

Production Function

With Two Inputs L AND K

$$Q = f(L, K)$$

K							Q
6	10	24	31	36	40	39	
5	12	28	36	40	42	40	
4	12	28	36	40	40	36	
3	10	23	33	36	36	33	
2	7	18	28	30	30	28	
1	3	8	12	14	14	12	
	1	2	3	4	5	6	L

Production Function With Two Inputs

Discrete Production Surface

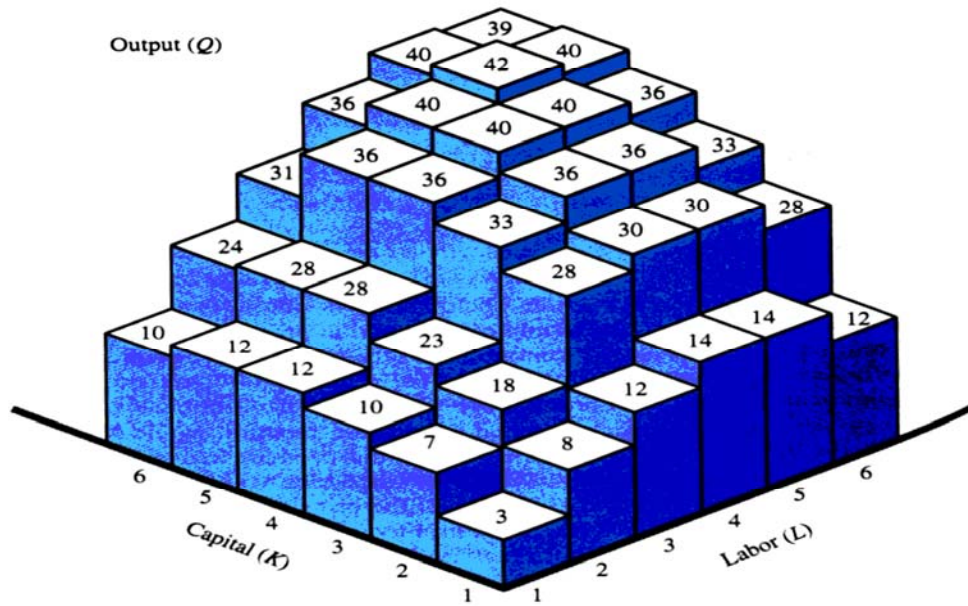
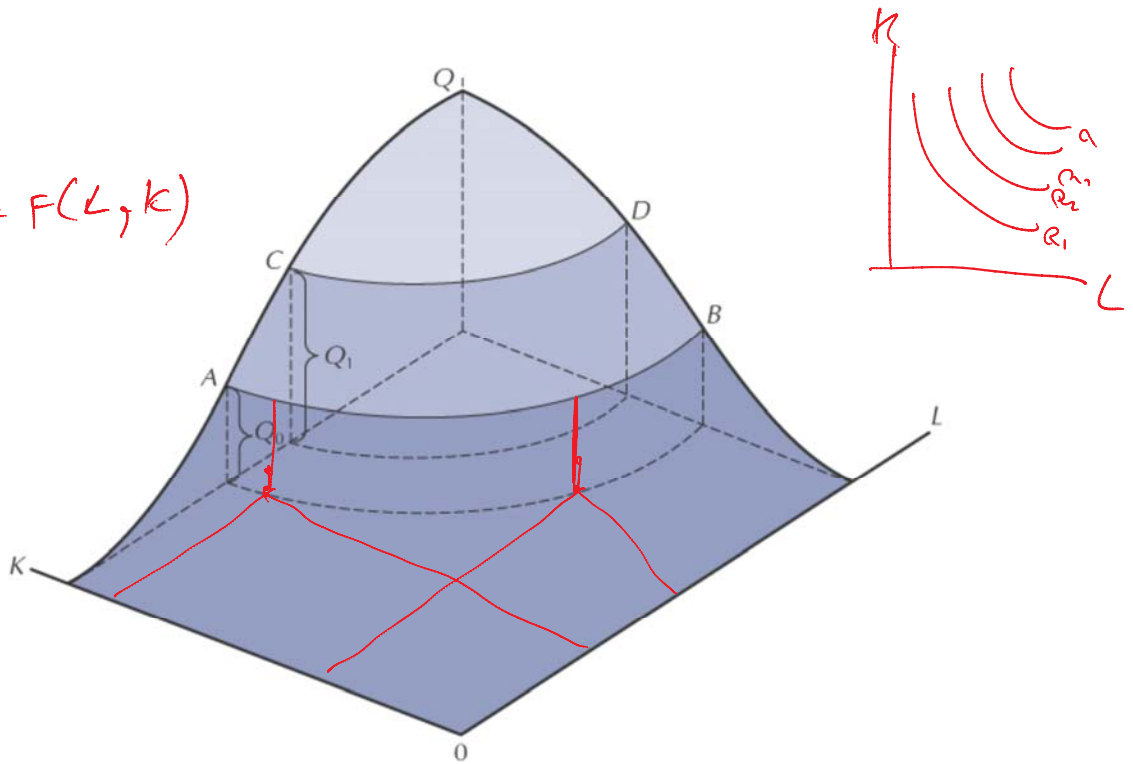


Figure A9-4: The Production Mountain

$$Q = F(L, k)$$



7.4



The Inflexibility of Short-Run Production

Figure 7.7

The Inflexibility of Short-Run Production

When a firm operates in the short run, its cost of production may not be minimized because of inflexibility in the use of capital inputs.

Output is initially at level q_1 . In the short run, output q_2 can be produced only by increasing labor from L_1 to L_3 because capital is fixed at K_1 . In the long run, the same output can be produced more cheaply by increasing labor from L_1 to L_2 and capital from K_1 to K_2 .

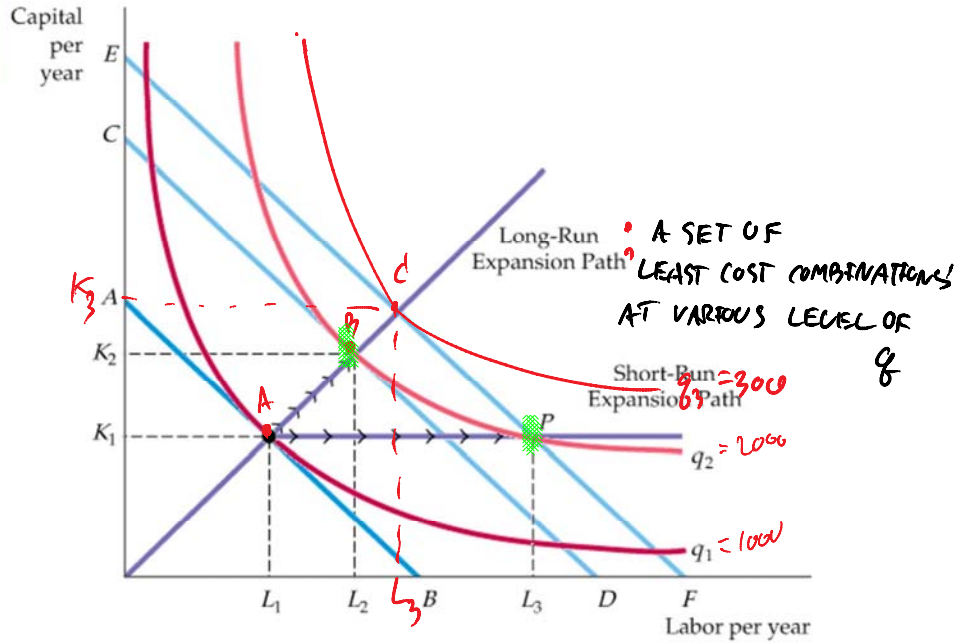
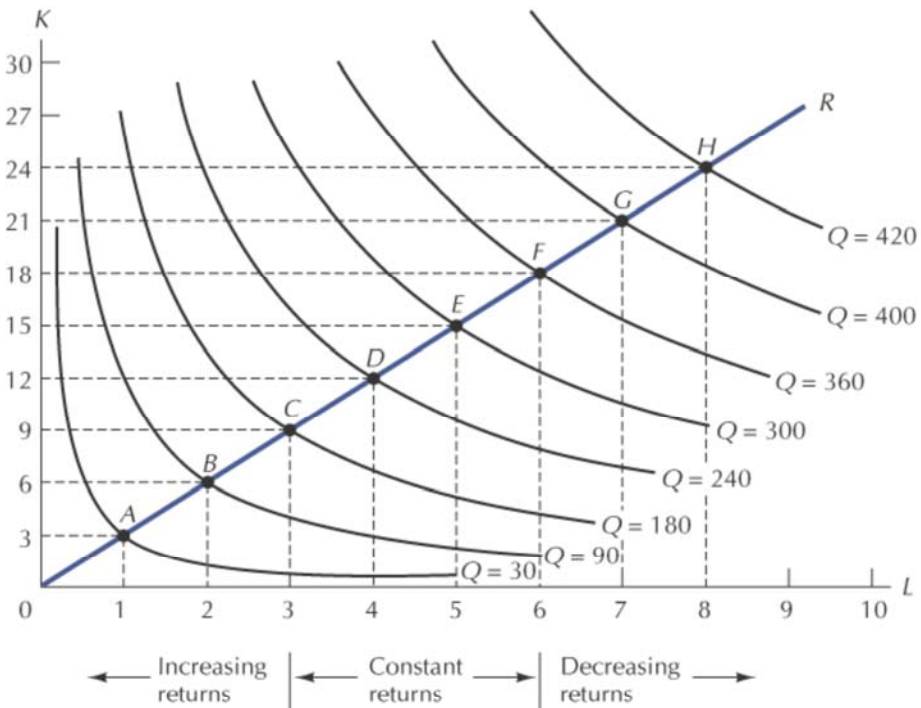


Figure 9-11: Returns to Scale Shown on the Isoquant Map

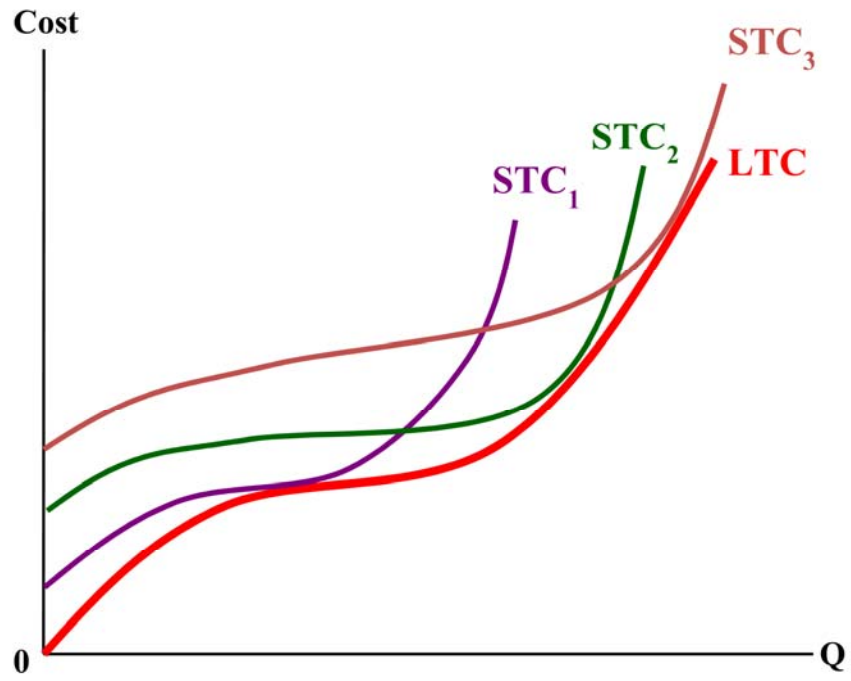


Point	L	% change	K	% change	Q	% change	RTS
A	1	-	3	-	30	-	
B	2	100.0%	6	100.0%	90	200%	IRS
C	3	50.0%	9	50.0%	180	100%	IRS
D	4	33.3%	12	33.3%	240	33%	CRS
E	5	25.0%	15	25.0%	300	25%	CRS
F	6	20.0%	18	20.0%	360	20%	CRS
G	7	16.7%	21	16.7%	400	11%	DRS
H	8	14.3%	24	14.3%	420	5%	DRS

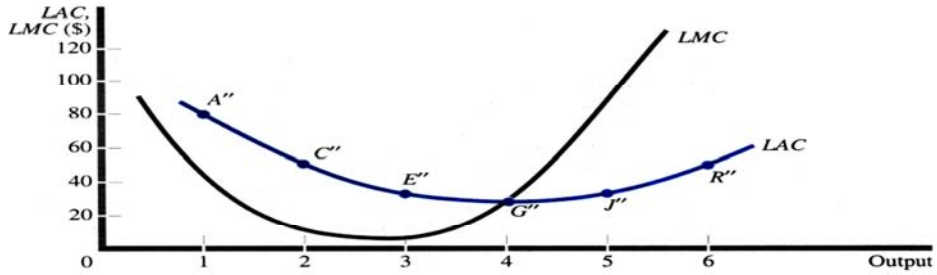
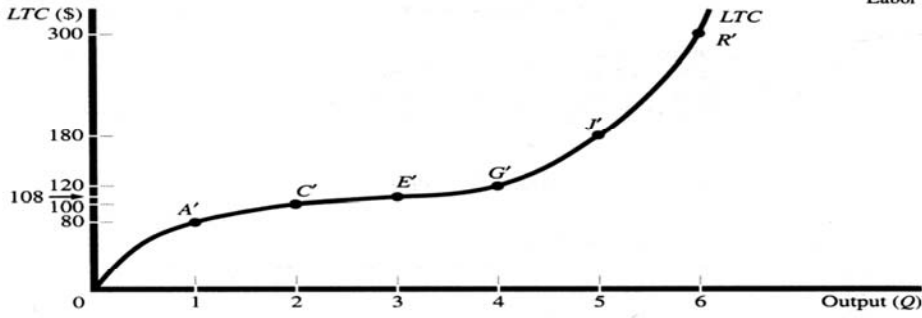
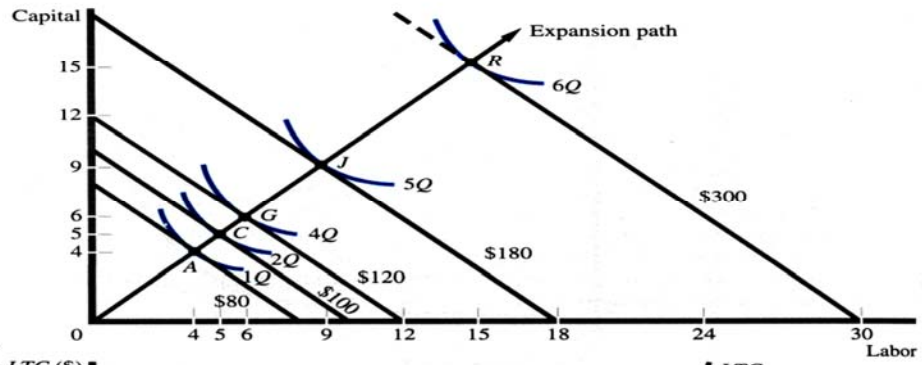
Note: Calculated from Figure 9-11: Returns to Scale Shown on the Isoquant Map, Frank (2006).

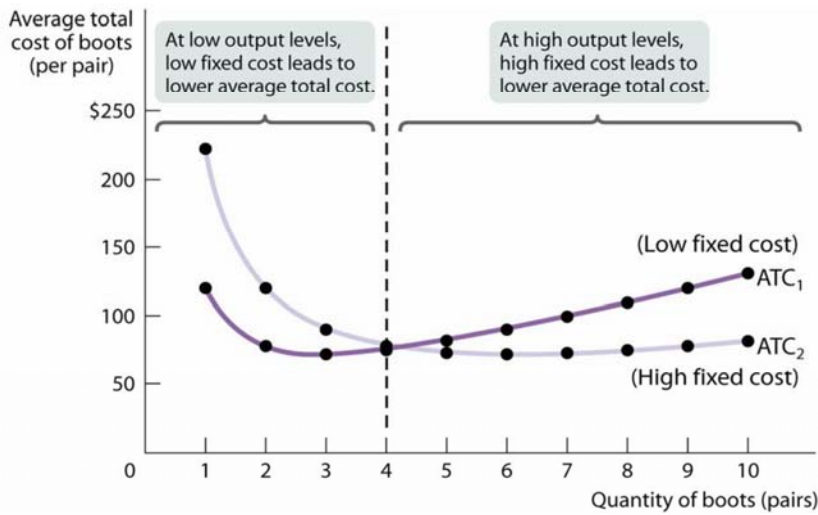
IRS: $\% \text{ INCREASE IN } Q > \% \text{ INCREASE IN BOTH } K \text{ AND } L$
 CRS: $\% \text{ INCREASE IN } Q = \% \text{ INCREASE IN BOTH } K \text{ AND } L$
 DRS: $\% \text{ INCREASE IN } Q < \% \text{ INCREASE IN BOTH } K \text{ AND } L$

Short Run and Long Run Total Cost Curves



How to
derive LAC
and LMC





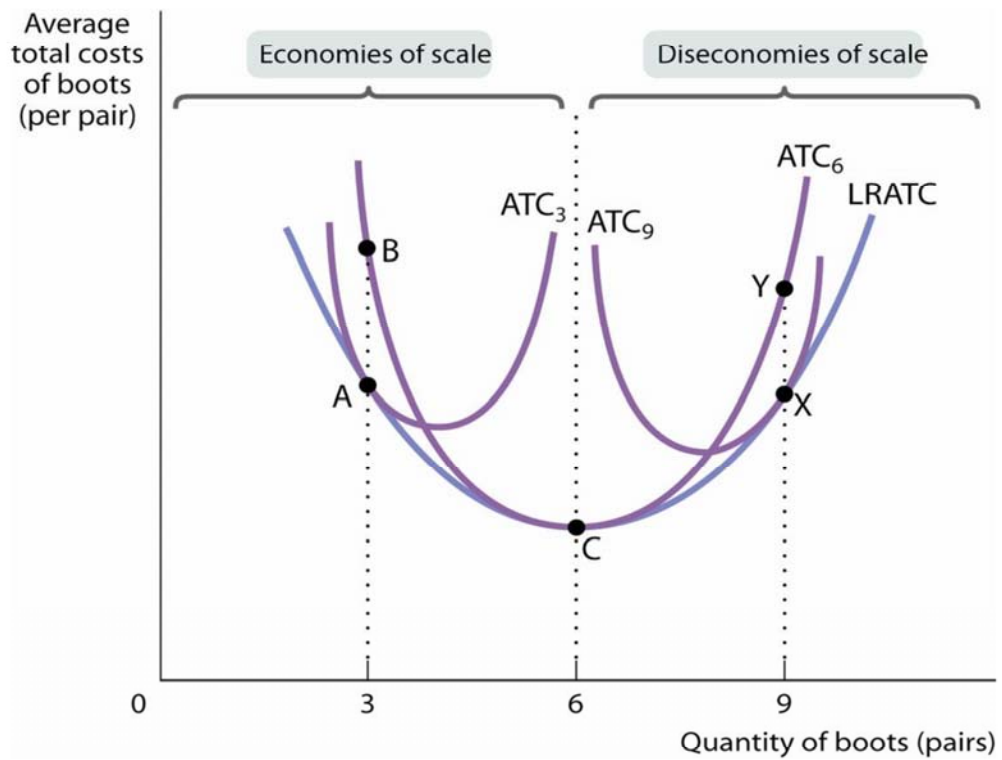
Choosing the Level of Fixed Cost for Ben's Boots

There is a trade-off between higher fixed cost and lower variable cost for any given output level, and vice versa.

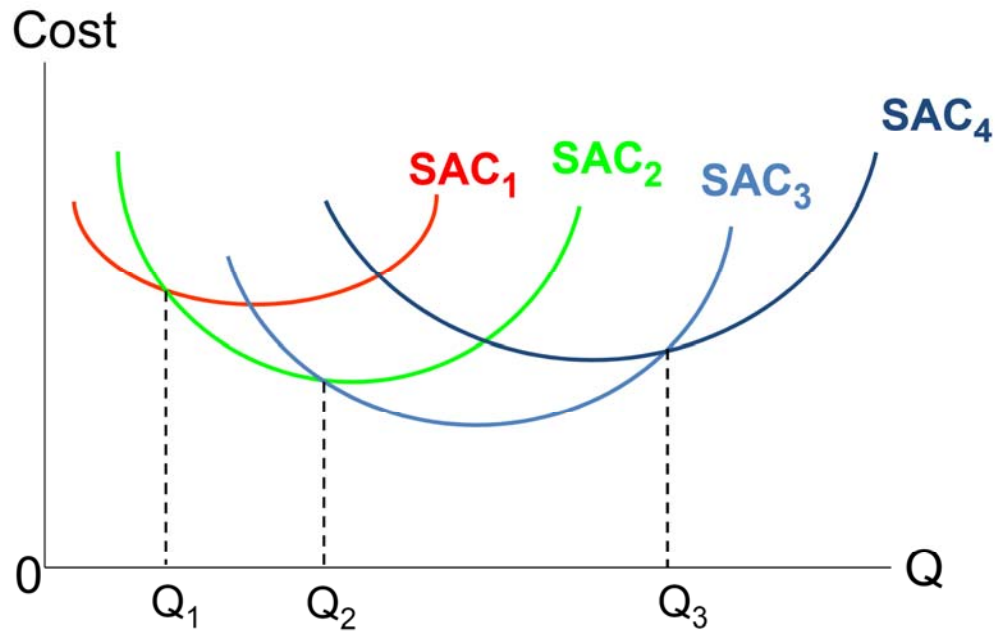
But as output goes up, average total cost is lower with the higher amount of fixed cost.

Quantity of boots (pairs)	Low fixed cost (FC = \$108)			High fixed cost (FC = \$216)		
	Variable cost	Total cost	Average total cost of boots ATC ₁ (per pair)	Variable cost	Total cost	Average total cost of boots ATC ₂ (per pair)
1	\$12	\$120	\$120	\$6	\$222	\$222
2	48	156	78	24	240	120
3	108	216	72	54	270	90
4	192	300	75	96	312	78
5	300	408	81.6	150	366	73.2
6	432	540	90	216	432	72
7	588	696	99.4	294	510	72.9
8	768	876	109.5	384	600	75
9	972	1,080	120	486	702	78
10	1,200	1,308	130.8	600	816	81.6

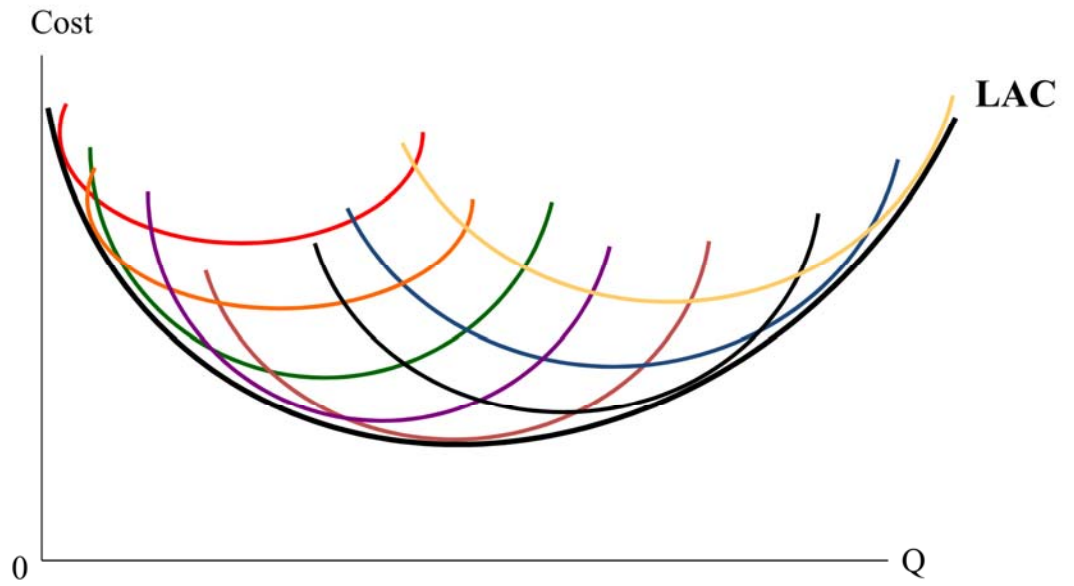
Short-Run and Long-Run Average Total Cost Curves



LAC



Long Run Average Cost Curve (LAC)



Why would a bathroom equipment manufacturer bake the image of a housefly onto the center of its ceramic urinals?



This example is base on Stefan Verhagen, "Fly in the Pot," Cornell Business, April 21, 1992.