Definitions of Costs

- **Differentiation between accounting cost and economic cost**
- **Accountants: cost implies out-of-pocket expenses, historical costs, depreciation, etc**
- **Economists: focus on opportunity cost**

- Labor Costs: Labor services are contracted at some hourly wage (w) and it is assumed that this is also what the labor could earn in alternative employment.
- Capital Costs: Capital is rent at some rate (v) and implies what someone else would be willing to pay for its use.
- Costs of Entrepreneurial Services: Economists consider the opportunity costs of time and funds that owners devote to the operation of their firms.

Accounting vs. Economic Profit

- Economic Cost vs Accounting Cost
- Economic Profit vs Accounting Profit
- Accounting profit = Total revenue – Explicit costs
- Economic profit = Accounting Profit – Implicit costs

  Firm owners must cover all costs of all resources used by the firm
- Objective is to maximize profit
- Profit Maximization vs Revenue Maximization

Two Simplifying Assumptions

1. There are only two inputs
   - Homogeneous labor (L), measured in labor-hours
   - Homogeneous capital (K), measured in machine-hours
   - Entrepreneurial costs are included in capital costs
2. Inputs are hired in perfectly competitive markets
   - Firms are price takers in input markets

Economic Profits

- Total costs for the firm are given by

$$\text{total costs} = C = wL + vK$$

- Total revenue for the firm is given by

$$\text{total revenue} = pq = pf(K,L)$$

- Economic profits (π) are equal to

$$\pi = \text{total revenue} - \text{total cost}$$
$$\pi = pq - wL - vK$$
$$\pi = pf(K,L) - wL - vK$$

Total Cost Function

- The total cost function shows that for any set of input costs and for any output level, the minimum cost incurred by the firm is

  $C = C(w, v, q)$

- As output (q) increases, total costs increase.

Short-Run Total Costs

- In the short run, economic actors have only limited flexibility in their actions.
- Assume that the capital input is held constant at K_1 and the firm is free to vary only its labor input

  The production function becomes: $q = f(K_1, L)$

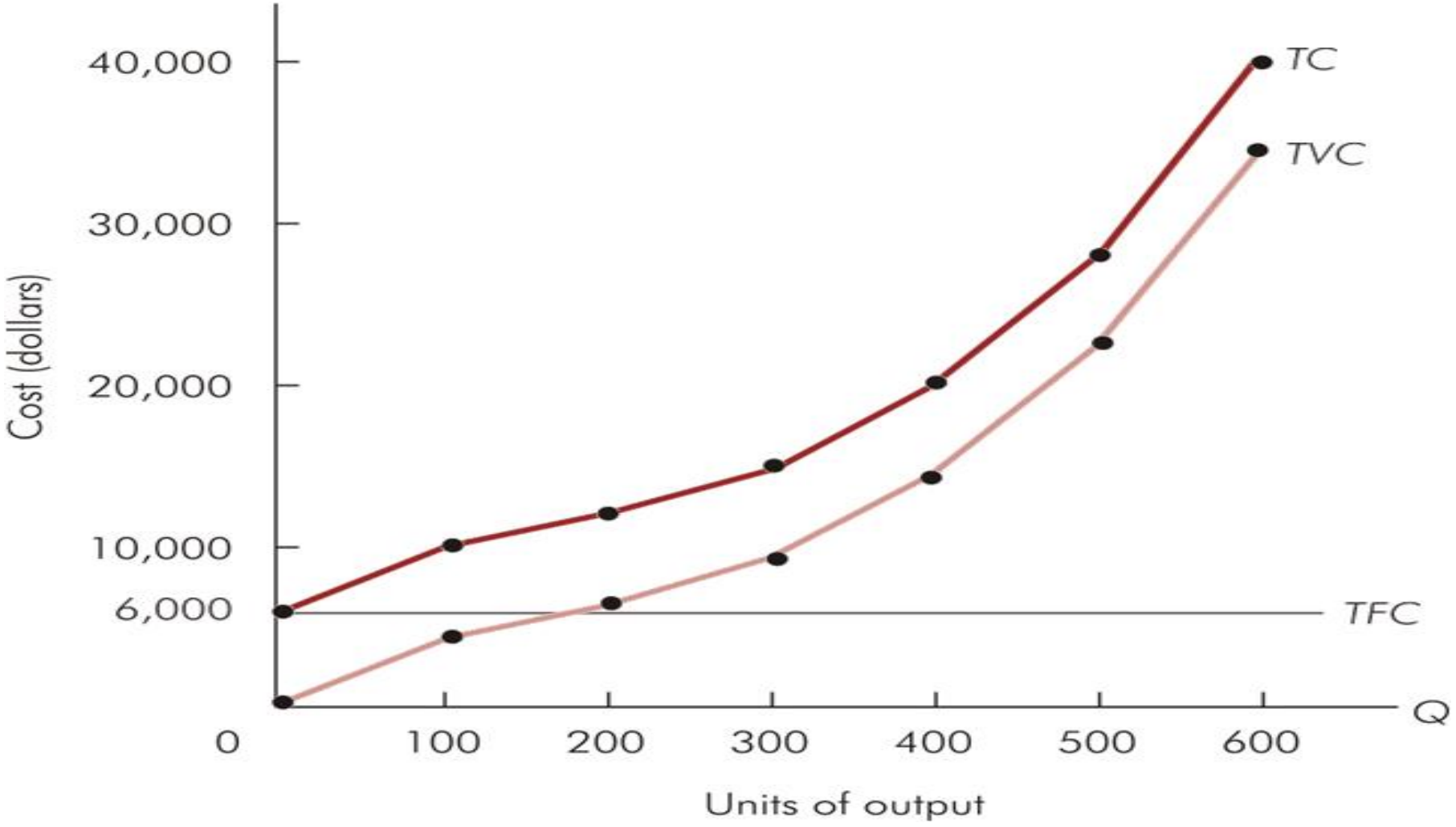
  Hence, the short-run total cost is $SC = v K_1 + wL$
- There are two types of short-run costs:

  Short-run fixed costs: associated with fixed inputs (vK_1)

  Short-run variable costs: associated with variable inputs (wL)

Graphical Analysis of Total Costs

Total Cost: TC(Q)=TVC(Q)+TFC



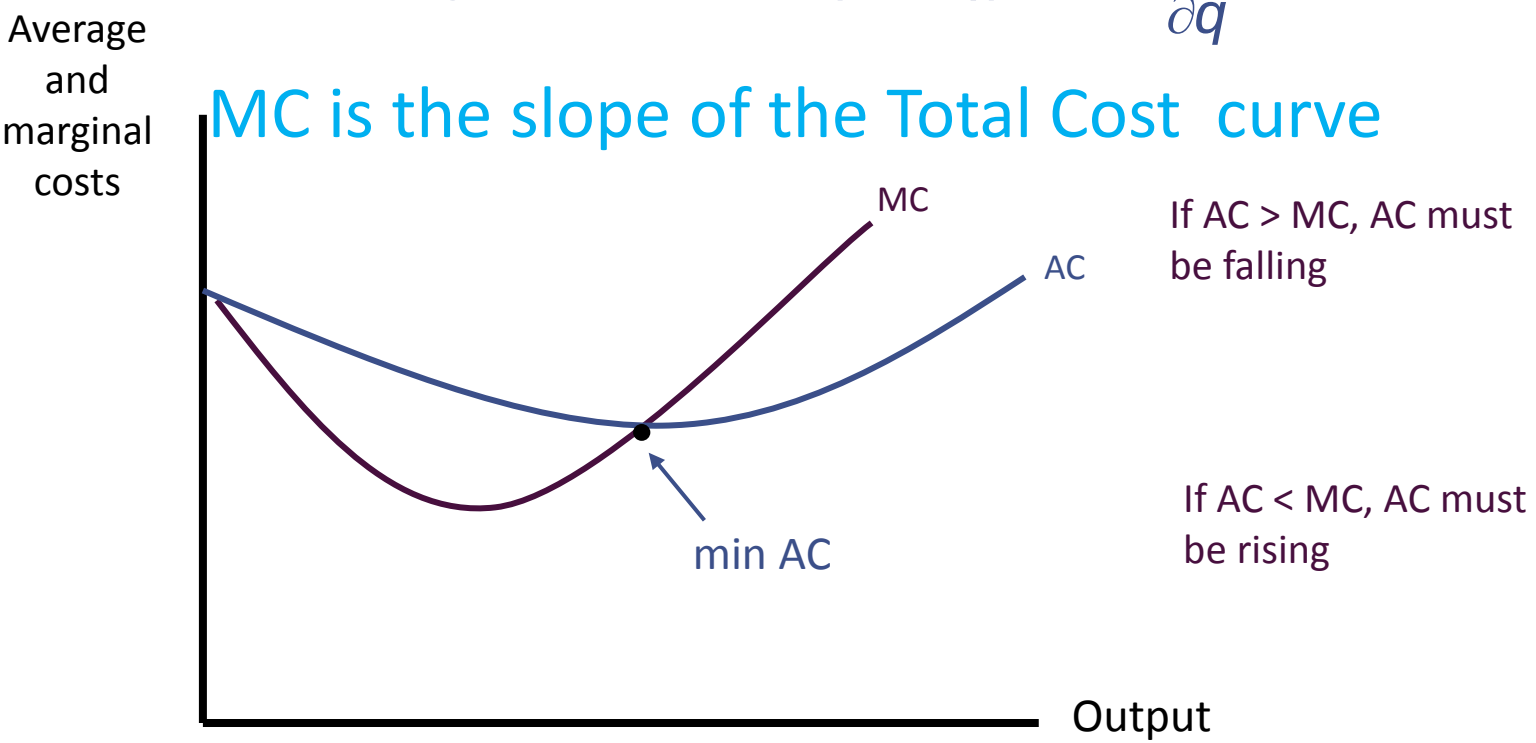
Average & Marginal Cost

- **The average cost function (AC) is found by computing total costs per unit of output.**

$$\text{average cost} = AC(v,w,q) = \frac{C(v,w,q)}{q}$$

- **The marginal cost function (MC) is found by computing the change in total costs for a change in output produced.**

$$\text{marginal cost} = MC(v,w,q) = \frac{\partial C(v,w,q)}{\partial q}$$



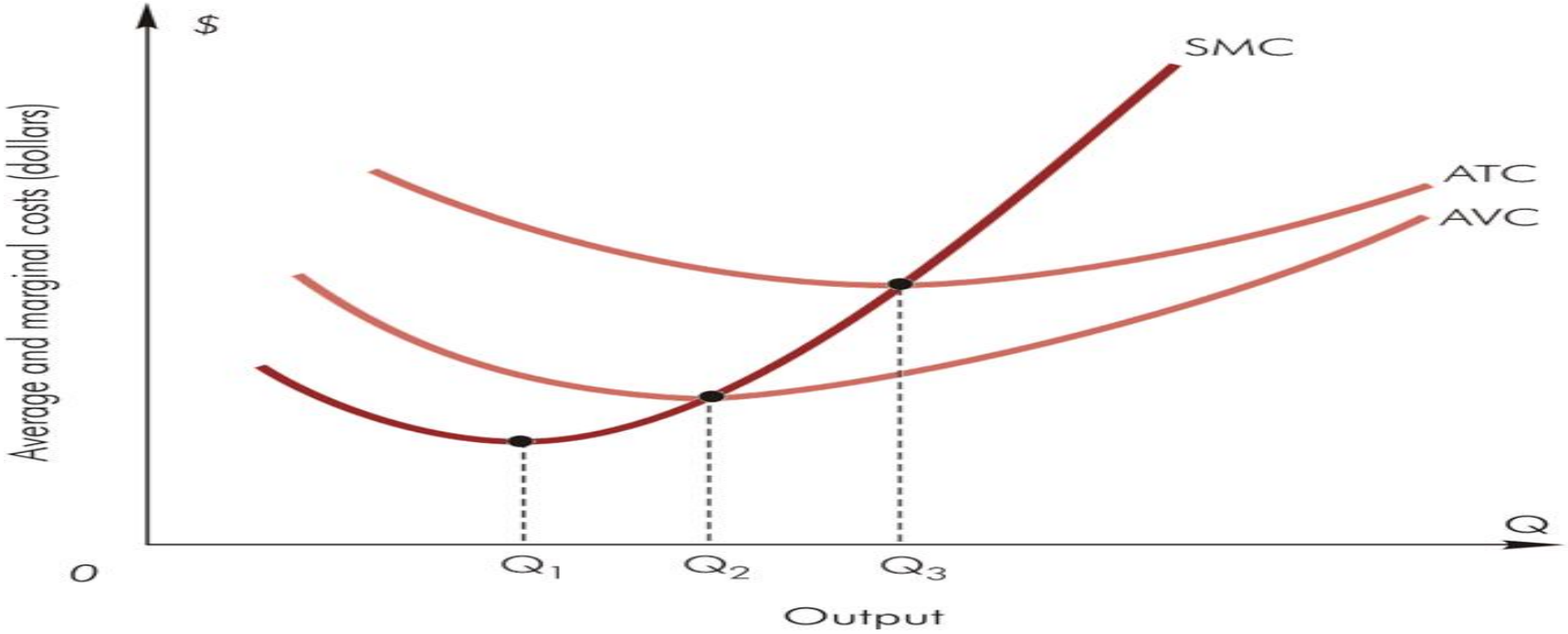
Graphical Analysis of Total Costs

Average Variable Cost: AVC(Q)=TVC(Q)/Q

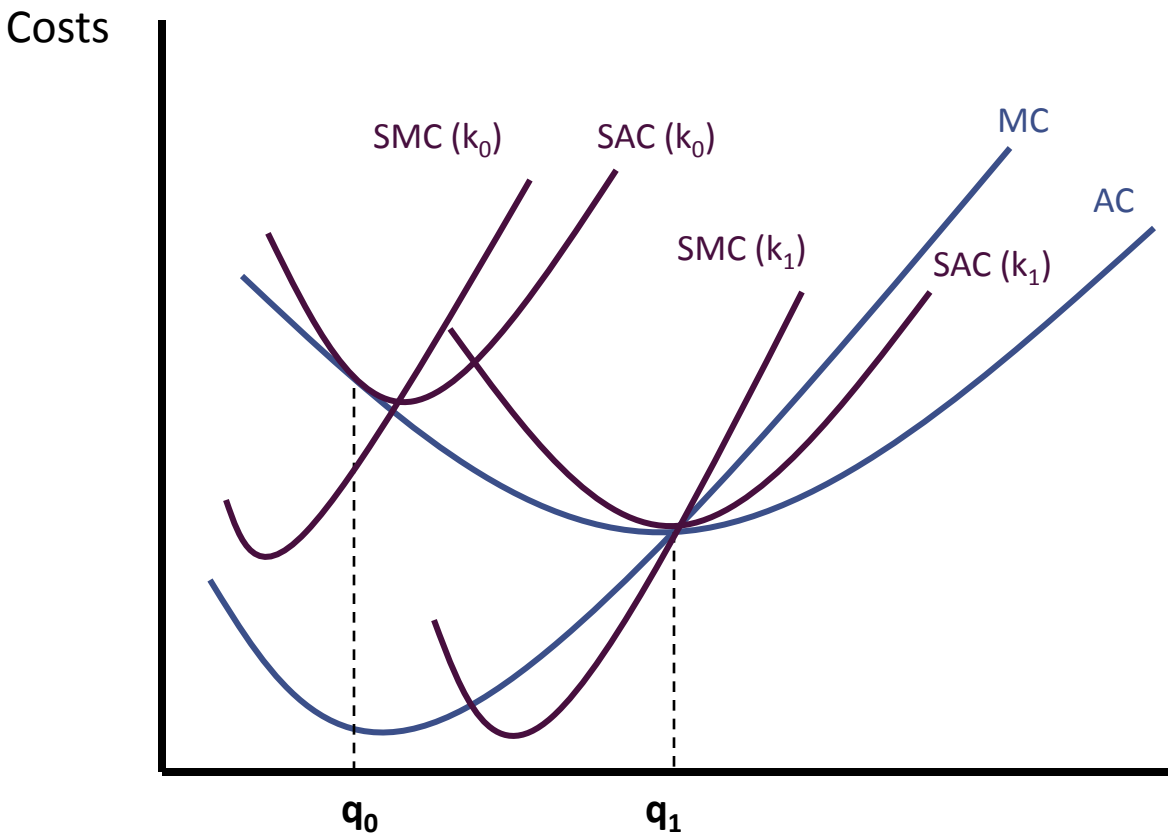
Average Fixed Cost: AFC=TFC/Q

Average Total Cost: ATC(Q)=TC(Q)/Q

Marginal Cost: MC(Q)=dTC/dQ=dTVC/dQ



Relationship between Short-Run and Long-Run Costs



The geometric relationship between short-run and long-run AC and MC can also be shown

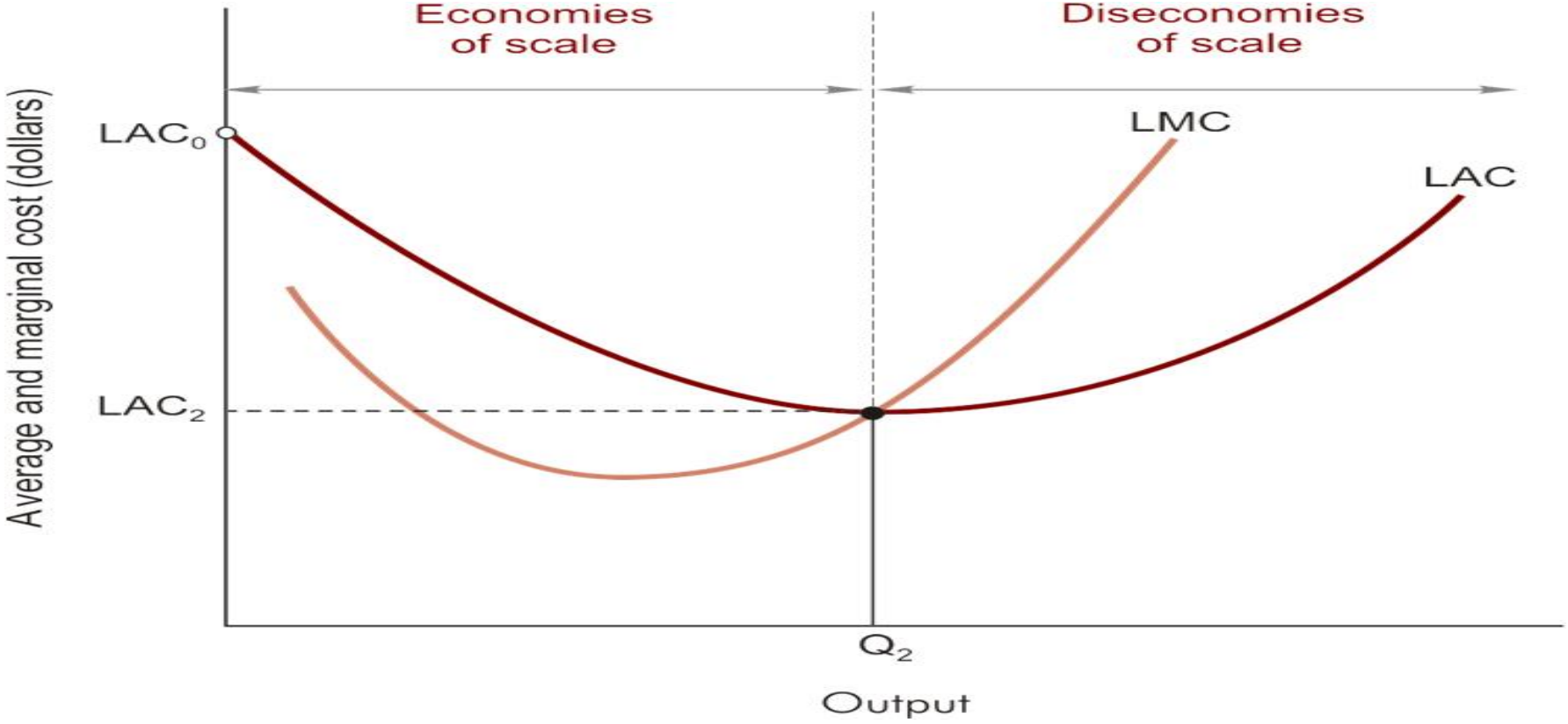
Long-Run Cost & Economies of Scale

Economies of Scale = Decreasing LAC

Specialization & division of labor

fixed costs are spread over more units

Variety of technological factors



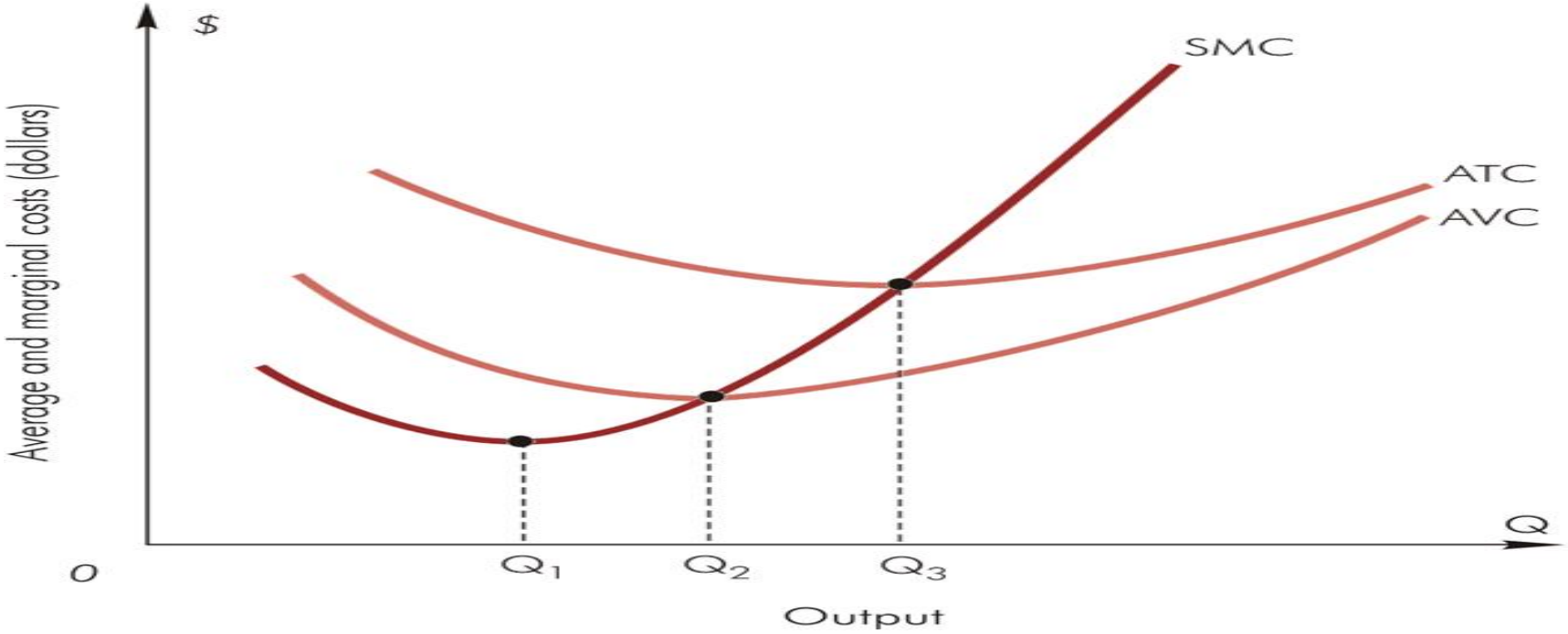
Graphical Analysis of Total Costs

Average Variable Cost: AVC(Q)=TVC(Q)/Q

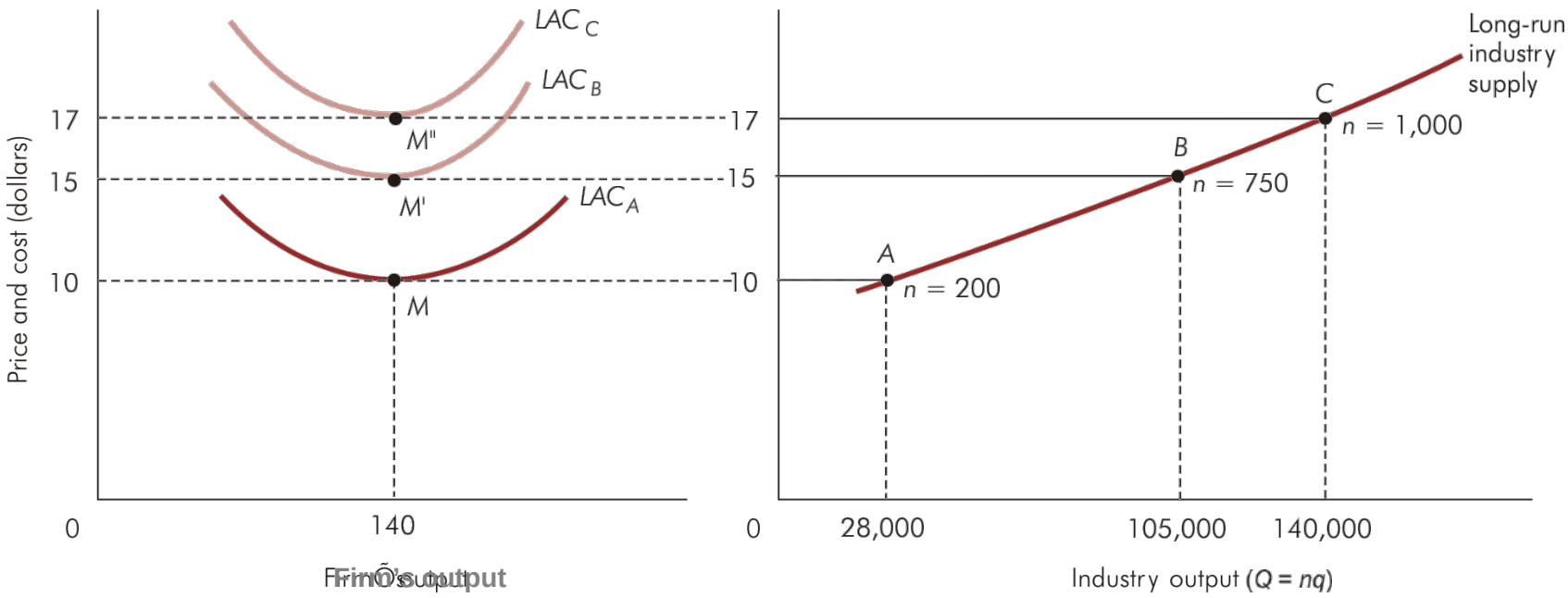
Average Fixed Cost: AFC=TFC/Q

Average Total Cost: ATC(Q)=TC(Q)/Q

Marginal Cost: MC(Q)=dTC/dQ=dTVC/dQ



Increasing Long-Run Costs



Panel A - A typical firm in long-run equilibrium

Panel B - The industry in long-run equilibrium