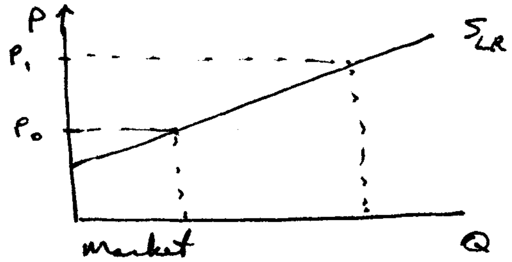
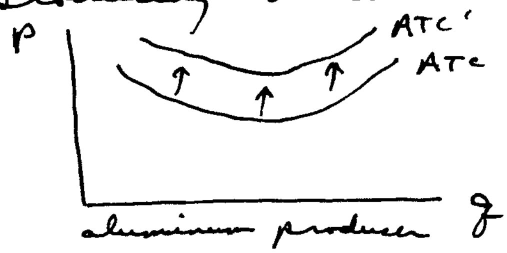
ECO 601 2nd Test Key Fall 1999

1. Bauxite:



As the demand for bauxite by aluminum producers increases, bauxite prices will rise. A bauxite producer who can break even at P_0 will earn economic rents when the price of bauxite rises to P_1.

An aluminum producer that owns bauxite reserves can use the bauxite itself or sell it in the marketplace. The opportunity cost of using the bauxite in its own internal production of aluminum is determined by the market price of bauxite. When the industry output of aluminum expands and the price of bauxite is bid up, this firm's costs of producing aluminum also go up:



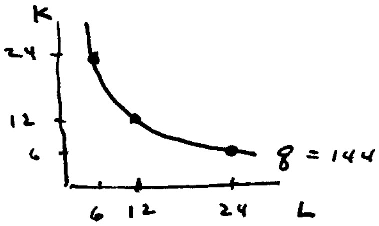
This firm will not be earning economic profit from its production of aluminum, but it will collect an economic rent from its ownership of cheap bauxite reserves.

2. $q = 10K^{1/2}L^{1/2}$

(a) $q = 120$: $120 = 10\,K^{1/2}L^{1/2}$

$K^{1/2}L^{1/2} = 12$, so $K \cdot L = 144$

K	12	16	9	18	8	24	6
L	12	9	16	8	18	6	24



(b) for cost minimization : $\dfrac{MP_L}{MP_K} = \dfrac{w}{v}$; $w = 6$, $v = 6$

$MP_L = 5\,K^{1/2}L^{-1/2}$

$MP_K = 5\,K^{-1/2}L^{1/2}$

$MRTS_{L,K} = \dfrac{MP_L}{MP_K} = \dfrac{5K^{1/2}L^{-1/2}}{5K^{-1/2}L^{1/2}} = \dfrac{K}{L}$

cost minimum $\Rightarrow$ $\dfrac{K}{L} = \dfrac{6}{6}$ $\Rightarrow$ $K = L$

for $q = 120$, $K \cdot L = 144$, and since $K = L$,

$K^* = 12$ and $L^* = 12$

(c) $q =$ [redacted] $10\,K^{1/2}L^{1/2}$; For cost minimization, $K = L$;

so $q = 10\,K^{1/2}K^{1/2}$ and $q = 10\,L^{1/2}L^{1/2}$

or $q = 10K$, $K = \frac{q}{10}$ and $q = 10L$, $L = \frac{q}{10}$

substitute into total cost definition :

$TC = vK + wL = 6\left(\frac{q}{10}\right) + 6\left(\frac{q}{10}\right)$

$TC = 1.2q$

$MC = \dfrac{dTC}{dq} = 1.2$

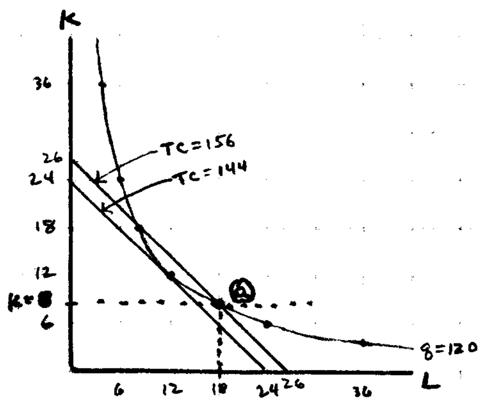
Alternatively, an additional unit of labor can produce 5 additional sandwiches at an additional cost of \$6, which works out to \$1.20 each.

3. $q = 10K^{1/2}L^{1/2}$, and $\bar{K} = 8$; $w = 6$, $v = 6$

(a) $KL = 144$ for $q = 120$

if $K = 8$, then $L = 18$

$TC = 6(8) + 6(18) = 156$



(b) slope of isoquant $= MRTS_{L,K} = \dfrac{MP_L}{MP_K} = \dfrac{K}{L} = \dfrac{8}{18}$

slope of isocost $= \dfrac{w}{v} = \dfrac{6}{6} = 1$

$\dfrac{8}{18} < 1$, so $\dfrac{MP_L}{MP_K} < \dfrac{w}{v}$

we are underutilizing capital and overutilizing labor.

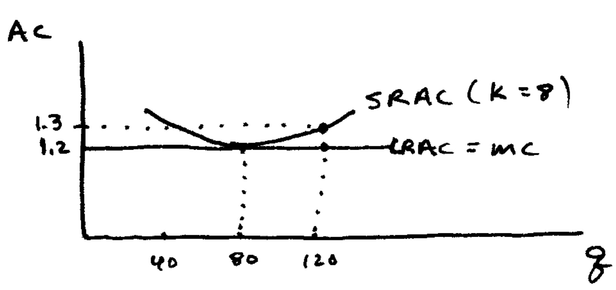
(c) From 2(c) we know that $TC = 1.2\,q$

Hence the LRAC is flat at $AC = 1.2 = MC$

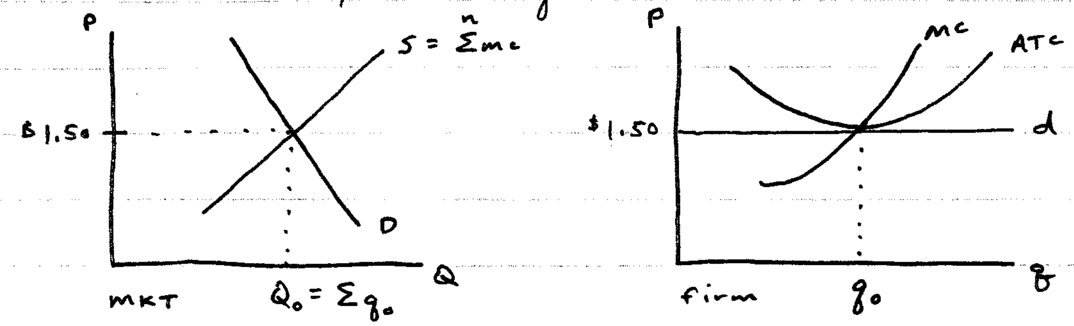
But to produce $q = 120$ with $K = 8$ and $L = 18$,

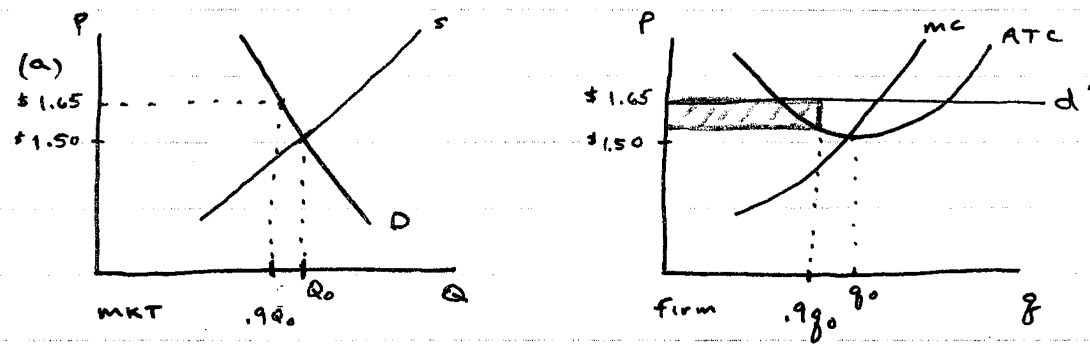
we know that $TC = 156$ and $AC = \dfrac{156}{120} = 1.3$

So,

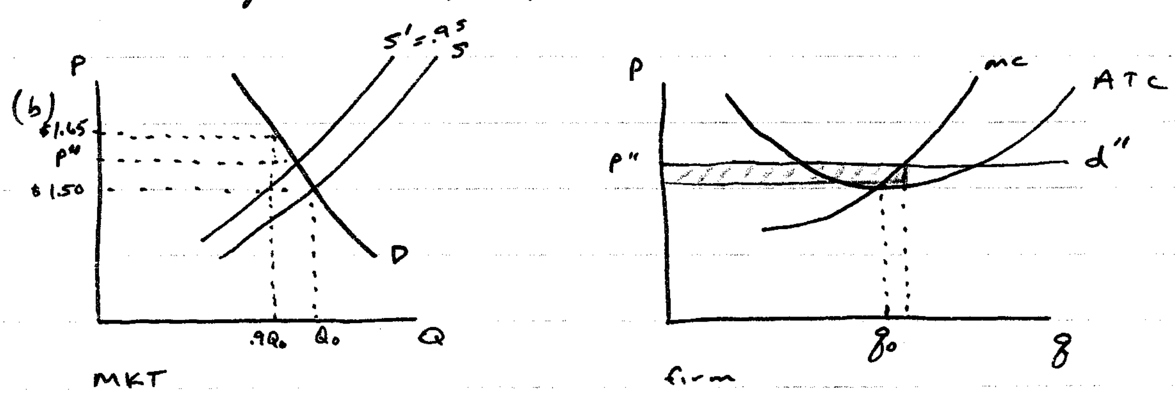


4. Initial long-run equilibrium:





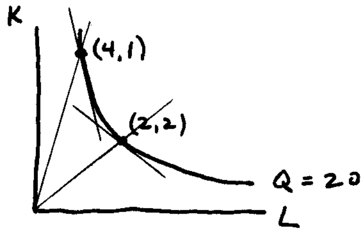
If each firm restricts output by 10% and there is no entry, market output falls by 10% and price rises by 10% to \$1.65. The representative firm earns positive economic profits as a result of this program.



With 10% fewer farmers, the new market supply curve will shift left by 10%. Price will rise, but by less than 10%, because the remaining farmers will produce more than q_0 at price P''. Short-run market output will fall by less than 10%.

ECO 601 Test #2 Key Fall 1998

1. $Q = 286H^{.37}$.
   a) $MP_H = dQ/dH = .37(286)H^{-.63} = 105.82H^{-.63}$.
   b) Yes, since MP_H decreases as horsepower increases.
   c) $AP_H = Q/H = 286H^{-.63}$.
   d) $MRP_H = (MP_H)(MR) = (105.82H^{-.63})(2) = 211.64H^{-.63}$.
   e) Set MRP_H = marginal expenditure on the input: $211.64H^{-.63} = 30$, so $H = 22.22$.



2. (a) see diagram.

(b) $\sigma = \dfrac{\%\ \Delta\ (K/L)}{\%\ \Delta\ MRTS_{L,K}} \Rightarrow$

$\%\ \Delta\ (K/L) \Rightarrow \frac{4}{1} \rightarrow \frac{2}{2}$

$\%\ \Delta\ MRTS_{L,K} = \%\Delta \dfrac{MP_L}{MP_K} = \%\ \Delta \dfrac{5K^{1/2}L^{-1/2}}{5K^{-1/2}L^{1/2}} = \%\ \Delta\ (K/L)$

so $\%\ \Delta\ MRTS_{L,K} = \%\ \Delta\ (K/L) \Rightarrow \frac{4}{1} \rightarrow \frac{2}{2}$ and is equal to the numerator of σ.

Hence $\sigma = 1$

(c) for cost minimization: $\dfrac{MP_L}{MP_K} = \dfrac{w}{v}$

from above, $\dfrac{MP_L}{MP_K} = \dfrac{K}{L}$; $\dfrac{w}{v} = \dfrac{1}{4}$; so

$\dfrac{K}{L} = \dfrac{1}{4}$, or $K = \dfrac{L}{4}$ for minimum cost.

Plug into production function constraint:

$Q = 10K^{1/2}L^{1/2} \Rightarrow 40 = 10\left(\frac{L}{4}\right)^{1/2}L^{1/2}$.

$40 = \frac{10}{2}L^{1/2}L^{1/2}$; $40 = 5L$;

$L^* = 8$, $K^* = 2$.

See diagram for illustration.

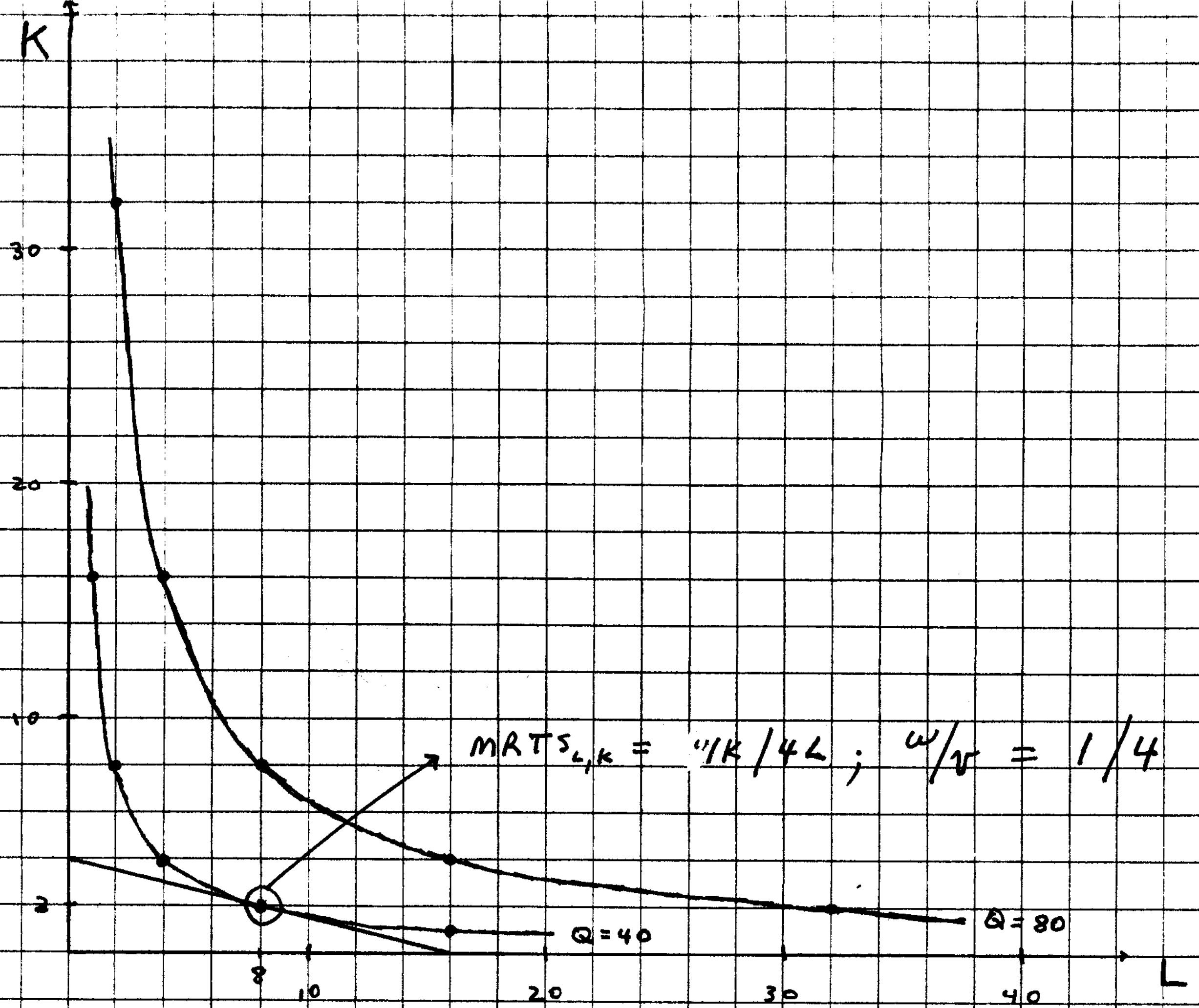
3. LRAC is U-shaped.
SRAC curves are also U-shaped, and are tangent to LRAC at q_0, q_1, and q_2.

SRMC = SRAC at min SRAC.

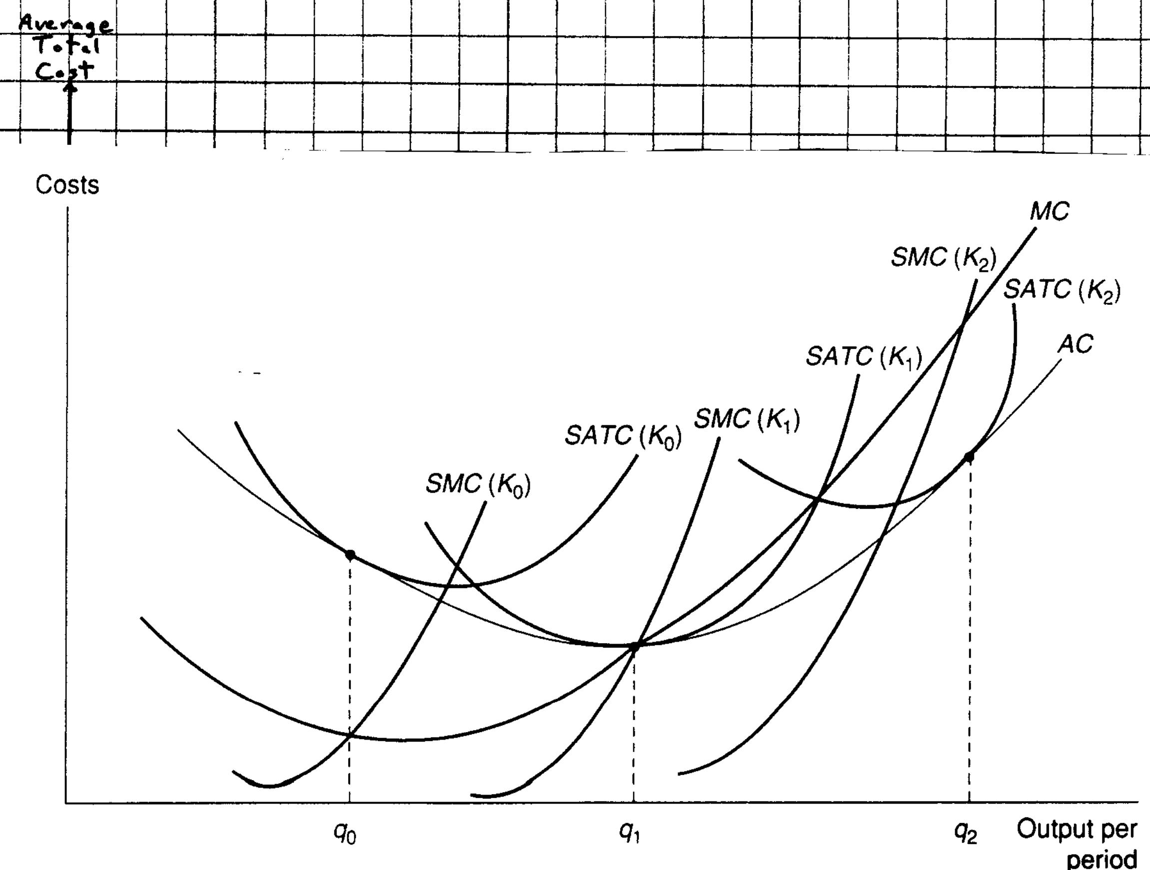
SRMC = LRMC at points of tangency of SRAC and LRAC curves.

[see diagram]

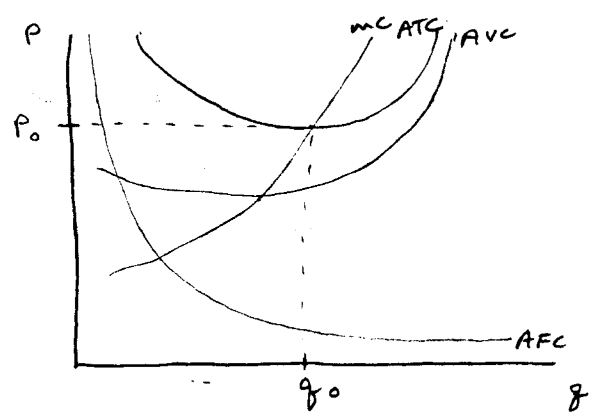
2.


K
30
20
10
2
8
10
20
30
40
L
MRTS$_{L,K}$ = 1/K / 4L ; w/v = 1/4
Q = 40
Q = 80

3.


Average Total Cost
Costs
MC
SMC (K_2)
SATC (K_2)
AC
SATC (K_1)
SMC (K_1)
SATC (K_0)
SMC (K_0)
q_0
q_1
q_2
Output per period

4. Firm's SRAC curves:



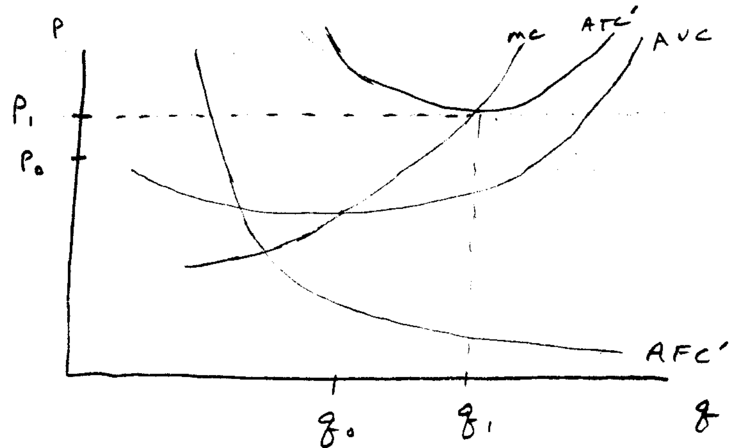
A large fixed annual fee would shift AFC to the right, and thus shift ATC upward. AVC and MC would not change.

(a) Since SRMC doesn't change, and market price doesn't change in the short run, each firm's optimal short-run output will not change.

(b) Since total costs have risen, firms will suffer economic losses, and some will exit from the industry. The new long-run equilibrium will be characterized by fewer firms.

(c) The new SRATC curve will "bottom out" at a larger output rate, and so the average size of the firm will increase.

(d) Long-run equilibrium price will rise to reflect the new higher ATC:



5. $Q = 45 - 5P \Rightarrow P = 9 - \frac{Q}{5}$

$TFC = 12 \qquad MC = AVC = 5$

(a) $TR = P \cdot Q = 9Q - Q^2/5$

$MR = \frac{dTR}{dQ} = 9 - \frac{2}{5} \cdot Q$

$MR = MC \Rightarrow 9 - \frac{2}{5} \cdot Q = 5$

$4 = \frac{2}{5} \cdot Q \; ; \; Q^* = 10 \; , \; P^* = 7$

$\pi = TR - TC = 70 - 12 - 50 = \$8$

(b) In short-run, P^* and Q^* will not change, even though firm will suffer economic losses of \$2. Optimal long-run response is to go out of business.

(c) MC rises from \$5 to \$5.50.

$MR = MC \Rightarrow 9 - \frac{2}{5} Q = 5.5$

$\frac{2}{5} Q = 3.5 \; ; \; Q^* = 8.75 \; , \; P^* = \$7.25$

$\pi = \$63.4375 - \$12 - \$48.125 = \$3.31$