

Factor Market #1

EE311 HW

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$$Q(L) = L^{\frac{1}{2}}$$

$$P = 100 - Q$$

$$w = 4 \text{ baht/hr}$$

Suppose factor mkt is competitive and output mkt is monopoly. find L^* , Q^* , P^* , π^* , and monopolistic exploitation rate $(V^M - w)$. Draw a picture too.

$$\text{note: } MP_L = \frac{dQ(L)}{dL} = \frac{1}{2} L^{-\frac{1}{2}} = \frac{1}{2\sqrt{L}}$$

$$\pi = TR - TC$$

$$\pi = P \cdot Q - w \cdot L$$

$$= (100 - Q)Q - 4L$$

$$= 100Q - Q^2 - 4L$$

$$= 100L^{\frac{1}{2}} - (L^{\frac{1}{2}})^2 - 4L \quad ; \text{ substitute } Q \text{ with } L^{\frac{1}{2}}$$

$$= 100\sqrt{L} - L - 4L$$

$$= 100\sqrt{L} - 5L$$

To maximize profit,

$$\frac{d\pi}{dL} = \frac{1}{2} \left(\frac{100}{\sqrt{L}} \right) - 5 = 0$$

$$= \frac{50}{\sqrt{L}} - 5 = 0$$

$$\frac{50}{\sqrt{L}} = 5 \rightarrow \sqrt{L} = 10 \rightarrow L = 100$$

firm should hire 100 workers, who can produce $Q(L) = \sqrt{100} = 10$ units

and set $P = 100 - Q = 100 - 10 = 90$ baht

hence it will get profit of $\pi = 90(10) - 4(100) = 500$ baht

$$VMP_L = P \cdot MP_L$$

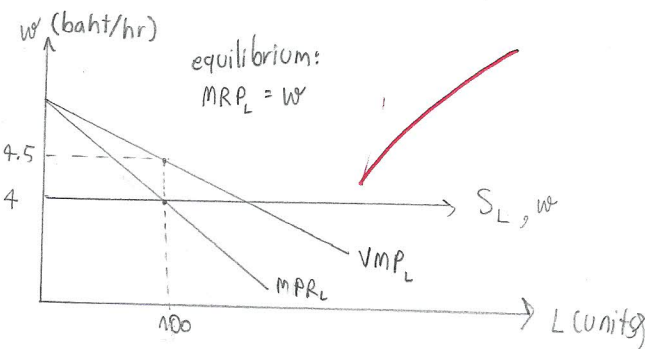
$$V^M = (100 - Q) \cdot \frac{dQ(L)}{dL}$$

$$= (100 - \sqrt{L}) \cdot \frac{1}{2\sqrt{L}}$$

$$= \frac{50}{\sqrt{L}} - \frac{1}{2}$$

$$V^M = \frac{50}{10} - \frac{1}{2} \quad ; \quad L = 100$$

$$= 5 - \frac{1}{2} = 4.5 \text{ baht/hr}$$



$$\text{labor exploitation rate} = V^M - w = 4.5 - 4 = 0.5 \text{ baht/hr}$$

Ans

$L^* = 100$, $Q^* = 10$, $P^* = 90$, $\pi^* = 500$, exploitation rate 0.5 baht/hr

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Factor Market #2

For case 3 : monopsony case

$$L^D = 600 - 20w$$

$$L^S = 20w$$

Find L^* , VMP^{ms} , w^{ms} , and exploitation rate ($VMP^{ms} - w^{ms}$)

Also, Draw a diagram and make a summary.

To maximize profit, the monopsony needs

$$VMP_L = MRC$$

VMP_L is the demand function:

$$VMP_L: L^D = 600 - 20w$$

$$w(L^D) = \frac{600 - L^D}{20}$$

$$w(L^D) = 30 - \frac{L^D}{20}$$

Now for MRC:

$$TRC: L^S = 20w$$

$$w = \frac{L^S}{20}$$

$$TRC = w \cdot L = \frac{L^2}{20}$$

$$MRC = \frac{dTRC}{dL} = \frac{2L}{20} = \frac{L}{10} = w(L^S)$$

note: ARC (Average Resource Cost)
 $= \frac{TRC}{L} = \frac{L}{20} = w(L^S)$

$$\text{set } VMP_L = MRC$$

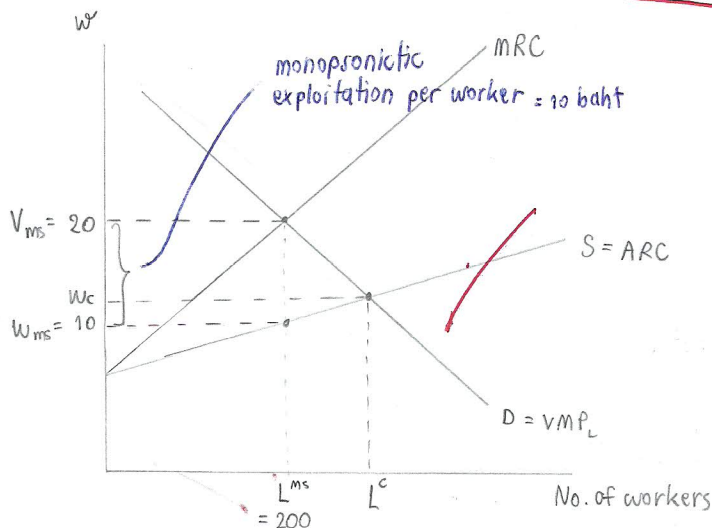
$$30 - \frac{L}{20} = \frac{L}{10}$$

$$30 = \frac{L}{10} + \frac{L}{20} = \frac{3L}{20}$$

$$\frac{600}{3} = L = 200$$

$$w(L^D) = VMP_L^{ms} = 30 - \frac{200}{20} = 20, \quad w(L^S) = \frac{200}{20} = 10$$

$$\text{exploitation rate} = VMP^{ms} - w^{ms} = 20 - 10 = 10 \text{ baht/worker}$$



In monopsony case, buyer of the factor has monopsonistic power to squeeze down wage. Workers provide VMP_L^{ms} of 20 baht but buyer pays wage of only w^{ms} , 10 baht. Hence, there is exploitation rate of 10 baht per worker.

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Ans

$$L^* = 200, \quad VMP^{ms} = 20, \quad w^{ms} = 10$$