Production and Cost Relationships Review

Production function:

Q = f(L, K, R, technology, cultural and legal, . . .)

Long run: Q = f(L, K, R), *ceteris paribus*

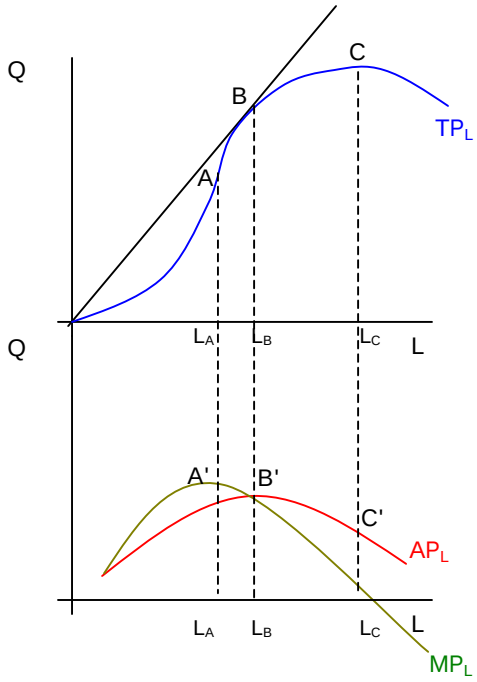
Short run: Q = (L) ceteris paribus (L is the variable input in this example, K and/or R ar the fixed inputs "Scale of Plant")

$$Q = TP_L = f(inputs, technology, etc)$$

$$AP_L = \frac{TP_L}{L} = \frac{Q}{L}$$

$$MP_L = \frac{\Delta TP}{\Delta L} = \frac{\Delta Q}{\Delta L}$$

$$MP_L = \frac{\partial Q}{\partial L},\ MP_K = \frac{\partial Q}{\partial K},\ MP_R = \frac{\partial Q}{\partial R}$$



- Inflection point is at L_A (point A), maximum of MP_L at L_A (point A')
- At L_B, tan of ray from origin at point B, maximum of AP_L at B'
- At L_C, TP_L is a maximum, MP_L = 0
- When $AP_L = MP_L$, AP_L is a maximum, when MP > AP, AP rises, MP < AP, AP decreases

Cost Functions:

Short run

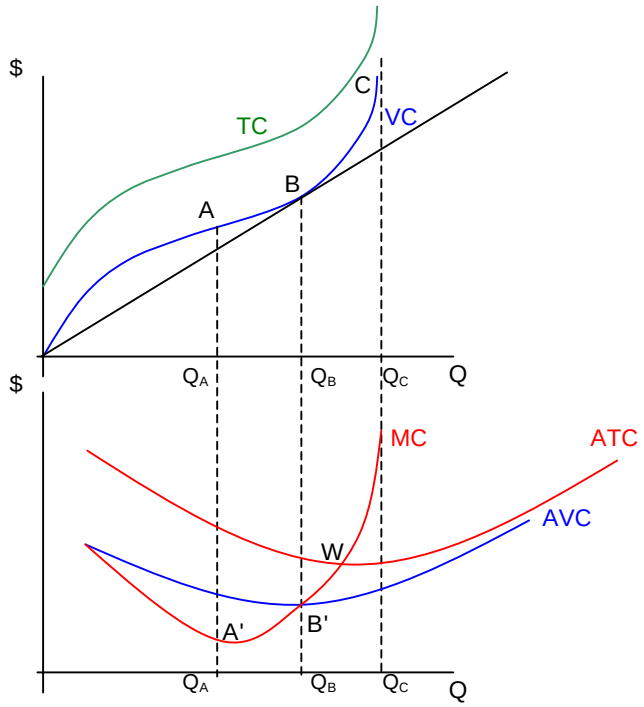
FC = TFC = (P_K)*K, where K is fixed input

FC = TC - VC

VC = TFC = (P_L)*L, where L is variable input

VC = TC - FC

TC = VC + FC



$$AVC = \frac{VC}{Q} = ATC - AFC$$

$$AVC = (\frac{1}{AP_L}) * P_L$$

$$AFC = \frac{FC}{Q} = ATC - AVC$$

$$ATC = \frac{TC}{Q} = AVC + AFC$$

$$MC = \frac{\Delta TC}{\Delta Q} = \frac{\Delta VC}{\Delta Q}$$

$$MC = (\frac{1}{MP_L}) * P_L$$

- At inflection point A (at Q_A), MC is a minimum, MP_L is a maximum
- At output Q_B (point B) AVC is a minimum
- When MC < AVC, AVC is falling
- When MC > AVC, AVC is rising
- When MC= AVC, AVC is a min.
- When AVC is a min, AP_L is a max.
- When MC < ATC, ATC is falling
- When MC > ATC, ATC is rising
- When MC= ATC, ATC is a min.
- When AVC is a min, AP_L is a max
- When MC is a min, MP_L is a max
- The vertical distance between AVC and ATC is the AFC