save cq_{s2} amount of cost of production, though the outputs will be sold by both firms. In other words, given the imposition of quota, we may observe outsourcing by firm 2 to firm 1. Further, outsourcing by firm 2 will also relax condition (12). However, it should be remembered that though firm 1 would produce all the outputs, the imposition of quota would be necessary to create competition in the product market.

3. Conclusion

This paper shows that if entry of a relatively cost inefficient firm is deterred due to fixed cost of production, the imposition of quota on the exporting firms can make the consumers of the importing country better-off. However, though the technologically inefficient firm may outsource its production to the technologically efficient firm, the imposition of quota is important to keep the competition between the exporting firms. Our paper suggests that the abolition of MFA and the entry of China in WTO may make the importing countries of textiles worse-off by eliminating technologically inefficient textile exporters.

As a final remark, though we have assumed away import competing sector in our analysis to show the results in the simplest way, quota on the exporting firms may reduce output of the import competing firm by inducing entry of some exporters. Hence, quota on the exporters is likely to be a preferable option if the importance of import competing sector can be neglected for the welfare of the importing country.

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