長期成本

$$L^*(Q, \overset{W_L}{\mathbb{R}}, \overset{W_K}{\mathbb{R}}).$$

$$k^*(Q, \underset{W_L}{\mathbb{R}}, \underset{W_K}{\mathbb{R}}).$$

$$TC = W_L L^*(Q, W_L, W_K) + W_K k^*(Q, W_L, W_K)$$

$$\left\{ \begin{array}{l} \dfrac{W_L}{f_L(L^*, k^*)} = \dfrac{W_K}{f_K(L^*, k^*)} \neq MC = MC. \\[4mm] f(L^*, k^*) = Q. \end{array} \right.$$

Long run

$$MC = W_L \frac{dL^*}{dQ}(Q) + W_K \frac{dk^*}{dQ}(Q).$$

$$\left(\begin{array}{l} f_L \dfrac{dL^*}{dQ} + f_K \dfrac{dk^*}{dQ} = 1 \\[4mm] \dfrac{dk^*}{dQ} = \dfrac{1 - f_L \dfrac{dL^*}{dQ}}{f_K} \end{array} \right)$$

$$= W_L \frac{dL^*}{dQ} + \frac{W_K}{f_K} - \frac{W_K f_L}{f_K} \cdot \frac{dL^*}{dQ}$$

$$= \left(W_L - \frac{W_K f_L}{f_K} \right) \frac{dL^*}{dQ} + \frac{W_K}{f_K}$$

$$= \frac{W_K}{f_K} = \frac{W_L}{f_L} = \lambda$$

short run MC

$$\left\{ \begin{array}{l} c = W_L L^0. \\[2mm] f(L^0, \bar{K}) = Q. \\[2mm] f_L dL^0 = dQ. \\[2mm] \dfrac{dL}{dQ} = \dfrac{1}{f_L} \\[3mm] \dfrac{dc}{dQ} = W_L \dfrac{dL}{dQ} = \dfrac{W_L}{f_L} = MC \end{array} \right.$$

L.R.
$$\left\{ \begin{array}{l} \text{Min } W_L L + W_K k \\ \text{s.t. } f(L, k) = Q \end{array} \right.$$

$$W_L L + W_K k + \lambda [Q - f(L, k)]$$

$$\frac{W_L}{f_L} = MC = MR = P \qquad W_L = P \cdot MPP_L$$
$$= MR \cdot MPP_L$$

$$\frac{W_K}{f_K} = MC = MR = P \qquad W_K = P \cdot MPP_K$$
$$= MR \cdot MPP_K$$

$$\Pi = P(Q) \cdot Q - W_L L - W_K k$$
$$= TR(f(L, k)) - W_L L - W_K k$$

$$\begin{cases} MR \cdot f_L = W_L \\ MR \cdot f_K = W_K \end{cases}$$
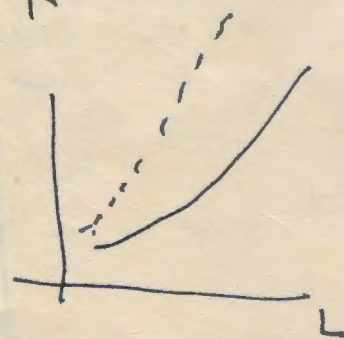
如果要素市场为 proven competitive

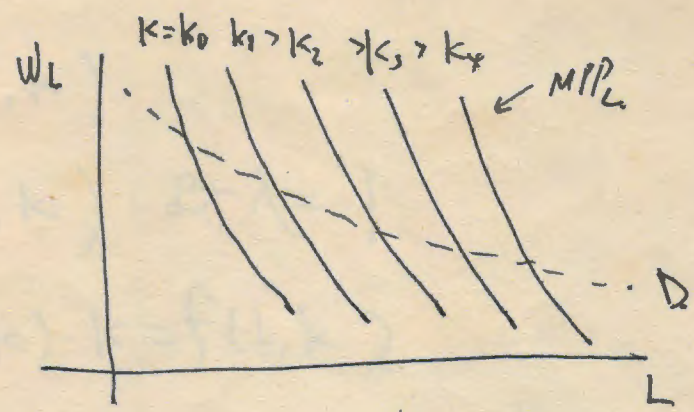$$\Pi = TR(f(L, k)) - \overset{TFC_L}{W_L(L) \cdot L} - \overset{TFC_k}{W_K(k) \cdot k}$$

$$MR \cdot f_L = MFC_L = \frac{dW_L}{dL} \cdot L + W_L$$

$$MR \cdot f_K = MFC_K = \frac{dW_K}{dk} \cdot k \cdot W_K$$

$$\cdot = \left(\frac{dW_L}{dL} \cdot \frac{L}{W_L} + 1 \right) W_L = \left(1 + \frac{1}{y_L^s} \right) P$$

称
之
$\begin{cases} P_0\, MPP_L = W_L \\ P\, MPP_k = W_k \end{cases}$ $\qquad W_L$

$k=k_0 \; k_1 > k_2 > k_3 > k_4 \qquad MPP_L$

D

L

$W_L \downarrow \Rightarrow L \text{(Q不变)} \uparrow$ 直到 $MPP_L = \frac{P_L}{P} \Rightarrow k: MPP \uparrow \Rightarrow k \uparrow \Rightarrow A \uparrow$

假如是产品市场非纯竞争市场

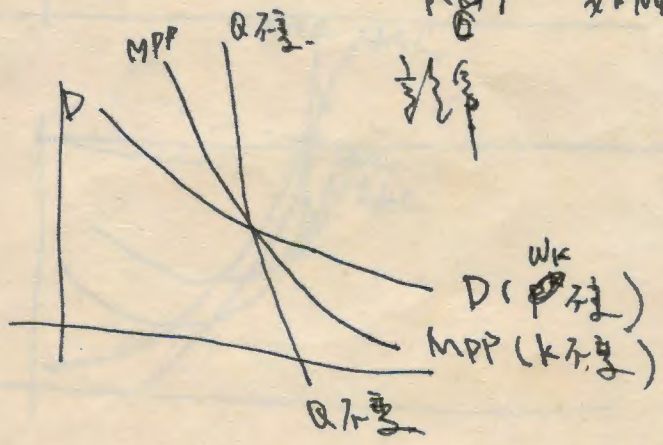$W_L \downarrow \Rightarrow L \uparrow \Rightarrow \begin{matrix} MPP_k \uparrow \\ MR \downarrow \end{matrix} \Rightarrow MRP_L = MPP_L \cdot MR ? \Rightarrow B \begin{smallmatrix}\uparrow\\\downarrow\end{smallmatrix} ?$

$\Rightarrow A \begin{smallmatrix}\uparrow\\\downarrow\end{smallmatrix} ?$

那么, $W_L \text{(Q不变)} \downarrow \text{(Q不变)} \Rightarrow L \uparrow, k \downarrow \Rightarrow \frac{W_L}{MPP_L} = \frac{W_k}{MPP_k \uparrow} = MCQ < MR$

$\Rightarrow Q \uparrow \Rightarrow \begin{matrix} L \uparrow \\ k \uparrow \end{matrix}$ 如MR不变则P↑ 否则不定一

MPP Q不变
D
$D\,(W_k\,不变)$
$MPP\,(k不变)$
Q不变

MPP P
$MPP\,(k不变)$
$D\,(W_k\,不变)$
价格增加↑

Marshall 3 原则   X 需求小.
                   L 代替小

$$f(\lambda L, \lambda k) = \lambda f(L, k)$$

$$\frac{\partial}{\partial \lambda} \quad f_L^{(\lambda L, \lambda k)} \cdot L + f_k^{(\lambda L, \lambda k)} \cdot k = f(L, k) \quad \text{at } \lambda = 1$$

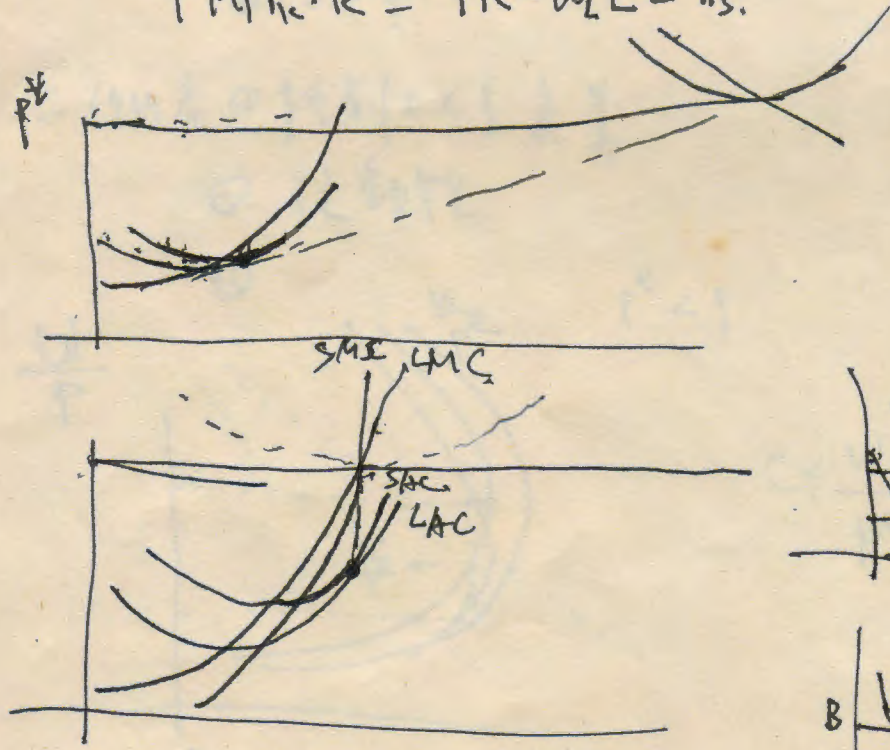$$f_L(L, k) \cdot L + f_k(L, k) \cdot k = f(L, k)$$

$$P \cdot MPP_L \cdot L + P \cdot MPP_k \cdot k = P \cdot Q = TR$$
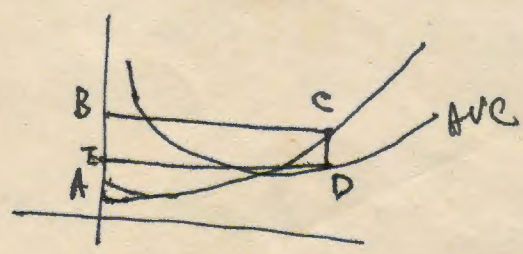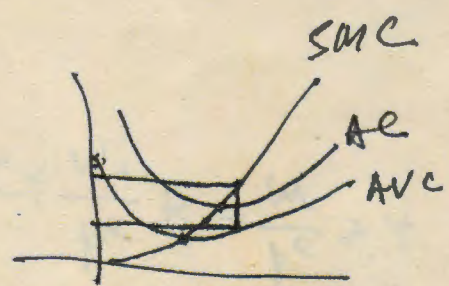
$$W_L \cdot L + W_k \cdot k = TR.$$

$$\therefore \pi = 0.$$

$$W_L \cdot L + P \cdot MPP_k \cdot k = TR$$

$$P \cdot MPP_k \cdot k = TR - W_L L = \pi_s.$$

$$\triangle CB = BCDE$$

长 长期成本（元）

长期平均成本 $LAC = \dfrac{W_L L^*(Q) + W_k k^*(Q)}{f(L^*_{(Q)}, k^*_{(Q)})}$

$\dfrac{dLAC}{dQ} = \dfrac{W_L \frac{dL^*}{dQ} + W_k \frac{dk^*}{dQ}}{f} - \dfrac{W_L L^* + W_k k^*}{f^2}$

$= \dfrac{MC}{f} - \dfrac{TC}{f^2} \left(= \dfrac{MC \cdot Q - TC}{Q^2} \right)$

短期平均成本

前述 $c = W_L L^0$ 当 k 固定在 $\bar{k}$ 时的总变动成本，故平均成本

$AVC = \dfrac{W_L L^0}{f(L^0, \bar{k})}$ 由$\bar{k}$有固定 $F = W_k \bar{k}$ 的固定成本
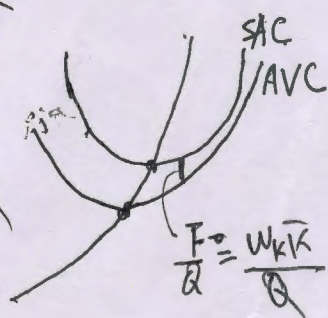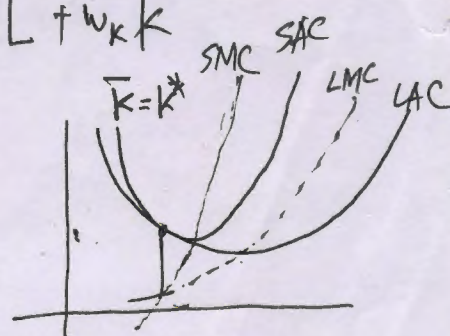
含固定成本的短期总成本 $F + W_L L^0 = W_L L^0 + W_k \bar{k}$
短期平均总成本为

$\dfrac{F + W_L L^0}{f(L^0, \bar{k})} \equiv SAC$

$\dfrac{dSAC}{dQ} = \dfrac{d}{dQ} \dfrac{W_L L^0 + W_k \bar{k}}{f(L^0, \bar{k})} = \dfrac{W \cdot \frac{dL^0}{dQ}}{f} - \dfrac{W_L L^0 + W_k \bar{k}}{f^2}$ 由$\bar{k}$为常数.

$= \dfrac{W_L / f_L}{f} - \dfrac{W_L L^0 + W_k \bar{k}}{f^2}$

$\dfrac{dLAC}{dQ}$

$\dfrac{F}{Q} = \dfrac{W_k \bar{k}}{Q}$

长期成本(续)

长期平均成本
$$LAC = \frac{w_L L^*(Q) + w_k k^*(Q)}{f(L^*(Q), k^*(Q))}$$

$$\frac{dLAC}{dQ} = \frac{w_L \frac{dL^*}{dQ} + w_k \frac{dk^*}{dQ}}{f} - \frac{w_L L^* + w_k k^*}{f^2}$$

$$= \frac{MC}{f} - \frac{TC}{f^2} \left(= \frac{MC \cdot Q - TC}{Q^2} \right)$$
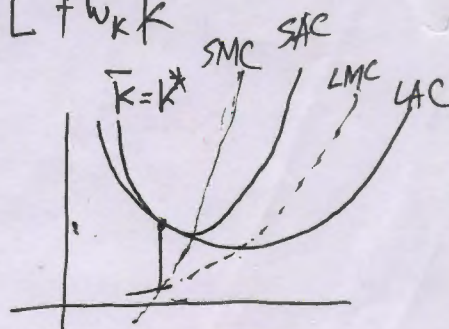
短期平均成本

前述 $c = w_L L^°$ 是当 k 固定在 $\bar{k}$ 时的变动成本, 称为变动成本

$$AVC = \frac{w_L L^°}{f(L^°, \bar{k})}$$ 而把 $F = w_k \bar{k}$ 称为固定成本

含固定成本的短期总成本 $F + w_L L^° = w_L L^° + w_k \bar{k}$
故短期平均总成本为.

$$\frac{F + w_L L^°}{f(L^°, \bar{k})} = SAC$$

$$\frac{dSAC}{dQ} = \frac{d}{dQ} \frac{w_L L^° + w_k \bar{k}}{f(L^°, \bar{k})} = \frac{w \cdot \frac{dL^°}{dQ}}{f} - \frac{w_L L^° + w_k \bar{k}}{f^2}$$

$$= \frac{w_L / f_L}{f} - \frac{w_L L^° + w_k \bar{k}}{f^2}$$

$$\frac{dLAC}{dQ}$$