

Boğaziçi University
Department of Economics
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EC 301 ECONOMICS of INDUSTRIAL ORGANIZATION
QUIZ 4 - Answer Key

You have 20 minutes! Good Luck!

NAME:

In a market for a homogeneous product let the inverse demand function be given by $p = 80 - q_1 - q_2$, where q_1 is the incumbent firm's output and q_2 is the potential entrant's output. One unit of production requires one unit of labor and one unit of capacity where capacity cost is sunk. The wage rate for one unit of labor is $w = 10$ and one unit of capacity costs $r = 10$. There is an entry cost for the potential entrant, $f = 375$. Incumbent picks its capacity. Potential entrant observes incumbent's capacity and decides whether to enter or not. If there is no entry, potential entrant gets $b = 25$. If there is entry, they compete in quantities.

What capacity will the incumbent choose? Will the potential entrant enter?

Solution:

Suppose that the incumbent firm invests in capacity k_1 .

If $q_1 < k_1$ then $MC = 10 (= w)$. Then $MR(q_1, q_2) = 80 - 2q_1 - q_2 = 10$ implies $BR_1^w(q_2) = 35 - \frac{q_2}{2}$.

If $q_1 \geq k_1$ then $MC = 20 (= w + r)$. Then $MR(q_1, q_2) = 80 - 2q_1 - q_2 = 20$ implies $BR_1^{w+r}(q_2) = 30 - \frac{q_2}{2}$.

For firm 2, $MC = 20$ regardless of k_1 . So $BR_2(q_1) = 30 - \frac{q_1}{2}$.

The profit level of the potential entrant firm from entering is

$$\pi_2(q_1, q_2) = (80 - q_1 - q_2 - 20)q_2 - f - b \quad (1)$$

Inserting the best response of entrant firm, $q_2 = 30 - \frac{q_1}{2}$, we get

$$\pi_2(q_1, q_2) = (80 - q_1 - (30 - \frac{q_1}{2}) - 20)(30 - \frac{q_1}{2}) - f - b = (30 - \frac{q_1}{2})^2 - f - b \quad (2)$$

That is, $\pi_2(q_1, q_2) = 0$ when $30 - \frac{q_1}{2} = (f + b)^{1/2} = 400^{1/2} = 20$. Note that the intersection of $BR_2(q_1) = 30 - \frac{q_1}{2}$ and $BR_1^{w+r}(q_2) = 30 - \frac{q_2}{2}$ occurs at $q_1 = 20$, which is the smallest q_1 that can come out in the equilibrium of quantity competition. Thus, if $k_1 \geq 20$, then there will be no entry, since the profit of the entrant will be zero or negative.

Note that the monopoly quantity is given by $q^m = 30 > 20$. Thus, in the equilibrium, the incumbent chooses $q_1 = k_1 = 30$, entry does not occur and the incumbent ends up with the monopoly profit and the entrant ends up with $b = 25$.