10-6-09

"OPTIMAL" SUBSIDY / TAX?

NOW: PRICE COMPETITION
(DIFF. PRODUCT)

MODEL 1:

COUNTRY 1 GOVERNMENT

— CHOOSES SUBS/TAX TO EXPORTS

— FIRMS COMPETE CHOOSING PRICES SIMULTANEOUSLY

RESULT: "OPTIMAL POLICY IS A TAX!"
W_1 & W_2 HIGHER THAN WITHOUT INTERVENTION

MODEL 2:

— BOTH COUNTRIES CHOOSE SUBS/TAX TO EXPORTS

— FIRMS COMPETE CHOOSING PRICES SIMULTANEOUSLY

RESULT: BOTH COUNTRIES CHOOSE TO TAX. W_1, W_2 HIGHER THAN IN MODEL 1

MODEL 1

$$q_1 = 168 - 2p_1 + p_2$$
$$q_2 = 168 - 2p_2 + p_1$$

$MC_1 = MC_2 = 0$

NOTATION: $C_1 = MC_1 - S_1$
$C_2 = MC_2 - S_2$

STEP 1: NE IN PRICES AS FUNCTIONS OF C_1, C_2

$$\max_{p_1} \pi_1(\;) = p_1 q_1 - C_1 q_1$$
$$= [p_1 - C_1]\, q_1$$
$$= [p_1 - C_1]\,[168 - 2p_1 + p_2]$$

$$\frac{\partial}{\partial p_1} = 0 \implies p_1 = R_1(p_2) \quad (*)$$

SIMILARLY

$$\max_{p_2} \pi_2(\;) = [p_2 - C_2]\,[168 - 2p_2 + p_1]$$

$$\frac{\partial}{\partial p_2} = 0 \implies p_2 = R_2(p_1) \quad (**)$$

SOLVING $(*)$, $(**)$

NE PRICES:

$$\boxed{p_1 = 56 + \frac{8}{15} c_1 + \frac{2}{15} c_2}$$

$$\boxed{p_2 = 56 + \frac{8}{15} c_2 + \frac{2}{15} c_1}$$

STEP 1:

$$\max_{s_1} \; W_1 = [p_1 - \underbrace{c_1}_{MC_1 - s_1}] q_1 - s_1 q_1$$

$$= [p_1 - MC_1 + s_1] q_1 - s_1 q_1$$

$$= [p_1 - \underbrace{MC_1}_{=0}] q_1 = p_1^{NE} q_1^{NE}$$

IN THIS CASE ($s_1 \gtrless 0$, $s_2 = 0$) THE NE PRICES / QUANT. ARE

$$\boxed{p_1^{NE}} = 56 + \frac{8}{15}(-s_1)$$

$$\boxed{p_2^{NE}} = 56 + \frac{2}{15}(-s_1)$$

$$\boxed{q_1^{NE}} = 168 - 2 p_1 + p_2$$

$$= \boxed{112 + \frac{14}{15} s_1}$$

$$\max_{s_1} \quad W_1 = p_1 q_1$$

$$= \left[56 - \frac{8}{15} s_1\right]\left[112 + \frac{14}{15} s_1\right]$$

$$\frac{d}{ds_1} = \frac{-8}{15}\left[112 + \frac{14}{15} s_1\right] +$$

$$\frac{14}{15}\left[56 - \frac{8}{15} s_1\right] = 0$$

$$\Longrightarrow \quad \boxed{s_1^* = -7.5} \quad \text{TAX!}$$

$$\Longrightarrow \quad c_1 = 7.5$$

$$c_2 = 0$$

$$p_1^{NE} = 60 \qquad p_2 = 57$$

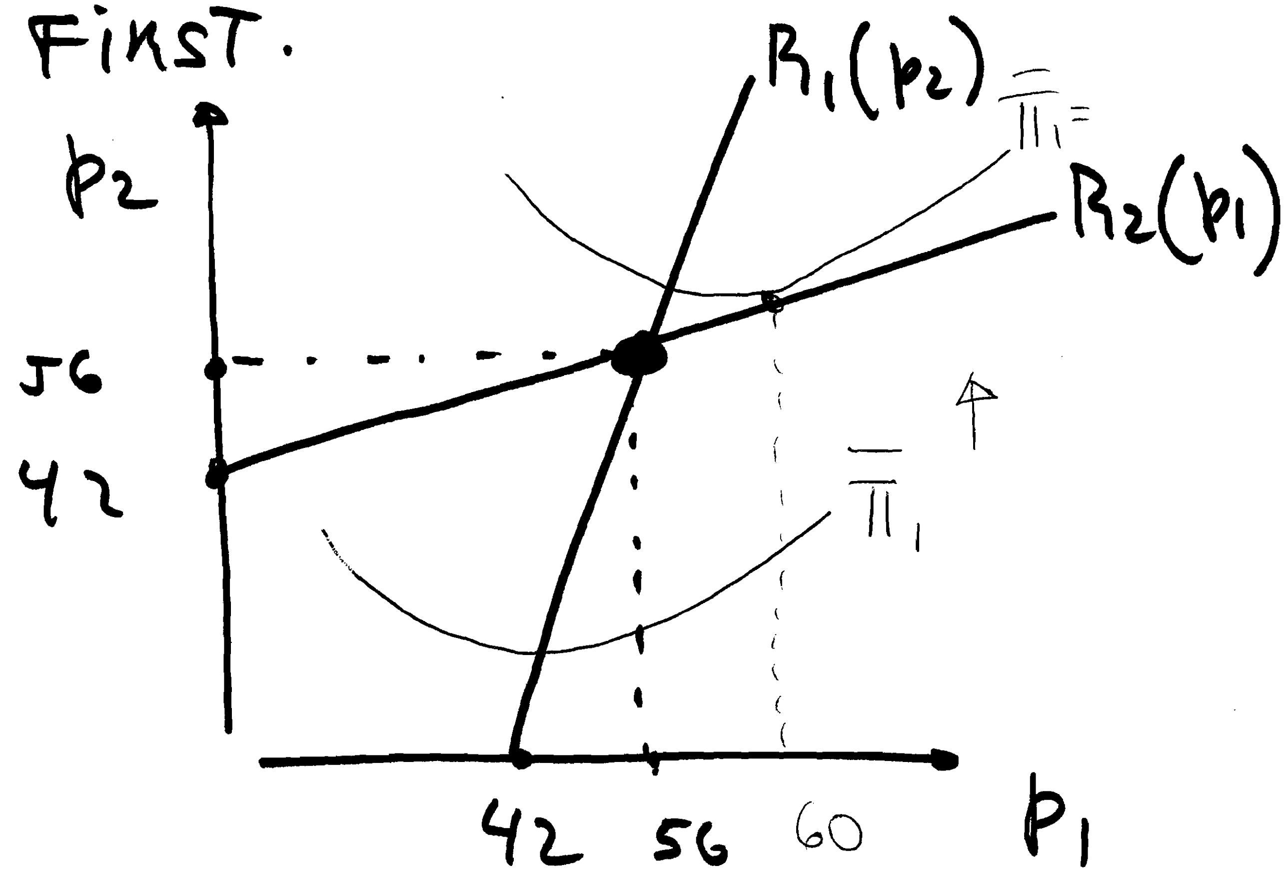
$$W_1 = \Pi_1 = 6300 \qquad W_2 = \Pi_2 = 6498$$

PROD. PROFITS

REMARKS: 1 PROFITS HIGHER THAN WHEN THERE IS NO GOV. INTERVENTION: $\Pi_1 = \Pi_2 = 6272$

$p_1 = p_2 = 56$

2 OUTCOME COINCIDES WITH OUTCOME OF THE SEQ. PRICE GAME (NO GOV. INTERVENTION) WHEN FIRM 1 CHOOSES PRICE FIRST.



MODEL 2:

- BOTH GOV. CHOOSE
  $s_1, s_2 \gtrless 0$
- FIRMS COMPETE IN PRICES

STEP 1: CALCULATE NE IN PRICES ASSUMING FIRMS HAVE c_1, c_2 AS EFF. MARGINAL COSTS

NE IN s_1, s_2

STEP 2: GOV. MAX WELFARE & CHOOSE s_1, s_2 SIMULTANEOUSLY

STEP 1: SEE EQ. IN PAGE 3

STEP 2: FIND NE IN s_1, s_2

$\max_{s_1} W_1 \Rightarrow \frac{\partial}{\partial s_1} = 0$

$\max_{s_2} W_2 \Rightarrow \frac{\partial}{\partial s_2} = 0$ $\Rightarrow$

RESULT:

$$\boxed{s_1 = s_2 = -7.6}$$

$$p_1 = p_2 = 61.07$$

$$q_1 = q_2 = 106.9$$

$$w_1 = w_2 = [p_1 - MC_1]\, q_1 = [p_2 - MC_2]\, q_2$$

$$= 6{,}528$$

REMARK:

TO MAXIMIZE w_1 WE TAKE s_2 AS A CONSTANT.

$$w_1 = p_1 \cdot q_1 =$$

WHERE

$$p_1 = 56 + \frac{8}{15}[-s_1] + \frac{2}{15}[-s_2]$$

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

GIVEN NEXT

$$p_2 = 56 + \frac{8}{15}(-s_2) + \frac{2}{15}(-s_1)$$

$$w_1 = \left\{56 + \frac{8}{15}[-s_1] + \frac{2}{15}[-s_2]\right\}$$

$$\left\{168 - 2\underbrace{[\quad]}_{p_1} + \underbrace{[\quad]}_{p_2}\right\}$$