Market Based Numericals

Type I Market Power = $\frac{P - MC}{P}$

$P > MC$
$P >>> MC$

Multiplant Structure

(M) (2) 1, 2, 3 . . . n different Plants

$MR = MC_1 = MC_2 = MC_3 = \ldots MC_n$

$\pi = (R - C_1 - C_2 - \ldots C_n)$

$MR = MC_1 = MC_2 \ldots = MC_n$

$MR_1 = MR_2 \ldots \cancel{=} MC$

$MR = \frac{dTR}{dQ}$ $TR = P \cdot Q$

$Z = 3x + 2y$

max Z = ~~max~~ min $\{a, b, c \ldots n\}$

$\cancel{\frac{dZ}{dQ}}$ $\cancel{\frac{dZ}{dQ}}$

a, b dif Rw
3 ← 3 5

full utilization of the resources
$TRR\ a = b = c = \ldots n$

iff $\boxed{a=b=c=\dots n}$

Sub-Additive Cost Function (natural monopoly)

$$\boxed{c(q_j)} \le c(q_1)+c(q_2)+\dots+c(q_n)$$

$$\boxed{q_1+q_2+\dots+q_n=q_j}$$

Natural monopoly..

$C = F + cq$

$q = q_1+q_2$

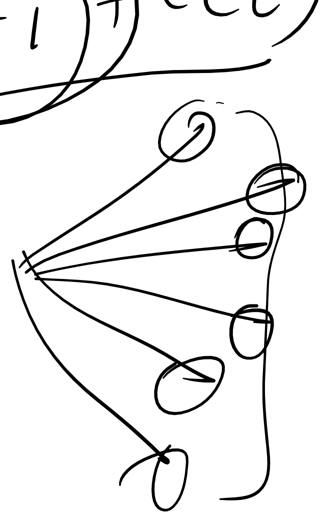
$$c(q_1)+c(q_2) = F+cq_1+F+cq_2$$

$$= 2F + c(q_1+q_2)$$

$$c(q_1+q_2) = F + c(q)$$

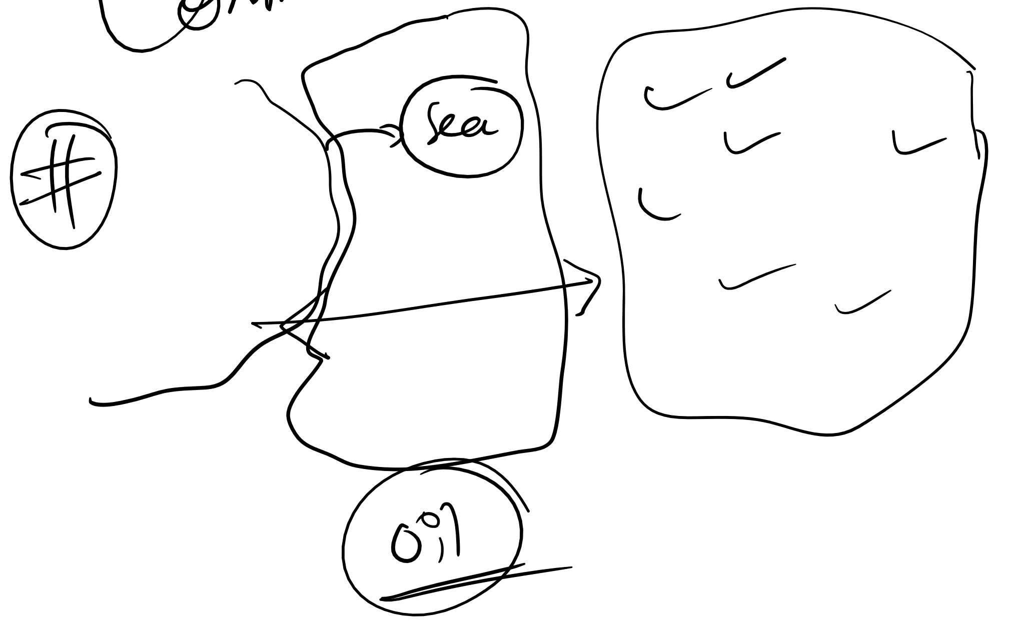
Big firm

GST



$$F < (F_1+F_2+\dots F_n)$$

Consumer is the Curve.



$q = \frac{144}{p^2}$, $AVC = \sqrt{q}$

$FC = 5$

$AVC = \sqrt{q}$
$\frac{TVC}{q} = \sqrt{q}$
$TVC = q^{3/2}$
$TC = FC + VC$
$= 5 + q^{3/2}$

a) Resulting profit? how much will it produce?

b) If P map = 4 ; Will it still be profitable??

Ans: $q = \frac{144}{p^2}$

$p^2 = \frac{144}{q}$ $\quad p = \frac{12}{\sqrt{q}} = \frac{12}{\sqrt{4}} = \frac{12}{2} = 6$

$\pi = TR - TC$
$= 12 . q^{\frac{1}{2}} - q^{\frac{3}{2}} - 5$

$\frac{d\pi}{dq} = \frac{1}{2} \cdot 12 q^{\frac{1}{2}-1} - \frac{3}{2} q^{\frac{3}{2}-1} = 0$

$= 6q^{-\frac{1}{2}} - \frac{3}{2} q^{+\frac{1}{2}} = 0$ (multiply both sides by $q^{\frac{1}{2}} . 2$)

$$= 6q^{-1/2} - \frac{3}{2} q^{1/2} = 0 \quad (\cdot \text{by } q^{\frac{1}{2}} \cdot 2)$$

$$\Rightarrow 12 - 3q = 0 \qquad \boxed{q = 4}$$

$$\boxed{p = 6}$$

$$\pi = pq - AVC \cdot q - F$$
$$= 6 \cdot 4 - 2 \cdot 2 - 5$$
$$= 24 - 9 = 15$$

Gen 2 forced to sell @ $p = 4$

$$\pi = 4q - q^{\frac{1}{2}} \cdot q - 5$$
$$= 4q - q^{3/2} - 5$$

$$\frac{d\pi}{dq} = 4 - \frac{3}{2}\sqrt{q} = 0$$

$$4 = \frac{3}{2}\sqrt{q}$$
$$\frac{8}{3} = \sqrt{q} \qquad q = \frac{64}{9} = 7.11$$

$$\pi = 4 \cdot \frac{16}{9} - \left(\frac{16}{9}\right)^{3/2} - 5$$
$$= \frac{64}{9} - \frac{64}{27} - 5$$

Reduction in P > Increase in Q

$\pi \downarrow$

Two markets

$P_1 = 15 - Q_1$ $\qquad$ $C = 5 + 3Q \rightarrow (Q_1 + Q_2)$

$P_2 = 25 - 2Q_2$

If $\boxed{P_1 = P_2 = P}$

$Q_1 = 15 - P$

$Q_2 = \dfrac{25 - P}{2}$

$\boxed{8{:}30\text{pm}}$

$Q_1 + Q_2$

$= 15 - P + \dfrac{25 - P}{2}$

$Q = \boxed{27.5 - \frac{3}{2}P}$

$2Q = 55 - 3P$

$\boxed{Q = \dfrac{55}{2} - \dfrac{3}{2}P}$

Entire Market Structure

$P = \left(\dfrac{55}{3} - \dfrac{2}{3}Q\right)$

$\pi = \left(\dfrac{55}{3} - \dfrac{2Q}{3}\right)Q - 5 - 3Q$

$\pi = \dfrac{55Q}{3} - \dfrac{2Q^2}{3} - 5 - 3Q$

$\dfrac{d\pi}{dQ} = \left(\dfrac{55}{3} - \dfrac{4Q}{3} - 3\right) = 0$

$$\frac{d\pi}{dq} = \left(\frac{55}{3} - \frac{48}{3} - 3\right) = 0$$

\# Multi-market ? $\rightarrow P_1 = P_2 = \dots = P_n$

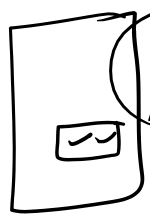
vs

Multi-plant ? $\rightarrow P_1,\ P_2,\ P_3$

W $\rightarrow$ Audi W, BMW $\rightarrow$ Gen

i-phone

$279



\# $MR = P\left(1 - \frac{1}{e_p}\right)$

\# $p = 90 - x^2$

$C = 10 + 2x^2 + 3x^3$

elasticity decides the Cost Burden

$e_c > e_p$

less burden on farmer for producer

Impact of $t = 10$ / unit ..

$TR = 90x - x^2$

$\pi = 90x - x^2 - 10 - 2x^2 - 3x^3$

$= 90x - 3x^2 - 10 - 3x^3$

$$\frac{d\pi}{dx} = \left(90 - 6x - 9x^2\right)$$

$$6 \pm \sqrt{36 + 4 \cdot 90 \cdot 9}$$

dx

$$x = \frac{6 \pm \sqrt{36 + 4 \cdot 7 \cdot 9}}{2 \cdot (}$$

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② # MC = 0 ??

$$MR = P\left(1 - \frac{1}{e_p}\right)$$

$$MR = MC = P\left(1 - \frac{1}{e_p}\right)$$

$$0 = P\left(1 - \frac{1}{e_p}\right)$$

$$P \neq 0 \qquad \left(1 - \frac{1}{e_p}\right) = 0$$

$$e_p = 1$$

CSI 2019

Q

$$P = 180 - 10Q$$

$$TC = 84 + 42Q - 12Q^2 + 1.5Q^3$$

(a) Lumpsum tax of 120
(b) Per unit sales tax of 24

$$\pi = 180Q - 10Q^2 - 84 - 42Q + 12Q^2 - 1.5Q^3$$

$$\frac{d\pi}{dQ} = 180 - 20Q - 42 + 24Q - 4.5Q^2 = 0$$

Calny_ $Q = 6$

Soln $\boxed{q = 6}$

$$\frac{d^2\pi}{dq^2} = -20 + 24 - 9q$$
$$= 4 - 9q < 0$$

hence profit is max

(a) for LS Tax

$TC^1 = 84 + 120 + 42q - 12q^2 + 1.5q^3$

$MC^1 = 42 - 24q + 4.5q^2$

(b) Unit tax

$TC^2 = 84 + 42q - 12q^2 + 1.5q^3 + 24q$

$MC^2 = 66 - 24q + 4.5q^2$

Per Unit tax is more effective than LS tax.

Netflix $\rightarrow$ 150

$\rightarrow$ 200

$\rightarrow$ fee