DIFF. PRODUCTS

- PRICE CHOICES
- 2 FIRMS
- BOTH FIRMS HAVE SAME MARG. COSTS (CONSTANT)

CASE 1: SIMULTANEOUS CHOICE

CASE 2: SEQUENTIAL CHOICES

RESULT: IT PAYS TO GO LAST!

SET UP

$$q_1 = 168 - 2p_1 + p_2$$

$$q_2 = 168 - 2p_2 + p_1$$

$$MC_1 = MC_2 = 0$$

CASE 1: FIND NE PRICES

STEP 1: CALCULATE BEST RESPONSE FUNCTIONS

STEP 2: SOLVE 2 EQ. / 2 UNKNOWNS.

STEP 1: FIRM 1

$$\max_{p_1} \pi_1(p_1, p_2)$$

$$= p_1 \cdot q_1 - \underbrace{MC_1}_{0} \cdot q_1$$

$$= p_1 \cdot [168 - 2p_1 + p_2]$$

$$\frac{\partial \pi_1}{\partial p_1} = 168 - 2p_1 + p_2 - 2p_1 = 0$$

$$168 - 4p_1 + p_2 = 0$$

$$\Rightarrow \boxed{p_1 = \frac{168 + p_2}{4} = R_1(p_2)} \quad (1)$$

FIRM 2

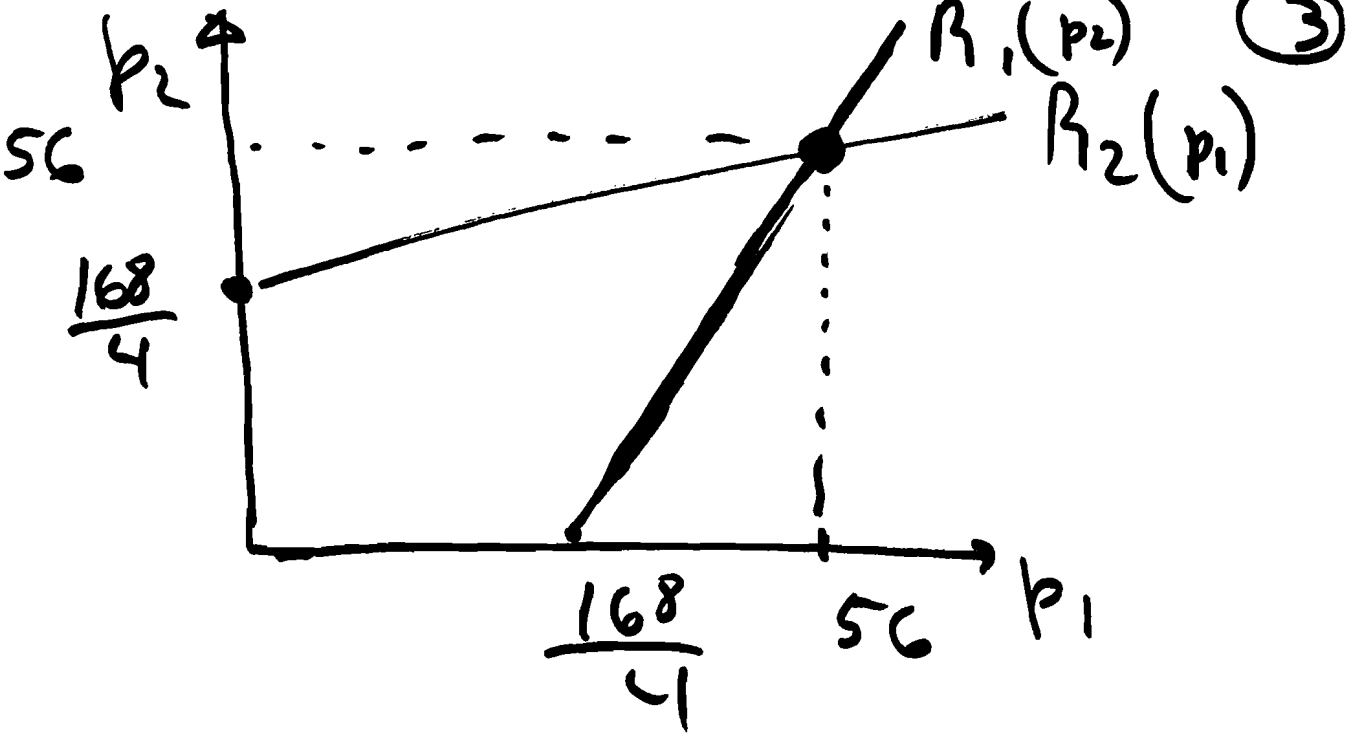
$$\max_{p_2} \pi_2(p_1, p_2)$$

$$= p_2 q_2 - \underbrace{MC_2}_{0} \cdot q_2$$

$$= p_2 [168 - 2p_2 + p_1]$$

$$\frac{\partial \pi_2}{\partial p_2} = 0$$

$$\Rightarrow \boxed{p_2 = \frac{168 + p_1}{4} = R_2(p_1)} \quad (2)$$



STEP 2 : SOLVING ① & ②

$$\Longrightarrow p_1^* = p_2^* = 56$$

QUANTITIES? PROFITS?

$$\boxed{q_1^*} = 168 - 2\underset{\underset{56}{\|}}{p_1^*} + \underset{\underset{50}{\|}}{p_2^*} = \boxed{112}$$

$$\boxed{q_2^* = 112}$$

$$\pi_1^*(56,56) = p_1^* q_1^* - MC_1 \cdot q_1^*$$

$$= \boxed{6272}$$

$$\pi_2^*(56,56) = \boxed{6272}$$

CASE 2:

SEQUENTIAL CHOICE:

FIRM 1 $\rightarrow p_1$

$\downarrow$

FIRM 2 $\rightarrow p_2$

SPNE IN PRICES

WORKING BACKWARDS:

STEP 1: COMPUTE $p_2 = R_2(p_1)$ MAX. π_1

STEP 2: CALCULATE p_1^*

ASSUMING FIRM 2 WILL BE ON ITS REACTION FUNCTION $(R_2(p_1))$

USING THE SAME EXAMPLE

$MC_1 = MC_2 = 0$

$q_1 = 168 - 2p_1 + p_2$

$q_2 = 168 - 2p_2 + p_1$

CALCULATE SPNE IF FIRM 1 GOES FIRST

STEP 1: DONE EARLIER

$$p_2 = R_2(p_1) = \frac{168 + p_1}{4}$$

STEP 2:

$$\text{MAX}_{p_1} \; \pi_1\left(p_1, R_2(p_1)\right)$$

$$\pi_1 = p_1 q_1 - MC_1 \cdot q_1$$

$$= p_1 \cdot \left[168 + \left(\frac{168 + p_1}{4}\right) - 2p_1\right]$$

$$\frac{d\pi_1}{dp_1} = 0 = [\;\;] + p_1\left[\frac{1}{4} - 2\right] = 0$$

$$\Rightarrow \boxed{p_1^* = 60}$$

THEN $\boxed{p_2^*} = R_2(p_1^*) = \frac{168 + 60}{4}$

$$= \boxed{57}$$

QUANTITIES?
PROFITS?

$p_1 = 60$ $\quad p_2 = 57$

$q_1^* = 168 - 2p_1 + p_2 = 105$

$q_2^* = 168 - 2p_2^* + p_1 = 114$

$\Pi_1^* = 6{,}300$ $\quad \Pi_2^* = 6{,}498$

$\Rightarrow$ IT PAYS TO GO LAST!

COMPARISON WITH SIMULTANEOUS CHOICE

$p_1 = p_2 = 56$

$\Pi_1 = \Pi_2 = 6272$

"SPENCER-BRANDER"
ORIGINAL PAPER

IN OLIGOPOLIST INDUSTRIES GOVERNMENTS CAN USE TRADE POLICY TO SHIFT PROFITS FROM FOREIGN FIRMS TO HOME FIRMS

→ X-SUBSIDY / TAX

SIMPLIFIED SET UP

- 2 FIRMS → FIRM 1 : COUNTRY 1, FIRM 2 : COUNTRY 2
- 2 COUNTRIES
- ALL PRODUCTION SOLD IN 3rd MARKET
- HOMOGENOUS PRODUCT, IDENTICAL FIRMS
- FIRMS COMPETE IN QUANTITIES & MAX. PROFITS
- SEQUENTIAL GAME
- COUNTRY 1 CAN CHOOSE X-TAX OR SUBSIDY TO MAX. WELFARE

COUNTRY 1 GOVERNMENT → s_1 (>0 SUBS. <0 TAX) (8)

↓

FIRMS COMPETE CHOOSING q_1, q_2 SIMULTANEOUSLY

SPNE : SOLVE GAME BACKWARDS

STEP 1 : CALCULATE q_1, q_2 AS NE IN LAST STAGE (WILL BE FUNCTIONS OF c_1, c_2 i.e. EFFECTIVE MARGINAL COSTS)

STEP 2 : FIND s_1 THAT MAXIMIZES W_1:

$$W_1 = p \cdot q_1 - [\underbrace{MC_1 - s_1}_{c_1}] q_1$$

$$-s_1 q_1 = pq - MC_1 q_1$$

↙ MEANS
FUNCTIONS OF s_1

NOTATION:

$$C_1 = MC_1 - s_1$$
$$C_2 = MC_2$$

EXAMPLE:

$$p = 36 - q_1 - q_2 \quad (\text{3rd MARKET DEMAND})$$
$$MC_1 = MC_2 = 0$$

STEP 1: NE IN LAST STAGE
↙ IN q's:

q_1 = FUNCTION OF s_1 ⎫
q_2 = " " s_1 ⎭ C_1, C_2

STANDARD NE 2 FIRMS

C_1, C_2
COSTS

$$\Longrightarrow \quad q_1 = \frac{1}{3}[36 - 2C_1 + C_2]$$
$$q_2 = \frac{1}{3}[36 - 2C_2 + C_1]$$
$$p = \frac{1}{3}[36 + C_1 + C_2]$$

STEP 2

$$\max_{s_1} \quad p\,q_1 - MC_1\,q_1$$

$$= \left[p - MC_1\right] q_1$$

$$= \frac{1}{3}\left[36 + c_1 + c_2\right] \cdot \frac{1}{3}\left[36 - 2c_1 + c_2\right]$$

$$c_1 = -s_1$$

$$c_2 = 0$$

$$= \frac{1}{3}\left[36 - s_1\right] \frac{1}{3}\left[36 + 2s_1\right]$$

$$\frac{d}{ds_1} = 0 \quad \Rightarrow \quad \boxed{s_1^* = 9}$$