FOP
ECON 467

(1)

AK - EXAM I

(II) SINGLE PERIOD / STATIC NE

(C, C)

WHY? BEST RESPONSES TO EACH OTHER

$C = B_1(C)$ $(1 > -2)$

$C = B_2(C)$ $(1 > -2)$

IT IS ALSO UNIQUE WHY?

BECAUSE C'S ARE DOMINANT STRATEGIES FOR BOTH PLAYERS.

WHEN GAME PLAYED TWICE

PERIOD 1: CHOOSE STRAT. SIMULTANEOUSLY

↓

PERIOD 2: CHOOSE STRAT. SIMULT.

SOLVING FOR SPNE – BACKWARDS

LAST SUBGAME : PERIOD 2

NE : (C, C)

LAST PERIOD OUTCOME HAS NO INFLUENCE ON PERIOD 1 PAYOFFS –

SO EVEN THOUGH WE ASSUME PLAYERS WILL PLAY NE STRAT. IN PERIOD 2, PERIOD 1 GAME IS JUST THE STATIC GAME $\Rightarrow$ NE : (C, C)

SPNE: BOTH PLAYERS PLAY C IN BOTH PERIODS.

III)

(1)

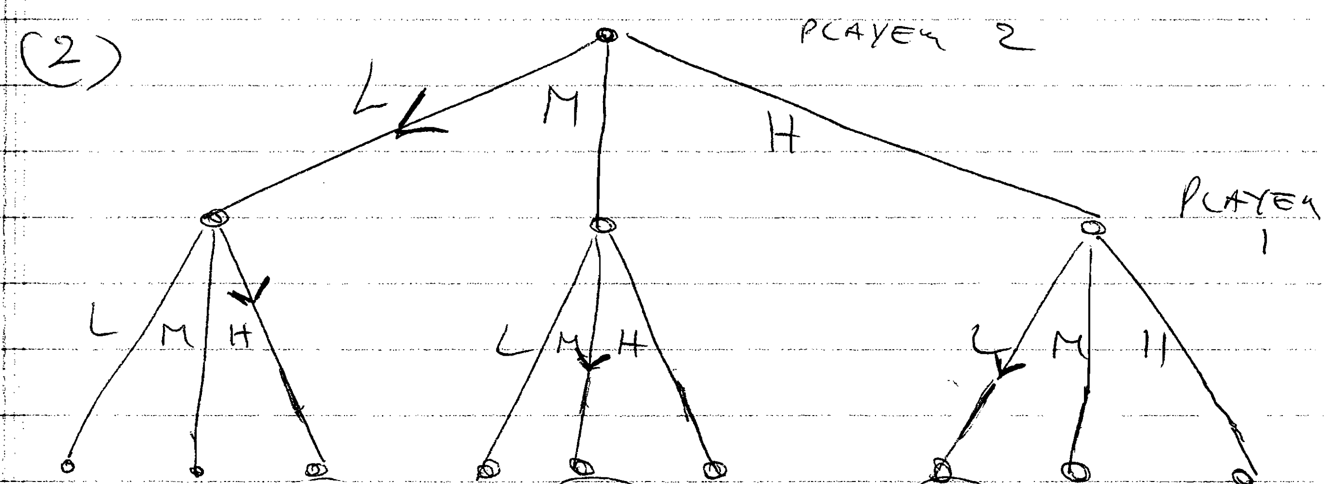
PLAYER 1	PLAYER 2
$M = B_1(L)$	M or $H = B_2(L)$
$M = B_1(M)$	L or $M = B_2(M)$
$L = B_1(H)$	$L = B_2(H)$

THERE ARE 2 N.E:

— PLAYER 1 USES L, PLAYER 2 USES H

— " " M, " " " M

(2)



$\pi_1 =$ −13 −4 1 −1 4 1 7 4 1

$\pi_2 =$ −8 −1 2 −4 −1 −1 −4 −4 −4

SPNE: PLAYER 1: USES H IF PLAYER 2 USES L

" M " " " M

" L " " " H

PLAYER 2: CHOOSES L

OUTCOME: PLAYER 2 CHOOSES L, PLAYER 1 CHOOSES H

IV) $p = 60 - (q_1 + q_2 + q_3)$ 1

$$MC_1 = MC_2 = MC_3 = 10$$

(1) NE q's

$$\max_{q_1} \quad \Pi_1 = [p - MC_1]\, q_1$$

$$= [60 - q_1 - q_2 - q_3 - 10]\, q_1$$

$$= [50 - q_1 - (q_2 + q_3)]\, q_1$$

$$\frac{\partial}{\partial q_1} = (-1)\, q_1 + (1) \cdot [50 - q_1 - q_2 - q_3] = 0$$

$$= -2 q_1 + 50 - (q_2 + q_3) = 0$$

$$\Rightarrow \boxed{q_1 = \frac{50 - (q_2 + q_3)}{2}} = R_1(q_1, q_2)$$

BY SIMMETRY AT NE $q_1 = q_2 = q_3 \Rightarrow$

$$q_1 = \frac{50}{2} - \frac{\cancel{2}\, q_1}{\cancel{2}} = 25 - q_1$$

$$\Rightarrow \quad q_1 (1+1) = 25$$

$$2 \cdot q_1 = 25 \Rightarrow$$

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$2q_1 = 25$ $\boxed{q_1} = \frac{25}{2} = \boxed{12.5 = q_2 = q_3}$

~~8qtbar~~ $q = 3 \times q_1 = 12.5 \times 3 = 37.5$

NOT NEEDED $\boxed{p} = 60 - 37.5 = \boxed{22.5}$

(2) $p = 60 - q$

$q = q_1 + q_2$

FIRM 1 : $MC_1 = 10$

FIRM NEW : $MC_0 = 5$ $FC_0 = 10$

(call it FIRM 0)

NE $\underline{\text{PRICES}}$

FIRM 0 MONOPOLY $\Rightarrow$

$MR_0 = MC_0$

$60 - 2q^M = 5$

$q^M = \frac{60-5}{2} = \frac{55}{2} = 27.5$

$p^M = 60 - 27.5 = 32.5$

SINCE $p^M > MC_1 = 10$

$\Rightarrow$ NE PRICES

$p_1 = MC_1 = 10$

$p_0 = MC_1$ - SMALL AMOUNT $= 10 - \varepsilon$ SMALL NUMBER

≈ 10

Check $\pi_0 (p = 10 - \varepsilon)$ ~~which~~

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IF $p_0 = 10 \Rightarrow q_0 = 60 - 10 = 50$

$$\Pi_0\ (p_0 \approx 10) \approx [p_0 - MC_0]\, q_0 - \overset{10}{\overline{FC}}$$

$$= [10-5] \times 50 - 10 > 0$$

FIRM 0 ~~HAS~~ POSITIVE PROFITS

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(V)

$$p_1 = 90 - \frac{1}{2} q_2 - q_1$$

$$p_2 = 90 - \frac{1}{2} q_1 - q_2$$

(1) WE ARE GIVEN NE IN q'S:

$$q_1^{NE} = \frac{2}{15}[270 + 4s]$$

$$q_2^{NE} = \frac{2}{15}[270 - s]$$

THEN WE CAN CALCULATE

$$p_1^{NE} = 90 - \frac{1}{2} q_2^{NE} - q_1^{NE}$$

$$= 90 - \frac{1}{2}\left[\frac{2}{15}(270 - s)\right] - \frac{2}{15}[270 + 4s]$$

$$= 90 - \frac{1}{15}(270 - s) - \underbrace{\frac{2}{15} \times 270}_{36} - \frac{8}{15} s$$

$$= 90 - 36 - 18 + \frac{s}{15} - \frac{8}{15} s$$

$$\boxed{p_1^{NE} = 36 - \frac{7}{15} s}$$

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WELF. MAX. FOR COUNTRY 1:

$$\max_{s} \; W_1 = \underbrace{p_1 q_1 - \overset{=0}{MC_1} q_1 + \cancel{s q_1}}_{\text{EFF. PROFITS}} - \underbrace{\cancel{s q_1}}_{\text{GOV. EXPEND.}}$$

$\Rightarrow$

$$\max_{S} \; W_1 = p_1^{NE} \, q_1^{NE}$$

$$= \left(36 - \frac{7}{15} s\right)\left(270 + 4s\right) \cdot \frac{2}{15}$$

$$\frac{d W_1}{d s_1} = \left[-\frac{7}{15}\left(270 + 4s\right) + 4\left(36 - \frac{7}{15} s\right) \right] \frac{2}{15} = 0$$

$\Rightarrow$ $\boxed{s^* = 4.82 > 0 \quad \text{SUBSIDY}}$

(2) WHEN FIRM 1 RECEIVES THE OPTIMAL "S" = 4.82 ITS OUTPUT COINCIDES WITH ~~THAT~~ OF ~~A~~ THE FIRST MOVER IN A SEQUENTIAL QUANTITY GAME (STACKELBERG LEADER).

IN ~~THAT~~ CASE THE FIRST MOVER CHOOSES ITS OUTPUT TO MAX. PROFITS ASSUMING THE FOLLOWER

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WILL ACT ACCORDING TO ~~ITS~~ REACTION FUNCTION –

IN (1) ABOVE, BY CHOOSING S TO MAX PROD. PROFITS OF ITS HOME FIRM, GOV. FROM COUNTRY 1 CHOOSES THE MC, EFFECTIVE (i.e THE LOCATION OF THE REACTION FUNCTION OF FIRM 1) ~~TO~~ ~~MAX~~ ASSUMING FIRM 2 IS IN ITS REACTION FUNCTION –

THE RESULT IS THE SAME: TANGENCY OF ISO PROFIT TO FIRM 2 REACTION FUNCTION

(3) COUNTRY 2 IS WORSE OFF THAN WHEN S=0 –

WHY?. THEORY ~~TE~~ TELLS US THAT THE SECOND MOVER IN A SEQ. QUANTITY GAME WILL BE WORSE OF THAN IN THE SIMULT. MOVES NE (CASE OF S=0)