Long Run Cost

Making Long-Run Production Decisions

- To make their long-run decisions:
  - Firms look at costs of various inputs and the technologies available for combining these inputs.
  - Then decide which combination offers the lowest cost.

Making Long-Run Production Decisions

- The firm makes long-run decisions on the basis of the expected costs and expected usefulness of inputs.

Technical Efficiency and Economic Efficiency

- ***Technical efficiency*** – as few inputs as possible are used to produce a given output.
- Technical efficiency is efficiency that does not consider cost of inputs.

Technical Efficiency and Economic Efficiency

- ***Economically efficient*** – the method that produces a given level of output at the lowest possible cost.
- It is the least-cost technically efficient process.

Economies of Scale and Long-Run Cost Curves

- In the **long run**, a firm has many sizes to choose from.
- The **short run** requires that scale be fixed— only one or a few resources can be changed.

Determinants of the Shape of the Long-Run Cost Curve

- The law of diminishing marginal productivity does not hold in the long run.
- All inputs are variable in the long run.

Determinants of the Shape of the Long-Run Cost Curve

- The shape of the long-run cost curve is due to the existence of economies and diseconomies of scale.

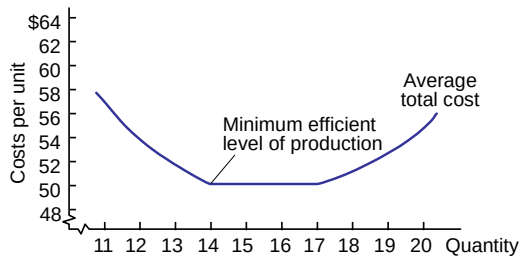
Economics of Scale

- **Scale** means size.
- **Economies of scale:** the decrease in per unit costs as the quantity of production increases and all resources are variable
- **Diseconomies of scale:** the increase in per unit costs as the quantity of production increases and all resources are variable
- **Constant returns to scale:** unit costs remain constant as the quantity of production is increased and all resources are variable

A Typical Long-Run Average Total Cost Table

Quantity	Total Costs of Labor	Total Cost of Machines	Total Costs = $TC_L + TC_M$	Average Total Costs = TC/Q
11	$381	$254	$635	$58
12	390	260	650	54
13	402	268	670	52
14	420	280	700	50
15	450	300	750	50
16	480	320	800	50
17	510	340	850	50
18	549	366	915	51
19	600	400	1,000	53
20	666	444	1,110	56

A Typical Long-Run Average Total Cost Curve



Economies of Scale

- ***Economies of scale*** – long run average total costs decrease as output increases.
- In real-world production processes, economies of scale are extremely important at low levels of production.

Economies of Scale

- An ***indivisible setup cost*** is the cost of an indivisible input for which a certain minimum amount of production must be undertaken before the input becomes economically feasible to use.

Economies of Scale

- Indivisible setup costs create many real-world economies of scale.
- The cost of a blast furnace or an oil refinery is an example of an indivisible setup cost.

Economies of Scale

- In the longer run all inputs are variable, so only economies of scale can influence the shape of the long-run cost curve.

Economies of Scale

- Because of the importance of economies of scale, business people often talk of a minimum efficient level of production.

Economies of Scale

- The ***minimum efficient level of production*** is the amount of production that spreads setup costs out sufficiently for firms to undertake production profitably.

Economies of Scale

- The minimum efficient level of production is reached once the size of the market expands to a size large enough so that firms can take advantage of all economies of scale.

Minimum Efficient Scale

- Most industries experience both economies and diseconomies of scale.
- **The minimum efficient scale (MES)** is the minimum point of the long-run average-cost curve; the output level at which the cost per unit of output is the lowest.
- The MES varies considerably across industries.

Diseconomies of Scale

- ***Diminishing marginal productivity*** refers to the decline in productivity caused by increasing units of a variable input being added to a fixed input.

Pay attention!
Diminishing marginal productivity only applies in the Short-run!

Diseconomies of Scale

- Diseconomies of scale refer to decreases in productivity which occur when there are equal increases of all inputs (no input is fixed).
  - Diseconomies of scale occur on the right side of the long-run average cost curve where it is upward sloping, meaning that average cost is increasing.

Diseconomies of Scale

- As the size of the firm increases, monitoring costs generally increase.
- ***Monitoring costs*** are those incurred by the organizer of production in seeing to it that the employees do what they are supposed to do.

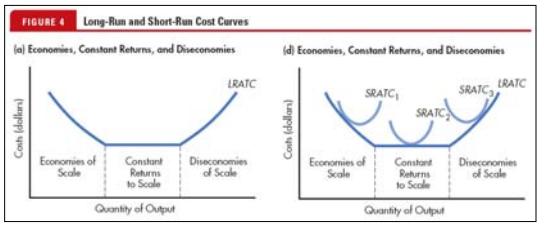
Diseconomies of Scale

- As the size of the firm increases, team spirit or morale generally decreases.
- ***Team spirit*** is the feelings of friendship and being part of a team that brings out peoples' best effort

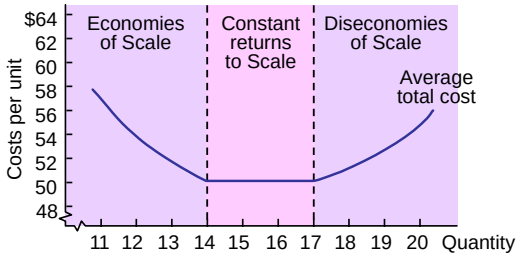
Constant Returns to Scale

- ***Constant returns to scale*** is where long-run average total costs do not change as output increases.
- It is shown by the flat portion of the LRATC curve.

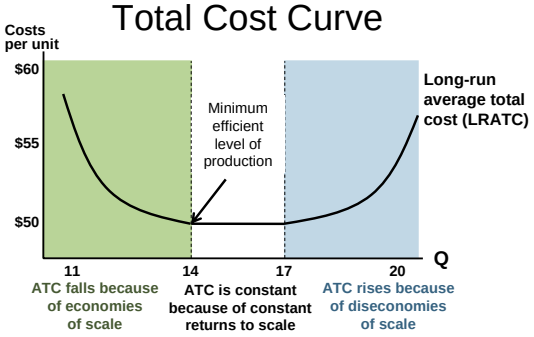
Long-Run and Short-Run Cost Curves (1)



Economies and Diseconomies of Scale



A Typical Long-Run Average Total Cost Curve



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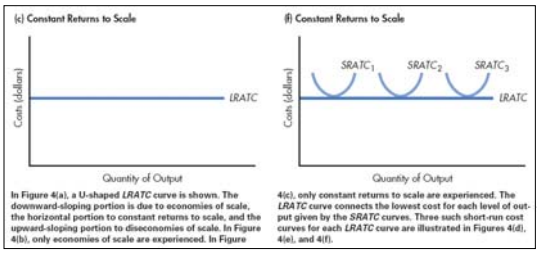
Long-Run and Short-Run Cost Curves (3)



In Figure 4(a), a U-shaped *LRATC* curve is shown. The downward-sloping portion is due to economies of scale, the horizontal portion to constant returns to scale, and the upward-sloping portion to diseconomies of scale. In Figure 4(b), only economies of scale are experienced. In Figure 4(c), only constant returns to scale are experienced. The *LRATC* curve connects the lowest cost for each level of output given by the *SRATC* curves. Three such short-run cost curves for each *LRATC* curve are illustrated in Figures 4(d), 4(e), and 4(f).

Importance of Economies and Diseconomies of Scale

- Economies and diseconomies of scale play important roles in real-world long-run production decisions.

Importance of Economies and Diseconomies of Scale

- The long-run and the short-run average cost curves have the same U-shape, but the underlying causes of these shapes differ.

Importance of Economies and Diseconomies of Scale

- Economies and diseconomies of scale account for the shape of the long-run total cost curve.

The Envelope Relationship

- Long-run costs are always less than or equal to short-run costs because:
  - In the long run, all inputs are flexible
  - In the short run, some inputs are fixed
- There is an **envelope relationship** between long-run and short-run average total costs. Each short-run cost curve touches the long-run cost curve at only one point.
- In the short run all expansion must proceed by increasing only the variable input
  - This constraint increases cost

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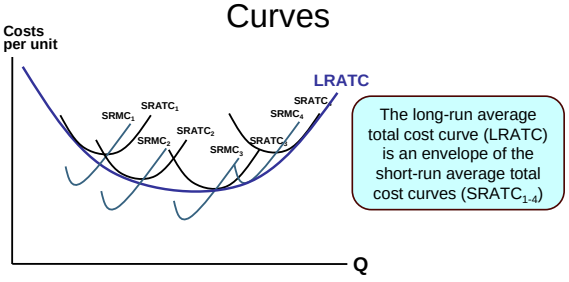
The Envelope of Short-Run Average Total Cost Curves



The long-run average total cost curve (LRATC) is an envelope of the short-run average total cost curves ($SRATC_{1\text{-}4}$)

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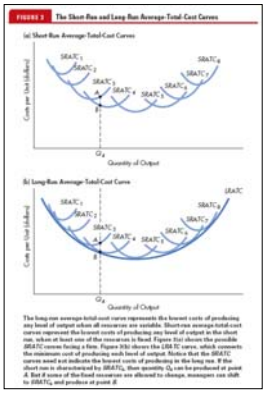
Short-Run and Long-Run Average-Cost Curves



Long-Run Average Total Cost

- **Long-run average total cost (*LRATC*):** the lowest-cost combination of resources with which each level of output is produced when all resources are variable.
- The long-run average total cost curve gets its shape from economies and diseconomies of scale.

Shape of LRATC

- If producing each unit of output becomes **less costly** there are **economies of scale**.
- If producing each unit of output becomes **more costly** there are **diseconomies of scale**.
- If unit costs remain **constant** as output rises there are **constant returns to scale**.

Long-Run and Short-Run Cost Curves (2)