Quiz #2 – IO (October 20th, 2026)

Question #1 (10 Points): Assume that Airbus and Boeing compete in the aircraft industry. These two firms face an inverse demand function equal to $P(Q) = 12 - Q$, where Q is the aggregate output level. In addition, Airbus and Boeing have a similar unit cost of c=4.

a) Identify the best response function for each firm when they simultaneously decide their output level. In addition, calculate the Cournot equilibrium output and profit for each firm. **[4 points]**

b) Calculate the equilibrium output and profit when Airbus and Boeing sequentially decide their output (assume Boeing is the Leader). **[4 points]**

c) Identify which setting generates the highest profit for Boeing and Airbus. Discuss your results. **[2 points]**

Solution

Part (a)

If they simultaneously decide their output level then each firm must solve the following maximization problem:

$$Max\ \pi_i(q_i) = p_i(Q) \times q_i - 4 \times q_i, \quad where\ i = \{Boeing, Airbus\}\ and\ i \neq j$$

Or equivalently

$$Max\ \pi_i(q_i) = (12 - q_i - q_j) \times q_i - 4 \times q_i$$

The best response function for each firm is:

$$R_i(q_j): q_i = \frac{8 - q_j}{2} = 4 - \frac{q_j}{2}$$

Hence, the Cournot equilibrium output for firm *i* is $q_i = \frac{a-c}{3} = \frac{12-4}{3} = \frac{8}{3}$, the market price is $P = 12 - \frac{8}{3} - \frac{8}{3} = \frac{36-16}{3} = \frac{20}{3}$ and the Cournot profit level for each firm is $\pi_i^C(q_i) = \frac{20}{3} \times \frac{8}{3} - 4 \times \frac{8}{3} = \frac{64}{9}$

Part (b)

Second stage, the follower (Airbus) chooses its ouput level

$$Max\ \pi_A(q_A) = (12 - q_A - q_B) \times q_A - 4 \times q_A$$

The first order condition with respect to q_A is,

$$\frac{\partial \pi_A(q_A)}{\partial q_A} = 12 - 2q_A - q_B - 4 = 0$$

Hence, Airbus's best response function is:

$$R_A(q_B): q_A = \frac{8 - q_B}{2} = 4 - \frac{q_B}{2}$$

First stage, the leader firm (Boeing) chooses its optimal output level considering Airbus's best response function,

$$Max\ \pi_B(q_B) = (12 - q_B - [4 - \frac{q_B}{2}]) \times q_B - 4 \times q_B$$

The first order condition with respect to q_B is,

$$\frac{\partial \pi_B(q_B)}{\partial q_B} = 12 - 2q_B - 4 + q_B - 4 = 0$$

Therefore, q_B=4 and q_A=2, P=12-4-2=6 and profit levels are:

$$\pi_B^S = 4 \times 6 - 4 \times 4 = 8 \ \ and \ \pi_A^S = 2 \times 6 - 2 \times 4 = 4$$

Part (c)

Therefore, comparing part (a) and part (b) we observe that Boeing would prefer to operate in a context in which quantities are sequentially selected, since $\pi_B^S > \pi_B^C$. However, Airbus prefers a setting in which both firms simultaneously decide their output level given that $\pi_A^S < \pi_A^C$. This result describes the first mover advantage that Boeing could obtain if it is the leader in the aircraft industry and firms sequentially choose their output level.