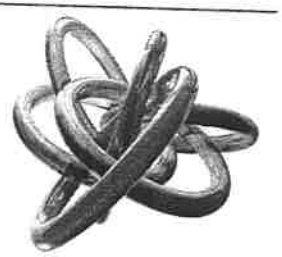
7.1 REVISION: WHICH COSTS MATTER?



Fixed Costs and Variable Costs

- **total cost (TC** or **C)** Total economic cost of production, consisting of FC & VC.

- **fixed cost (FC)** does not vary with output & that can be eliminated only by shutting down.

- **variable cost (VC)** Cost that varies as output varies.

In the SR most costs are fixed & in LR most costs are variable – rent & wages must be paid!

Sunk costs can never be recovered

REVISION

$$MC = \Delta VC/\Delta q = \Delta TC/\Delta q \quad (\text{or } TC_2 - TC_1)$$

- **average total cost (ATC or just AC)** Firm's total cost divided by q.
- **average fixed cost (AFC)** Fixed cost divided by q

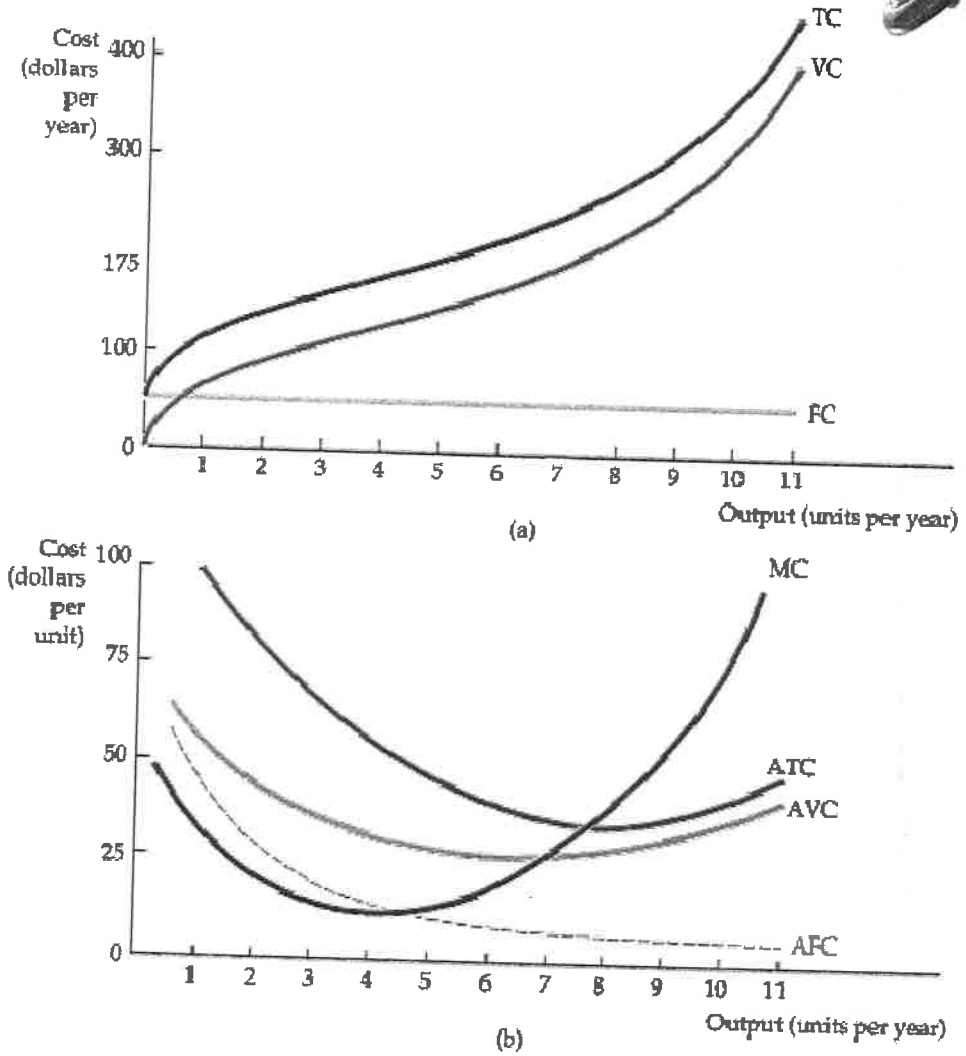
- **average variable cost (AVC)** Variable cost divided by q.

7.2 REVISION: COST IN THE SHORT RUN

The Shapes of the Cost Curves

Figure 7.1

Cost Curves for a Firm



In **(a)** total cost TC is the vertical sum of fixed cost FC and variable cost VC.

In **(b)** ATC is the sum of AVC and AFC.

MC crosses the average variable cost and average total cost curves at their minimum points.

7.3 NOW COST IN THE LONG RUN- K is flexible! NB

The User Cost of Capital

- **user cost of capital** Annual cost of owning & using K, equal **to economic depreciation plus forgone interest.**

  (if it was invested in some bank)

$$\text{User Cost of Capital} = \text{Economic Depreciation} + (\text{Interest Rate})(\text{Value of Capital})$$

$$r = \text{Depreciation rate} + \text{Interest rate}$$

7.3 COST IN THE LONG RUN

The **Cost-Minimizing** Input Choice

We now turn to a problem faced by firms: ***how to select inputs to produce a given output at minimum cost.***

For simplicity, we work with costs of K & L

The Price of K

The price of capital is its *user cost*, given by r = Depreciation rate + Interest rate.

The Rental Rate of Capital

- **rental rate** Cost per year of renting one unit of capital.

If the K market is competitive. *The competitive return is the user cost of capital.*

So cost of K is r
& cost of L is w

7.3 COST IN THE LONG RUN

The Isocost Line

- **isocost line** Graph showing all possible combinations of L and K that can be purchased for a given cost.

Total cost *C* of producing any some q = the sum of the firm's L cost (*wL)* + K cost *rK:*

$$C = wL + rK \qquad \textbf{(7.2)}$$

If we rewrite the cost equation as an equation for a straight line, we see the slope of equation

$$K = C/r - (w/r)L$$

SLOPE = w/r [absolute value]

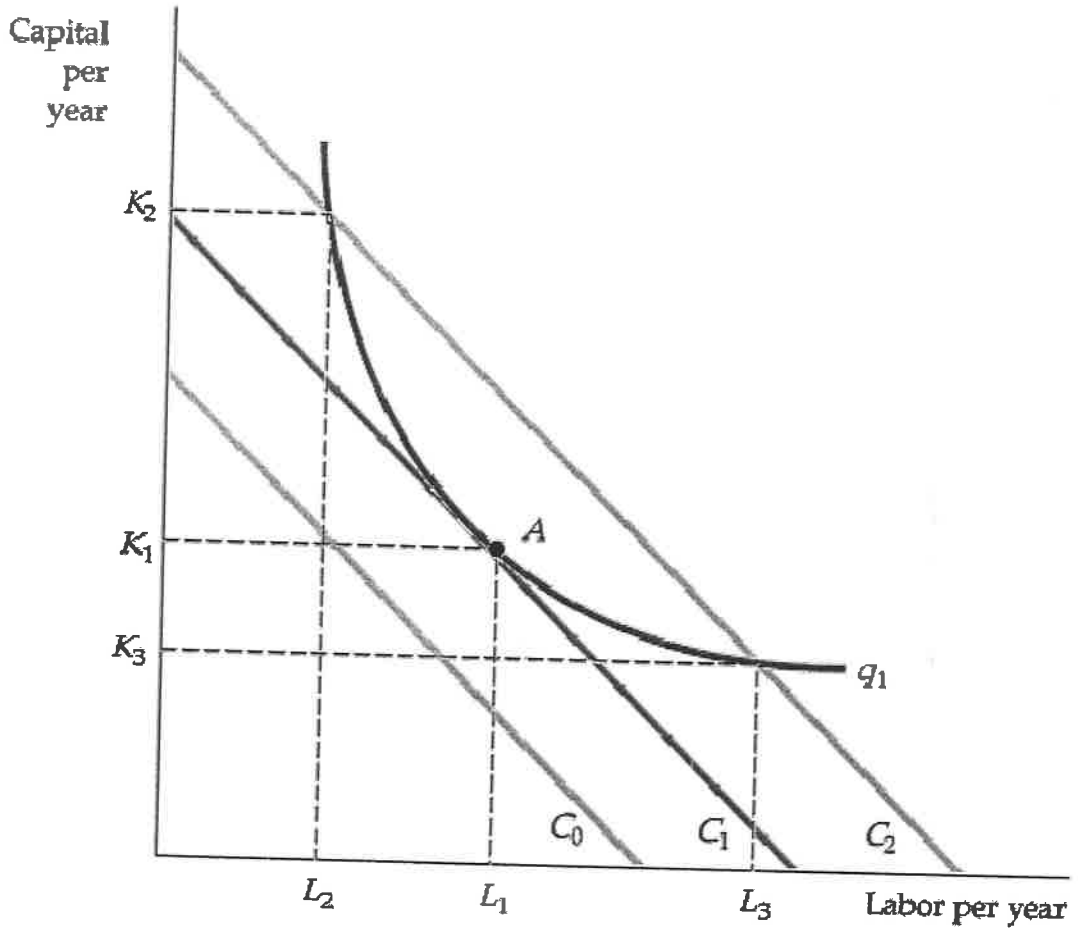
Really a price ratio of L and K.

Similar to slope of BL (Pf/Pc or Px/Py)

7.3 COST IN THE LONG RUN

The Isocost Line with isoquant

Figure 7.3



Isocost describe the combination of inputs to production that cost the same amount !!!!

at *A* q_1 can be produced at min. cost with L_1 & K_1.

This is equilibrium in the production side of economy

MRTS = MPL/MPK = **w/r**

In consumption we had

MRS = MUF/MUC = Pf/Pc

7.3 Cost in long run NB

- If Tot Cost are the same along isocost, we can READ out Total Cost at any point along the line
- If we are given TC and costs of K, we can work out costs of L$C = wL + rK$
- We can also work out the most efficient mix of inputs, given the isoquant map (tangent pt)
- Also given 2 isocosts & one isoquant, firm can choose 2 different efficient pts associated with the two isocosts (next slide)

7.3 COST IN THE LONG RUN

Choosing Inputs

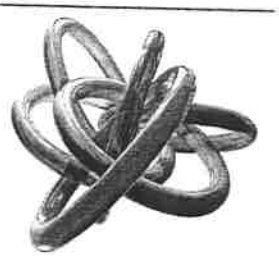


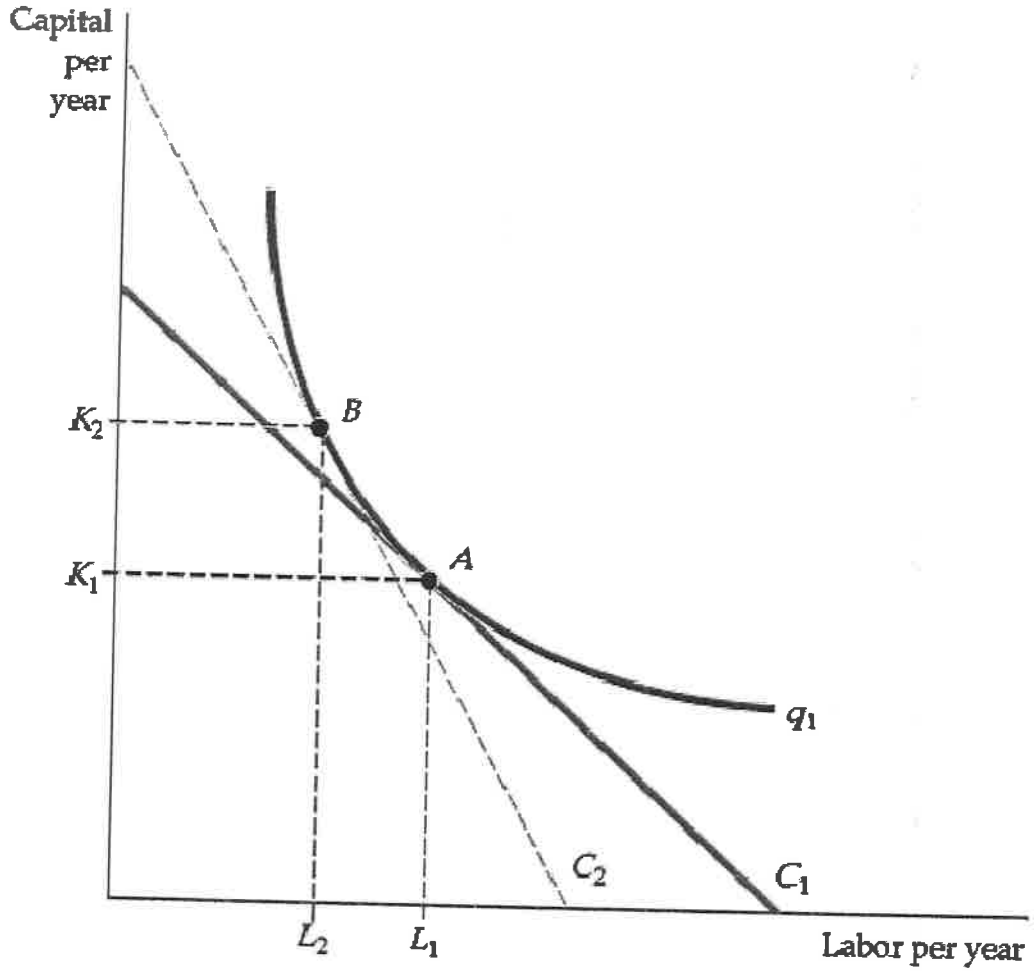
Figure 7.4

When prices of either K or L change the isocost curve will change slope

Then different combination K & L will be bought to produce same output (q1)

Cause: COST MINIMISATION requires that

MRTS=MPL/MPK=w/r



7.3 COST IN THE LONG RUN

Cost Minimization **with Varying Output Levels**

- **expansion or growth path**
  Curve passing through
  equilibrium points

The Expansion Path and Long-Run Costs

To move from the expansion path to the cost curve, we follow three steps:

1. Basically work out the TC associated with each equilibrium point
2. Plot this TC against each output level

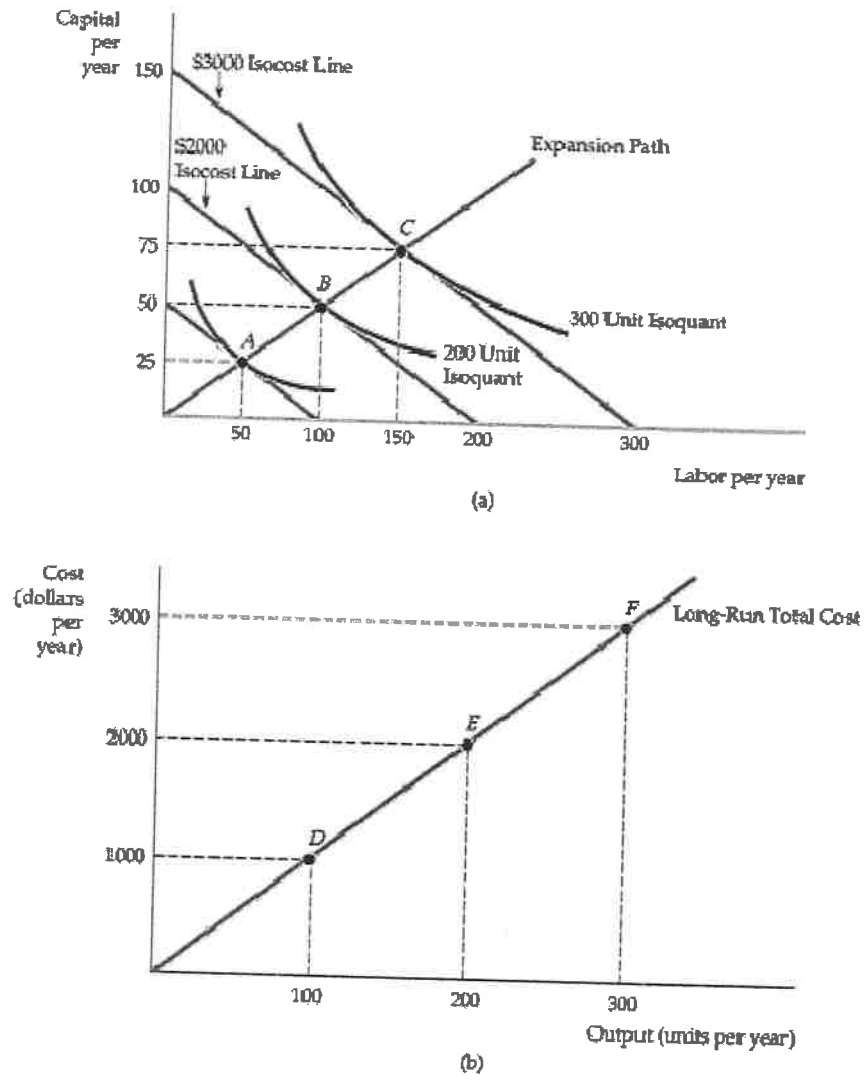
Next slide

7.3 COST IN THE LONG RUN

Cost Minimization with Varying Output Levels

Figure 7.6

A Firm's Expansion Path and Long-Run Total Cost Curve



In **(b)**, the corresponding LR total cost curve (from the origin through points *D*, *E*, and *F*) measures the least cost of producing each level of output.

Work out that r = 20

& w = 10

Rem: TC = rK + wL

Isocost = same costs

Hint: $2000= rK

7.4 LONG-RUN VERSUS SHORT-RUN COST CURVES ****

The Inflexibility of Short-Run Production: **K is not variable**

Figure 7.7

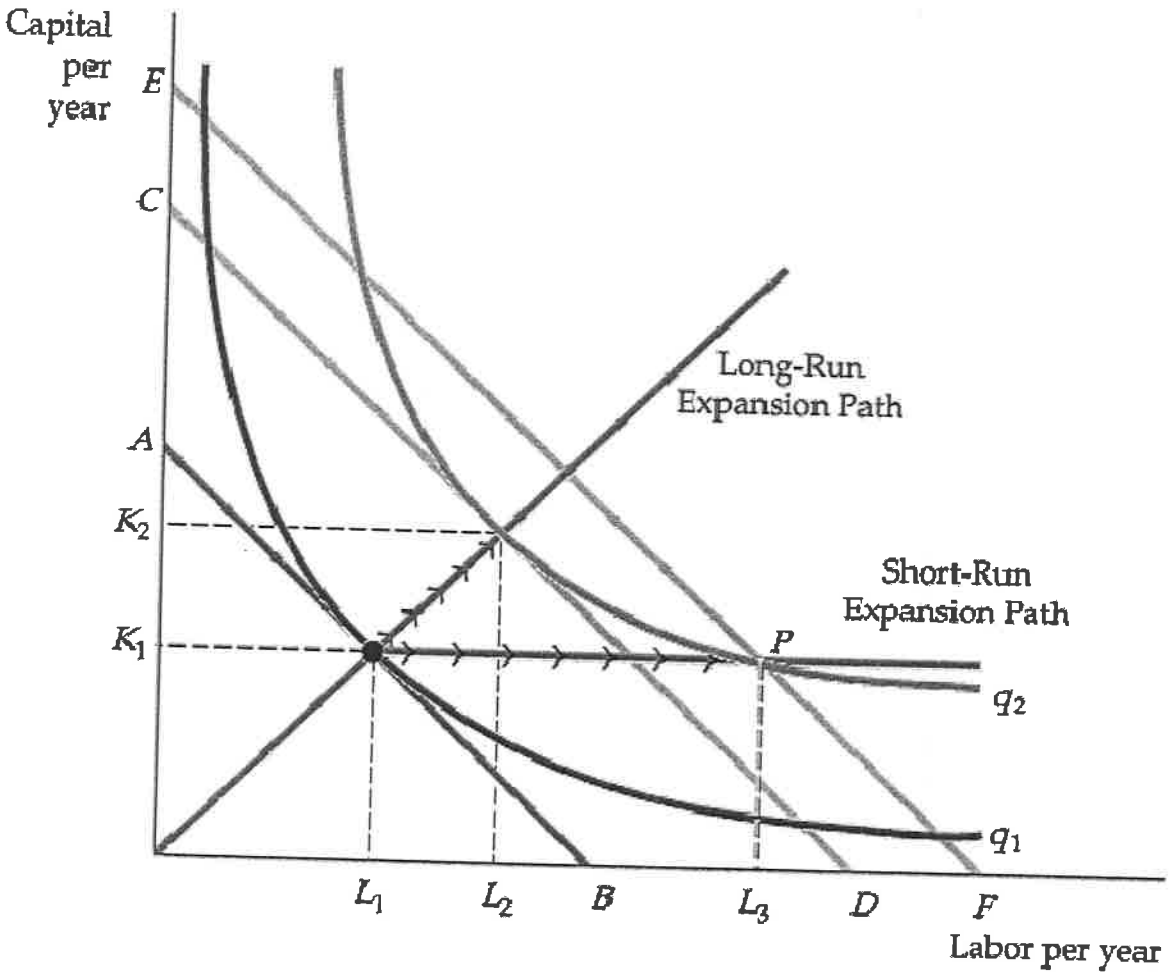
The Inflexibility of Short-Run Production

Output is initially at level q_1.

In SR q can be expanded only by increasing L

K is fixed at K_1.

In LR, q can be expanded cheaply by increasing L & K.



End of 1st part

- Now we know the relationship between TC and q in SR and LR (expansion paths)
- We can get ATC = TC/q
- And get MC = dTC/dQ

7.4 LONG-RUN VERSUS SHORT-RUN COST CURVES

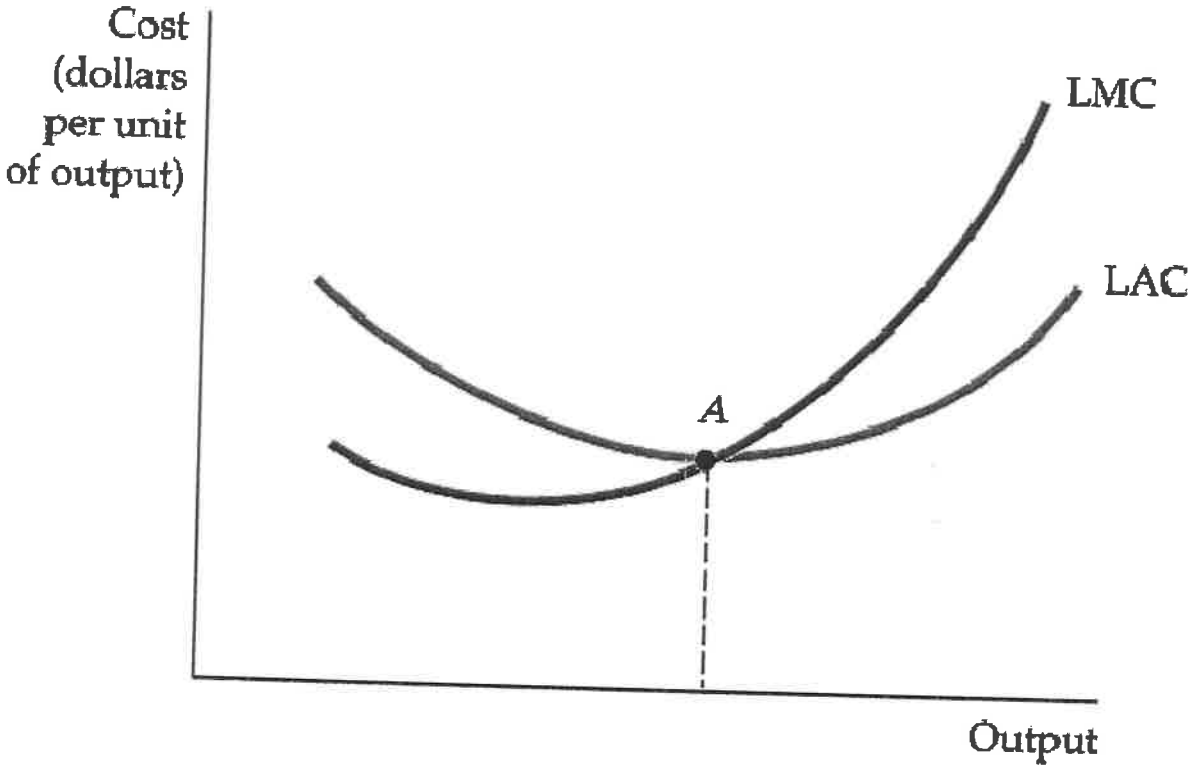
Long-Run Average Cost

The we can reproduce our familiar costs curves

Where we have increasing returns to scale we also have economies of scale

AC > MC

Falling AC



7.4 LONG-RUN VERSUS SHORT-RUN COST CURVES

Economies and Diseconomies of Scale

At some point AC of production will begin to increase with output.

There are three reasons for this shift:

1. **In the short run, factory space and machinery may make it more difficult for workers to do their jobs effectively.**
2. **Managing a larger firm may become more complex**
3. **The advantages of buying in bulk may have disappeared**

7.4 LONG-RUN VERSUS SHORT-RUN COST CURVES

The Relationship Between Short-Run and Long-Run Cost

The LAC is the envelope of the SAC_1, SAC_2, and SAC_3.

Only at q2 we have minima of SR & LR corresponding

This is because of economies/diseconomies of scale