

UNIT 5

Market Structure

(9 Hrs) — Applied Economics (CAEC353), BCA III/VI

⚠ Please Take Care — This May Contain Errors

These notes were prepared from the course syllabus and may contain errors, omissions or over-simplifications — including in numerical examples, diagrams, and Nepal-specific facts and figures (which change over time). Please take care: cross-check every formula, number and definition with your prescribed textbook, class notes and the official syllabus before relying on it for study or examination.

5.1 Introduction: Classification of Markets

A **market structure** describes the competitive environment in which firms sell — mainly how many sellers there are, whether products are identical or differentiated, how easy entry is, and how much control a firm has over price. The theory of product pricing asks: *how are price and output determined in each market form?* In all forms a profit-maximising firm follows the rule **MR = MC**, with MC cutting MR from below.

Feature	Perfect competition	Monopoly	Monopolistic competition	Oligopoly
No. of sellers	Very many	One	Many	Few
Product	Homogeneous	Unique, no close substitute	Differentiated	Homogeneous or differentiated
Entry / exit	Free	Blocked	Free	Restricted (barriers)
Control over price	None (price-taker)	Large (price-maker)	Some	Interdependent
Demand curve	Horizontal (AR = MR)	Downward sloping	Downward, fairly elastic	Indeterminate / kinked
Selling cost	None	Little	Important	Important
Example	Farm products (in theory)	Nepal Electricity Authority (distribution)	Restaurants, apps, clothing brands	Telecom (NTC, Ncell), airlines, cement

Note: Examples are illustrative; real markets rarely match the theoretical models exactly, and market shares in Nepal change with time.

5.2 Perfect Competition

5.2.1 Meaning and Characteristics

Perfect competition is a market structure with a very large number of buyers and sellers dealing in a homogeneous product, with free entry and exit, so that no single participant can influence the price.

- **Large number of buyers and sellers** — each is too small to affect the market price.
- **Homogeneous product** — perfect substitutes; no branding.
- **Free entry and exit** of firms in the long run.
- **Perfect knowledge** of prices and technology among buyers and sellers.
- **Perfect mobility of factors** of production; no transport-cost differences.
- **Uniform price** — a single price prevails, so the firm's $AR = MR = P$ (horizontal demand curve).
- **Profit maximisation** as the goal; no government intervention or collusion.

Note: Price is determined by the industry (market demand and supply); the firm is a price-taker and only decides the quantity to produce.

5.2.2 Short-Run Equilibrium of the Firm — MC–MR Approach

The firm is in equilibrium when it maximises profit — where **$MR = MC$** and **MC is rising (cuts MR from below)**. Since $MR = P$ under perfect competition, the condition becomes **$P = MC$** . If $MR > MC$, producing more adds to profit; if $MR < MC$, cutting output raises profit.

In the short run the firm may earn: (a) **supernormal profit** if $P > ATC$ at the equilibrium output; (b) **normal profit** if $P = ATC$ (the firm is at 'break-even', at the minimum of ATC); (c) **a loss** if $P < ATC$. In case (c) the firm continues producing so long as $P \geq AVC$ because it then recovers all variable cost and part of fixed cost; if **$P < AVC$** it should **shut down** (the shutdown point is at the minimum AVC).

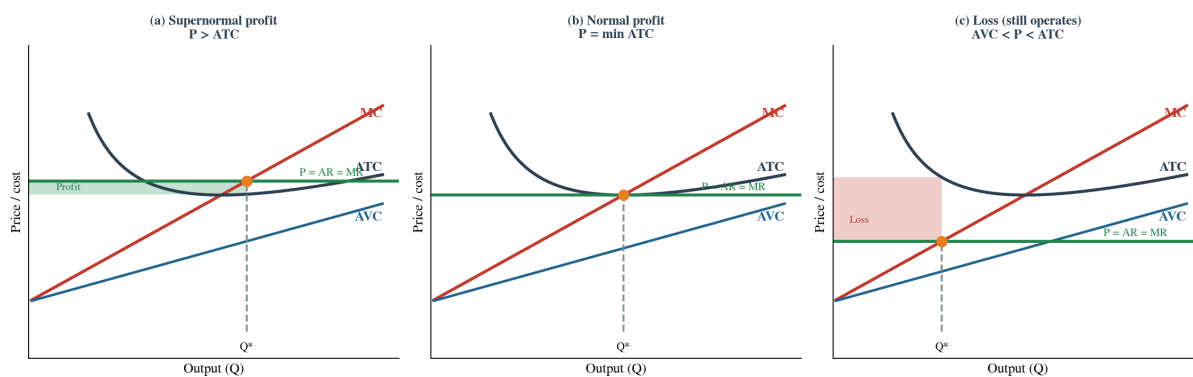


Figure 5.1 — Short-run equilibrium of a competitive firm: profit, normal profit and loss (MC–MR approach)

5.2.3 Short-Run Equilibrium — TR–TC Approach

The firm maximises profit at the output where the **vertical distance between TR and TC is greatest** (TR – TC is maximum), provided TC cuts TR from above. Under perfect competition TR is a straight line from the origin with slope equal to P . The output where slope of TC = slope of TR (i.e., $MC = P$) is the equilibrium. Intersections of TR and TC are the **break-even points**; the firm makes losses outside them.

Example 5.1 — Perfect competition equilibrium

A competitive firm faces market price $P = \text{Rs. } 20$. Its total cost is $TC = 50 + 4Q + Q^2$. Find (a) equilibrium output, (b) profit, (c) the shutdown price, and verify using the TR–TC table.

Solution

$MC = dTC/dQ = 4 + 2Q$. Equilibrium: $P = MC \rightarrow 20 = 4 + 2Q \rightarrow Q = 8$. (MC rising ✓)

$TR = 20 \times 8 = 160$; $TC = 50 + 32 + 64 = 146 \rightarrow \text{Profit} = 14$. (ATC at $Q = 8$ is $146/8 = 18.25 < P \rightarrow$ supernormal profit.)

$AVC = 4 + Q$, which is at its minimum (4) as $Q \rightarrow 0 \rightarrow \text{shutdown price} \approx \text{Rs. } 4$; the firm supplies at any price above it.

Table check ($TR = 20Q$; $TC = 50 + 4Q + Q^2$): $Q = 6 \rightarrow \pi = 120 - 110 = 10$; $Q = 7 \rightarrow 140 - 127 = 13$; $Q = 8 \rightarrow 160 - 146 = 14$; $Q = 9 \rightarrow 180 - 167 = 13$; $Q = 10 \rightarrow 200 - 190 = 10$. Maximum at $Q = 8$ ✓.

Break-even: $20Q = 50 + 4Q + Q^2 \rightarrow Q^2 - 16Q + 50 = 0 \rightarrow Q = 8 \pm \sqrt{14} \approx 4.26$ or 11.74 .

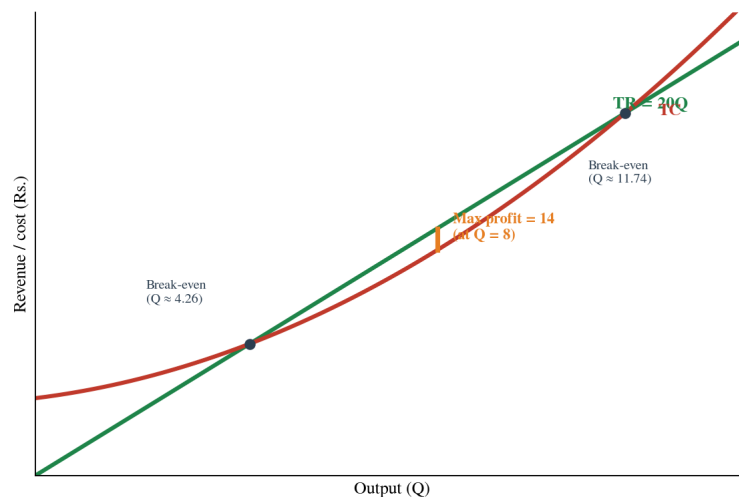


Figure 5.2 — TR–TC approach for Example 5.1: profit is largest where the gap between TR and TC is largest

5.2.4 Derivation of the Short-Run Supply Curve of the Firm and Industry

- **Firm:** a competitive firm supplies the quantity where $P = MC$. Hence the **portion of the MC curve above the minimum of AVC** is the firm's short-run supply curve — below min AVC it supplies nothing.
- **Industry:** the short-run industry supply curve is the **horizontal summation** of the supply curves (MC curves above min AVC) of all firms in the industry, assuming input prices unchanged.

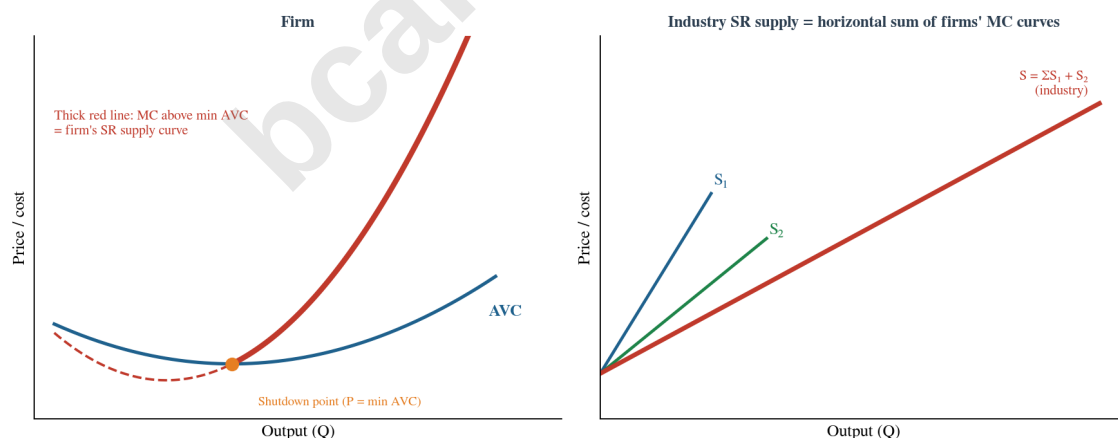


Figure 5.3 — Firm's SR supply curve (MC above min AVC) and industry supply as horizontal sum

Example 5.2 — Firm and industry supply

For the firm of Example 5.1, derive the supply function. If there are 100 identical firms and the market demand is $Q_D = 1,400 - 30P$, find equilibrium price and output.

Solution

Firm supply: $P = MC = 4 + 2Q \rightarrow Q = (P - 4)/2$ for $P \geq 4$.

Industry supply: $Q_S = 100 \times (P - 4)/2 = 50P - 200$.

Equilibrium: $50P - 200 = 1,400 - 30P \rightarrow 80P = 1,600 \rightarrow P = \text{Rs. } 20$; $Q = 50(20) - 200 = 800$ units, i.e., 8 units per firm ✓ (matches Example 5.1).

5.2.5 Long-Run Equilibrium of the Firm and Industry

In the long run firms can adjust plant size and can enter or leave. If firms earn supernormal profit, new firms enter $\rightarrow$ industry supply increases $\rightarrow$ price falls until profit disappears. If firms make losses, some exit $\rightarrow$ supply decreases $\rightarrow$ price rises. Long-run equilibrium requires:

$P = AR = MR = LMC = SMC = LAC = SAC$ (minimum LAC) — each firm earns only **normal profit**, produces at the **optimum scale** (minimum LAC) and the industry has no tendency to expand or contract.

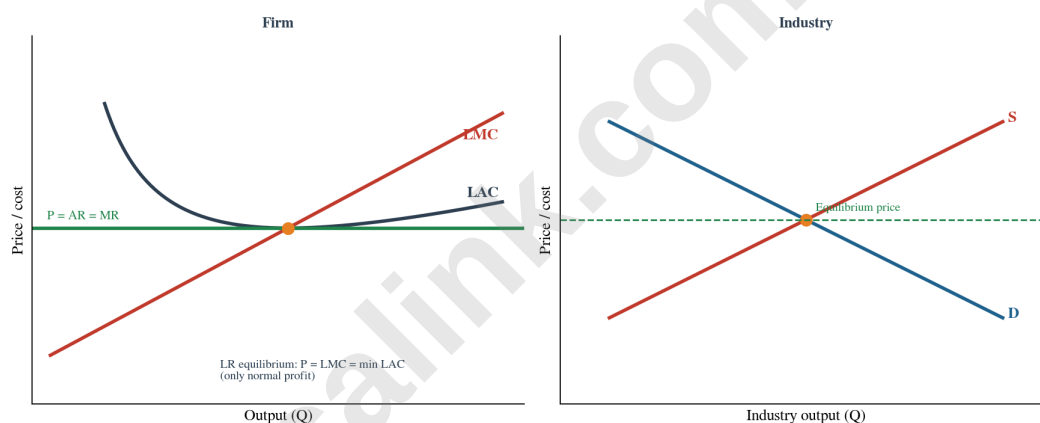


Figure 5.4 — Long-run equilibrium under perfect competition: firm and industry

- **TR–TC approach:** in the long run TR is tangent to LTC (TR = LTC at the equilibrium output) — zero economic profit.
- **Continuing example:** firms earn Rs. 14 profit at Rs. 20 $\rightarrow$ entry lowers price toward min $LAC = 4 + 2\sqrt{50} \approx \text{Rs. } 18.14$ (at $Q \approx 7.07$ per firm) when profit is zero (assuming these cost curves are also the long-run curves).

Long-Run Industry Supply Curve

Type of industry	Reason	LR supply curve
Constant-cost	Input prices unaffected by industry expansion	Horizontal at min LAC
Increasing-cost	Expansion bids up input prices (scarce resources)	Upward sloping

Type of industry	Reason	LR supply curve
Decreasing-cost	External economies lower costs as the industry grows	Downward sloping

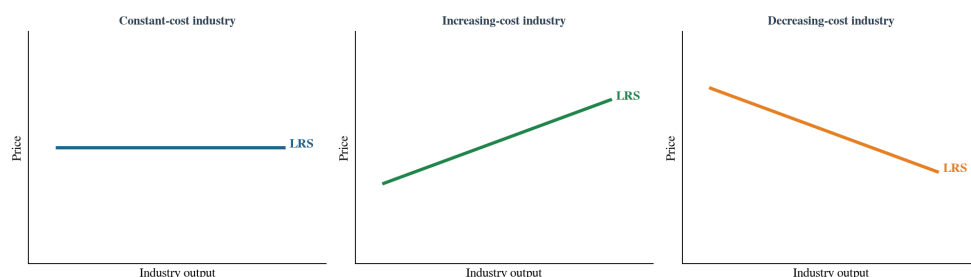


Figure 5.5 — Long-run industry supply curves

5.3 Monopoly

5.3.1 Meaning and Characteristics

Monopoly is a market structure with a **single seller** of a product that has **no close substitutes**, protected by barriers to entry. The monopolist is a **price-maker**.

- **One seller**, so the firm and the industry are the same.
- **No close substitutes**; the cross elasticity of demand is very low.
- **Barriers to entry**: legal (patents, licences, government franchise), control of key resources, economies of scale (natural monopoly), and strategic barriers.
- **Downward-sloping AR (demand) curve**, with MR below AR.
- **Price discrimination** is possible; the firm can control either price or quantity but not both.

5.3.2 Short-Run Equilibrium — MC–MR Approach

Equilibrium requires (i) **MC = MR** and (ii) **MC cuts MR from below**. The output is read from **MR = MC**; the price is then read from the **demand (AR) curve** at that output — so $P > MR = MC$. Profit per unit = $P - AC$. In the short run the monopolist may earn supernormal profit, normal profit or even a loss (if $P < AC$ but $\geq AVC$ it continues; if $P < AVC$ it shuts down).

5.3.3 Short-Run Equilibrium — TR–TC Approach

Profit is maximum where the vertical distance between TR (an inverted-U curve) and TC is greatest — where the slopes of TR and TC are equal ($MR = MC$).

Example 5.3 — Monopoly equilibrium

A monopolist faces the demand $P = 40 - Q$ and has $TC = 100 + 10Q$. Find output, price, profit and compare with perfect competition.

Solution

$TR = P \cdot Q = 40Q - Q^2$; $MR = 40 - 2Q$. $MC = 10$.

$MR = MC$: $40 - 2Q = 10 \rightarrow Q = 15$; price from demand: $P = 40 - 15 = \text{Rs. } 25$.

$TR = 25 \times 15 = 375$; $TC = 100 + 150 = 250 \rightarrow \text{Profit} = 125$ (AC at $Q = 15$ is $250/15 \approx 16.67$).

Under perfect competition $P = MC = 10 \rightarrow Q = 30$. The monopolist charges a **higher price (25 vs 10)** and produces **less (15 vs 30)**.

Deadweight loss = $\frac{1}{2} \times (25 - 10) \times (30 - 15) = 112.5$.

Lerner index (degree of monopoly power) = $(P - MC)/P = 15/25 = 0.6$. Elasticity at equilibrium: $e = P/(P - MC) = 25/15 \approx 1.67 (> 1, \text{ as required})$.

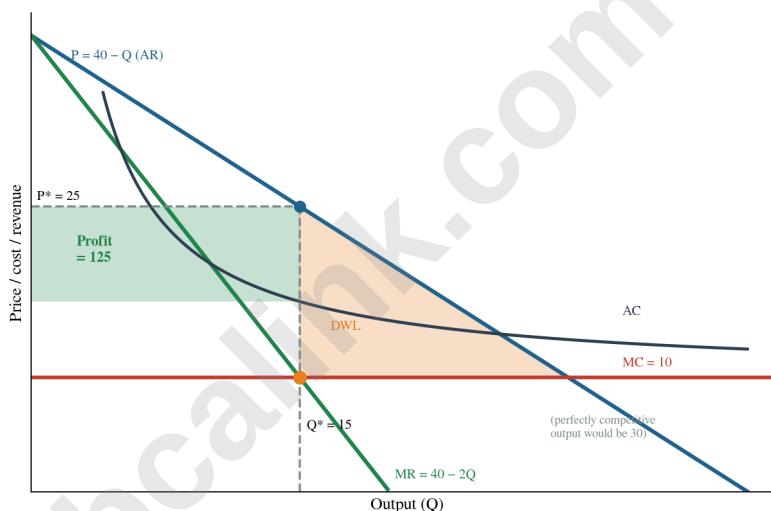


Figure 5.6 — Monopoly equilibrium for Example 5.3 ($MR = MC$) with profit and deadweight loss

5.3.4 Long-Run Equilibrium

Entry is blocked, so supernormal profit can persist in the long run. The monopolist adjusts plant size to the level where $MR = LMC = SMC$ and $P > LAC$. The firm does **not** necessarily produce at the minimum of LAC (there is no tendency to reach optimum scale), and it has **no supply curve** since price and output are jointly determined by demand as well as cost.

Basis	Perfect competition	Monopoly
Price	$P = MC$ (lower)	$P > MC$ (higher)
Output	Larger	Smaller
Long-run profit	Normal profit only	Supernormal profit possible

Basis	Perfect competition	Monopoly
Efficiency	Produces at min LAC (productive and allocative efficiency)	Not at min LAC; deadweight loss
Demand curve faced	Perfectly elastic	Downward sloping
Supply curve	Exists (MC above min AVC)	None

5.3.5 Price Discrimination

Price discrimination means selling the same (or a nearly identical) product to different buyers or in different markets at **different prices that are not justified by differences in cost**. Examples: student and senior discounts, different entrance fees for Nepali citizens, SAARC nationals and other foreigners at tourist sites, peak/off-peak electricity or data-package tariffs, block pricing.

Conditions: (1) the seller has market power (a downward-sloping demand curve); (2) markets can be **separated** so that resale (arbitrage) is not possible; (3) the price elasticity of demand differs between the markets.

Degrees of Price Discrimination

Degree	Meaning	Example
First degree (perfect)	Each unit is sold at the highest price each buyer is willing to pay; the whole consumer surplus is captured. Output equals the perfectly competitive level.	A doctor or consultant charging each client according to ability to pay.
Second degree	Price varies with the quantity bought (block/quantity pricing); the buyers pick the block.	Electricity slab rates, bulk discounts, data packages.
Third degree	Total market is divided into sub-markets by elasticity of demand; a higher price in the less elastic market, lower in the more elastic one.	Domestic vs export prices; student vs adult tickets; day vs night rates.

Equilibrium under Third-Degree Price Discrimination

The monopolist decides (i) **total output** where the combined marginal revenue equals MC: $MC = \Sigma MR$, and (ii) **allocation among markets** so that $MR_1 = MR_2 = MC$. Because $MR = P(1 - 1/e)$, a market with lower elasticity gets a higher price.

Example 5.4 — Third-degree price discrimination

A monopolist sells in two separate markets: $P_1 = 100 - 2Q_1$ and $P_2 = 60 - Q_2$. $MC = \text{Rs. } 20$ (constant). Find prices, quantities, elasticities and profit (ignore fixed cost).

Solution

$MR_1 = 100 - 4Q_1 = 20 \rightarrow Q_1 = 20, P_1 = 60$. $MR_2 = 60 - 2Q_2 = 20 \rightarrow Q_2 = 20, P_2 = 40$.

Elasticities: $e_1 = (1/2)(60/20) = 1.5$; $e_2 = (1)(40/20) = 2$. The less elastic market has the higher price ✓. (Check: $60(1 - 1/1.5) = 20$ ✓; $40(1 - 1/2) = 20$ ✓.)

Total output = 40. Profit = $20(60 - 20) + 20(40 - 20) = 800 + 400 = \text{Rs. } 1,200$.

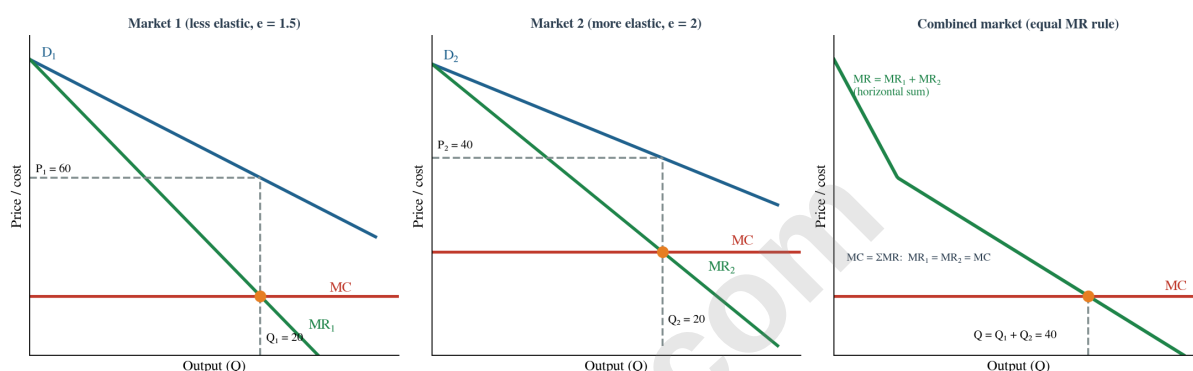


Figure 5.7 — Third-degree price discrimination: $MR_1 = MR_2 = MC$ (Example 5.4)

5.4 Monopolistic Competition

5.4.1 Meaning and Characteristics

Monopolistic competition (E. H. Chamberlin, Joan Robinson, 1933) combines elements of competition and monopoly: many sellers offer **differentiated** products that are close but not perfect substitutes.

- **Large number of sellers**, each with a small share; no collusion.
- **Product differentiation** — by quality, design, brand, packaging, location or service.
- **Free entry and exit** in the long run.
- **Selling costs** (advertising, promotion) are important — non-price competition.
- **Downward-sloping but highly elastic demand curve** — each firm has some control over price.
- The industry is called a '**group**' of firms producing close substitutes.

5.4.2 Equilibrium of the Firm — Short Run

The firm equates $MR = MC$ (MC cutting MR from below); output is found at that point and price from the AR curve above it. Depending on the position of AR relative to ATC the firm may earn supernormal profit ($AR > ATC$), normal profit, or a loss ($AR < ATC$).

5.4.3 Equilibrium of the Firm — Long Run

Supernormal profit attracts new firms; their close substitutes reduce the demand for each existing firm — the AR curve **shifts left and becomes more elastic** — until AR is **tangent to ATC** ($P = ATC$, only normal profit). Losses lead to exit and the opposite adjustment. At the LR tangency, $MR = MC$ as well.

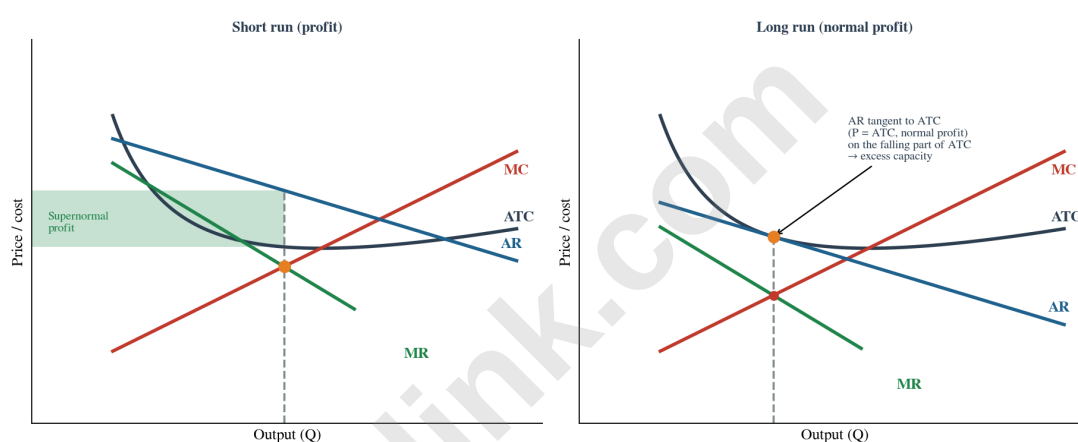


Figure 5.8 — Monopolistic competition: short-run profit and long-run tangency equilibrium

- **Excess capacity:** the tangency occurs on the **falling part of ATC**, so each firm produces less than the output at which ATC is minimum. The gap is the 'excess capacity'.
- **Price is higher and output lower** than under perfect competition, but consumers enjoy greater variety.
- **No supply curve** exists for a monopolistically competitive firm.

5.4.4 Product Variation and Selling Expenses

Besides price, a firm adjusts (i) the **product** (variation in quality, design, packaging) and (ii) **selling expenses** (advertising and promotion), because both influence demand. The firm's decision is a joint optimisation of price, product and selling outlay.

- **Selling expenses** shift the demand curve to the **right** and make it **less elastic**, but raise costs: the ATC curve shifts upward as selling cost per unit is added. Ordinary production costs are U-shaped, and selling cost per unit first falls and then rises.

- **Optimum selling outlay:** the firm keeps increasing selling expenditure so long as the **additional revenue from an extra rupee of selling outlay exceeds the extra cost**; the optimum is where the marginal revenue from selling expenditure equals the marginal selling cost (equivalently, where $MR = MC$ at the chosen level of selling outlay).
- **Product variation:** a change in product quality raises demand but also raises production cost; the firm chooses the variant that gives the greatest net profit (highest excess of revenue over cost).
- **Long-run (group) equilibrium:** entry continues until, at the best product variant and selling outlay, $AR = ATC$ (including selling costs) — a tangency at a higher cost curve, so only normal profit remains.

Note: Textbooks present this topic differently (Chamberlin's model; Kaldor and others). Check the treatment in your prescribed book before writing an exam answer.

5.5 Oligopoly

5.5.1 Meaning and Characteristics

Oligopoly is a market dominated by a **few large firms**, each large enough that its actions noticeably affect rivals. Products may be homogeneous (pure oligopoly — cement, steel) or differentiated (mobile handsets, airlines, telecom).

- **Few sellers;** a small number of firms hold most of the market.
- **Interdependence:** each firm's price and output decisions depend on rivals' likely reactions — the central feature.
- **Barriers to entry** (large capital, economies of scale, patents, brand).
- **Price rigidity** (explained by the kinked-demand curve) and heavy **non-price competition** (advertising, product design).
- **Indeterminate demand curve** — the firm cannot know it without knowing rivals' reactions.
- Firms may compete (non-collusive) or cooperate (collusive: cartels, price leadership).

5.5.2 Pricing under Cartel (Joint Profit Maximisation)

A **cartel** is a formal agreement among oligopolists to fix price, total output and market shares, so that the group behaves like a **single monopolist**. OPEC is the classic example.

- **Industry MC** = horizontal sum of the member firms' MC curves (ΣMC).
- The cartel finds industry output where **industry MR = ΣMC** ; the price is read from the industry demand curve.

- The output is allocated among members so that **each firm's MC equals the common MR** (cost-minimising allocation): $MC_1 = MC_2 = \dots = MR$.
- Profits are shared as per agreement (quotas, market share, or negotiated split).

Example 5.5 — Cartel pricing

Two firms form a cartel. Industry demand: $P = 60 - 0.5Q$. Costs: $MC_A = 10 + Q_A$ and $MC_B = 4 + 2Q_B$. Find cartel price, output, quotas and total profit (ignore fixed costs).

Solution

Industry $MR = 60 - Q$. Horizontal sum of MCs: $Q_A = MC - 10$; $Q_B = (MC - 4)/2 \rightarrow Q = 1.5 \cdot MC - 12 \rightarrow \Sigma MC = (Q + 12)/1.5$.

$MR = \Sigma MC$: $60 - Q = (Q + 12)/1.5 \rightarrow 90 - 1.5Q = Q + 12 \rightarrow Q = 31.2$. Common $MC = MR = 60 - 31.2 = 28.8$.

Price: $P = 60 - 0.5(31.2) = \text{Rs. } 44.4$.

Quotas: $Q_A = 28.8 - 10 = 18.8$; $Q_B = (28.8 - 4)/2 = 12.4$ (sum = 31.2 ✓).

Total revenue = $44.4 \times 31.2 = 1,385.28$. Total variable cost: $A = 10(18.8) + 0.5(18.8)^2 = 364.72$; $B = 4(12.4) + (12.4)^2 = 203.36 \rightarrow \text{cost} = 568.08$. **Joint profit $\approx \text{Rs. } 817.20$** (before fixed cost).

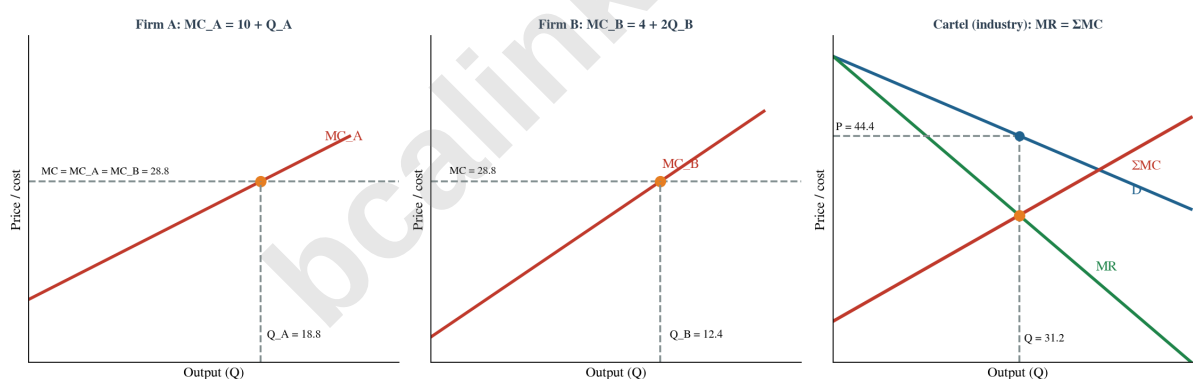


Figure 5.9 — Cartel: industry $MR = \Sigma MC$ fixes the price; each member produces where its own MC equals that MR

5.5.3 Weaknesses of Cartels; Kinked Demand Curve (Brief)

- Cartels are **unstable**: members have an incentive to cheat (sell more at a slightly lower price); disagreements arise over quotas; new entrants; and cartels are illegal in many countries under competition law.
- **Kinked demand curve (Sweezy)**: if a firm raises its price, rivals do not follow (demand is elastic above the kink); if it lowers price, rivals match (demand is inelastic below the kink). The MR curve has a vertical gap at the kink, so costs may change within the gap without altering price — explaining **price rigidity**.

5.6 Numerical Exercises Using Excel

Task	Excel approach
Perfect competition profit table	A: Q (0–14); B: $=20*A2$ (TR); C: $=50+4*A2+A2^2$ (TC); D: $=B2-C2$ (profit); find the maximum with $=MAX(D2:D16)$ and $=INDEX(A2:A16,MATCH(MAX(D2:D16),D2:D16,0))$.
Monopoly	A: Q; B: $=40-A2$ (price); C: $=A2*B2$ (TR); D: $=100+10*A2$ (TC); E: $=C2-D2$ (profit); E's maximum gives Q = 15. Use Data → What-If Analysis → Goal Seek or Solver to maximise E.
Price discrimination	Compute $Q_1 = (100 - MC)/4$ and $Q_2 = (60 - MC)/2$ with $=(100- \$B\$1)/4$ etc. (MC in B1); add revenue and cost to obtain profit.
Cartel	Compute ΣMC through $=(A2+12)/1.5$ and MR through $=60-A2$; find where the two are equal using Goal Seek (set difference to 0).
Charts	Insert → Scatter with lines to plot TR, TC, MR, MC; mark the equilibrium point.

Key Takeaways — Unit 5

- ✓ All firms maximise profit at $MR = MC$ (MC cutting MR from below); under perfect competition $P = MR = MC$; the SR supply curve of a firm is MC above min AVC.
- ✓ Perfect competition: LR equilibrium at minimum LAC with normal profit; industry supply is the horizontal sum of firms' supply curves.
- ✓ Monopoly: $P > MC$, lower output than competition, possible supernormal profit in the LR, no supply curve; price discrimination requires separable markets and differing elasticities (equal-MR rule).
- ✓ Monopolistic competition: differentiated products, LR tangency $AR = ATC$ on the falling part of ATC (excess capacity); selling expenses and product variation shift demand and cost curves.
- ✓ Oligopoly: interdependence; a cartel acts as a monopolist with $MR = \Sigma MC$, but is unstable.

— End of Unit 5 —

Reminder: these notes may contain errors — verify with your textbook and syllabus.