

Chapter 8

The Costs of Production

Chapter Objectives

- Explicit and implicit costs
- Law of diminishing returns
- Fixed and variable costs
- Total, average, and marginal costs
- The firm's size in the long run

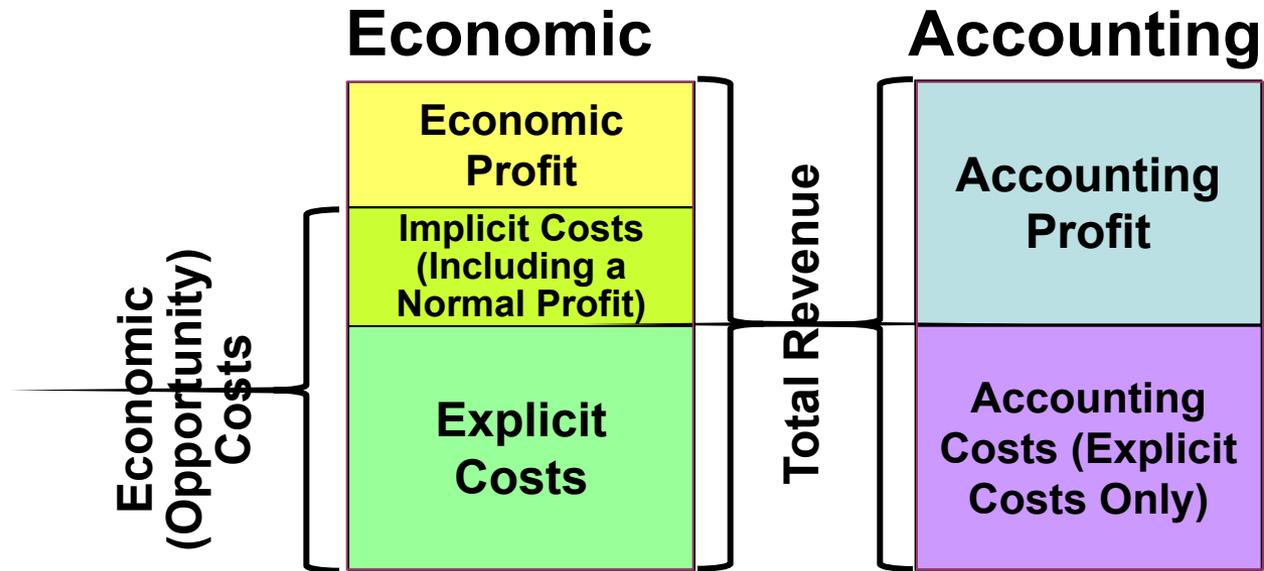
Economic Costs

- Equal to opportunity costs
- Explicit + implicit costs
- Explicit costs
 - Monetary payments
- Implicit costs
 - Value of next best use
 - Self-owned resources
 - Self-employed resources

Profit

- Accounting profit
 - Total revenue less explicit cost
- Normal profit
 - Equal to implicit cost
- Economic or pure profit
 - Total revenue less economic cost

Profits Compared



Short and Long Run

- The short run
 - Fixed plant capacity
 - Variable intensity of plant use
 - Variable output
- The long run
 - Variable plant capacity
 - Firms enter and exit

Production Relationships

- Total product (TP)
- Marginal product (MP)

$$\text{Marginal Product} = \frac{\text{Change in Total Product}}{\text{Change in Labor Input}}$$

- Average product (AP)

$$\text{Average Product} = \frac{\text{Total Product}}{\text{Units of Labor}}$$

Law of Diminishing Returns

- Fixed technology
- Add variable resource to fixed resource
- Marginal product will decline
 - Beyond some point
- Rationale

Law of Diminishing Returns

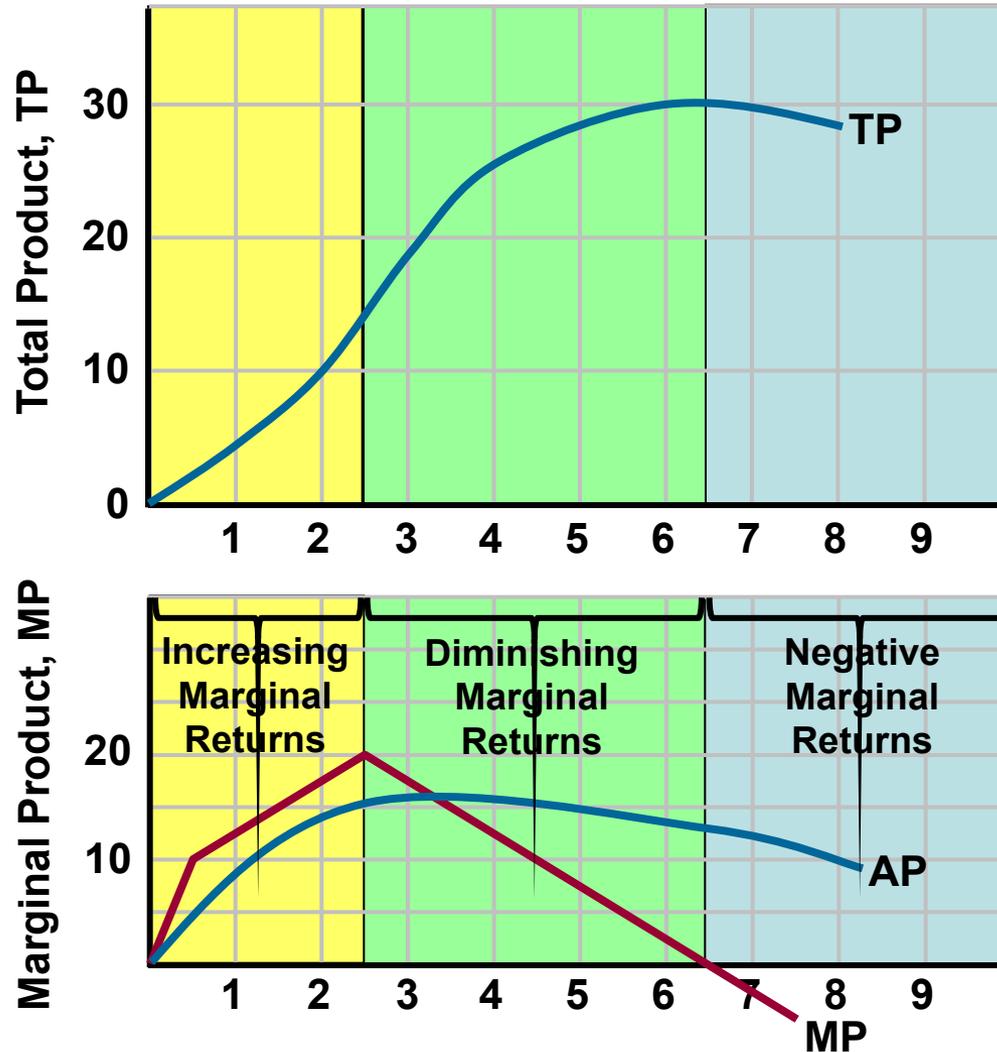
(1) Units of the Variable Resource (Labor)	(2) Total Product (TP)	(3) Marginal Product (MP), Change in (2)/ Change in (1)	(3) Average Product (AP), (2)/(1)
0	0		-
1	10	10	10.00
2	25	15	12.50
3	45	20	15.00
4	60	15	15.00
5	70	10	14.00
6	75	5	12.50
7	75	0	10.71
8	70	-5	8.75

**Increasing
Marginal
Returns**

**Diminishing
Marginal
Returns**

**Negative
Marginal
Returns**

Law of Diminishing Returns



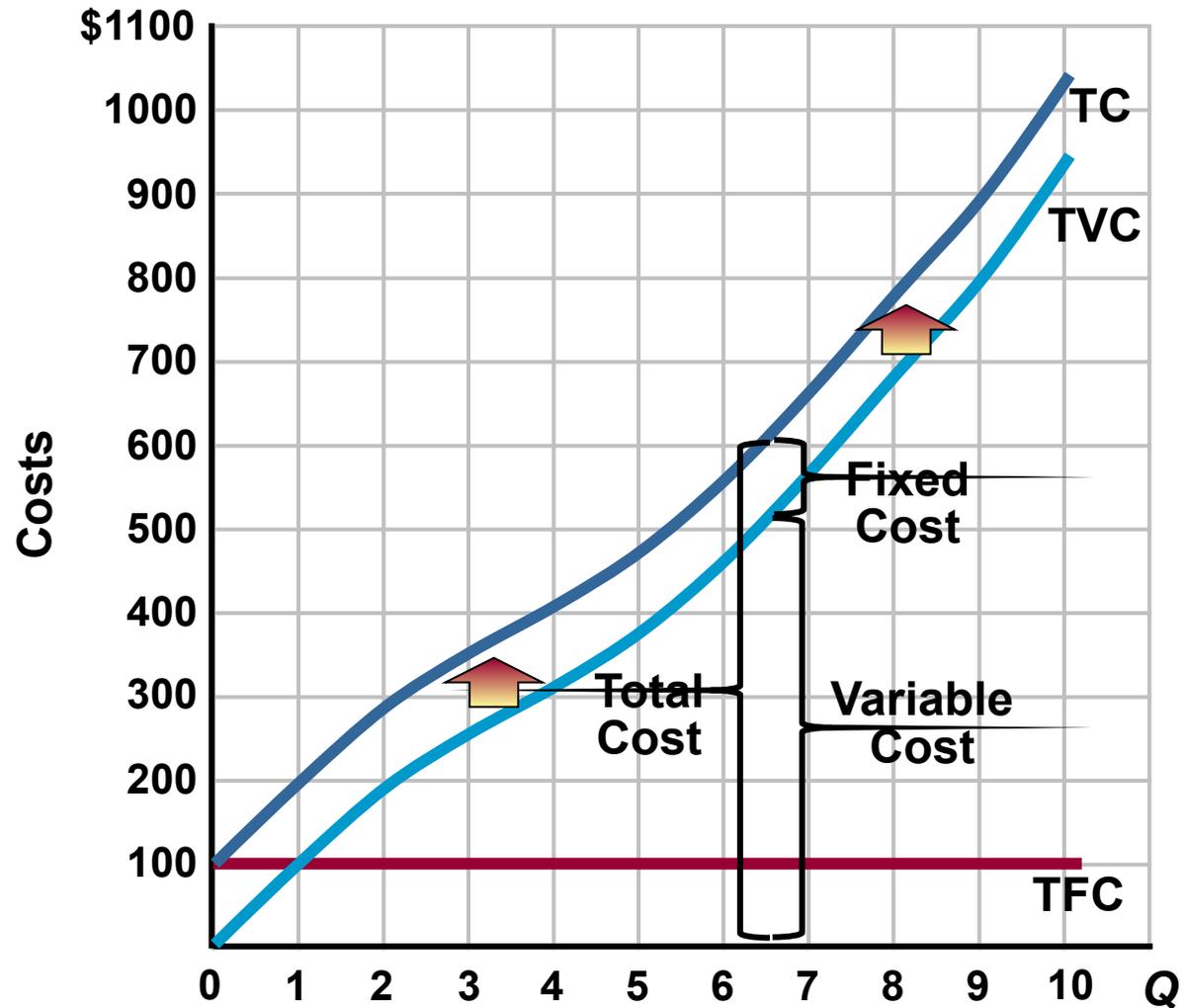
Short-Run Production Costs

- Fixed Costs
 - Do not vary with output
- Variable Costs
 - Materials, most labor
- Total Cost
 - $TC = TFC + TVC$

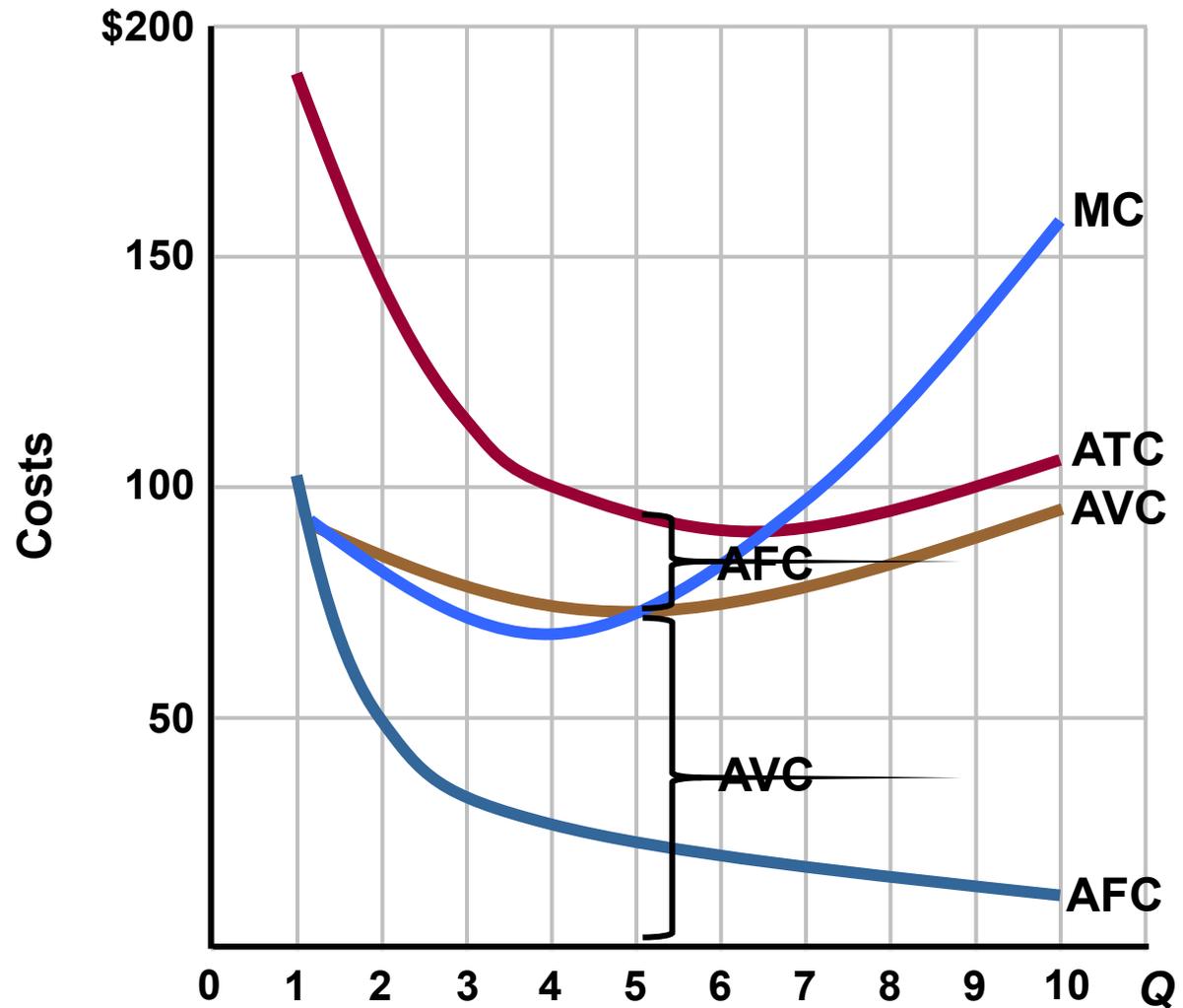
Per-Unit Production Costs

- Average fixed cost
 $AFC = TFC/Q$
- Average variable cost
 $AVC = TVC/Q$
- Average total cost
 $ATC = TC/Q = TFC/Q + TVC/Q$
 $= AFC + AVC$
- Marginal cost
 $MC = \text{change in } TC / \text{change in } Q$

Short-Run Production Costs



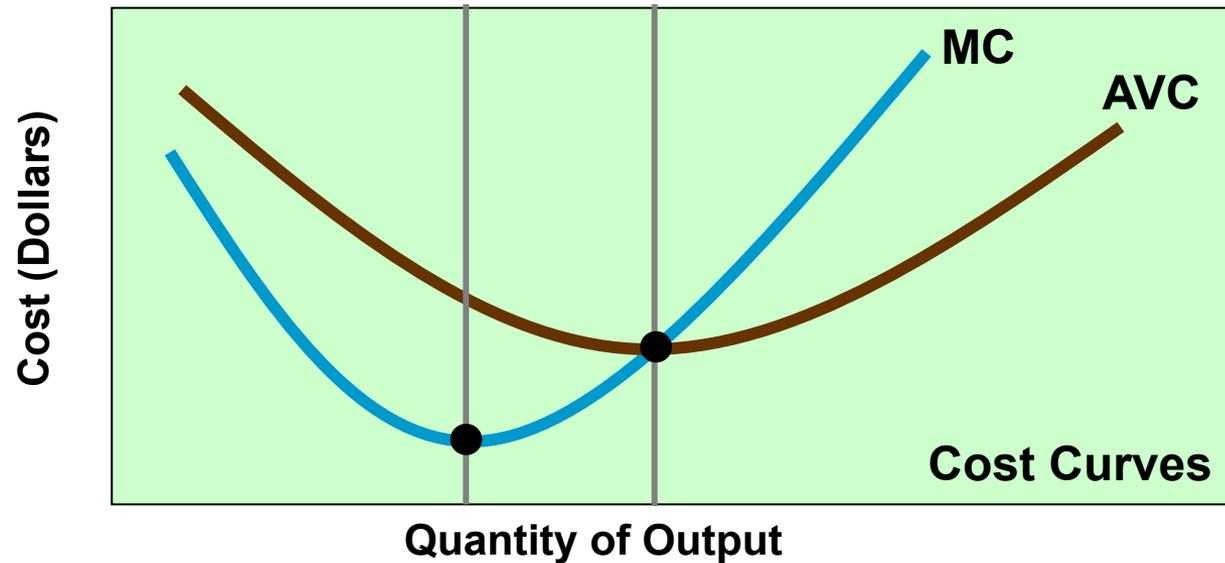
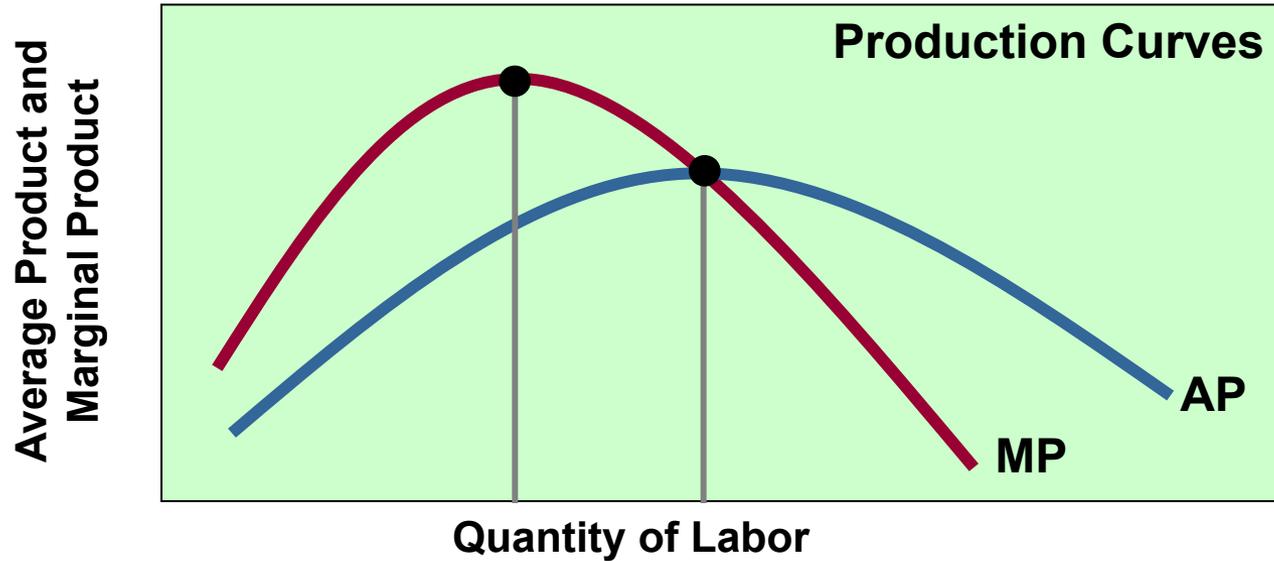
Short-Run Production Costs



Production Relationships

- Marginal cost and diminishing returns
- Marginal cost and marginal product
- Marginal cost and average variable cost
- Marginal cost and average total cost
- Production curves and cost curves
- Shifts in cost curves

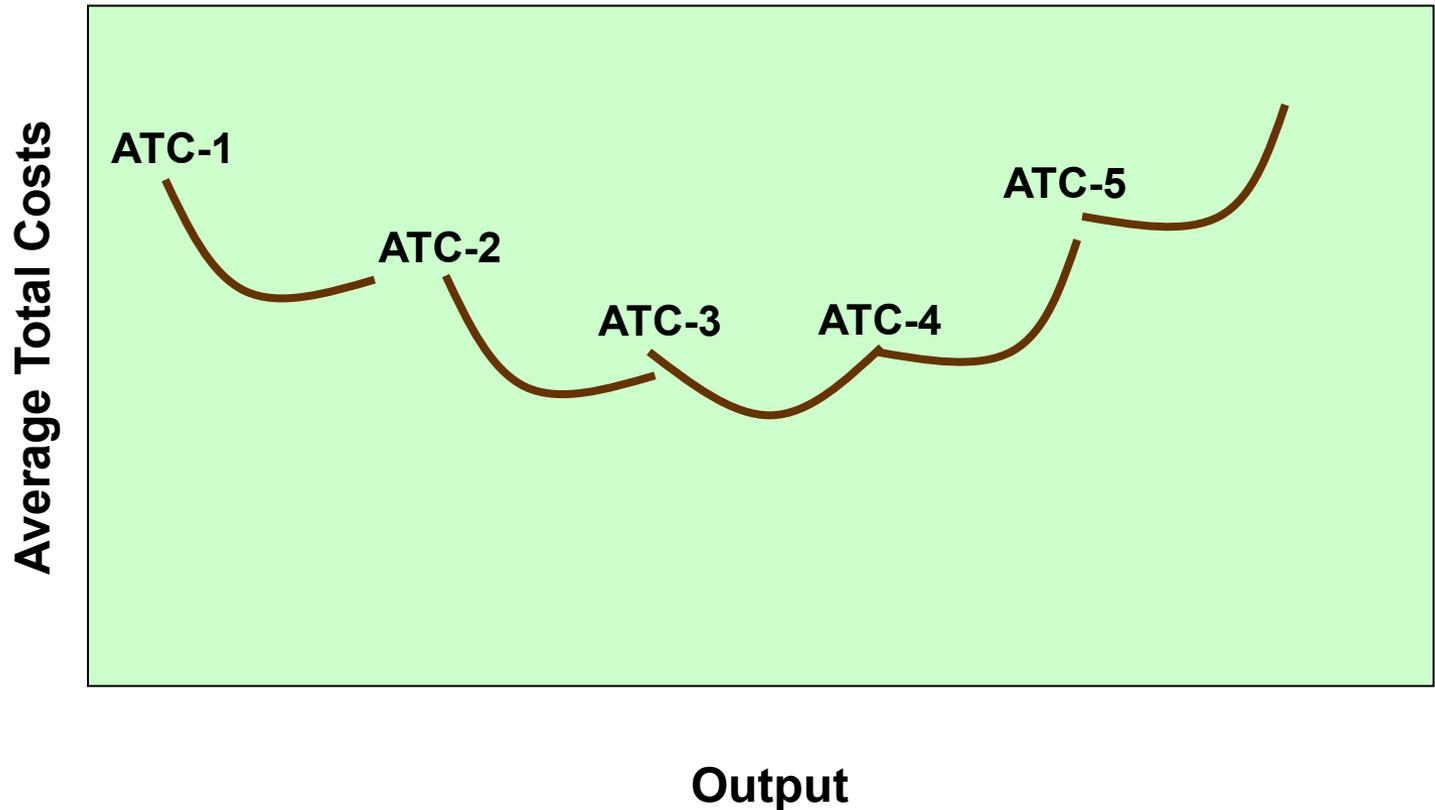
Graphical Relationships



Long-Run Production Costs

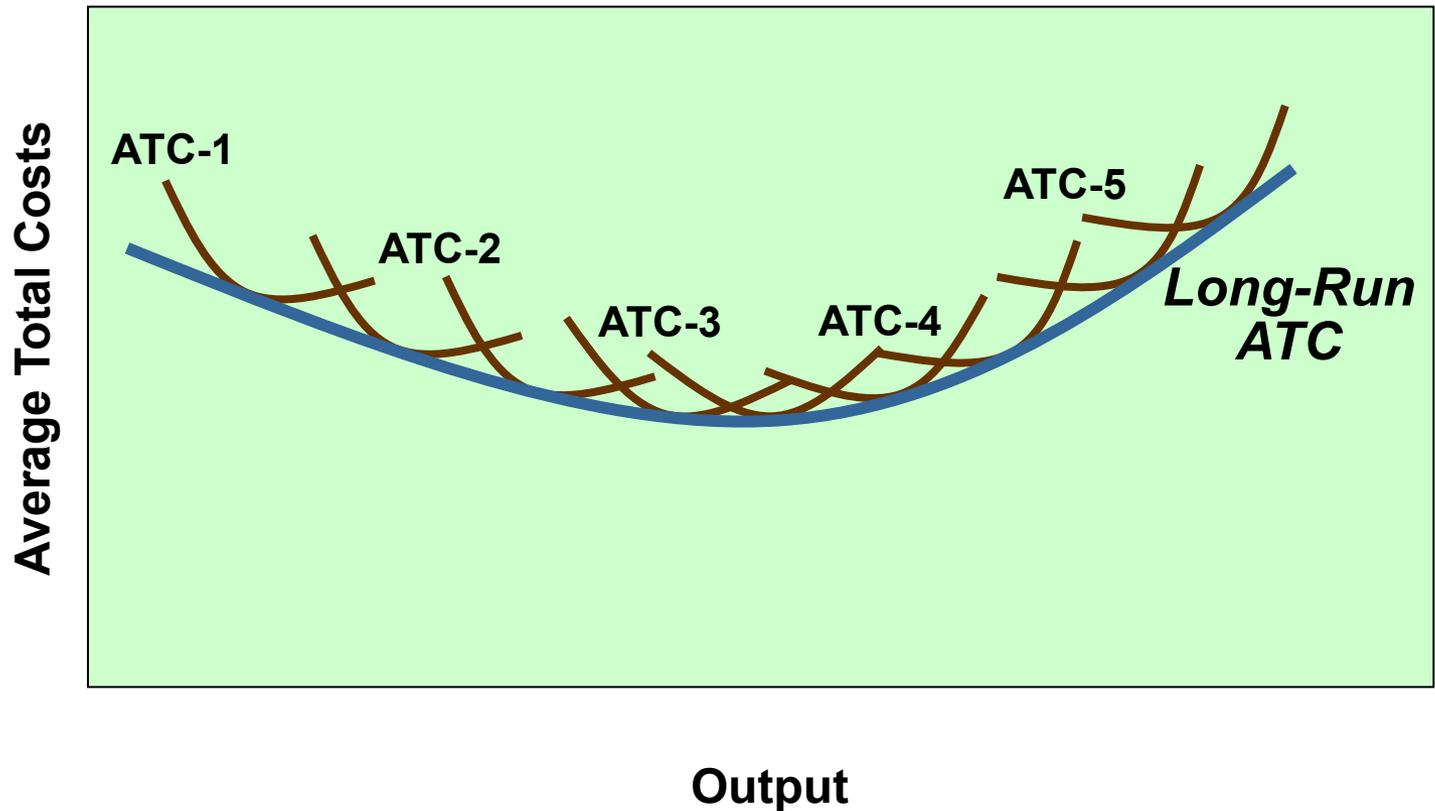
- Choose your plant size
- Minimize ATC
- Different ATC curves
 - Short run
- Long run ATC
 - Envelope of short run ATC

Long-Run ATC Curve



**Any number of short-run optimum
size cost curves can be constructed**

Long-Run ATC Curve

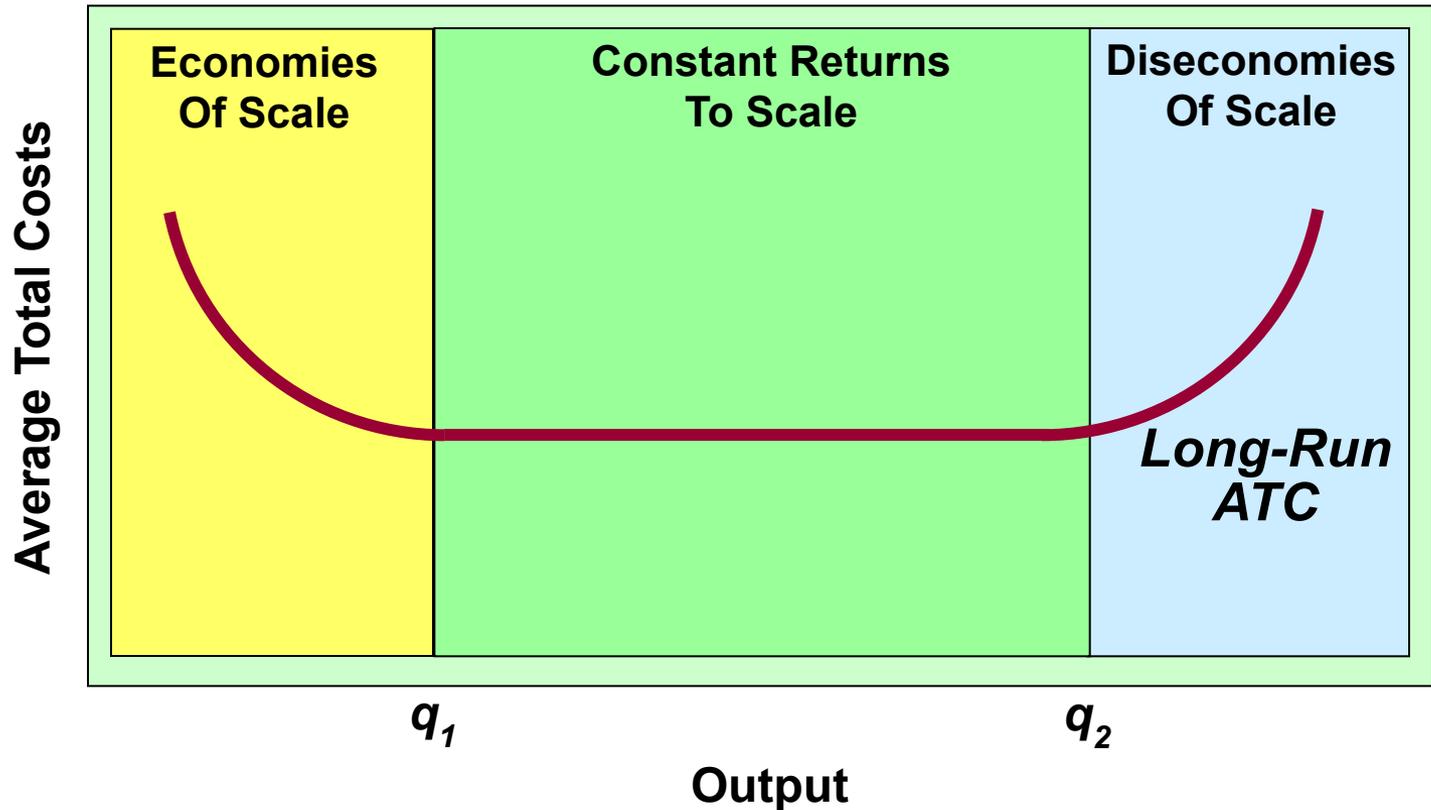


**The long-run ATC curve just
“envelopes” the short run ATCs**

Long Run Production Cost

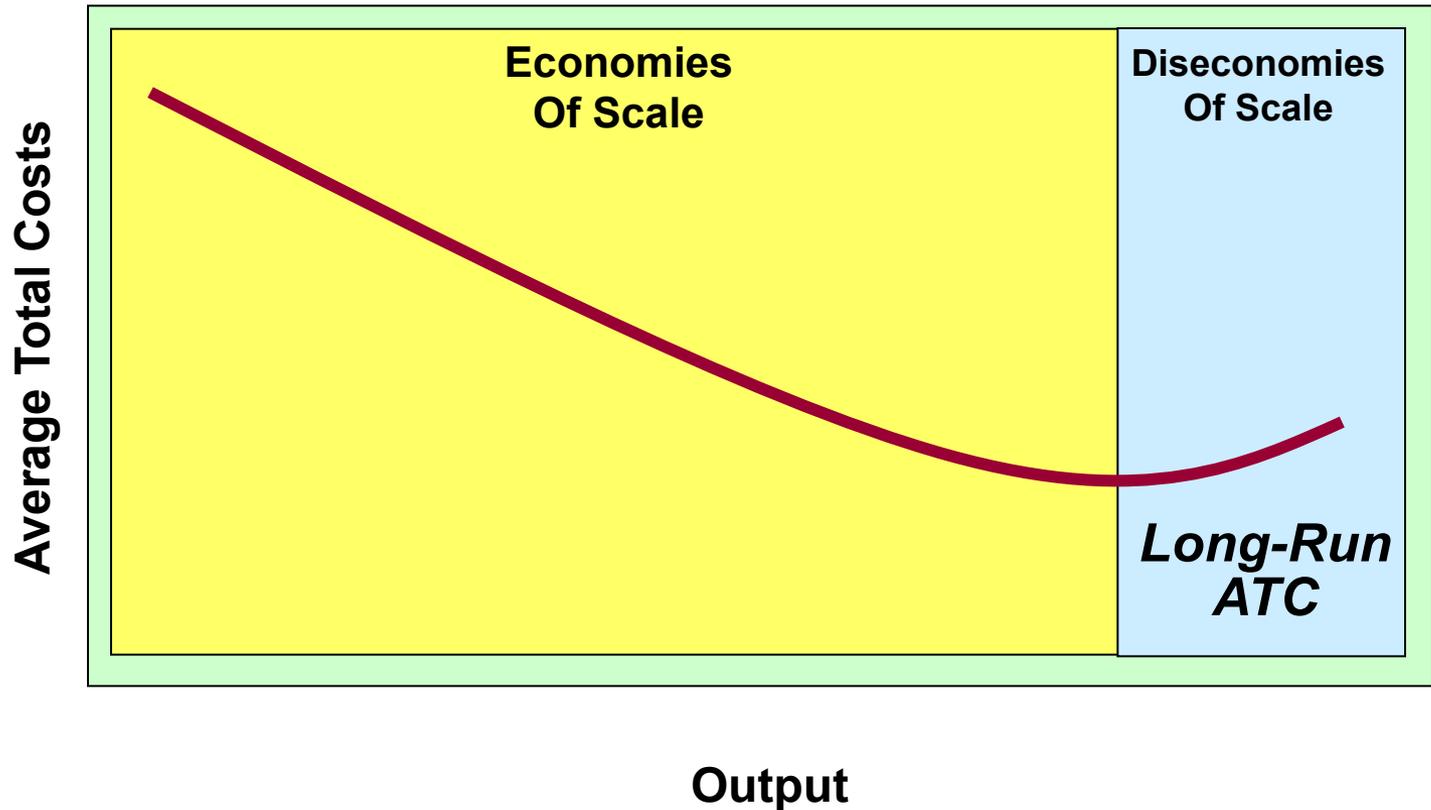
- Economies of Scale
 - Labor specialization
 - Managerial specialization
 - Efficient capital
- Diseconomies of Scale
- Constant Returns to Scale

Long-Run ATC Shapes



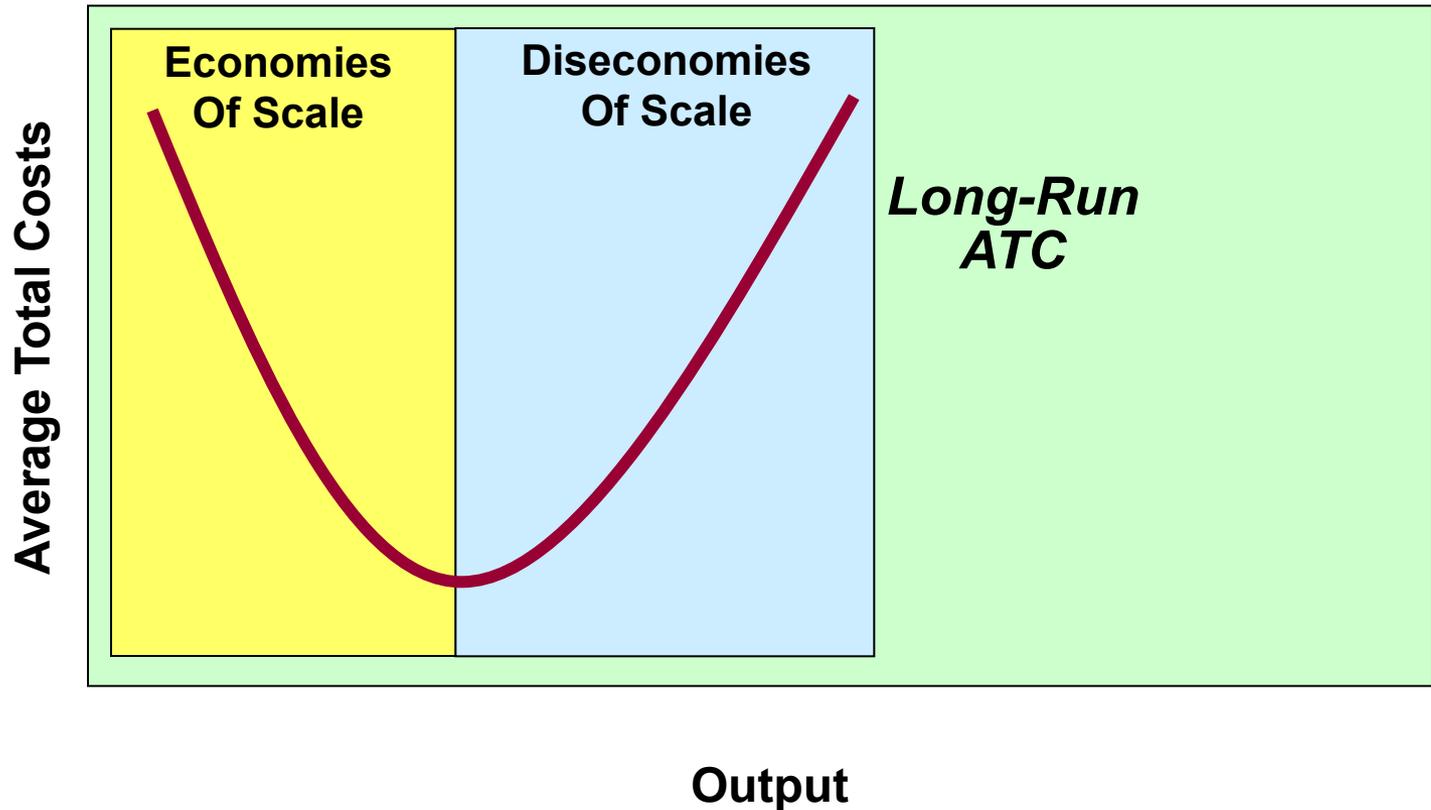
Long-run ATC curve where economies of scale exist

Long-Run ATC Shapes



Long-run ATC curve where costs are lowest only when large numbers are participating

Long-Run ATC Shapes



Long-run ATC curve where economies of scale exist, are exhausted quickly, and turn back up substantially

Industry Structure

- Minimum efficient scale (MES)
- Natural monopoly
- Applications and illustrations
 - Price of corn
 - Successful start-up firms
 - The Verson stamping machine
 - The daily newspaper
 - Aircraft and concrete plants

Sunk Costs

- Irrelevant in decision making
- Cannot be recovered
- Do not affect marginal benefit and marginal cost
- Firm example:
 - R&D costs

Key Terms

- economic (opportunity) cost
- explicit costs
- implicit costs
- normal profit
- economic profit
- short run
- long run
- total product (TP)
- marginal product (MP)
- average product (AP)
- law of diminishing returns
- fixed costs
- variable costs
- total cost
- average fixed cost (AFC)
- average variable cost (AVC)
- average total cost (ATC)
- marginal cost (MC)
- economies of scale
- diseconomies of scale
- constant returns to scale
- minimum efficient scale (MES)
- natural monopoly

Next Chapter Preview...

Pure Competition