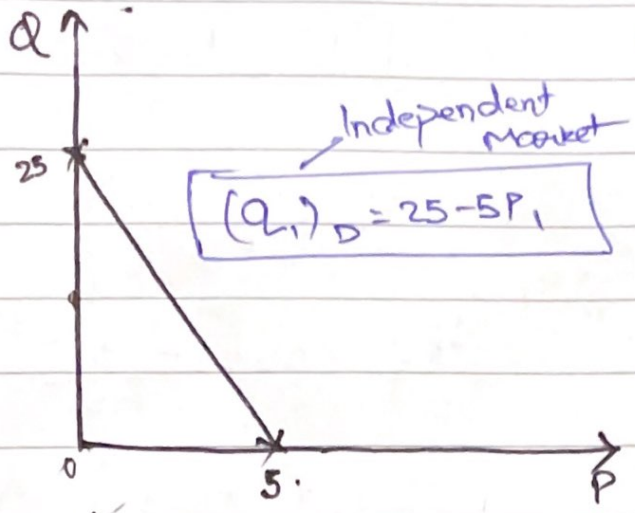
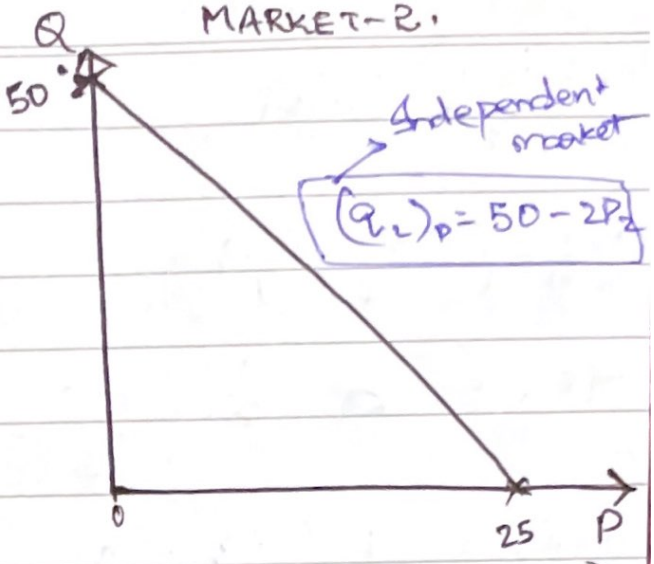
MARKET-1



MARKET-2.



$q_1 = D_1(P_1) + \alpha_{12} D_2(P_2)$ $\quad$ $q_2 = D_2(P_2) + \alpha_{21} D_1(P_1)$

$\alpha_{12} = 1$
$\alpha_{21} = 5$

CROSS-NETWORK MULTIPLIER EFFECT.

★ Which market to subsidise?

★ How much loss if you don't subsidise?

In digital economy; it is safe to assume that Marginal cost is 0. (to firm).

Demand Curves for ★ independent markets:

$(q_1)_D = 25 - 5P_1$ $\quad$ $(q_2)_D = 50 - 2P_2$.

Marginal Revenue (MR) $= \frac{d\ TR}{dq}$.

$(T.R)_1 = P_1 \cdot q_1$ $\qquad$ $(TR)_2 = P_2 \cdot q_2$

$(TR)_1 = \left(\frac{25 - q_1}{5}\right) \cdot q_1$ $\qquad$ $(TR)_2 = \left(\frac{50 - q_2}{2}\right) \cdot q_2$

$TR_1 = 5q_1 - \frac{q_1^2}{5}$ $\qquad$ $TR_2 = 25q_2 - \frac{q_2^2}{2}$

$(M.R)_1 = \frac{d}{dq_1}\left(5q_1 - \frac{q_1^2}{5}\right)$ $\qquad$ $(MR)_2 = \frac{d}{dq_2}\left(25q_2 - \frac{q_2^2}{2}\right)$

$(MR)_1 = 5 - \frac{2q_1}{5}$ $\qquad$ $(MR)_2 = 25 - q_2$

$(MC)_1 = 0$ $\qquad$ $(MC)_2 = 0$

↳ Assumption for Digital Economy.

∴ Equilibrium Quantity (q^*) — for independent markets:

$MR_1 = MC_1$ $\qquad$ $MR_2 = MC_2$

$5 - \frac{2}{5} q_1^* = 0$ $\qquad$ $25 - q_2^* = 0$

$q_1^* = 12.5$ $\qquad$ $q_2^* = 25$

$\therefore P_1^* = \frac{25 - q_1^*}{5}$ $\quad P_2^* = \frac{50 - q_2^*}{2}$

$= \frac{25 - 12.5}{5}$ $\quad = \frac{50 - 25}{2}$

$\boxed{P_1^* = 2.5}$ $\quad \boxed{P_2^* = 12.5}$

NOW, CONSIDER NETWORK EFFECTS:

q_1 (without network effect) $= 25 - 5(2.5) = 12.5$

q_1 (with network effect) (NE)

$= D_1(P_1) + \alpha_{12} D_2(P_2)$

$= (25 - 5P_1) + \alpha_{12}(50 - 2P_2)$

$(q_1^*)_{NE} = (25 - 5(2.5)) + 1 \cdot (50 - 2 \times 12.5)$

$= 12.5 + 25 = 37.5$

$\boxed{(q_1^*)_{NE} = 37.5}$

(TR$_1$) without NE $= P_1^* \cdot q_1^* = 62.5 \times 12.5 = 31.25$

$(TR_1)_{NE} = (P_1^*) \cdot (q_1^*)_{NE} = 2.5 \times 37.5 = 93.75$

Similarly in Market 2:

(Q_2) without NE $= 25$

q_2^*

$(Q_2)_{NE} = D_2(P_2) + \alpha_{21} D_1(P_1)$

$= (50 - 2P_2) + 5(25 - 5P_1)$

$(q_2)^*_{NE} = 50 - 2P_2^* + 5(25 - 5P_1^*)$

$= (50 - 2(12.5)) + 5(25 - 5 * 25)$

$= 25 + 5(12.5)$

$(q_2^*)_{NE} = 87.5.$

$(T.R)_2 = P_2^* \cdot Q_2^* = 12.5 \times 25 = 312.5$

$(T.R_2)_{NE} = P_2 \cdot (q_2^*)_{NE} = 12.5 \times 87.5 = 1093.75$

TOTAL REVENUE AT BOTH MKTS

without NE

$31.25 + 312.5$

$= 343.75$

with NE

$93.75 + 1093.75$

$= 1187.5$

NETWORK EFFECTS.

CASE-1 : SUBSIDISE MARKET 1 ; SAME PRICE @ MARKET 2

$P_1 = 0$ $\quad$ $P_2 = 12.5$

$$(T.R) = P_1Q_1 + P_2Q_2$$
$$= 0 + (12.5) \times (50 - 2P_2) + 5(25 - 5P_1)$$
$$= 12.5 \times [25 + 125]$$
$$= 1875.$$

BUT, if we can optimise P_2 by optimising TR. $(\because P_1 = 0)$

$$(T.R) = P_1Q_1 + P_2Q_2$$
$$= 0 + P_2[50 - 2P_2 + 125]$$
$$= 175P_2 - 2P_2^2$$

MAX (T.R) $\quad \therefore \frac{d}{dP_2}(T.R) = 0$

$$= 175 - 4P_2 = 0$$

$$P_2 = 43.75$$

$Q_2 = [50 - 2P_2 + 125] = 87.5 = Q_2$

$\therefore$ $TR = P_1Q_1 + P_2Q_2$

$= 0 + 43.75 \times 87.5$

$TR = 3828.125$ ★

CASE-1

CASE-2 : SUBSIDISE MARKET-2 ($P_2 = 0$)

OPTIMISE T.R ,, P_1

$Q_1 = (25 - 5P_1) + 1 \cdot (50 - 2P_1)$

$Q_1 = 25 - 5P_1 + 50$

$Q_1 = 75 - 5P_1$

$T.R = P_1 Q_1 + P_2 Q_2$

$= P_1 Q_1 + 0$

$T.R = P_1 (75 - 5P_1)$

$= 75P_1 - 5P_1^2$

MAX T.R

$\frac{d\,TR}{dP_1} = 0$

$75 - 10P_1 = 0$

$P_1 = 7.5$

$Q_1 = 37.5$

$TR = 281.25$

→ CASE 2.

Clearly

$(TR)_{CASE1} > (TR)_{CASE-2}$

3828.125 > 281.25

∴ SUBSIDISE MARKET 1

If you don't subsidise, you would lose

$(T.R)_{After\ subsidise} - (T.R)_{befor\ subs}$

$= 3828.125 - 1187.5$

$= 2640.625$