Chapter 1

Introduction to Managerial Economics

A **Managerial Economics**.

1 **Definition**. Managerial economics is the science of cost-effective management of scarce resources.

2 **Application**. Managerial economics applies to:

i) Profit-oriented businesses, nonprofit organizations, and households.

ii) Decisions in relation to customers; suppliers; competitors or the internal workings of the organization.

B **Value Added**.

1 **Definition.** Value added = Buyer benefit – Seller cost = Buyer surplus + Seller economic profit.

2 **Sharing of Value Added.**

i) Buyer: gets buyer surplus = buyer's benefit – buyer's expenditure.

ii) Seller: gets the other part of value added = seller economic profit = seller's revenue (same as buyer's expenditure) – seller's cost of production.

C **Economic Profit**.

1 **Definition.** Economic profit = Accounting profit – Opportunity cost + Sunk cost.

2 **Adjustments to Accounting Profit.**

i) Accounting profit does not take account of opportunity cost. Opportunity cost is a cost of continuing the status quo. By continuing the status quo, the manager is forgoing the profit contribution from the alternative course of action. Hence, to make correct business decisions, managers must take account of (take out) opportunity costs.

ii) Accounting profit takes out sunk cost. However, sunk cost is irrelevant to the current decision because it has already been incurred and cannot be reversed. Hence, to make correct business decisions, managers must ignore (add back) sunk cost.

D **Decision-Making**.

1 Average vis à vis Marginal Variables.

i) Average value: the total value of the variable divided by the total quantity of the measure, e.g., total earnings divided by total no. of hours worked;

ii) Marginal value: the change in the variable associated with a unit increase in a measure, e.g., amount earned by working one more hour;

iii) The marginal value of a variable may be less that, equal to, or greater than the average value, depending on whether the average value is decreasing, constant or increasing with respect to the measure; and
iv) If the marginal value of a variable is greater than its average value, the average value increases, and vice versa.

2 **Participation** (which market, product, job…etc): compare total benefit and total cost.

3 **Extent** (how much to produce, what price to set, how many hours to work): compare marginal benefit and marginal cost.

4 **Bounded rationality.**
i) Rationality means that, when presented with various alternatives, individuals choose the alternative that that maximizes the difference between value and cost.
ii) Human beings behave with **bounded** (less than full) **rationality** because they have limited cognitive abilities and cannot fully exercise self-control**.** Under uncertainty, individuals tend to adopt simplified rules in making decisions, resulting in systematic biases:
(1) Sunk-cost fallacy. E.g., consumers who had incurred a larger sunk cost tended to consume more.
(2) Status quo bias: decision-makers tend (out of sheer inertia) to prefer the status quo.
(3) Anchoring. E.g., consumers anchor on the (higher) list price (posted by the retailers) and are attracted by the discounts (also posted by the retailers).

iii) In decision-making, take care to avoid systematic biases.

E **Timing.**
1 Static/dynamic models.
i) Static model describes behavior at a single point in time, disregarding differences in the sequence of actions and payments.
ii) Dynamic model explicitly focuses on the timing and sequence of actions and payments.

2 **Discounting** is a procedure used to transform future dollars into an equivalent number of present dollars. It is necessary to discount future values so that they can be compared with the present.

3 Net present value (**NPV**) is the sum of the discounted values of a series of inflows and outflows over time.

4 When evaluating a series of benefits (inflows) and costs (outflows) that occur in different times from the vantage point of the present, use **NPV** with the *appropriate* discount rate.

F **Organization**.
1 Organizations include businesses, non-profits, and households.
2 Organizational boundaries.
i) **Vertical boundaries** – delineate activities closer to or further from the end user. E.g., an aircraft manufacturer that produces wings and landing gear and assembles aircraft is more vertically integrated than an aircraft manufacturer that does not produce wings and landing gear and only assembles aircraft.

ii) **Horizontal boundaries** are defined by the scale and scope of an organization's operations.
   (1) **Scale** refers to the rate of production or delivery of a good or service. E,g., an aircraft manufacturer that produces 40 planes per month is producing on a larger scale than one that produces 30 planes per month.
   (2) **Scope** refers to the range of different items produced or delivered. E,g., an aircraft manufacturer that produces both commercial and military aircraft is producing with a larger scope than one that specializes in commercial aircraft.

iii) Members of the same industry may choose different vertical and horizontal boundaries.

G **Markets**.

1 Markets.

i) A **market** consists of buyers and sellers that communicate with one another for voluntary exchange. It is not limited to any physical structure or particular location.
   (1) In markets for consumer products, the buyers are households and sellers are businesses.
   (2) In markets for industrial products, both buyers and sellers are businesses.
   (3) In markets for human resources, buyers are businesses and sellers are households.

ii) An **industry** consists of the businesses engaged in the production or delivery of the same or similar items. Members of an industry can be buyers in one market and sellers in another. E.g., the clothing industry is a buyer in the textile market and a seller in the clothing market.

2 **Competitive markets**.

i) Model of competitive markets: basic starting point of managerial economics.
   (1) Markets with many buyers and many sellers, e.g., the cotton market;
   (2) Where buyers provide the demand and sellers provide the supply.

ii) Also called the *demand-supply model*, the model describes the systematic effect of changes in prices and other economic variables on buyers and sellers; and the interaction of these choices. E.g., the model can describe how the cotton producer should adjust prices when the price of water increases/labor laws change, and the interaction among the adjustments of various cotton producers and how these affect buyers…etc.

iii) An individual manager may have little freedom of action. Market forces determine input mix, prices, and scale of operations.

3 **Market power**.

i) Market power: the ability of a buyer or seller to influence market conditions. A seller with market power will have relatively more freedom to choose suppliers, set prices, and use advertising to influence demand.

ii) A business with market power must determine its horizontal boundaries – depending on how costs vary with the scale and scope of operations.

iii) Accordingly, businesses with market power, whether buyers or sellers, must understand and manage their costs and demand (via pricing, advertising, and policy towards competitors).

4 **Imperfect Market**.

i) In an imperfect market:
   (1) One party directly conveys a benefit or cost to others; or

(2) One party has better information than others.

ii) The challenge is to resolve the imperfection and be cost-effective.

iii) Businesses in imperfect markets should act strategically to resolve the imperfection.

iv) Imperfections can also arise within an organization, and hence, another issue in managerial economics is how to structure incentives and organizations.

H **Globalization.**

1 Local vis à vis global markets.

i) Local markets – owing to relatively high costs of communication and trade, some markets are local, e.g., housing, groceries. The price in one local market is independent of prices in other local markets.

ii) Global markets - owing to relatively low costs of communication and trade, some markets are global, e.g., commodities, shipping, financial services. For an item with a global market, the price in one place will move together with the prices elsewhere.

iii) Whether a market is local or global, the same managerial economic principles apply.

2 Falling trade barriers (bilateral and multilateral agreements) and communication costs (with developments in technology and deregulation) result in global markets being more integrated across geographical border.

3 **Outsourcing** is the purchase of services or supplies from external sources (domestic or foreign). Foreign sources may provide cheaper skilled labor, specialized resources, or superior quality, resulting in lower production costs and/or improved quality.

Chapter 2

Demand

A **The Demand Curve.** A demand curve describes the quantity demanded of an item as a function of its price.

B **Individual Demand**.

1 Construction.

i) Definition: A graph showing the quantity (horizontal axis, e.g., no. of movies watched per month) that the buyer will purchase at every possible price (vertical axis, e.g., ticket price per movie).

2 Slope.

i) **Marginal benefit** – the benefit provided by an additional unit of the item.

ii) The *principle of diminishing marginal benefit* - each additional unit of consumption provides less benefit than the proceeding unit. Accordingly, the price that an individual is willing to pay will decrease with the quantity purchased.

iii) Diminishing marginal benefit gives rise to a downward sloping demand curve: the lower the price, the larger the quantity demanded.

3 Preferences.

i) The procedure for constructing a demand curve relies completely on the consumer's individual preferences and this has two implications:

(1) Different consumers may have different preferences and hence different demand curves;

(2) Demand curves will change with changes in the consumer's preferences.

C **Demand and Income**.

1 **Income changes**.

i) A change in income will affect individual demand at all price levels.

ii) A change in price vis a vis changes in income or other factors on individual demand.

(1) A change in the price of an item (holding income and all other factors unchanged) generally causes movement ***along*** the demand curve (a change in the quantity demanded)

(2) A change in income or factors other than the price of an item (e.g., the prices of related products, advertising, season, weather, and location) causes a ***shift*** in the entire demand curve (a change in demand at all price levels).

2 Normal vis à vis inferior products.

i) Goods and services are categorized according to the effect of changes in income on demand.

ii) **Normal product:** demand is positively related to the buyer's income. Demand increases as buyer's income increases, and demand falls as buyer's income falls.
   (1) When the economy is growing and incomes are rising, demand for normal products will rise.
   (2) In a recession where incomes are falling, demand for normal products will fall.
   (3) The demand for normal products is relatively higher in richer countries.

iii) **Inferior product:** demand is negatively related to the buyer's income. Demand increases as buyer's income decreases, and demand falls as buyer's income increases.
   (1) When the economy is growing and incomes are rising, demand for inferior products will fall.
   (2) In a recession where incomes are falling, demand for inferior products will rise.
   (3) The demand for inferior products is relatively higher in poorer countries.

iv) Broad categories (e.g., movies, transportation, consumer electronics) tend to be normal, while particular products within the categories (e.g., matinees, buses, all-in-one stereos) may be inferior.

v) Distinction between normal and inferior products is important for business strategy and international business.

D **Other Factors in Demand.**

1 **Prices of related products**.

i) **Complements:** two products are complements if an increase in the price of one causes a fall in the demand for the other, e.g., popcorn and movies.

ii) **Substitutes:** an increase in the price of one causes an increase in the demand for the other, e.g., video rentals and movies.

iii) In general, the demand curve *shifts* to the left when there is an increase in the price of a complement or a fall in the price of a substitute.

iv) In general, the demand curve *shifts* to the right when there is a fall in the price of a complement or an increase in the price of a substitute.

2 **Advertising**.

i) Advertising may be informative or persuasive.

ii) In general, an increase in the seller's advertising increases individual demand, and the buyer's demand curve *shifts* to the right.

iii) The effect of advertising expenditure on demand may be subject to diminishing marginal product - each additional dollar spent on advertising has a relatively smaller effect on demand.

E **Business Demand**.

1 **Inputs**.

i) Consumers buy goods and services for final consumption or usage.

ii) Businesses buy goods and services as inputs for the production of other goods and services for sale to consumers or other businesses.

iii) The inputs purchased by a business can be classified into materials, energy, labor, and capital.

iv) The inputs may be substitutes (workers/machines) or complements (trucks and drivers).

2 **Demand**.
   i) By increasing inputs, the business can produce a larger output and raise revenue.
   ii) Demand curve of a business.
      (1) A business can measure its marginal benefit from an input as the increase in revenue arising from an additional unit of the input.
      (2) Construct the demand curve of a business for an input using the marginal benefit of an input.
      (3) A business should buy an input up to the quantity that its marginal benefit from the input exactly balances the price.
      (4) If the input provides a *diminishing marginal benefit* to the business, the demand curve for the input slopes downward.

3 **Demand factors**.
   i) A change in the price of an input is represented by a movement *along* the demand curve.
   ii) Changes in other factors will lead to a *shift* of the entire demand curve.
      (1) A major factor in consumer demand is income. Business demand does not depend on income but rather on the **output** – if the output is larger, the demand for inputs will increase.
      (2) The demand for an input also depends on the **prices of complements and substitutes** in the production of the output. E.g., trucks and drivers are complements – an increase in drivers' wages will reduce the demand for trucks.

F **Buyer Surplus**.
1 Implication for pricing policy: the perspective of "willingness to pay" shows the maximum that the buyer can be charged.
2 The individual demand curve shows:
   i) The quantity that the buyer will purchase at every possible price; and
   ii) The maximum amount that a buyer is wiling to pay for *each unit* of the item, i.e., the buyer's **marginal benefit** from each unit.
3 **Total benefit.**
   i) Total benefit: the benefit provided by all the units that the buyer consumes, i.e., the marginal benefits from the first up to and including the last unit purchased.
   ii) Graphically, this is the area under the buyer's demand curve up to an including the last unit consumed.
   iii) This is the maximum that the buyer is willing to pay for that quantity of purchases, this is also the **maximum that a seller can charge**.
4 Benefit and expenditure.
   i) **Buyer surplus**: The difference between the buyer's total benefit from some consumption and her or his actual expenditure.
   ii) Graphically represented by the area between the buyer's demand curve and the price line.
   iii) Effect of price changes. Price reduction leads to increase in buyer's surplus in two ways.
      (1) First, the buyer gets a lower price on the quantity that the buyer would have purchased at the original higher price; and
      (2) Second, as the buyer buys more (depending on the buyer's sensitivity to the price reduction), she gains buyer surplus on each of the additional purchases.

iv) The buyer loses from a price increase.
    (1) Pay higher price; and
    (2) Reduction in the quantity purchased.

5 **Package deals and two part pricing**. A seller who has complete flexibility over pricing maximizes profit by charging buyer just a little less than total benefit – *extracting* buyer's surplus as follows:
   i) Package deal: A pricing scheme comprising a fixed payment for a fixed quantity of consumption.
   ii) Two-part price: a pricing scheme comprising a fixed payment and a charge based on usage, e.g., telephone monthly charge coupled with an airtime charge.
   iii) A combination of the above two pricing techniques.

G **Market Demand**.

1 Construction of market demand curve.
   i) Definition: A graph showing the quantity that all buyers will purchase at every possible price. It is the horizontal summation of the individual demand curves.
   ii) It enables businesses to understand the demand of the entire market rather than individual customers.

2 The properties of the market demand curve are similar to those of the individual demand curve.

3 Slope. As each buyer's marginal benefit *diminishes* with the quantity of consumption, the market demand curve slopes downward. At a lower price, the market as a whole will buy a larger quantity.

4 Price changes, income changes and other factors in demand.
   i) A change in the price of an item (holding income and all other factors unchanged) generally causes ***movement*** along the market demand curve from one point to another on the same curve.
   ii) A change in income or factors other than the price of an item (e.g., the prices of related products, advertising) causes a ***shift*** of the entire market demand curve.

5 Market demand for a business input depends on output of all businesses and the prices of related products.

6 **Market buyer surplus**.
   i) This is the difference between the buyers' total benefit from the input and the buyers' actual expenditure.
   ii) Graphically, it is the area between the market demand curve and the price line.

Chapter 3

Elasticity

A **Elasticity of Demand**.

1 **The Concept**. It measures the responsiveness of demand to changes (increase or decrease) in an underlying factor (e.g., price of the item itself, buyers' income, prices of complementary or substitute products, advertising expenditure…etc).

2 There is an elasticity corresponding to every factor (i.e., measuring the responsiveness of demand to changes in each factor) that affects demand.

B **Own-Price Elasticity of Demand (Price Elasticity or Demand Elasticity)**.

1 This measures the responsiveness of the quantity demanded to changes in the price of the item. The own-price elasticity can be measured along any demand curve (including the individual demand curve and market demand curve).

i) Definition. Own-Price Elasticity = Percentage by which the quantity demanded will change if the price of the item rises by 1%.

(1) Own-Price Elasticity = Percentage change in quantity demanded divided by Percentage change in price.

(2) Own-Price Elasticity = Proportionate change in quantity demanded divided by Proportionate change in price.

(a) Proportionate change in quantity demanded = the change in quantity demanded divided by the initial quantity demanded.

(b) Proportionate change in price = the change in price divided by the initial price.

2 **Properties**.

i) It is a *negative* number (sometimes reported as an absolute number, without negative sign), as demand curves generally slope downward;

ii) It is a ratio of two proportionate changes, and hence a *pure* number independent of units of measurement and can be used to compare the price sensitivity of the demand for different goods and services;

iii) It ranges from *0* (where a large % change in price causes no change in quantity demanded) to *negative infinity* (where an infinitesimal % change in price causes a large change in quantity demanded).

3 Elastic/Inelastic Demand.

i) Demand is price **inelastic** if a price increase causes a proportionately smaller reduction in quantity demanded.

(1) Elasticity > -1;

(2) Absolute value of elasticity < 1.

ii) Demand is price **elastic** if a price increase causes a proportionately larger reduction in quantity demanded.

(1) Elasticity < -1;

(2) Absolute value of elasticity > 1.

4 **Intuitive factors** affecting own-price elasticity.
   i) **Availability of direct or indirect substitutes**.
      (1) The fewer substitutes are available, the less elastic the demand.
      (2) The demand for the product category (cigarettes as a whole) will be relatively less elastic than demand for particular product in category (particular brand of cigarettes).
   ii) **Buyer's prior commitments**. E.g., buyer of a particular car/software becomes a captive customer/locked in for spare parts/future upgrades.
   iii) **Benefits/costs of economizing**.
      (1) Cost relative to the benefit from searching for better prices. Buyers have limited time so they focus on items that account for relatively larger expenditure (as opposed to "low involvement" products).
      (2) The balance between the cost and the benefit of economizing also depends on a possible split between the person who incurs the cost of economizing and the person who benefits.
5 Estimation and accuracy.
   i) Denominator.
      (1) Use of initial prices and quantities; or
      (2) Average or final prices/quantities.
   ii) "Point estimate" of elasticity: as we consider smaller and smaller price changes, the estimate will converge to a single number.
   iii) Changes in any of the factors that affect demand (e.g., price of the item itself, buyers' income, prices of complementary or substitute products, advertising expenditure…etc) may lead to a change in the own-price elasticity.
   iv) The own-price elasticity may vary along the demand curve, and changes in the price itself. Strictly, it is accurate only for small changes in the price.
6 **Forecasting Quantity Demanded and Expenditure**.
   i) Forecasts. Given the own-price elasticity of demand, a seller (both an individual seller or all sellers) can estimate the impact of an increase of reduction in price on:
      (a) quantity demanded, i.e., sales in the case of an individual seller;
      (b) buyers' expenditure (quantity demanded x price) = revenue in the case of an individual seller.
   ii) Quantity demanded.
      (1) Proportionate change in quantity demanded = Proportionate change in price x own-price elasticity of demand.
   iii) Expenditure.
      (1) Proportionate change in expenditure = Proportionate change in price **+** Proportionate change in quantity demanded.
      (2) Proportionate change in expenditure = Proportionate change in price **x** (1 **+** own-price elasticity of demand).
7 **Pricing strategy**.
   i) If demand is price **inelastic** at the current price, a price increase will raise buyers' expenditure and the seller's revenue. A seller can increase profit by raising price:
      (1) Net Effect. The <u>drop</u> in quantity demanded (i.e., the drop in sales which reduces expenditure) will be proportionally *smaller* than the <u>increase</u> in price (which will tend to raise expenditure);

(2) Buyers' expenditure (seller's revenue) will increase; and
(3) Also, as production is reduced, costs are cut.

ii) If demand is price **elastic**, a price increase would reduce buyers' expenditure and seller's revenue. When a seller raises price:
(1) The drop in quantity demanded will be proportionally *larger* than the increase in price; and
(2) Buyers' expenditure (seller's revenue) will decrease.

iii) Generally, it is in the best interest of a seller to raise the price **until** the demand becomes price **elastic**.

C **Other Elasticities.**

1 **Income elasticity of demand**.

i) Definition. Income Elasticity = Percentage by which demand will change if the buyers' incomes rise by 1%.
(1) Income Elasticity = Percentage change in demand divided by Percentage change in buyers' incomes.

ii) **Properties**.
(1) Can range from *negative infinity* to *positive infinity*.
(a) Normal products: if buyers' income rise, demand will rise; *positive* income elasticity.
(b) Inferior products: if buyers' incomes rise, demand will fall; *negative* income elasticity.

iii) Elastic/Inelastic Demand.
(1) Demand is income **inelastic** if a 1% increase in income causes a less than a 1% change in the quantity demanded;
(2) Demand is income **elastic** if a 1% increase in income causes a more than 1% change in the quantity demanded.

iv) Factors affecting income elasticity.
(1) Demand for necessities (e.g., raw food) tends to be relatively less income elastic than the demand for discretionary items (restaurant meals).

2 **Cross-price elasticity of demand with respect to another item**.

i) Definition. Cross-price elasticity = Percentage by which demand will change if the price of the related item rises by 1%.
(1) Cross-price elasticity = Percentage change in demand divided by Percentage change in price of related item.

ii) **Properties**.
(1) Can range from *negative infinity* to *positive infinity*.
(a) Substitutes: an increase in the price of one will increase the demand for the other; *positive* cross-price elasticity. The more substitutable two items are, the higher their cross price elasticity will be.
(b) Complements: an increase in the price of one will reduce the demand for the other; negative cross-price elasticity.

3 **Advertising elasticity**.

i) Definition. Advertising elasticity = Percentage by which the demand will change if the sellers' advertising expenditure rises by 1%.
(1) Advertising elasticity = Percentage change in demand divided by Percentage change in sellers' advertising expenditure.

ii) Most advertising is undertaken by individual sellers to promote their own business.
(1) By drawing buyers away from competitors, advertising has a much stronger effect on the sales of an individual seller than on the market demand.
(2) Advertising elasticity of the demand faced by an individual seller tends to be *larger* than the advertising elasticity of the market demand.

D **Forecasting Multiple Factors**. Generally, the net effect on the percentage change in demand due to changes in multiple factors (sometimes pushing in different directions) = **sum** of the percentage changes due to each separate factor, using the corresponding elasticities.

E **Adjustment Time.**
1 Buyers need time to adjust. Adjustment time is a factor that affects all elasticities. Distinguish between short run and long run.
i) Short run for the buyer - the time horizon within which buyers *cannot adjust* at least one item of consumption.
ii) Long run for the buyer - the time horizon long enough for buyers to adjust all items of consumption.
2 **Nondurables**.
i) For both good and services: Demand is *more* elastic in the long run than the short run.
(1) Buyers need time to adjust - The longer the time that buyers have to adjust, the bigger will be the response to a price change.
3 **Durables.**
i) Demand may be more or less elastic in the long run than the short run, depending on the balance between time for adjustment and replacement frequency.
(1) Buyers need time to adjust - The longer the time that buyers have to adjust, the bigger will be the response to a price change. This causes demand is *more* elastic in the long run than the short run.
(2) However, a countervailing effect causes demand to be more elastic in the short run. E.g., **Replacement frequency effect** with respect to income elasticity,
(a) Short run: a drop in income will cause demand (e.g., automobiles) to fall more sharply in the short run.
(b) Long run: the effects on sales will be muted.

Chapter 4

Supply

A **Introduction:** short run and long run.
1 Two key business decisions.
i) **Participation**: Whether to continue in production.
(1) Whether the business would break even, depending on total revenue and total (relevant) cost.
ii) **Extent**: The scale at which to operate (= rate of production = sales).
(1) Depends on marginal revenue and marginal cost.
2 Both two key business decisions depend on the **time horizon**.
i) Short run: time horizon in which the seller cannot adjust at least one input. In the short run, the business must work within the constraints of past commitments such as employment contracts and investment in facilities and equipment.
ii) Long run: time horizon long enough for the seller to adjust all inputs, including possibly entering or exiting the industry. The business will have complete flexibility in deciding on inputs and production.

B **Short-Run Costs**.
1 **Fixed vis à vis variable costs**.
i) Assign estimates of the expenses on inputs (e.g., rent, equipment lease, wages, and payments on supplies needed at various scales of operation (production rates)) into the 2 categories of fixed costs and variable costs.
ii) **Fixed cost**: The cost of inputs that do not change with the production rate. *Assume* that the entire fixed cost is a **sunk cost**, i.e., a cost that has been committed and cannot be avoided. Downsizing will have no effect on fixed costs.
(1) Represented by the height of the total cost curve at the production rate = zero.
iii) **Variable cost:** The cost of inputs that do change with the production rate.
iv) **Total cost**: The sum of fixed cost and variable cost (C = F + V).
(1) Total cost curve: the variable cost curve shifted up everywhere by the amount of the fixed cost.
2 **Marginal cost** = the change in total cost due to the production of an additional unit.
i) Derived from the analysis of fixed costs and variable costs.
3 **Average cost**.
i) **Average cost** = average total cost = unit cost: The total cost divided by the production rate.
(1) The cost of producing a typical unit.
(2) The sum of average fixed cost and average variable cost.

(a) **Average fixed cost** = fixed cost divided by the production rate.
(b) **Average variable cost** = variable cost divided by the production rate.

4 **Marginal product**.
i) Definition. The increase in output arising from an additional unit of an input.
ii) *Diminishing marginal product from the variable inputs*: the marginal product becomes smaller with each increase in the quantity of the variable inputs.

5 Average cost generally first *declines* with increase in the production rate and then *increases* because:
i) When the production rate is higher, the fixed cost will be spread over more units, and the average fixed cost will *decline*.
ii) With respect to the average variable cost:
(1) At low production rate, owing to the mismatch between the variable inputs and the fixed input, the average variable cost is *high*;
(2) At higher production rate, as the variable inputs match the fixed input relatively better, the average variable cost *falls*; and
(3) Then, as more of the variable inputs are added in combination with the fixed input, there will be a mismatch again, leading to a diminishing marginal product from the variable inputs, the average variable cost *rises*.
iii) If the fixed cost is not too large and the average variable cost increases sufficiently, the average cost will first *decline* with the production rate and then *increase*.

6 **Production technology**.
i) Adjustments in a seller's technology.
(1) A technology with a lower fixed cost will lower the seller's average cost curve;
(2) A technology with a lower variable cost will lower the seller's average cost, average variable cost, and marginal cost curves.
ii) Sellers with different technologies have different cost curves.
(1) Better technologies yield lower overall costs.

C **Revenues and Short-Run Individual Supply.**

1 Individual and market supply: counterparts to individual and market demand.

2 **Assumptions**.
i) Business aims to maximize profit.
ii) Assumption of smallness: The business is so small relative to the market that it can sell as much as it would like at the going market price.

3 **To decide whether to continue production at all**.
i) *Compare* profit from continuing in production with the profit from shutting down. Profit = total revenue – total cost. Note: Total revenue = price x sales (production rate); R = p x q.
(1) If continue in production, profit = R – F – V.
(2) If the business shuts down, it must pay the fixed cost, though not the variable cost.
(a) Since R = 0 and V is avoidable; profit = –F.
ii) **Short-run break-even condition**. A business should continue in production if the maximum profit from continuing in production is *at least as large as* the profit from shutting down; i.e., if the business breaks even.
(1) R – F – V ≥ –F; or **R ≥ V**

(a) So long as **total revenue covers variable cost** (the fixed cost is a sunk cost and is not relevant); or equivalently,
(b) So long as **price** (R divided by q) **covers average variable cost** (V divided by q).

4 **Profit-maximizing scale of production**.
i) Profit = total revenue – total cost.
(1) If continuing in production, profit = R – F – V.
ii) Total revenue = price x sales (production rate); R = p x q.
iii) Marginal revenue = the change in total revenue arising from selling an additional unit.
iv) Profit-maximizing scale.
(1) The point where **marginal revenue equals marginal cost** (where the total revenue line and the total cost curve climb at exactly the same rate).
(a) Whenever the marginal revenue exceeds the marginal cost, profit will be raised by increasing production.
(b) Whenever the marginal revenue is less than the marginal cost, profit will be raised by reducing production.
(2) When a business can sell as much as it would like at the market price, marginal revenue equals price (it does not have to reduce price to sell more units); and therefore, the profit-maximizing rule for such a business becomes that production rate at which **price equals marginal cost**.

5 Summary. In the short run, a business maximizes profit by:

i) If the total revenue does not cover the variable cost, shutting down.
ii) If the total revenue covers the variable cost, producing at the rate where the marginal cost equals the price.

6 **Individual supply curve**.
i) A graph showing the quantity that one seller will supply at every possible price. It shows the minimum price that the seller will accept for each unit of production.
ii) It is identical to that part of the marginal cost curve above the average variable cost curve.
iii) For every possible price of its output, a business should produce at the rate that balances its marginal cost with the price, provided that the price covers average variable cost.
iv) As marginal cost rises when production is expanded, a seller should expand production only if it receives a higher price. Accordingly, the individual supply curve **slopes upward**.
v) A change in the price of the output generally causes movement *along* a supply curve.

7 **Input demand**.
i) As the costs of inputs change, the marginal cost curve shifts up or down, the profit-maximizing scale of production changes, and the demand for inputs also changes.
ii) By varying the cost of a particular input, we can determine the quantity demanded of that input at every possible cost and construct the seller's demand for that input.
iii) As the quantity demanded of the input will be higher at a lower input price, the demand curve will slope downward.

D **Long-Run Individual Supply**.

1 **Long-run costs**.

i) Based on estimates of expenses on inputs (e.g., rent, equipment lease, wages, and payments on supplies needed at various scales of operation (production rates)) when all inputs are avoidable.

ii) Even in the long run, there may be **fixed costs (but these are not sunk)**. The business may incur some costs even at production level of zero, e.g., maintenance of minimum size facility.

2 **To decide whether to continue production at all in the long-run**.

i) *Compare* profit from continuing in production with the profit from shutting down. Profit = total revenue – total cost. Note: Total revenue = price x sales (production rate); R = p x q.

(1) If continue in production, profit = R – C.

(2) If the business shuts down, it will incur no costs (as all costs are avoidable in the long run); profit = 0.

ii) **Long-run break-even condition**. A business should continue in production if the maximum profit from continuing in production is *at least as large as* the profit from shutting down; i.e., if the business breaks even.

(1) R – C ≥ 0; or **R ≥ C**

(a) So long as **total revenue covers total cost**; or equivalently,

(b) So long as **price** (R divided by q**;** average revenue) **covers average cost** (C divided by q).

3 **Profit-maximizing production rate in the long-run**. The profit-maximizing rule is to produce:

i) where **marginal revenue equals marginal cost;** or equivalently,

ii) where **price equals marginal cost**. Note: for a business that can sell as much as it would like at the market price, the marginal revenue equals the price of its output.

4 Summary. In the long run, for a business that can sell as much as it would like at the market price, a business maximizes profit by:

i) If the total revenue does not cover the total cost, shutting down. ii) If the total revenue covers the total cost, producing at the rate where the marginal cost equals the price.

5 Long-run individual supply curve.

i) By varying the price, we can determine the quantity that the seller will supply at every possible price of the output.

ii) It is identical to that part of the long run marginal cost curve above the long run average total cost.

6 Short and Long Run.

i) Long run average cost curve is lower and has a gentler slope than that of the short run. In the short run, the seller may not be able to change one or more inputs. In the long run, the seller has more flexibility in optimizing inputs to changes in the production rate, and can thus produce at a lower cost.

ii) The short run average cost includes the average fixed cost, which being sunk, is not relevant. To compare the short-run and long-run break-even conditions, the

relevant comparison is between the short-run average variable cost and the long-run average cost.

E **Seller Surplus**.

1 **Seller's surplus**: The difference between a seller's total revenue from some quantity of production and the seller's avoidable cost of producing that quantity.

i) In the short run, the seller surplus = total revenue less variable cost (assuming that the fixed cost is sunk).

ii) In the long run, the seller surplus = total revenue less total cost (assuming that the fixed cost is avoidable).

2 **Purchasing**. A buyer can extract the seller's surplus.

i) The minimum that a seller would be wiling to accept for some quantity of production is the avoidable cost. Any extra payment would yield seller surplus.

ii) The buyer should pay each supplier just the avoidable cost, leaving the seller with zero surplus, i.e., the buyer should buy up the seller's marginal cost curve.

F **Elasticity of supply**

1. **Price elasticity of supply.**

i) This measures the responsiveness of the quantity supplied to changes in the price of an item.

ii) Definition. It is the percentage by which the quantity supplied will change if the price of the item rises by 1%.

(1) Price elasticity of supply = Percentage change in quantity supplied divided by Percentage change in price

2. **Intuitive factors**.

i) Available production capacity.

(1) A seller with considerable excess capacity will step up production in response to even a small price increase.

(2) If capacity is tight, the seller may not increase production much even if the price rises substantially, and supply will be relatively inelastic.

ii) Adjustment time.

(1) In the short run, some inputs may be costly or impossible to change, the marginal cost of expanding production will be relatively high and supply inelastic.

(2) In the long run, the marginal cost will increase more gently, and an individual and market supply curve will be more elastic.

(3) Generally, the long run supply will be more elastic than the short run supply.

G **Market supply.**

1. Market supply curve.

i) It is a graph showing the quantity that all sellers will supply at every possible price.

2. Properties

i) The market supply curve slopes upward. The higher the price of the output, each individual seller will wish to produce more, the market as a whole will also produce more.

ii) A change in the price of an input will affect an individual seller's marginal cost at all production levels and shift the entire marginal cost curve. Such changes will also shift the market supply curve.

iii) The market supply curve depends on the sellers in existence.
iv) The market seller surplus is the difference between the sellers' total revenue and the sellers' avoidable cost.
v) The effect of a change in the price of an output is represented by a *movement* along the supply curve.
vi) A change in the price of an input will cause a shift in the entire market supply curve.

3. Short and long run.
   i) Freedom of entry and exit is the essential difference between the short run and the long run. In the long run, every business has complete flexibility in deciding on inputs and production.
      (1) Sellers whose total revenue cannot cover total costs will leave the industry until all remaining sellers break even.
      (2) An industry where businesses are profitable (i.e., total revenue exceeds total costs) will attract new entrants. This will increase market supply, reduce market price (push down the profit of all sellers):
         (a) If the existing sellers continue making profits, new entrants will enter the industry;
         (b) Some sellers may leave or enter the market until all sellers just break even.
   ii) In the long run, a change in the market price will have two effects
      (1) Existing sellers will adjust along their individual supply curves;
      (2) Sellers may enter or exit.
   iii) The long-run market supply curve slopes upward more gently (i.e., is more elastic) than the short-run market supply curve.

Chapter 5

Market Equilibrium

A **Introduction**. It is important to consider both demand and supply when predicting the impact of any change on price and quantity.
1 Even though only one side of the market may be changing initially, it is necessary to consider the interaction with the other side to obtain a complete picture.
2 The central concepts are the role of price in communicating information to buyers and sellers, and market equilibrium of demand and supply.
3 Demand-supply framework: core of managerial economics. It can be applied to address managerial decision-making in goods and services, consumer and industrial products, and domestic and international markets.

B **Perfect Competition.**
1 Market demand and supply.
i) When deriving a market demand curve, it is assumed that every buyer can purchase as much as she would like at the going price and all buyers pay the same price.
ii) When deriving a market supply curve, it is assumed that every seller can deliver as much as she would like at the going price and all sellers receive the same price.
2 **Five conditions for perfect competition**. If a market meets the five conditions for perfect competition, we can validly apply demand-supply analysis. A market is said to be in perfect competition if:
i) **Homogeneous product**.
(1) The products are homogeneous (i.e., they are perfect substitutes).
(2) Competition in a market where products are differentiated (e.g., mineral water from different sources, owing to different chemical compositions) is not as keen as that in a market where products are homogeneous (e.g., gold). Generally, prices for differentiated products may differ.
ii) **Many small buyers**.
(1) There are many buyers, each purchasing a quantity that is small relative to the market (e.g., cotton). No buyer can get a lower price than others. All buyers pay the same price and all buyers compete on the same level playing field.
(2) In a market where some buyers have market power (e.g., Roche buying a Chinese herb), buyers pay different prices,
(a) The same buyer may even pay different prices for different units of the same product,

(b) It is not possible to construct the market demand curve – construction of the demand curve requires an assumption that each buyer can buy as much as he or she would like at the market price.

iii) **Many small sellers.**

(1) There are many sellers, each supplying a quantity that is small relative to the market. No seller can get a higher price than others (e.g, dry cleaners). All sellers face the same price and all sellers compete on the same level playing field.

(2) Where some sellers have market power (e.g., cable TV), they receive different prices,

(a) It is not possible to construct a market supply curve – construction of the supply curve requires an assumption that each seller can supply as much as he or she would like at the market price.

iv) **Free entry and exit**.

(1) New buyers and sellers can enter freely, and existing buyers and sellers can exit freely.

(a) There are no technological, regulatory, or legal barriers.

(b) With free entry and exit, the market price cannot stay above a seller's average cost for very long.

(i) If the market price is above a seller's average cost, new sellers will enter, add to the market supply, and bring down the price.

(c) The market is very competitive.

v) **Symmetric information**.

(1) All buyers and all sellers have symmetric information about market conditions (e.g., photocopying services), e.g., prices, available substitutes, and technology.

(2) Markets where there are differences in information among buyers, among sellers (e.g., medical services), or between buyers and sellers (e.g., medical services), are not as competitive as those where all buyers and sellers have equal information.

3 Very few markets exactly satisfy all five conditions for perfect competition. We can still apply the demand – supply analysis but must check the implications against the conditions that are not met.

C **Market Equilibrium.**

1 **Definition**. Market equilibrium is the *price* at which the quantity demanded equals the quantity supplied (a price in which there is neither a surplus nor a shortage).

i) Demand and supply.

(1) The price will not tend to change: the quantity demanded just balances the quantity supplied.

(2) Purchases will not tend to change: buyers maximize benefits less expenditure at the equilibrium quantity.

(3) Sales will not tend to change: sellers maximize profits at the equilibrium quantity.

(4) Neither buyers nor sellers may face rationing or other restrictions. Both the demanded and quantity supplied must be the voluntary choices by buyers and sellers.

ii) When the market is not in equilibrium, the market price will change in a way to restore equilibrium. The *price* signals information and provides incentive for buyers and sellers to converge to equilibrium.

2 **Excess supply**: the amount by which the quantity supplied exceeds the quantity demanded.
   i) If the market price is *above* equilibrium, there will be an excess supply.
   ii) Sellers will compete to clear their extra capacity, buyers will cut back purchases, and the market price would fall back toward the equilibrium level.
   iii) The higher the price above equilibrium, the larger will be the excess supply.

3 **Excess demand** (a shortage): the amount by which the quantity demanded exceeds the quantity supplied.
   i) If the market price is *below* equilibrium, there will be an excess demand.
   ii) Buyers will compete for the limited quantity, sellers will expand production, and the market price would tend to rise to the equilibrium level.
   iii) The lower is the price below equilibrium, the larger will be the excess demand.

D **Supply Shift.**

1 Changes in the cost of inputs (e.g., wages, interest rates) or government policies will shift the demand, supply or both. To understand the impact of a supply shift, it is crucial to consider the interaction between supply and demand.

2 **Equilibrium change**. <u>E.g., a reduction in wages:</u>
   i) Affects sellers' marginal costs whatever the quantity that they supply.
   ii) The entire supply curve of (e.g., tanker service) *shifts down.* Alternatively, the entire supply curve *shifts* to the *right*: at every possible price, sellers want to supply more.
   iii) The demand curve is unchanged.
   iv) A new market equilibrium (price and quantity). Generally, a supply shift will change the equilibrium price *by no more than* the amount of the supply shift.

3 **Price elasticity**. The change in the equilibrium price depends on the price elasticities of both demand and supply.
   i) **Extremely inelastic demand.** When demand is extremely inelastic, buyers are completely insensitive to price (they purchase the same quantity regardless of the price). When the supply curve shifts, buyers continue to purchase exactly the same quantity, and the equilibrium price changes by the *same amount* as the supply shift.
   ii) **Extremely elastic demand**. When demand is extremely elastic, buyers are extremely sensitive to price. When the supply curve shifts, buyers soak up all the additional quantity supplied, and the equilibrium price remains *unchanged*.
      (1) Generally, if demand is more elastic, the change in the equilibrium price resulting from a supply shift will be *smaller***.**
   iii) **Extremely inelastic supply.** When supply is extremely inelastic, sellers are completely insensitive to price (they provide the same quantity regardless of price). When their costs change, the sellers provide the same quantity, and the equilibrium price remains *unchanged*.
   iv) **Extremely elastic supply.** When supply is extremely elastic, the marginal cost of production is essentially constant. If the cost of an input changes, the marginal cost changes by the same amount at all production levels. When the

supply curve shifts, the equilibrium price changes by the *same amount* as the supply shift.

(1) Generally, if supply is more elastic, the change in the equilibrium price resulting from a supply shift will be *larger.*

4 **Impact of supply shift**. There is a common misconception is that if sellers' costs fall by some amount, then the market price will fall by the same amount. Realistically,

i) Demand is somewhat elastic and sensitive to price.
ii) Supply is somewhat elastic and sensitive to price.
iii) Both market quantity and price will change to some degree.

E **Demand Shift.**

1 When there is a demand shift, for a complete understanding of the outcome, it is necessary to consider the supply side as well.

2 **Equilibrium Change**. E.g., an increase in oil shipments:

i) The entire demand curve *shifts* to the *right.*
ii) The supply curve does not change.
iii) A new market equilibrium (price and quantity).

3 **Price elasticity**. The change in the equilibrium price depends on the price elasticities of both demand and supply.

4 **Impact of demand shift**. Realistically,

i) Demand is somewhat elastic and sensitive to price.
ii) Supply is somewhat elastic and sensitive to price.
iii) Both market quantity and price will change to some degree.

F **Adjustment Time.**

1 As the elasticities of demand and supply vary with the time horizon under consideration, shifts in demand and supply may have different short-run and long-run effects.

2 **Short-run market equilibrium**.

i) The short run supply curve of an individual seller is that portion of its short run marginal cost curve that lies above its short run average variable cost curve.
ii) Assuming perfect competition: each seller supplies a quantity that is small relative to the market. It has a small market share and faces an extremely elastic demand.
iii) A seller maximizes profit by operating where its short run marginal cost equals market price.
iv) At the short run market equilibrium price, the short run market demand curve crosses the short run market supply curve.

3 **Long-run market equilibrium**.

i) The long run supply curve of an individual seller is that portion of its long run marginal cost curve that lies above its long run average cost curve.
ii) Assuming perfect competition: each seller supplies a quantity that is small relative to the market. It has a small market share and faces an extremely elastic demand.
iii) A seller maximizes profit by operating where its long run marginal cost equals market price.

iv) At the long run market equilibrium price, the long run market demand curve crosses the long run market supply curve.

4 **Demand increase**. Starting from short and long-run equilibria. Assuming that short and long-run demand curves are the same. E.g., If the demand curve shifts to the right:

i) **New short run equilibrium**.
   (1) Higher market price.
   (2) Every seller expands its operations to the scale where its short run marginal cost equals the new market price.
      (a) If the short run marginal cost curve is steep, the price increase will not lead to a large expansion of operations.
      (b) If the short run marginal cost curve is gentle, the price increase will induce a large expansion of operations.
      (c) The steepness of the short-run marginal cost curve depends on factors like availability of excess production capacity and overtime costs.

ii) **New long run equilibrium**.
   (1) The price in the new long run equilibrium is higher than in the original equilibrium but is lower than in the new short run equilibrium.
   (2) Every seller expands its operations and new sellers enter the market.
      (a) The quantity in the new long run equilibrium is higher than in the new short run equilibrium which in turn is higher than in the original equilibrium.
      (b) The market supply curve tends to be more elastic in the long run (all costs become avoidable, freedom of entry and exit) than in the short run.
      (c) The industry will expand along the long run market supply curve.
      (d) Higher input prices result in higher marginal and average cost curves. Each individual seller just breaks even: No more new entry or exit.

5 **Demand reduction**. E.g., a reduction in demand for tanker service.

i) New short-run equilibrium.
   (1) Lower market price.
   (2) Every seller will cut back its operations to the scale where its short run marginal cost equals the new market price.
      (a) Sellers whose average variable cost exceeds the price will shut down.
      (b) Sellers whose average variable cost is covered by the price will remain in business.
      (c) Extent of cut back in operations depends on two factors:
         (i) The extent of sunk costs. A seller that has many prior commitments will continue to produce so long as the price covers its average variable cost.
            1. In this case, the price reduction will lead to a relatively minor cutback in operations.
            2. Generally, in an industry where production involves substantial sunk costs, the reduction in demand will translate into a relatively large drop in price and a small reduction in quantity.
         (ii) Slope of the seller's short run marginal cost curve.
            1. If the slope is steep, a price reduction will not induce the seller cut back operations by very much.

2. If the slope is gentle, the price reduction will have a relatively larger impact on quantity.

ii) **New long-run equilibrium**.

(1) The price in the long run equilibrium is higher than in the new short run equilibrium but lower than in the original equilibrium.

(2) Smaller number of sellers.

(a) The quantity in the new long run equilibrium is less than in the new short run equilibrium, which in turn is less than in the original equilibrium.

(b) The market supply curve tends to be more elastic in the long run (all costs become avoidable, freedom of entry and exit) than in the short run. Note: For some sellers, the long run price is below their average total cost. They will exit the industry.

(c) Entire industry will shrink along the long run market supply curve.

(d) Each individual seller just breaks even: with average total cost equal to the market price.

6 **Short and Long-Run**.

i) In the long run, supply is more elastic.

(1) In response to shifts in demand:

(a) The market price will be more volatile in the short run than the long run.

(i) If there is an increase in demand, market price will increase more in the short run than in the long run.

(ii) If there is a reduction in demand, market price will fall more in the short run than in the long run.

(iii) Generally, market price overshoots: adjusting relatively more in the short run and then *reversing* toward the initial price in the long run.

(b) Adjustment of production will be concentrated in the long run than the short run.

(i) If there is an increase in demand, production will increase somewhat in the short run and more in the long run.

(ii) If there is a reduction in demand, production will fall somewhat in the short run and more in the long run

(iii) Generally, the long run adjustment in production *amplifies* the short run adjustment.

ii) In the long run, demand is more price elastic (except possibly for durables).

Chapter 6

Economic Efficiency

A **Concept of Economic Efficiency**.
1 Helps managers (in both profit-oriented and non-profit organizations) to identify and exploit opportunities to increase value added and profit.
2 Applies both across the economy and within an organization.
3 Competitive markets allocate scarce resources in an economically efficient way.
4 Market prices communicate information and provide incentives for users and suppliers to maximize the value added from scarce resources.

B **Benchmark.** An allocation of resources is economically efficient if no reallocation of resources can make one person better off without making another person worse off.

1 **Conditions for Economic Efficiency.**
i) Three conditions for economic efficiency. An allocation of resources is economically efficient if:
(1) All users achieve the **same marginal benefit**;
(2) All suppliers operate at the **same marginal cost**; and
(3) Every user's **marginal benefit** = every supplier's **marginal cost**. When marginal benefit is less than marginal cost, society overall could gain by reducing provision of that item, and vice versa.
2 Philosophical basis.
i) **Consumer sovereignty**. The concept of economic efficiency takes individual users' evaluations of their benefit as a given in assessing the efficiency of resource allocation.
ii) Economic efficiency *distinguished from* technical efficiency.
(1) Technical efficiency: the provision of an item at the minimum possible cost; does not imply scarce resources are being well used.
(2) Economic efficiency extends beyond technical efficiency. The quantity of an item supplied must be such that the marginal benefit equals the marginal cost.
3 Internal organization.
i) Bank (businesses: commercial and individual banking) example:
(1) Users: lending units.
(2) Suppliers: deposit-taking units.
ii) Three conditions.
(1) Same marginal benefit. If one lending unit gets more profit than another, the company should switch some funds to the more profitable lending unit. The company's overall profit will be higher.

(2) Same marginal cost. If one deposit-taking unit can produce funds at a lower marginal cost than another, then the company should direct the lower cost deposit-taking unit to produce more and the higher cost deposit-taking unit to produce less. The company's overall profit will be higher.
(3) Marginal benefit = marginal cost. If the marginal benefit of funds to the lending units is less than the marginal cost of production, the company should cut back deposit-taking. The reduction in benefit would be less than the reduction of cost. The company's overall profit will be higher.

C **Adam Smith's "Invisible Hand"**.
1 Competitive market.
i) Perfect competition achieves economic efficiency.
ii) In a competitive market, the market price guides the multitude of buyers and sellers, acting independently and selfishly, to channel scarce resources into economically efficient uses.
iii) The invisible hand is the market price.
2 **Market system/price system**.
i) The market price performs two roles to achieve economic efficiency.
(1) The price communicates necessary information. It tells buyers how much to purchase and tells sellers how much to supply.
(2) The price provides a concrete incentive:
(a) For each buyer to purchase the quantity that balances marginal benefit with the market price: by purchasing this quantity, the buyer achieves the maximum net benefit; and
(b) For each seller to supply the quantity that balances marginal cost with the market price: by supplying this quantity, the seller maximizes its profit.
ii) The term market system or price system is an economic system in which freely moving prices guide the allocation of resources. The role of the invisible hand (prices in a market system) in achieving economic efficiency is the intellectual foundation of the market system.

D **De-centralized Management.**
1 **Internal organization**. Two alternatives:
i) Central planning; or
ii) Decentralized management.
2 A **transfer price** is the price charged for the sale of an item within an organization.
3 **Decentralized management of an internal resource.** Achieving internal economic efficiency (i.e., within an organization), two general rules:
i) **If there is a competitive market for an item, the transfer price should be set equal to the market price**.
(1) The decentralized policy will achieve the 3 conditions of economic efficiency within the same organization.
(2) The organization is establishing an internal market that is integrated with the external market.
ii) **Right of outsourcing**: The purchase of services or supplies from external sources.
(1) Consuming units within the organization should be allowed to *buy* the product from external sources; and

(2) Producing units within the organization should be allowed to sell the product to outside buyers.

4 Example of commercial and individual banking:

i) Users: lending units. Every lending unit maximizes profit and is permitted to buy funds at the market price (up to the point where marginal benefit balances market price) from any supplier, whether internal deposit-taking units or an outside source. Since all lending units face the same market price, their marginal benefits will be equal.

ii) Suppliers: deposit-taking units. Managers of every deposit-taking unit maximize profit and sell funds at the market price (up to the point where marginal cost balances the market price) to either internal lending units or outside buyers. Since all deposit-taking units face the same market price, their marginal costs will be equal.

iii) Since the lending units and the deposit-taking units face the same market price, marginal benefit equals marginal cost.

E **Intermediation.**

1 Need to understand the impact of the costs of retailing, distribution, transportation, brokerage and other forms of intermediation on the market for the final good or service.

2 Definitions:

i) **CF price** ("cost including freight" price): the manufacturer includes the cost of delivery to the buyer, charging a price including freight.

ii) **FOB price** ("free on board" price or "ex-works price"): the manufacturer does not include the cost of delivery to the buyer, leaving the customer to pay the freight.

3 Graphical representation:

i) A switch from CF to FOB pricing (paid by buyer). Represented by
(1) Shifting the supply curve *down* by the cost of the freight.
(2) Shifting the demand curve *down* by the cost of freight.

ii) Note: final equilibrium "total" price and quantity (sales) are the same under CF and FOB pricing.

F **Incidence**.

1 **Definition**. Incidence for a buyer or seller: The change in the price for a buyer or seller resulting from a *shift* in demand or supply.

2 The incidence of freight charges, retailing and distribution costs, brokerage fees, and government taxes depends not on who pays the charge/fee, only on the **price elasticities of demand and supply**.

i) However, behavior biases due to sunk costs, status quo, and anchoring may affect the incidence of receipts or payments. E.g., consumer may anchor on free shipping (as opposed to price of the product) and demand for vendors that offer free shipping (as opposed to vendors that charge separately for shipping) would be higher.

G **Taxes**. Some taxes are levied on buyers, others on sellers, and some are levied on both.

1 **Buyer's vis-à-vis seller's price**.

i) Buyer's price = price that the buyer pays.
ii) Seller's price = price that the seller receives.
iii) The seller's price = the buyer's price – the amount of the tax.

2 Apply demand-supply framework.
   i) Graphically: the tax can be represented as follows:
      (1) From the buyer's point of view, shifting the supply curve vertically up by the amount of the tax;
      (2) From the seller's point of view, shifting the demand curve vertically down by the amount of the tax; or
      (3) Shifting neither demand nor supply, but show the tax as a wedge between the demand and supply curves.
   ii) As a result of the tax, there will be a new equilibrium. The price is *higher* and the quantity is *smaller*.

3 **Tax incidence**.
   i) Aside from administrative and psychological differences, the effect of a tax will be the **same**, whether it is collected from the buyers or the sellers.
   ii) Incidence only depends on the **price elasticities of demand and supply.** Generally, the buyers and sellers share the tax according to their relative **price elasticities**. The side of the market that is relatively less sensitive to price changes will bear the relatively larger portion of the tax.

Chapter 7

Costs

A **Introduction.**

1 **Framework for understanding costs**. Within a single period of production, costs are:

i) Sunk (committed and cannot be avoided); or

ii) Avoidable.

(1) Includes opportunity costs.

(a) Not reported in accounting statements but are relevant to management decisions.

(b) Must be forgone to continue with the current course of action.

(2) Classifications.

(a) Fixed vis a vis variable costs, depending on the technology of production.

(i) Fixed costs.

1. Do not vary with the scale of production.
2. An essential reason for economies of scale.

(ii) Variable costs.

1. Vary with the scale of production.

(b) Joint vis a vis not joint costs.

(i) Joint costs.

1. Do not vary with the number of products.
2. An essential reason for economies of scope.

2 Cost of production may fall with cumulative production according to an experience curve.

3 Managers (profit, non-profit, government) need to understand costs from more than a pure accounting perspective to make more effective decisions in investment, performance evaluation, outsourcing, and pricing.

B **Opportunity Cost**.

1 **Alternative courses of action**. A proper evaluation of performance should consider the alternatives uses of investment funds.

i) Accounting statements do <u>not</u> always provide the appropriate information for effective business decisions. Conventional cost accounting:

(1) Focuses on the cash outlays of the course of action (more easily verifiable) that management has adopted. Ignores costs that are relevant but do not involve cash outlays.

(2) Does <u>not</u> present the revenues and costs from alternative courses of action.

2 **Identifying opportunity cost**.

i) **Definition**. The opportunity cost of the current course of action is what must be forgone from the best alternative course of action.

ii) Two ways of dealing with opportunity costs to arrive at the correct decision:
(1) Explicit approach. Explicitly present the revenues and costs of alternative courses of action; or
(2) The opportunity cost approach. Includes the opportunity costs among the costs of the business and compute the economic profit.
(3) When there is more than one alternative, the explicit approach still works well, but the opportunity cost approach becomes more complicated:
(a) First identify the best of the alternatives; and
(b) Then charge the profit contribution from that alternative as the opportunity cost of the current course of action.

3 **Opportunity cost of capital**.
i) A complete measure of business performance should take into account the opportunity cost of equity capital: that rate of return on equity should at least match the return from other investments with the same risk profile.
ii) Conventional accounting requires the expensing of interest payments but does not require the expensing of expected dividends.
(1) A business partly financed by debt will appear "less profitable" than an otherwise identical business financed completely by equity.
(2) Businesses that evaluate performance in terms of accounting profit will tend to be biased in favor of capital intensive activities.
iii) Stern Stewart's **"**Economic value added**"** = the net operating profit after tax subject to adjustments for accounting conventions less a charge for the cost of capital.
(1) This is a better measurement of business performance than accounting earnings.
(2) Businesses that evaluate performance in terms of "economic value added" are less likely to be biased in favor of capital intensive activities.
(3) It considers only the seller's revenue and ignores the buyer's surplus; a more precise name would be "business value added".
iv) Note: **true** economic value added = the difference between buyer's benefit and seller's cost (including the opportunity cost of capital).

C **Transfer Pricing**.
1 **Definition**. A transfer price is the price for the sale of an item within an organization.
2 **Profit-maximizing transfer price for the entire organization**.
i) To maximize the overall profit, produce at the rate where the downstream division's (e.g., marketing division) marginal benefit equals the upstream selling division's marginal cost (e.g., manufacturing division).
ii) **Generally**, *profit maximizing transfer price of an internally produced input = its marginal cost* (which is the change in total cost due to the production of an additional unit).
iii) **Two special cases.**
(1) **Perfectly competitive market** for the input.
(a) *Profit maximizing transfer price = the market price*.
(i) In a perfectly competitive market, a profit maximizing business would produce the input at a rate where its marginal cost equals the market price.

(ii) Hence, the transfer price set at the market price will also be the *marginal cost*.

(2) The upstream division that supplies the input is operating at **full capacity**.

(a) Marginal cost curve is vertical and marginal cost is not well defined.

(b) Set transfer price = *the opportunity cost of the input*, which is the *marginal benefit* that input provides to the current internal user (marketing division), which is the reduction in profit for the marketing division in the event of a reallocation of the unit to an alternative user (external customer).

(i) In this way, the alternative user (external customer) will only buy the unit if its benefit exceeds the transfer price, and hence only if its benefit exceeds the current user's (marketing division's) benefit.

(ii) Accordingly, this rule will maximize the profit for the entire organization.

D **Sunk Cost**.

1 **Alternative courses of action**.

i) Conventional accounting statements present some costs which are not relevant to effective business decisions and hence should be ignored. Conventional cost accounting:

(1) Focuses on the cash outlays of the course of action (more easily verifiable) that management has adopted

(a) These methods report all costs that involve cash outlays, even sunk costs which are not relevant and should be ignored.

2 **Identifying sunk cost**.

i) **Definition**. A sunk cost is a cost that has been committed and cannot be avoided once incurred. Since sunk costs cannot be avoided, they are not relevant to business decisions and managers should ignore them.

ii) To arrive at the correct decision:

(1) Explicit approach. Explicitly consider the alternative courses of action; or

(2) The sunk cost approach. Use a single income statement that omits all sunk costs and includes only avoidable costs (rather than cash outlays).

(3) When there is more than one alternative, the explicit approach still works well, but the sunk cost approach becomes more complicated:

(a) What is sunk depends on the alternative at hand.

3 **Commitments and planning horizon**.

i) Classification of costs.

ii) The division of costs into sunk and avoidable depends on past commitments and planning horizon.

(1) Commitments.

(a) If the contract provides for a 6 months' notice of termination, from the current standpoint, the expenditure is sunk for a 6-month planning horizon but not beyond.

(b) If the contract provides for a 3 months' notice of termination, from the current standpoint, the expenditure is sunk for only the next 3 months. For planning beyond the 3rd month, the expense is avoidable.

(2) The longer the planning horizon, the more time there will be for past commitments to unwind and greater the freedom of action.

(a) The short run is a time horizon in which at least one input cannot be adjusted. In the short run, there will be some sunk costs,
(b) The long run is a time horizon long enough that all inputs can be freely adjusted. In the long run, there will be no sunk costs.

iii) The division of avoidable costs into fixed and variable elements depends on the technology of the business.

4 **Strategic implications**.

i) Managers should ignore sunk costs, and consider only avoidable costs.
(1) Sunk costs, once incurred, are not relevant for investment, pricing, or any other business decision.

ii) Substantial sunk costs (relatively low avoidable costs):
(1) **Participation**: the break-even revenue would be relatively low. The business should continue in operation even with relatively low revenues, provided that the revenues cover the avoidable costs.
(2) **Extent** (how much to produce, at what scale to operate): marginal costs would be relatively low. The business should price relatively low and aim to serve larger demand.

iii) Managers should be careful about committing costs that will become sunk, since such commitments cannot be reversed.

E **Economies of Scale.**

1 For effective business decisions, managers must identify all relevant costs and appreciate how costs vary with **scale** (scale of production/production scale/production rate) and **scope** (scope of production/variety of different products), and **experience**.

2 Costs depend on scale.

i) **Fixed and variable costs in the long run**.
(1) By distinguishing between fixed and variable costs, management can understand which cost elements will be affected by changes in scale.
(2) Fixed cost: cost of inputs that do not change with scale. This supports the production of multiple units of output. E.g., first copy cost of the newspaper industry.
(3) Variable cost: cost of inputs that change with scale.
(4) The distinction between fixed and variable costs applies in the short and long run.
(5) Note: some costs are partly fixed and partly variable.

ii) **Marginal and average costs**.
(1) Average cost (unit cost): total cost divided by scale; equals to the sum of average fixed cost and average variable cost.
(a) Average fixed cost = fixed cost divided by scale.
(2) Marginal cost: change in total cost due to the production of an additional unit; equals the rate of change of the variable cost.

3 **Economies of scale/increasing returns to scale**.

i) **Definition:** The situation where the average cost *decreases* with the scale of production. With economies of scale, marginal cost will be lower than the average cost. Since the marginal unit of production costs less than the average, any increase in production will reduce the average. So the average cost curve slopes downward.

ii) **Intuitive factors**. Scale economies arise from two possible sources.
  (1) **Substantial fixed inputs** – those that can support any scale of production.
    (a) At a larger scale, the cost of fixed inputs will be spread over more units, so that the average fixed cost will be lower. If the average variable cost is constant or does not increase much with scale, the average cost will fall with scale.
    (b) Any business with a strong element of composition, design, or invention has substantial fixed inputs. E.g., newspaper production, cost of developing a new pharmaceutical, cost of preparing a software code.
  (2) **Average variable costs that fall with scale** (e.g., pipeline).
    (a) Generally, an increase in scale may increase or reduce the average variable cost. Whether the average variable cost increases or falls with scale depends on the particular technology of the business. The average variable cost decreases with scale in the physical storage and transport industries.
      (i) E.g., if a 10% increase in the capacity of a gas pipeline requires less than 10% additional materials, the average variable cost falls with the scale of service.

iii) **Strategic implications.**
  (1) Large scale operators achieve a lower average cost than smaller-scale competitors.
    (a) Mass marketing, relatively low pricing.
  (2) Concentrated industries. With a few producers serving the entire market, e.g., broadband service (via a network, wired or wireless). Extreme case: a monopoly (one producer).
  (3) Large scale production: mass marketing and relatively low pricing.

4 **Diseconomies of scale/decreasing returns to scale**.

i) **Definition**: The situation where the average cost *increases* with the scale of production.

ii) **Intuitive factors**. E.g., a hairdressing salon
  (1) **Non-substantial fixed cost; and**
  (2) **Variable cost rises more than proportionately with scale**.
    (a) Initially, the average cost decreases with scale because of the decreasing average fixed cost.
    (b) The variable cost rises more than proportionately with scale. The main variable cost is labor. To the extent additional workers are less productive, the cost of labor rises more than proportionately with scale. The average variable cost is increasing.
    (c) There is a scale where the decreasing average fixed cost is outweighed by the increasing average variable cost.
    (d) Then average cost reaches a minimum and rises with further increases in scale. The average cost curve is U-shaped.

iii) **Strategic implications.**
  (1) Small scale.
    (a) Niche marketing and relatively high pricing.
  (2) Fragmented industries. Extreme case: perfect competition (many producers, none of whom can influence market demand).

(3) Niche marketing, relatively high pricing.

5 **Sunk and fixed costs**.

i) **Fixed cost**: cost of inputs that do not change with the production rate, tends to give rise to economies of scale, and so management should aim to operate on a large scale.

ii) **Sunk cost**: a cost that cannot be avoided once incurred. Managers should ignore sunk cost as they cannot be avoided.

iii) Some fixed costs become sunk once incurred, e.g., *design* cost for the shoes.
(1) The design can support any number of shoes.
(2) Once committed, the cost cannot be avoided.

iv) Not all fixed costs become sunk, e.g., license fee to provide telecommunications service. If the license is transferrable, the fee need not be sunk. Only the part of the fee that cannot be recovered from resale is sunk.

v) Sunk costs are not fixed (in the sense of supporting any scale of operations), e.g., cost for making the shoe molds. More molds may be required as production increases.

F **Economies of Scope.**

1 The determination of the scope of a business depends in part on the relation between cost and the scope of production.

2 Costs depend on the scope of production**.**

i) Joint cost: the cost of inputs that does not change with the scope of production. The joint cost supports the production of multiple products (e.g., the expense of the printing press is a joint cost of the morning and afternoon newspapers).

3 **Economies of scope**.

i) **Definition**: There are economies of scope across two products if the total cost of production is lower when two products are produced together than when they are produced separately.

ii) **Intuitive factors**.
(1) Economies of scope arise wherever there are significant joint costs.

iii) **Strategic implications.**
(1) A supplier of two products linked by economies of scope achieves a relatively lower cost than competitors that specialize in one or the other product. Subject to market demand and competition, management should offer both products. E.g., broadband service and cable TV.
(2) Multiproduct suppliers dominate industries with economies of scope.
(3) **Brand extension**.
(a) Economies of scope in advertising and promotion are essential for brand extension in marketing.
(i) The expenditure on advertising a brand is a joint cost of marketing all the products marked with the brand.
(ii) This joint cost gives rise to economies of scope in advertising and promotion.
(b) Though a brand extension, the owner of an established brand (e.g., Sony) can introduce new products at relatively lower cost than a competitor with no established brand.
(4) **Core competence**.

(a) A core competence is a generalized expertise in the design, production, and marketing of products based on common or closely related technologies. E.g., a manufacturer with a core competence in small liquid crystal displays.
(i) A core competence is a joint cost that gives rise to economies of scope.
(b) The manufacturer with a core competence in small liquid crystal displays can apply this to produce digital watches and mobile phone displays. It can produce these items at a relatively lower cost than a specialized competitor.

4 **Diseconomies of Scope**.

i) **Definition**: There are diseconomies of scope across two products if the total cost of production is higher when two products are produced together than when they are produced separately.

ii) **Intuitive factors**.

(1) Diseconomies of scope arise where joint costs are not significant and making one product increases the cost of making the other in the same facility.

iii) **Strategic implications.**

(1) It will be relatively cheaper to produce the various items separately. Specialized producers can achieve relatively lower costs than competitors that combine production. Management should aim for a narrow scope and focus on one product.

G **Experience Curve**.

1 Costs of production vary with scale and scope within any time period.

2 Costs of production may also vary with experience over time.

3 **Experience curve.**

i) **Definition**. Typically, experience is measured by accumulated production over time. The experience curve (also called the learning curve) shows how the unit (average) cost of production falls with cumulative production over time.

(1) The **learning percentage** determines the rate at which the unit cost falls with cumulative production.

(a) The lower the learning percentage, the higher the rate of cost reduction from doubling cumulative output.

(b) The learning percentage depends on the particular technology and process of manufacturing, and so varies with product and industry.

ii) **Intuitive factors**.

(1) Accumulated experience matters in industries characterized by relatively short production runs and a relatively substantial input of human resources, e.g., aerospace manufacturing, shipbuilding.

(2) As engineers gain experience, they become more proficient individually and as teams. They devise new ways to reduce cost and defects, develop better tools and faster processes.

(3) Accordingly, unit (average) cost falls with accumulated experience.

iii) **Strategic implications**.

(1) In any industry where production costs are subject to a substantial experience curve relative to cumulative sales, accurate forecasting of cumulative production would be crucial for both planning investments and setting prices.

(a) Challenges: sales and cumulative production depend on pricing and competitor's strategies.

(2) The experience curve can justify a strategy of competing for market share.

(a) Cut price to increase sales and gain more cumulative production. The business that gets ahead in cumulative production can then outcompete competitors on costs.

4 The experience curve is **distinct** from economies of scale.

i) The experience curve relates cumulative production over *preceding* periods to production costs in one period.

ii) Economies of scale relate the scale of production within one period to production costs in the *same* period.

H **Bounded Rationality in Costing Decisions.** Mangers, like consumers, are subject to bounded rationality in decision making.

1 Sunk cost fallacy.

i) The human tendency to rationalize costs that are already sunk by increasing usage/consumption or additional expenditures results in ***over*** investment. E.g., case of the Concorde.

2 Status quo bias.

i) Opportunity costs: the status quo bias reinforces any systematic failure to account for opportunity costs, resulting in an even stronger bias toward continuing with the status quo, rather than taking an alternative course of action which might be more profitable.

3 Fixed cost fallacy. Related to sunk cost fallacy, but resulting in the opposite outcome.

i) The tendency to treat fixed costs as variable: the mistake is to set a target production rate and allocate the fixed cost to each unit of production. The allocation increases the perceived variable cost and results in ***under*** production relative to the profit-maximizing level.

Chapter 8

Monopoly

A **Introduction**.
1 **Market power**: The ability of a buyer or seller to **influence market conditions**.
i) A seller with market power can influence market demand, in particular, the price and quantity demanded.
ii) A buyer with market power can influence market supply, in particular, the price and quantity supplied.
2 Business can use their market power to increase revenue, reduce cost and so increase economic profit.
3 **Monopoly**: the only one seller in the market.
4 **Monopsony**: the only one buyer in the market.

B **Sources of Market Power**.
1 **Sources of market power**.
i) **Barriers to competition**. Competitors must be deterred or prevented from entering the market to compete for the business.
ii) **Elasticity of demand or supply**. Seller with market power can reduce the price elasticity of demand, raise prices and increase profit.
2 Sellers can create barriers to competition and reduce the price elasticity of demand in four ways:
i) **Product differentiation.** To the extent that differentiation appeals to buyers it would increase demand and reduce price elasticity of demand.
(1) Design (appearance, form and feel): an appealing design can transform utilitarian products into distinctive offerings.
(2) Function.
(3) Distribution channels.
(a) Luxury products: exclusive distribution to build brand image and demand.
(b) Mass consumer goods: intensive distribution to provide wide and timely availability.
(4) Advertising and promotion introduce the buyers to products and communicate the brand image; and can be used to influence and sustain buyers' preferences.
ii) **Intellectual property (IP).** Product differentiation builds, in part, on innovation. Innovators may able to exclude competitors by establishing IP over their innovators.
(1) Patent: gives the owner exclusive right to an invention for a specified period of time. E.g., Pfizer's patent over Lipitor.
(2) Copyright: exclusivity over published expressions for a specified period of time. E.g., Microsoft's copyright over Windows.

(3) Trademarks: exclusivity over words or symbols associated with a good or service; the basis for branding, advertising, and promotion. E.g., Pfizer's Lipitor trademark.
(4) Trade secrecy: exclusivity over information that is not generally known and provides commercial advantage; broader in scope than patents – extends to customer lists and technical information. E.g., Google's algorithms.

iii) **Economies of scale, scope, and experience**. By establishing a sufficient cost advantage and through strategic management of costs, an incumbent producer may be able to deter entry by potential competitors.
(1) Economies of scale. A producer that produces on a larger scale has a cost advantage over smaller scale competitors. E.g., cable network (large fixed costs and relatively low variable costs).
(2) Economies of scope. A combined provider of multiple products can achieve lower costs/gain a cost advantage over specialized competitors. E.g., the broadband and cable TV industries (both depend on a network of cables) tend to be dominated by a few providers, each providing both services.
(3) Economies of experience. A producer that accumulates larger production can gain a cost advantage over competitors with less experience.

iv) **Regulation.** The government may limit competition by law and in the extreme, allow only a single producer.
(1) Economic reason: the presence of large fixed costs in production. E.g., the government may award exclusive franchises (intended to avoid duplication of the fixed costs of the distribution network) in the distribution of electricity, natural gas, and water.
(2) Social policy or profit maximization: major sports, mass media, alcohol, tobacco, gambling.
(3) In advanced economies: indirectly restrict competition through trade policy against imports or through health or environmental policy.

C **Profit Maximum**.

1 **Extent: Scale of production and price**. A monopoly (unlike a perfectly competitive seller) has to consider how its sales will affect the market price.

i) Given a downward sloping market demand curve, a monopoly can either:
(1) Decide how much to sell and let the market determine the price at which it is willing to buy that quantity; **<u>or</u>**
(2) Set the price and let the market determine how much it will buy.
A monopoly can set either **sales or price**, but not both. Otherwise, there may be inconsistency (a combination of sales and price off the demand curve).

2 **Profit-maximizing sales**.

i) **Revenue**. Consider the relationship among price, sales, and revenue.
(1) For simplicity: scale of production and sales are equivalent (by ignoring inventories, hence production = sales).
(2) Total revenue = price x sales.
(3) To sell additional units, the price must be reduced. When increasing sales by one unit, the monopoly:
(a) Gains revenue from selling the additional or marginal unit; but
(b) Loses revenue on the inframarginal units.

(c) **Inframarginal units** are those units sold other than the marginal unit. The monopoly would have sold the Inframarginal units without reducing the price.

(4) Marginal revenue = change in total revenue arising from selling an additional unit.

(a) In general, the marginal revenue from selling an additional unit will be less than the price of that unit. It is the price of the marginal unit minus the loss of revenue on the inframarginal units.

(i) The difference between price and marginal revenue depends on the elasticity of demand.

(ii) If demand is very *elastic*, the seller need not reduce the price very much to increase sales, the marginal revenue will *be close to* price.

(iii) If demand is very *inelastic*, the seller must reduce the price substantially to increase sales, the marginal revenue will be *much lower* than price.

(b) Marginal revenue could be negative: if the loss of revenue on the inframarginal units exceeds the gain on the marginal unit.

ii) **Costs**. The other side to profit is cost.

(1) Total cost increases with the scale of production.

(2) Marginal cost = change in total cost due to the production of an additional unit.

(a) The change in total cost arises from change in the variable cost.

iii) **Profit-maximizing scale**.

(1) Profit = total revenue – total (fixed and variable) cost.

(2) Profit-maximizing scale of operation (and profit-maximizing price) is where:

(a) Marginal revenue balances marginal cost; or

(b) The sale of an additional unit will result in no change to the **contribution margin**.

(i) Contribution margin is the total revenue less variable cost.

(ii) Change in contribution margin for an additional unit sold = marginal revenue – marginal cost.

3 **Participation**: participate if the total revenue covers total cost – with both revenue and cost calculated at the profit-maximizing scale.

4 **Economic inefficiency.** Where marginal benefit exceeds marginal cost (meaning some buyers are willing to pay more than the marginal cost of the item but cannot get it), a profit can be made through resolving the inefficiency.

5 A seller should *simultaneously* maximize on price, advertising, and other influences on demand.

D **Changes in demand and cost**. The monopoly should adjust sales until marginal revenue equals marginal cost.

1 **Demand change**. Suppose that demand increases:

i) From the new demand curve, calculate the new marginal revenue curve. The new marginal revenue curve lies further to the right.

ii) The original marginal cost curve does not change.

iii) The new marginal revenue curve and the original marginal cost curve cross at a *larger* scale.

iv) The new profit-maximizing price is *higher*.

2 **Marginal cost change**. Suppose that marginal cost decreases:
   i) The original marginal revenue curve and the new marginal cost curves cross at a *larger* scale.
   ii) The new profit-maximizing price is *lower.* The cut in price is less than the fall in marginal cost.
3 **Fixed cost change**.
   i) So long as fixed cost is not too large, changes in fixed cost do not affect marginal cost, and will not affect the profit maximizing price and scale.
   ii) However, if the fixed cost is so large that total cost exceeds total revenue, then the monopoly should shut down.
   iii) Fixed costs only matter for the break-even decision (whether to be in business at all).
   iv) Note: knowledge-intensive industries like media and publishing, pharmaceuticals, software characterized by relatively high fixed costs and low variable costs.

E **Advertising.**
1 A seller with market power and can influence market demand (changes in demand and/or elasticity of demand) through promotion. **Promotion** is the set of marketing activities that a business undertakes to communicate with its customers and sell its products: comprises advertising and public relations.
   i) **Advertising** can influence market demand by:
      (1) Shifting out the demand curve; and
      (2) Causing demand to be less price elastic.
2 **Benefit of advertising**.
   i) Increase in sales will affect total revenue and variable cost and the contribution margin.
3 **Profit-maximizing level of advertising expenditure**. Advertise up to:
   i) The level that the marginal benefit = the marginal cost, i.e., where the increase in contribution margin = the additional advertising expenditure; or
   ii) The level that the **Advertising-sales ratio** = the **incremental margin percentage** multiplied by the **advertising elasticity of demand**.
      (1) **Advertising-sales ratio = the** ratio of the advertising expenditure to sales revenue.
      (2) The **incremental margin** =
         (a) Price less marginal cost; or
         (b) The increase in the contribution margin (and profit) from selling an additional unit, holding the price constant.
      (3) The **incremental marginal percentage** = the ratio of the incremental margin (price less marginal cost) to the price.
      (4) The **advertising elasticity of demand** = the percentage by which demand will change if the seller's advertising expenditure rises by 1%, other things equal.
4 A seller should *spend more* on advertising if:
   i) The incremental margin percentage is *higher*, as each dollar of advertising produces relatively more benefit as measured by the incremental margin percentage. This means that, whenever a seller raises its price or its marginal cost falls, it should also increase advertising expenditure; or

ii) Either the advertising elasticity of demand or the sales revenue is *higher*, as the influence of advertising on buyer demand is relatively greater.

F **Research and Development**.

1 A seller with market power and can influence market demand (changes in demand and/or elasticity of demand) through R&D.

i) R&D can:

(1) Shift out the demand curve; and

(2) Cause demand to be less price elastic

ii) Generally, R&D in knowledge-intensive industries drives new products and refreshes existing products.

2 **Benefit of R&D**.

i) Increase in sales will affect total revenue and variable cost and the contribution margin.

ii) Net benefit from R&D = change in contribution margin less the R&D expenditure.

3 **Profit-maximizing level of R&D expenditure**.

i) **R&D-sales ratio** = the **incremental margin percentage** multiplied by the **R&D elasticity of demand.**

(1) **R&D-sales ratio** = the ratio of the R&D expenditure to sales revenue.

(2) The **R&D elasticity of demand** = the percentage by which demand will change if the seller's R&D expenditure rises by 1%, other things equal. This elasticity depends on two factors:

(a) The effectiveness of R&D in generating new products and enhancing existing product,

(b) The effect of new and enhanced products on demand.

4 A seller should *increase* R&D expenditure relative to sales revenue if:

i) The incremental margin percentage is *higher* (higher price or lower marginal cost); or

ii) Either the R&D elasticity of demand or the sales revenue is *higher*.

G **Market Structure**. Production and price depend on the competitive structure of the market.

1 **Effects of competition.** Perfect competition (a market with numerous sellers, each too small to affect market conditions) vis a vis monopoly**.**

i) Market price.

(1) A monopoly restricts production below the competitive level to raise price above competitive level, and so, extract a relatively higher margin and larger profit.

(2) Competition drives the market price down toward the long run average cost and results in more production.

ii) The profit of a monopoly exceeds what would be the combined profit of all the sellers if the same market were perfectly competitive.

2 **Potential competition**.

i) A monopoly in a perfectly contestable market cannot raise its price substantially above its long run average cost. Other sellers can profit by entering the market – they will quickly enter to compete for a share of the market. The resulting increase in supply will drive the market price back toward the long run average cost.

(1) A **perfectly contestable market** is one where sellers can enter and exit at no cost.
(2) So, even potential competition would be sufficient to keep the market price close to the long run average cost.

ii) The degree to which a market is contestable depends on the extent of barriers to enter and barriers to exit (e.g., liquidation costs, which will be considered by potential competitors when they decide whether to enter the market for temporary profits in the first place).

3 **Measuring market power: the incremental margin percentage**.

i) It measures the degree of actual and potential competition in a market.

ii) It enables comparison of market power in markets with different prices and different currencies.

(1) Perfectly competitive market. Every seller produces at a scale where market price equals marginal cost, hence the incremental margin percentage = 0.
(2) With potential competition: if a monopoly sets a price close to its marginal cost, the incremental margin percentage will be relatively low.
(3) A seller with market power restricts sales to raise its price above its marginal cost. The more inelastic is market demand, the more a seller can raise its price above its marginal cost.

H **Monopsony: A Single Buyer.**

1 **Benefit and expenditure**.

i) Assumption: Maximization of net benefit of an input.

ii) Net benefit = benefit less expenditure.

iii) Suppose the marginal benefit of a small quantity is very high and falls with the scale of purchases.

iv) The supply curve represents the monopsony's average expenditure for every possible quantity of purchases.

(1) Since the price must be higher to induce a greater quantity of supply, the average expenditure curve slopes *upward*.

v) **Marginal expenditure** is the change in expenditure resulting from an increase in purchases by one unit.

(1) For the average expenditure curve to slope upward, the marginal expenditure curve must lie above the average expenditure curve and slope *upward* more *steeply*.

2 **Maximizing net benefit**.

i) A buyer with market power will maximize its net benefit by purchasing at the scale such that its **marginal benefit equals marginal expenditure**.

ii) A monopsony restricts purchases (demand) to get a lower price and increases its net benefit above the competitive level.

Chapter 9

Pricing Policy

A **Introduction**. This chapter systematically ties threads from previous chapters on demand, elasticity, costs, and monopoly to analyze how a seller with market power should set prices to maximize profit.

B **Uniform Pricing**.

1 **Definition**. Uniform pricing is a policy where the seller charges the same price for every unit of the product.

2 **Price elasticity**. Generally, if demand is inelastic, an increase in price will lead to a higher profit. A seller that faces an inelastic demand should raise the price.

3 **Profit-maximizing price.**

4 In the price elastic range, what price maximizes the seller's profit?

i) The rule of marginal revenue equals the marginal cost; or

ii) Equivalently, the **incremental margin percentage rule**: a price such that the incremental margin percentage (i.e., price less marginal cost divided by the price) equals the reciprocal of the absolute value of the price elasticity of demand.

(1) Determining the profit-maximizing price typically involves a series of trials with different prices as:

(a) price elasticity may vary along a demand curve; and

(b) marginal cost may change with scale of production.

5 Price adjustments following **demand and cost changes**.

i) The price adjustment following a change in price elasticity or marginal cost depends on both the price elasticity and marginal cost.

ii) Changes in price elasticity.

(1) If demand is *more elastic* (price elasticity will be a larger negative number), the seller should aim for a *lower* incremental margin percentage.

(2) If demand is *less elastic*, the seller should aim for a *higher* incremental margin percentage.

iii) Changes in seller's marginal cost.

(1) The seller must consider the effect of the price change on the quantity demanded.

(2) A seller should not necessarily adjust the price by the same amount as the change in the marginal cost.

6 **Common misconceptions**.

i) Cost-plus pricing (i.e., setting price by marking up average cost) is problematic.

(1) In businesses with economies of scale, average cost depends on scale. To apply cost-plus pricing, the seller must make an assumption about the scale.

But sales and production scale depend on price. Cost-plus pricing leads to circular reasoning.

(2) Cost plus pricing gives no guidance as to the appropriate mark-up on average cost.

ii) A common mistake is the belief that the profit-maximizing price depends only on the price elasticity. This approach considers only the demand and ignores costs. To maximize profits, however, management should take into account both price elasticity and marginal costs.

iii) Increasing capacity utilization may lead to lower profit: to achieve 100% utilization requires increasing sales. With uniform pricing, that means cutting price and losing revenue on the inframarginal buyers.

C **Complete Price discrimination**.

1 **Shortcomings of uniform pricing**. Uniform pricing does not yield the maximum possible profit.

i) It does not extract the entire buyer surplus: the inframarginal buyers do not pay as much as they would be willing to pay. By taking some of the buyer surplus, a seller could increase profit.

ii) It does not provide the economically efficient quantity. By providing the service to everyone whose marginal benefit exceeds the marginal cost, a seller could also earn more profit.

2 **Price discrimination/price differentiation.** This is a pricing policy under which a seller sets prices to earn different incremental margins on various units of the same or a similar product.

3 **Complete price discrimination** is the policy whereby the seller prices each unit at the buyer's benefit and sells a quantity such that the marginal benefit equals the marginal cost. "Complete" as it charges every buyer the maximum they are willing for pay for each unit. Hence, the policy leaves each buyer with no surplus. A seller earns a higher profit with complete price discrimination than with uniform pricing. It resolves the two shortcomings of uniform pricing:

i) By pricing each unit at the buyer's benefit, the policy extracts all the buyer surplus.

ii) The policy provides the **economically efficient** quantity; hence, it exploits all opportunity for additional profit through increasing sales.

4 **Economic efficiency.** Maximizing profit is aligned with the social goal of economic efficiency: allocating resources so that no person can be better off without making another person worse off. By charging more to customers who are willing to pay more, a non-profit or government organization can use the additional revenue to provide service to more (poorer) customers.

5 **Information and resale**. To implement complete price discrimination:

i) The seller must know each potential buyer's entire individual demand curve. It is not enough to know the price elasticities of the individual demand curve.

ii) The seller must be able to prevent customers from buying at a low price and reselling to others at a higher price.

(1) Hence, complete price discrimination is more widespread in services (especially personal services) than goods.

D **Direct Segment Discrimination.**

1 **Introduction**. If a seller does not know the entire individual demand curve of each potential buyer and cannot price on an individual basis, the seller may still be able to discriminate among segments of buyers.

2 **Direct Segment Discrimination** is the policy of pricing to earn different incremental margins from each identifiable segment (e.g., adults vis a vis seniors). A **segment** is a significant, cohesive group of buyers within a larger market.

3 **Homogeneous segments**.
   i) If the buyers within each segment are homogeneous, direct segment discrimination will achieve complete price discrimination.
   ii) For each segment, the *profit-maximizing price* is the buyers' willingness to pay (which is also their benefit from the item).

4 **Heterogeneous segments**.
   i) If the buyers within each segment are heterogeneous and:
      (1) The seller lacks sufficient information to identify sub-segments; or
      (2) The seller cannot prevent resale within the sub-segments, direct segment discrimination will not achieve complete price discrimination. There are two alternatives for pricing within each segment:
         (a) Apply **uniform pricing** within each segment.
            (i) *Profit maximizing prices*: Set prices so that the incremental margin percentage of each segment equals the reciprocal of the absolute value of that segment's price elasticity of demand.
         (b) Apply **indirect segment discrimination** within each segment.

5 **Implementation**.
   i) The seller must identify and be able to use some identifiable and **fixed** (otherwise the buyer might switch segments to take advantage of a lower price) buyer characteristic that divides the market into segments with different demand curves (e.g., age, gender, location…etc).
   ii) The seller must be able to prevent resale. Generally, resale of services is more difficult than resale of goods, hence it is easier to implement price discrimination in services than goods.
   iii) Generally, prices should be set to derive a relatively *lower* incremental margin percentage from the segment with the more elastic demand and a relatively *higher* incremental margin percentage from the segment with the less elastic demand.

E **Discrimination by Location**. To the extent that a product is costly to transport and the seller can identify a buyer's location, a seller can discriminate on the basis of a buyer's location:

1 **FOB pricing: set a common price to all buyers that does not include delivery**.
   i) A free on board price (FOB or ex-works price) does not include the cost of delivery to the buyer.
   ii) Each buyer pays the FOB price plus the cost of delivery to its respective location.
   iii) FOB pricing ignores the differences between the price elasticities of demand in various markets.
   iv) The differences among prices at various locations are exactly the differences in the costs of delivery to those locations.

2 **CF pricing**: **set prices that include delivery**.

i) A cost including freight price (CF price) includes the cost of delivery to the buyer.
ii) The seller can implement direct segment discrimination across the markets (with uniform pricing in each market), aim for different incremental margin percentages (= the reciprocal of the absolute value of the price elasticity of demand) in the markets (e.g., domestic vis a vis Japan), and obtain higher profit.
   (1) If the Japanese demand is *more elastic* than domestic demand, the seller should set prices so that is incremental margin percentage is *lower* in Japan than in the domestic market. A lower margin does not necessarily mean a lower price, because the seller's marginal cost of supplying to the Japanese market is higher owing to the cost of freight.
   (2) If the Japanese demand is *less elastic* than domestic demand, the seller should set prices so that is incremental margin percentage is *higher* in Japan than in the domestic market. This definitely means a higher price in Japan, taking into account the seller's higher marginal cost of supplying to the Japanese market owing to the cost of freight.
iii) The differences among CF prices at various locations need not necessarily correspond to the differences in the cost of delivery to the respective locations. The differences are the result of the different incremental margin percentages and the different marginal costs of supplying the various markets, and may be larger or smaller than the freight costs.

3 Direct segment discrimination provides more profit than uniform pricing. CF pricing yields *more* profit than FOB pricing, because it takes account of differences in the price elasticity of demand.

4 **Parallel imports.**
i) For most products, a seller can control only the location at which it sells the product and cannot directly monitor the buyer's location. If the difference between the prices of a product in two markets exceeds the transportation cost, retailers and consumers might buy the item in one market and ship it to another.
ii) To deal with the "grey market", manufacturers can:
   (1) Customize the product;
   (2) Limit sales to the sources of parallel imports, and to markets where prices are low;
   (3) Restrict warranty service to the country of purchase (durable goods).

F **Indirect Segment Discrimination.** A seller may know that specific segments (e.g., business vis a vis leisure travelers) have different demand curves but cannot find a fixed characteristic with which to discriminate directly. The seller may still be able to discriminate on price, but *indirectly*.

1 **Indirect Segment Discrimination** is the policy of structuring (where a seller cannot directly identify the customer segments) a choice for buyers so as to earn different incremental margins from each segment.

2 **Structured choice**. Indirect segment discrimination usually involves a structured choice that persuades the various buyer segments to identify themselves through their choices (e.g., an airline structures a choice between unrestricted and restricted fares to exploit the differential sensitivity of business and leisure travelers to fees for changes).

3 **Implementation**.

i) The seller must control some variable to which buyers in the various segments are differentially sensitive. The seller then uses this variable to structure a set of choices that will discriminate among the segments.
ii) Buyers must not be able to circumvent the differentiating variable. The seller must strictly enforce all conditions of sale to prevent switching. Note: since indirect segment discrimination allows each buyer a choice of products, the seller obviously cannot prevent buyers from reselling the product.

4 **Profit maximizing prices**.

i) The seller must consider how buyers with different attributes substitute among the various choices. Accordingly, the seller must not price any product in isolation. It must set the prices of all the products together.
ii) Indirect segment discrimination is particularly profitable where the buyer segments (owing to inertia or poor information) are unwilling or unable to circumvent the discriminating variable. E.g., in e-commerce, if one segment anchors on free shipping while another segment anchors on the product price, the vendor can profitably discriminate by offering a choice of free shipping and paying for shipping.

G **Selecting the Pricing Policy.**

1 **Ranking**. Generally, the ranking of the pricing policies by profitability and information requirement is as follows.

Policy	Conditions	Profitability	Information requirement
Complete price discrimination	Seller discriminates directly on the buyer attributes. Seller can identify each buyer.	Highest	The most
Direct segment discrimination	Seller discriminates directly on the fixed segment attributes. Seller can identify each segment and prevent one segment from buying the product targeted at another segment.	(Exception: When all buyers within each segment are identical, profit equals that with complete price discrimination.)	
Indirect segment discrimination	Uses product attributes to discriminate indirectly (rather than directly through buyer attributes) among various buyer segments.	Less profitable than direct segment discrimination for 2 reasons: **Buyer benefit**: the product provides less benefit to buyers. To induce buyers with different attributes to choose different products, the seller may resort to designing low-end products in a less appealing way. E.g., airlines deliberately impose conditions on restricted fares to make them unappealing to business travelers. **Cost**: indirect discrimination may involve relatively high costs.	

		Coupons (to indirectly discriminate among consumers with different price elasticity) impose costs on manufacturers, retailers, and consumers	
Uniform pricing	No discrimination	Lowest	The least

2 **Technology.**
- i) Information technology both facilitates and impedes price discrimination.
- ii) With the explosion in consumer usage of the Internet and the falling costs of computing power and storage:
  - (1) Marketers can collect, store, analyze and apply large volumes of detailed information about consumer preferences.
  - (2) Sellers can better design and target offers to particular segments.
- iii) With the explosion in consumer usage of the Internet and the falling costs of computing power and storage:
  - (1) Consumer-oriented search services grow and help consumers to compare product and prices, thus identifying the best offer and circumventing price discrimination.

3 **Cannibalization**. This occurs when buyers switch from high incremental margin products to lower incremental margin products, i.e., high-benefit segments buying the item aimed at low-benefit segments. E.g., business travelers flying on restricted fares, high-income consumers redeeming coupons.
- i) Cannibalization reduces the profitability of *indirect* segment discrimination.
- ii) Reason for cannibalization: the seller cannot discriminate directly, and must rely on a structured choice of products to discriminate indirectly. To the extent that the discriminating variable does not perfectly separate the buyer segments, cannibalization will occur.
- iii) Ways to mitigate cannibalization.
  - (1) Product design:
    - (a) Upgrade the high-margin item to make it relatively more attractive. Degrade low-margin item.
    - (b) Use multiple discriminating variables to differentiate products. E.g., airlines specify multiple conditions for restricted fares: minimum and maximum stay, limits on stopovers, penalties for changes. Each condition helps to reduce the degree to which the restricted fare would cannibalize the demand for the unrestricted fare.
  - (2) Limit the availability of low-margin item, e.g., limited number of seats allocated to lower fares.

Chapter 10

Strategic Thinking

A **Introduction**.

1 A **strategy** is a plan for action in a strategic situation.

2 A strategic situation is one where parties consider the interactions with one another in making decisions.

3 **Game theory** is a set of principles to guide strategic thinking.

i) Model of **games in strategic form** applies to situations where parties choose strategies ***at same time***.

(1) Example: Price competition in markets with few sellers.

ii) Model of **games in extensive form** applies to situations where parties act ***in sequence***.

(1) Use game in extensive form to plan strategic moves and conditional strategic moves, both threats and promises.

iii) Game theory is useful to any business with market power in deciding competitive strategy. The ideas and principles of game theory provide an effective guide to strategic decision making in many businesses. E.g., leveraged buyouts band takeovers; bargaining between labor unions and employers.

B **Nash Equilibrium.**

1 A **game in strategic form** depicts one party's strategies in rows, the other party's strategies in columns, and the consequences for the parties in the corresponding cells. This is a useful way to organize thinking about strategic decisions that parties must take ***simultaneously***.

i) A **dominated strategy** is one that generates worse consequences than some other strategy, under all circumstances (regardless of the choices of the other parties). It makes no sense to adopt a dominated strategy.

ii) **Cartel's dilemma**. A cartel is an agreement to restrain competition. Both companies know that, if they abide by their quotas and maintain price, then they can increase their profit. However, when each individual company acts independently, it will decide to exceed its quota and cut price. The final outcome is that both companies exceed their quotas, erode the market price below the monopoly level and lose profit.

2 A **Nash equilibrium** in a game in strategic form is a set of strategies such that, given that the other parties choose their Nash equilibrium strategies, each party prefers its own Nash equilibrium strategy.

i) A stable situation.

ii) In many typical strategic situations such as the cartel's dilemma, the Nash equilibrium strategies seem like the most reasonable and obvious way to behave.

(In the cartel's dilemma, the pair of strategies in which both gas stations cut price is a Nash equilibrium.)

iii) In less intuitive settings, the relevant parties should also act according to Nash equilibrium strategies.

3 **Solving equilibrium - formal method**.

i) First, rule out dominated strategies; and

ii) Next, check all the remaining strategies, one at a time.

4 **Solving equilibrium - informal method**. The "arrow" technique.

i) A strategy is dominated if the row or column corresponding to the strategy has all arrows pointing *out*.

ii) If there is a cell with all arrows leading *in*, then the strategies marking that cell are a Nash equilibrium. E.g., going north for Kimura and going north for Kenney in the Battle of the Bismarck Sea.

5 **Non-equilibrium strategies**.

i) If some party does not follow its Nash equilibrium strategy, then the best strategy for the other parties may or may be the Nash equilibrium strategy:

(1) If the alternative to the Nash equilibrium strategy is a dominated strategy, then the Nash equilibrium strategy is better, even if the other party does not follow its Nash equilibrium strategy. E.g., in the Battle of the Bismarck Sea, even if Kenney decides to fly south, Kimura should still go north as the alternative strategy (south) is dominated.

C **Randomized Strategies**.

1 A **pure strategy** is one that does not involve randomization.

2 With a **randomized strategy**, the party specifies a probability for each of the alternative **pure** strategies. It then adopts each pure strategy randomly according to the probabilities. The probabilities must add up to 1.

3 A **Nash equilibrium** in randomized strategies. A **Nash equilibrium** in randomized strategies is like a **Nash equilibrium** in pure strategies: given that the other parties choose their Nash equilibrium strategies, each party's best choice is its own Nash equilibrium strategy.

4 In a competitive setting, the **advantage of randomization** comes from its being unpredictable (e.g., a coin toss). If a party chooses in a conscious way, the other party may be able to guess or learn the first party's decision and act accordingly.

5 Solving for Nash equilibrium in randomized strategies.

i) Crossing point of lines representing the outcomes of alternative pure strategies as a function of the other party's probability; or

ii) Using algebra.

D **Competition or Coordination**.

1 **Classification of strategic situations by outcomes**.

i) A **zero-sum game**.

(1) This is a strategic situation where one party can be better off only if another is made worse off.

(2) A strategic situation is a zero-sum game if the outcomes for the parties add up to the same number (whether negative, zero, or positive) in every cell of the game in strategic form.

(3) A zero-sum game characterizes the extreme of **competition**. There is no way for all parties to become better off.

ii) A **positive-sum game**.

(1) This is a strategic situation where one party can become better off without another being made worse off.

(2) E.g., in the price war between the gas stations, if we add the outcomes for the gas stations in each cell, the sum varies from 1,600 to 2,000.

(3) A positive-sum game involves at least some element of **coordination**. E.g., the challenge is for the gas stations to enforce the agreement to maintain price.

2 Some situations involve elements of <u>both</u> competition and coordination.

i) E.g., the two TV stations would certainly cooperate to avoid the outcome where both schedule their news at the same time. The situation is a **positive-sum game**. The total profit of the two TV stations is the largest when the stations broadcast in different time slots. But there are elements of competition for the 8:00pm time slot as the station that gets the 8:00pm slot will benefit more.

E **Sequencing.**

1 In many strategic situations, various parties move ***sequentially***, rather than simultaneously. A **game in extensive form** explicitly depicts the **sequence** of moves and the corresponding outcomes. It consists of nodes and branches: a node represents a point at which a party must choose a move, while the branches leading from a node represent the possible choices at the node.

2 **Backward induction**. We can use this procedure to identify the best strategies for the parties. We solve the game in extensive form by backward induction:

i) Looking forward to the final nodes; and

ii) Reasoning backward toward the initial node.

3 **Equilibrium strategy.** In a game in extensive form, a party's equilibrium strategy consists of a <u>sequence</u> of its best actions, where each action is decided at the corresponding node.

4 **First mover advantage.**

i) There is first mover advantage in any strategic situation where a party gains an advantage by moving first (before others). E.g. in the evening news, the station that is first to commit its schedule will make the larger profit.

ii) To identify whether a strategic situation involves first mover advantage, it is necessary to analyze the game in extensive form.

(1) The first mover has an advantage in situations of coordination and competition. E.g. in the evening news, both stations can agree to broadcast at different times, but they cannot agree on who gets the 8:00pm time slot. The power of the first mover is to determine the equilibrium.

iii) First mover advantage is not a universal rule in business or other strategic situations.

(1) If the equilibrium is the same whether a party moves first or second, then there is no first mover advantage.

(2) In some circumstances, the follower has an advantage, e.g., the launch of smart phones, other manufacturers can piggyback on the advertising of the pioneer and introduce their products at lower cost.

5 **Uncertain consequences**. In uncertain circumstances, even if one party does not know the consequences of the various actions for the other party, it may know or be able to assess the probabilities with which the other party will choose between the alternative actions. It can apply **backward induction** using these probabilities

F **Difference** between the Nash equilibrium strategy in a game in strategic form and the equilibrium strategy in a game in extensive form: Evening news example.
1 When the 2 TV stations move simultaneously: there are 2 Nash equilibria in pure strategies.
2 When the 2 TV stations move in sequence: there is only 1 equilibrium.
3 In the evening news example, the equilibrium in the extensive form is also the equilibrium in the strategic form.
4 In other situations, the equilibrium in the extensive form need not be a Nash equilibrium in the corresponding strategic form.

G **Strategic Move**.
1 A strategic move is an action to influence the beliefs or actions of other parties in a favorable way.
2 To be effective, a strategic move must be **credible** – and typically involves self imposed restrictions and real costs, e.g., a lithographer's destroying the plates.
3 The leveraged buyout is a strategic move. In the status quo, the owners of the company could set performance targets, but these would not be so credible. A more effective way is to raise the break-even level. This commitment is credible and the management would respond accordingly.

H **Conditional Strategic Move**.
1 A conditional strategic move is an action under specified conditions to influence the actions or beliefs of other parties in a favorable way.
2 Two forms of conditional strategic moves.
   i) A **threat** imposes costs under specified conditions, e.g., poison pill, strikes.
      (1) Threats are frequently used in negotiations.
      (2) To be effective, it must be **credible**, e.g., the union's threat of a strike is credible only if the workers are better off with a strike - this in turn depends on the probability that the employer will eventually raise wages.
   ii) A **promise** conveys benefits under specified conditions, e.g., a buy-back offer from the lithographer, deposit insurance offered by the government.
3 Conditional strategic moves are more cost-effective than unconditional strategic moves.
   i) An unconditional strategic move usually involves a cost under all circumstance (not conditioned on any eventuality), e.g., the lithographer destroying her plates.
   ii) A conditional strategic move has no cost if it need not actually be carried out.

I **Repetition**.
1 May strategic interactions are **repeated**.
2 The range of possible strategies is much wider in repeated interactions than in one-shot scenarios. The parties may be able to achieve better outcomes than in once-only interactions.
3 A party may condition its actions on external events or the actions of other parties.

4 Conditioning on other parties' actions. Such strategies can improve the outcome in the context of the cartel's dilemma.
   i) In a **once-only** situation, individual members have an overwhelming incentive to cut price.
   ii) In a **repeated** cartel's dilemma, a seller can adopt a strategy under which it conditions its price on the other party's price, and vice versa.
      (1) A **tit-for-tat** strategy combines a promise with a threat. The promise is to maintain price if the other seller maintains price. The threat is to cut price if the other seller cuts price.
      (2) Whether tit-for-tat is an **equilibrium strategy** in the repeated cartel's dilemma depends on two factors.
         (a) How a seller values money in the future relative to the present (discounting). The less a seller values money in the future, the more likely it is to cut price. E.g., in the gasoline station war, tit-for-tat is an equilibrium strategy if the one time gain (from a price cut) is outweighed by the future losses due to the other gas station's retaliation.
         (b) The time horizon. The shorter the time horizon (due to the obsolescence of the product or entry of new competitors), the more likely a seller will cut price.
            (i) Under certain conditions, tit-for-tat is an **equilibrium strategy** in the repeated cartel's dilemma. When competing sellers interact over an extended period of time, they can maintain profit above the competitive level.

Chapter 11

Oligopoly

A **Introduction**.
1 **Definition.** An **Oligopoly** is a market with a small number of sellers who behave strategically.
2 It is a market structure that lies between the two extremes of perfect competition (no seller has market power) and monopoly (there is only one seller).
3 Strategic interaction between sellers: Apply game theory:
i) Nash equilibrium;
ii) Equilibrium in games in extensive form.
4 Distinguish between two time horizons: businesses must decide on capacity (less flexible than pricing)(long run) before pricing (short run).

B **Price Competition**. **(Competitors acting simultaneously.)**
1 Strategic variable in the short run: Price.
2 **Homogeneous product**.
i) **Monopoly**. The monopoly maximizes profit at the scale of operations where the *marginal revenue = marginal cost*.
ii) In the **Bertrand model** of oligopoly, sellers produce at constant marginal cost with unlimited capacity, and compete on price to sell a homogeneous product.
(1) In the context of a **duopoly** (a market with two sellers who behave strategically), the market outcome is identical to that with **perfect competition**, the *Nash equilibrium* is for both competitors to *set price equal to the marginal cost*.
(a) The price-cutter faces a demand curve that it is infinitely elastic. It will get the entire market demand.
(2) The same analysis applies even more strongly if there are more than two competitors.
(a) Every seller will prefer to undercut the others:
(i) Its incremental margin would be only slightly lower; but
(ii) Its sales would increase in proportion to the number of competitors it undercuts.
3 **Differentiated products**.
i) In the **Hotelling model** of oligopoly, sellers compete on price to sell a product differentiated by distance from consumers. Sellers independently set prices simultaneously and incur a constant marginal cost.
(1) To maximize profit, *set price so that residual marginal revenue equals marginal cost*. The equilibrium price exceeds the marginal cost.

(a) The price-cutter's demand curve is not infinitely elastic. If one seller undercuts the competitor's price, it would take away only part of the competitor's demand.
(b) **Residual demand** curve: demand given the actions of competing sellers.
(i) Slopes downward.
(ii) Using the residual demand curve, construct the residual marginal revenue curve.
(c) **Best response function**: a seller's best action as a function of competing sellers' actions.
(i) A seller's profit-maximizing price as a function of a competitor's price.
(ii) Nash equilibrium: at the *intersection* of the best response functions.
(d) The equilibrium does not depend on fixed costs.
(i) Only the sellers' participation decisions (whether to produce at all) depend on fixed costs.
(ii) Each seller will produce only if the profit contribution exceeds its fixed cost.

4 **Consumer preferences.**
i) The **Hotelling model** applies to differentiation in terms of any attribute on which consumers have differing preferences.
(1) Attributes: taste, design, membership of a loyalty program…etc.
(2) "Transport cost": consumer's disutility from consuming any attribute that differs from the ideal or most preferred.
ii) In the context of oligopoly, sellers can mitigate competition by *differentiating* their products.
(1) The stronger the consumers' preferences over the differentiating attribute (the larger the consumer's disutility from a less than ideal attribute), the less price elastic will be each seller's residual demand.
(2) With residual demand being less price elastic, the equilibrium prices would be higher.

5 **Demand and cost changes**.
i) With demand and cost changes, a seller's response comprises two steps:
(1) Each seller should adjust price until its *residual marginal revenue equals marginal cost* (like a monopoly); and
(2) Each seller's best-response function would shift and then establish a new equilibrium.
ii) Increase in market demand.
(1) Residual demand would shift to the right. Residual marginal revenue would shift to the right. Profit maximizing price would be higher.
(2) Best response function would be higher and shift to the right. In the new equilibrium, each seller would set a higher price.
iii) Increase in marginal cost.
(1) Profit maximizing price would be higher.
(2) Best response function would be higher. If a competitor's marginal cost does not change, its response function would remain the same. In the new equilibrium, all sellers would raise price. The seller with the higher cost would raise price relatively more.
(a) The competitors absorb part of the impact of (a seller's higher marginal cost) by raising their prices.

(b) The seller with the higher cost loses consumers and profit contribution, but the loss is reduced to the extent the competitors respond with higher prices.

6 **Strategic complements**.

i) **Definition**. Actions are strategic complements if an adjustment by one party leads other parties to adjust in the *same* direction.

ii) Among sellers producing at constant marginal cost with unlimited capacity, and competing on price to sell a **differentiated** product (**Hotelling model**), prices are strategic complements.

(1) In an oligopoly, if prices are strategic complements, then competitors would maximize profit by *following each other's price moves in the same direction.*

C **Limit Pricing**. (**Sequential actions**.)

1 **Definition**. **Limit pricing** is a strategic move by which the leader commits to a pricing so low and it takes away so much demand that a potential competitor cannot break even.

i) This is the strategy of producing so much as to choke off potential entry.

ii) No other producer would enter the market.

2 A strategy of limit pricing makes sense under two conditions.

i) The **leader's price** must be **credible**.

(1) Potential competitors must believe the leader has committed to the entry-deterring level of price and will not change if the potential competitor should enter.

(2) For the leader, it must be more profitable to produce at the entry-deterring price than to accommodate entry and produce an equal share with competitors.

ii) Production must involve a **substantial fixed cost**.

(1) If there were no fixed cost, then a potential competitor could break even at a very small scale of production. The average cost and marginal cost curves would be the same. At the profit-maximizing capacity, the price would exceed the average cost. There is no way to deter the potential competitor from entry.

D **Capacity Competition. (Competitors acting simultaneously.)**

1 Strategic variable for oligopolistic sellers in the <u>long run</u>: production capacity.

2 **Homogeneous product.**

i) For simplicity, focus on a **duopoly**, and suppose capacity = sales = production.

ii) In the **Cournot model** of oligopoly, sellers compete on production capacity to sell a homogeneous product. Sellers independently and simultaneously set production capacity, and produce at a constant marginal cost.

(1) To maximize profit, *set capacity so that residual marginal revenue equals marginal cost*.

(a) The duopoly total capacity and production exceeds the monopoly profit-maximizing capacity. The duopoly price is less than the monopoly price. The combined profit contribution of the two duopolists is less than the monopoly profit contribution.

(b) A seller's **residual demand** curve is the market demand curve less the quantities supplied by other sellers. Using its residual demand curve, a

seller can calculate its profit-maximizing capacity by equating its residual marginal revenue with the marginal cost.

(c) To find the Nash equilibrium in capacities, we must calculate the sellers' respective **best response functions**. The *Nash equilibrium* of the oligopoly is at the *intersection* of the two best response functions.

(d) The equilibrium does not depend on fixed costs.

(i) Only the sellers' participation decisions (whether to produce at all) depend on fixed costs.

(ii) Each seller will produce only if the profit contribution exceeds its fixed cost.

3 **Demand and cost changes.**

i) The response comprises two steps:

(1) Each seller should adjust capacity until its *residual marginal revenue equals marginal cost*; and

(2) The new capacity is a function of the other sellers' capacities. With the new demand or cost, the seller's best-response function would shift and then establish a new equilibrium.

ii) Increase in market demand.

(1) Residual demand would shift to the right. Residual marginal revenue would shift to the right. Profit maximizing capacity would be larger.

(2) Best response function would be higher and shift to the right. In the new equilibrium, each seller would choose larger capacity.

iii) Increase in marginal cost.

(1) Profit maximizing capacity would be smaller.

(2) Best response function would be lower. If the competitor's marginal cost does not change, its best response function would remain the same. In the new equilibrium, the seller with the higher cost would reduce capacity while the competitors increase capacity.

(a) The competitors take advantage of the weakness to increase their capacities to grab market share.

(b) The seller with the higher cost loses in two ways:

(i) By the higher cost itself; and

(ii) By the competitors' strategic adjustment.

4 **Strategic substitutes**.

i) Actions are strategic substitutes if an adjustment by one party leads other parties to adjust in the *opposite* direction.

ii) Among sellers producing at constant marginal cost and competing on production capacity to sell a **homogeneous** product (**Cournot model),** capacity choices are strategic substitutes.

(1) In an oligopoly, if production capacities are strategic substitutes, then competitors would maximize profit by *adjusting capacity in the opposite direction to the adjustments of others.*

5 **Strategic complements or strategic substitutes.** Generally, whether strategic variables are strategic complements or strategic substitutes depends on the relevant demand and cost conditions.

(1) Advertising and R&D expenditure may be either strategic complements or strategic substitutes.

(2) Increased R&D spending can have a similar effect to increasing capacity.

(3) On the other hand, an increase in one producer's R&D expenditure may drive competitors to increase R&D as well, particularly when they compete for patents.

E **Capacity Leadership.** (**Sequential actions**.)

1 In the long-run, the seller that moves first must take account of the entrant's production capacity. In the **Stackelberg model** of oligopoly (which is the sequential version of the **Cournot model**), both leader and follower sell a **homogeneous** product, and the leader commits to some capacity to grab a larger share.

i) To push down the competitor's residual demand so that it chooses a smaller capacity.

ii) To raise profit.

iii) Downside to the leader's commitment to large capacity: the total capacity (including the competitor's) in the market would be larger, and so the market price would be lower.

iv) Since the product is homogeneous, both competitors sell it at the same market price.

2 A strategy of capacity pricing makes sense only if:

i) The **leader's capacity is credible**.

(1) Potential competitors must believe the leader has committed to its capacity, and will not change if the potential competitor should enter.

(2) For the leader, it must be more profitable to produce at the pre-committed capacity (which implies a relatively low price) than to accommodate entry and produce an equal share with competitor(s).

F **Restraining Competition**. A monopoly is generally more profitable than an oligopoly – whether the businesses compete on price or capacity. An oligopoly is at least as profitable as a perfectly competitive industry. Rather than compete, sellers can increase profits by restraining competition among themselves and achieve monopoly profits. Competing sellers can restrain competition in two ways: through agreement or by integration.

1 **Cartels**.

i) A buyer cartel is an agreement among buyers to restrain competition in demand.

ii) A seller cartel is an agreement among sellers to restrain competition in supply

(1) Sets a maximum sales quota for each participant. By limiting each participant's sales, the cartel restricts the quantity supplied and raises sellers' profit above the competitive level.

(a) To the extent any one seller exceeds its quota, quantity supplied will increase and market price will fall.

(b) If a cartel succeeds in raising the price above the competitive level, it will attract new sellers to enter.

(2) The key to an effective cartel is enforcement against:

(a) Existing sellers exceeding their quotas; and

(b) The entry of new competitors.

2 **Enforcement**. The effectiveness of private enforcement of (illegal) cartels depends on 5 factors.

i) The **number of sellers** in the market. A cartel will be more effective in an industry in a *concentrated* as compared with a fragmented industry.
ii) **Excess capacity**. If all sellers are operating *near capacity*, it will be difficult for them to expand and there is little incentive to exceed the specified quotas. A seller with substantial excess capacity has more incentive to exceed its quota.
iii) The extent of **sunk costs**. Sellers with significant sunk costs will be relatively more willing to cut price and exceed their quotas – willing to operate so long as price covers avoidable cost.
iv) The extent of **barriers to entry and exit**. In a perfectly contestable market, a cartel of all sellers cannot raise price above the long run average cost – that would draw new suppliers into the market, which would drive the market price back down.
v) The nature of the **product** – homogeneous or heterogeneous – has an ambiguous influence on the effectiveness of a cartel. If product is homogeneous,
    (a) Each individual seller faces a relatively elastic demand, it can easily sell more than its quota.
    (b) But it is also easier for the cartel to monitor the various sellers.

3 **Labor unions**.
i) Unions are explicit seller cartels: to gain higher wages and better conditions than workers could obtain via individual negotiation.
ii) To raise wages, a union must restrict employment and exclude some workers from work.
    (1) A workplace is a "closed shop" if the employer commits not to hire non-union workers. At its most extreme, the employer must dismiss all non-union workers and cannot hire non-union workers in the future.
    (2) A union with a "closed shop" has a monopoly over the labor supply.
iii) Negotiations in which workers are represented by a union are called collective bargaining.
iv) Challenges to a labor union: automation/shift of production overseas.

4 **Integration**.
i) Competing sellers can restrain competition in a way that does not raise enforcement issues.
ii) **Horizontal integration** is the combination of two entities, in the same or similar businesses, under a common ownership.
    (1) The horizontal integration of any two businesses with market power will lead to a reduction in the quantity supplied, raise the market price and increase profits, subject to the entry of potential competitors.
iii) **Vertical integration** is the combination of the assets for two successive stages of production, under a common ownership.

Chapter 12

Externalities

A **Introduction**.
1 **Externality.**
i) **Definition**. An externality arises when one party directly conveys a benefit or cost to others (not through a market).
(1) A **positive externality** arises when one party directly conveys a benefit to others, e.g., the additional customers that an anchor department store generates for nearby specialty retailers in a mall.
(2) A **negative externality** arises when one party directly imposes a cost to others, e.g., the customers that a betting shop drives away from a family restaurant.
2 **Public good**.
i) **Definition**. An item is a public good if one person's increase in consumption does not reduce the quantity available to others, e.g., fireworks. Public goods can be privately provided.
3 In any market with externalities and public goods, managers can increase value added (and profit) by bringing provision closer to the economically efficient level.

B **Benchmark: Economic Efficiency**.
1 An externality conveys a benefit or cost directly rather than through a market. The benchmark for an externality is the economically efficient level.
2 **Positive externalities**. E.g., the additional customers that an anchor department store generates for a nearby restaurant.
i) In deciding on the levels of activities that give rise to externalities, e.g., a department store must decide on how much to spend on advertising to attract shoppers:
(1) If the source of the externality (the department store) considers only the benefits and costs to itself, and ignores the benefits and costs to others (e.g., a nearby restaurant), i.e., ignoring the externalities; the level of customer traffic that maximizes the department store's profit is that where the marginal profit contribution to the department store equals the marginal customer cost.
(2) For economic efficiency in customer traffic, the number of customers should be such that the *combined* marginal benefit (department store's plus restaurant's marginal profit contribution) equals the marginal cost of attracting customers:
(a) The *combined* marginal benefit is the vertical sum of the department store's marginal profit contribution and the restaurant's marginal profit contribution.

(b) Another perspective is to suppose that the department store owns the restaurant.

3 **Negative externalities**. E.g., a betting shop's customers (attracted by advertising by the betting store) discourage families with children from patronizing the next-door restaurant. The betting shop imposes a cost (negative externality) on the next-door restaurant.

i) In deciding on the levels of activities that give rise to externalities, e.g., a betting store must decide on how much to spend on advertising to attract gamblers:

(1) The level of customer traffic that maximizes the betting store's profit is that where the marginal profit contribution to the betting store equals the marginal customer cost.

(2) For economic efficiency in customer traffic, the number of customers should be such that the betting shop's marginal benefit (marginal profit contribution) equals the *combined* (betting shop's plus restaurant's) marginal cost of customers:

(a) The *combined* marginal cost is the vertical sum of the betting shop's marginal cost of advertising and the restaurant's marginal cost (loss of profit contribution).

(b) Another perspective is to suppose that the betting shop owns the restaurant.

4 **General benchmark**.

i) In the presence of both positive and negative externalities, the affected parties maximize combined profit: where **the *combined* marginal benefits equal the *combined* marginal costs**. This is the point where an externality is **resolved**.

ii) There will be an opportunity for increasing profit whenever the combined marginal benefits differ from the combined marginal cost. The source of a positive externality could raise profit by collecting a fee from the beneficiaries and increasing the level of externality.

iii) The source of a negative externality could raise profit by collecting a fee from the sufferers and reducing the level of externality.

iv) To take account of nonmonetary externalities, we require the recipients to measure the benefits and costs in terms of money and then apply the economic efficiency analysis.

C **Resolving Externalities**.

1 This involves *deliberate* action as externalities do not pass through markets.

2 Two ways to resolve externalities.

i) **Common ownership**. Combine the source and the recipient of an externality under common ownership. The common owner will choose the economically efficient level of the externality, whether positive or negative.

(1) E.g., if the department store owned the restaurant, it would consider all the benefits and costs of additional customers, and would increase advertising to attract the economically efficient number of customers

ii) **Agreement**.

(1) The source and recipient of the externality could negotiate and agree on the level of the externality.

(a) E.g., the restaurant could offer to pay part of the department store's advertising cost. This would encourage the store to increase advertising.

(b) Similarly, the restaurant could pay the betting shop to reduce advertising.

(2) Two steps.

(a) The affected parties must agree on how to resolve the externality. They must collect information on the benefits and costs to the various parties and then agree on the level of the externality.

(b) Then, they must enforce compliance: monitoring the source and applying incentives to ensure that the source complies with the agreed level of the externality.

3 **Hurdles.**

i) **Unclear assignment of rights**.

(1) If rights are not clearly assigned, the two parties would have difficulty agreeing on common ownership or the level of externality. E.g., does the betting shop have the right to impose an externality on the restaurant, or does the restaurant have the right not to suffer an externality?

(2) This is an especially acute issue in externalities from a common source. E.g., several oil producers drilling from the same oil field, multiple trawlers fishing the same stock.

ii) **Free rider problem**.

(1) **Definition**. A free rider is a party that contributes less than its marginal benefit to the resolution of the externality. E.g., a florist that takes a free ride on the advertising by the department store and fees paid by the other specialty retailers (to the department store for advertising).

(2) In the extreme, the free rider avoids all contribution.

(3) Free riding arises whenever it is costly to exclude certain parties from benefiting from the externality, especially when the externality affects many recipients, and the amount that any particular recipient must pay is relatively small.

D **Network Effects and Externalities**.

1 **Introduction**.

i) **Definition**. A network effect is a benefit or cost that increases with the size of the network.

(1) The adjective "network" emphasizes that the benefit or cost is generated by the entire network of users, e.g., connections to telephone service generate network effects.

(2) The marginal benefit and demand for an item that exhibits network effects increases with the number of other users, e.g., when one more person subscribes to telephone service, the marginal benefit and demand curves of all other users will *shift* up.

ii) A **network externality** is a benefit or cost directly (and not through a market) conveyed to others that increases with the size of the network.

(1) The **benchmark** for a network externality is economic efficiency: the *combined* marginal benefits equal the *combined* marginal costs.

iii) The presence of network effects or network externalities implies that the character of demand and competition will differ from that in conventional supply–demand markets.

2 **Critical mass**. In markets with network effects, demand may be zero unless the number of users exceeds the critical mass.

i) **Definition**. Critical mass is the number of users at which demand becomes positive.
ii) **Technical standards**. Suppose the critical mass for telephone service is 10,000 users:
   (1) If there are two incompatible telephone services, and each attract at most 5,000 users, then neither will achieve critical mass.
   (2) If both telephone services conform to a common technical standard and interconnect, then they can collectively achieve the critical mass.
iii) **Installed base**: The quantity of complementary hardware in service (e.g., mobile phones in the demand for mobile service). If each user needs one separate unit of the complementary hardware and if each unit supports just one user, an alternative way to measure the size of the critical mass is the size of the installed base.

3 **Expectations**. Expectations of potential users help to determine the attainment of critical mass.
i) **Good equilibrium:** every potential user is optimistic and expects the others to adopt the new technology, and accordingly adopts; demand exceeds critical mass and the technology succeeds as expected.
ii) **Bad equilibrium:** every potential user is pessimistic and expects less than critical mass to adopt the new technology, and accordingly does not adopt; demand fails to reach critical mass and the technology flops as expected
iii) In equilibrium, expectations can be self-fulfilling.
iv) Expectations can be influenced through commitments (sellers of items with network effects give away large quantities to establish a sufficient installed base) and hype (a grand launch).

4 **Tipping**.
i) **Definition**. Tipping is the tendency for demand to shift toward a product with a small initial lead.
ii) In markets with network effects, where demand is close to the tipping point (near critical mass), demand is extremely sensitive to small differences among competitors.
   (1) A small increase in the user base of one product can tip the market demand toward that product.
iii) In a market for competing products that generate network effects, the likelihood of tipping means that one product may dominate the market.
   (1) If demand for some product just exceeds critical mass, any slight movement in demand away from that product will tip all the users away.
   (2) By contrast, in a conventional market, several competitors of similar size may continue profitably for a long time.

5 **Price elasticity**. The presence of network effects affects the price elasticity of demand depending on whether the demand has reached critical mass.
i) When demand is <u>below</u> critical mass, demand is zero, and extremely price *inelastic*: even large price reductions will not increase demand at all.
ii) When demand <u>exceeds</u> critical mass, the network effect causes the market demand to be *relatively more price elastic*.
   (1) The network effect tends to amplify the effect or a price increase or price deduction on demand. E.g., a price increase would reduce demand, the

reduction would feed back through the network effect to further reduce the demand.

iii) Around the critical mass, demand would be very price *elastic*.
(1) A slight price increase would push demand below critical mass, demand would collapse to zero.
(2) A slight price cut would pull demand above critical mass, and further increase demand through the network effect.

E **Public Goods**.

1 **Introduction**.

i) A public good (such as open-air fireworks) provides non-rival consumption. Consumption is non-rival if one person's increase in consumption does not reduce the quantity available to others.

ii) There is an extreme economy of scale in providing a public good *with respect to the number of consumers*. The cost of provision is fixed and the marginal cost of serving an additional consumer is zero.
(1) There might not be economies of scale *with respect to the scale of provision*, e.g., increasing the length of a fireworks show does involve more costs.
(2) Every additional customer brings in pure profit contribution: hence, sell the public good to more customers to maximize the revenue. E.g., movie producers increase their profit by selling the movie *content* (public good) through multiple formats.

2 **Rivalness**. There is a continuum between nonrival, congestible, and rival consumption.

i) Consumption is **non-rival** if one person's increase in consumption does not reduce the quantity available to others. A public good (such as open-air fireworks, scientific formula, musical composition, TV broadcast) provides non-rival consumption.

ii) Consumption is **congestible** if one person's increase in consumption by some quantity reduces the total available to others but by less than that quantity. Congestible items are public goods when consumption is low but are private goods when consumption is high, e.g., air, Internet service, transportation facilities.

iii) Consumption is **rival** if one person's increase in consumption reduces the total available to others by the same quantity. A private good (such as food clothing, computers, electricity, restaurant meals) provides rival consumption.

3 **Economically efficient** quantity of public good: at the point where the *combined* individual marginal benefits (the vertical sum of the individual marginal benefits cures) equals the marginal cost. Opportunities to profit from adjusting the provision of the public good are exhausted at that point.

F **Excludability**. The basis for commercial provision of many public goods is to deliver them in the format of private goods.

1 **Excludable consumption**.

i) **Definition**. Consumption is excludable if the provider can exclude particular consumers.

ii) Excludability is a fundamental condition for the commercial production of *any* product. Otherwise free riders will cut into the seller's revenues, profits and hamper provision.

2 **Content and delivery**.
   i) Since private goods are excludable, if a public good is delivered in the form of a private good, the public good can be commercially provided.
   ii) Content. TV programming, ignoring the delivery method (broadcast or cable);
   iii) Delivery. The method of delivery may be a public good or private good.
      (1) Delivery by free-to-air transmission: public good.
      (2) Delivery by cable: private good.

3 Excludability depends on **law and technology**.
   i) **Law** – establishes excludability through intellectual property, hence commercial development and production are feasible.
      (1) **Patent**: a legal exclusive right to a product or process. (Note: scientific formulas are otherwise public goods).
      (2) **Copyright**: a legal exclusive right to an artistic, literary, or musical expression. (Note: content of the Oxford English Dictionary, computer software are otherwise non-rival).
      (3) The owner of a copyright or patent can sue the infringers for a court order to stop the infringement as well as an award of damages.
      (4) Effectiveness of patents and copyright is limited:
         (a) They are limited in time.
         (b) Enforcement. Enforcement ease/cost varies with product.
   ii) **Technology.**
      (1) The content of TV programming/software algorithms and codes: pubic goods**,** but delivery can be excludable via scrambling technology, access technology.

Chapter 13

Asymmetric Information

A **Asymmetric Information**. In a situation of asymmetric information, one party has better information than another, e.g., sellers of wine and antiques have better information about wine quality than buyers.
1 Techniques to resolve asymmetries apply broadly, beyond finance to commercial, non-commercial, and personal settings.
2 Managers can use these methods to resolve information asymmetry and realize transactions and relationships to increase value added and profit.

B **Imperfect Information.**
1 **Imperfect information vis-à-vis asymmetric information**.
i) **Imperfect information**.
(1) *Imperfect* information about something is the absence of certain knowledge about that thing by a single person or by more than one party.
(2) A market can be perfectly competitive even when buyers and sellers have *imperfect* information, so long as they all have symmetric information, e.g., demand for heating oil.
(a) In a perfectly competitive market, the forces of demand and supply will channel resources into economically efficient uses; no further profitable transactions are possible.
ii) **Asymmetric information**.
(1) Asymmetric information involves two or more parties, one of whom has better information than the other or others.
(a) Asymmetric information will always be associated with *imperfect* information, because the party with poorer information definitely will have imperfect information.
(2) A market where information is asymmetric cannot be perfectly competitive. If buyers and sellers can resolve the information asymmetries, they can increase their benefits by more than their costs, and so add value and increase profit.
2 **Risk defined**. Risk is uncertainty about benefits or costs and arises whenever there is *imperfect* information about something that affects benefits or costs, e.g., a car owner bears a risk that her car might be stolen.
i) A person can have *imperfect* information about something, but if that thing does not affect her/his benefits or costs, it does not impose any risk on her/him.
ii) Classification:
(1) A **risk averse** person prefers a certain amount to risky amounts with the same expected value.
(a) Risk averse persons will pay to avoid risk.

(i) Insurance is the business of taking certain payments in exchange for eliminating risk.
(ii) How much risk averse persons are willing to pay for insurance depends on their degree of risk aversion.

(2) A **risk-neutral** person is indifferent between a certain amount and risky amounts with the same expected value.
(a) A risk neutral person will not pay anything to avoid risk.

iii) Whenever information is asymmetric, the less-informed party has *imperfect* information. To the extent that this means uncertainty about benefits or costs, the less-informed party faces risk.

C **Adverse Selection**.

1 **Definition**. Adverse selection arises in situations of asymmetric information: In an adverse selection, the less-informed party draws a selection with relatively bad characteristics, e.g., consumer who cannot distinguish good from bad wines would get an adverse selection – a mixture of bad and good wines.

2 Demand and supply, market equilibrium and **economic inefficiency**.

i) The equilibrium in a market with asymmetric information will not be economically efficient.
(1) Consumers buy up to the point that the expected marginal benefit (adjusted for the probability of getting low quality) equals the market price.
(a) Low quality wine provides no marginal benefit so, in equilibrium, the marginal benefit of consumers who get low quality wine is *less than* the wine producer's marginal cost.
(b) The marginal benefit of high quality wine *exceeds* the wine producer's marginal cost.
(2) At equilibrium, marginal benefit does not equal marginal cost.
(3) The quantity traded is not economically efficient.

ii) Sellers of low quality wine impose a negative externality on consumers and producers of high quality wine. By resolving the negative externality (information asymmetry), a profit can be made.

3 **Market failure**.

i) Severe adverse selection can cause a market to fail, and price changes do not help to restore equilibrium.
(1) As market price drops, high quality wine producers produce less. Quantity of low quality wine is not affected, increasing the proportion of low quality wine, leaving buyers with a worse adverse selection. Consumers' willingness to pay and the expected demand curve would drop. A price reduction cuts demand and production, and does not necessarily restore the equilibrium.
(2) In the extreme, if the price is cut very low, so much low quality wine floods the market that actual demand curve drops to zero and the market would fail completely (there is no sale at all).

4 **Lending and insurance**.

i) **Lending**.
(1) To the extent that borrowers have better information about their personal willingness to default, there is asymmetric information between borrowers and lenders.

(a) Generally, a lender will have some chance of lending to a (bad) borrower who would readily default and some chance of lending to a (good) borrower who would be reluctant to default.
(b) If the lender raises the interest rate, it will draw an adverse selection of borrowers: the higher the interest rate, the fewer good borrowers will want loans and the higher will be the proportion of bad borrowers.

ii) **Insurance**.
(1) There is asymmetric information between insurers and applicants for insurance.
(a) Life insurers face an adverse selection problem. If an insurer charges a high premium, it is likely to draw applicants who know that they are in relatively poor health or who maintain risky lifestyles.

D **Appraisal**.

1 Appraisal (including wine appraisal, credit checks, employment records) overcomes asymmetric information by obtaining the information directly.

2 Appraisal works (resolving the information asymmetry) under two conditions:
i) The characteristic about which information is asymmetric is objectively verifiable
(1) If the expert cannot objectively distinguish high quality from low quality wine, then appraisals would not help.
(2) If different appraisers give different opinions, the information will still be asymmetric.
ii) It is not too costly, i.e., the potential gain (for buyer: difference between marginal benefit and market price; for seller: difference between market price and marginal cost) from resolving the asymmetry covers the cost of appraisal. This, in turn, depends on two factors.
(1) One is the proportion of low quality relative to high quality.
(2) The other is the difference between the marginal benefit and the marginal cost.

3 Procuring the appraisal.
i) The appraisal is a public good. Any number of potential buyers can use the same information. When there are many potential buyers, it is less costly for the seller to obtain one appraisal and present it to the many potential buyers, e.g., a wine producer should procure the appraisal.
ii) If the buyer is the better informed party and dealing with multiple sellers, it would be less costly for the buyer to procure the appraisal, e.g., commercial borrowers pay credit rating agencies to appraise their creditworthiness and present the credit rating to potential lenders and investors.

E **Screening**.

1 Screening is an initiative of a less-informed party to indirectly elicit the better-informed party's characteristics (e.g., the true quality of the wine).
   i) Screening is an indirect way to resolve asymmetric information. (E.g., consumers do not directly determine whether wine is of high quality or low quality, they require producers to make a choice that indirectly communicate their characteristics.)

2 Screening is possible only if the less-informed party can control some variable to which the better-informed parties are *differentially sensitive*.
   i) The less informed party must design choices around that variable to induce **self-selection**: in self-selection, parties with different characteristics choose different alternatives.
      (1) The "deal": Consumers insist that they get the first bottle free and pay double for the second bottle.
      (2) The deal makes sense only for producers of high quality wine. Producers of low quality wine will not get any revenue. They will not accept the deal. Low quality producers were *more sensitive* to the "deal" than high quality producers.

3 **Differentiating variable(s).**
   i) When the less-informed party has the choice of several differentiating variables, it should structure the choice that drives the biggest possible wedge between the better-informed parties with the different characteristics.
   ii) The less-informed party must consider the effectiveness of each differentiating variable in driving a wedge between the various segments by comparing the differential sensitivity of the segments to each variable. It should place relatively more emphasis on the more effective variable.
   iii) The most effective screening may involve a combination of the differentiating variables (e.g., to screen between leisure vis à vis business travelers, airlines use a combination of advance booking, penalties for changes, frequent flyer benefits…etc).

4 **Multiple unobservable characteristics**.
   i) If a party is uninformed about several characteristics, then screening based on a single differentiating variable may not resolve the asymmetry.
   ii) To resolve information asymmetries through screening, the less-informed party needs *as many* differentiating variables (e.g., choice of deductibles) as there are characteristics that it cannot observe (e.g., (i) driver's carefulness, (ii) degree of risk aversion)).

F **Auctions.**

1 **Indirect segment discrimination** is an application of **screening** to pricing. A seller who is less informed about how much the buyer is willing to pay for an item uses indirect segment discrimination to screen (induce self-selection) among buyers with different price elasticities of demand.

2 **Auctions** are a particular form of **indirect segment discrimination** that exploits strategic interaction among the bidders.
   i) A seller who doesn't know buyers' valuations can use an auction to sell, while a buyer doesn't know sellers' costs can use an auction to buy.

ii) An auction applies competitive pressure to the participating bidders. Each bidder must act strategically since its best bid depends on the competing bids.
iii) Each bidder faces a fundamental trade-off. By bidding more aggressively, it will improve its chances of winning the auction but will get a smaller profit from winning the auction.
iv) The differentiating variable in an auction is the probability of winning. Thus, the auction induces self selection among the participants according to their respective values for the item.

3 **Auction methods**.

i) **Open/sealed bidding.**
   (1) **Open auction**. The auctioneer calls out prices in an ascending sequence, the bidders indicate whether or not they wish to continue participating. The bidders in an open auction can see each other's behavior. Colluding bidders (who increase their net benefit by colluding to depress the price) can observe whether they are each abiding by their collusive agreement.
   (2) **Sealed-bid auction**. In a sealed-bid auction, a bidder can easily cheat on the collusive agreement with a bid exceeding the agreed price.
   (3) The seller can counteract collusion by applying a **reserve price.**
      (a) The reserve price is the price below which the seller will not sell the item.
      (b) In setting a reserve price, the seller must balance the increased revenue from a sale against the probability of no sale: when there are many bidders, it is more likely that at least one bidder will exceed the reserve price.

ii) **Prices for multiple units**.
   (1) In a **discriminatory** auction, each winning bidder pays their bid.
   (2) In a **non-discriminatory** auction, each winning bidder pays the price bid of the marginal winning bidder.
   (3) Whether a seller gets a higher revenue from a discriminatory or a non-discriminatory auction depends on the balance between two factors:
      (a) Bidders at a non-discriminatory auction *bid relatively higher* than at discriminatory auctions; but
      (b) A seller collects only the price bid by the *marginal* bidder.

4 **Winner's curse**.

i) **Definition**. The winning bidder over-estimates the true value of the item for sale.
ii) The winner's curse arises where the various bidders in an auction are *uncertain* about some common element in the value of the item for sale.
   (1) A bidder whose estimate of that common element is high is more likely to win.
   (2) Hence, on average, the winning bidder is one who has overestimated the true value of the item.
iii) The winner's curse is more severe:
   (1) If there are more bidders: an estimate that is higher than 19 others is more likely exceed the true value than an estimate that is higher than 3 others.
   (2) If the true value of the item is more *uncertain*: if the true value of the item is more uncertain, the probability that the highest estimate exceeds the true value will be higher.

(3) In a sealed-bid compared with an open auction: since the record of bidding is open, the prices at which other bidders drop out reveal information about their estimates of the true value of the item. The remaining bidders can use this additional information to refine their estimate of the true value. Hence, open bidding mitigates the winner's curse.

iv) When the winner's curse is more severe, a bidder should bid more conservatively.

G **Signaling**.

1 **Definition**. Signaling is an initiative of the better-informed party to communicate its characteristics in a credible way to the less-informed party.

i) It is an indirect way to resolve asymmetric information.

2 The communication must be **credible**: the parties with different characteristics must choose different signaling policies.

i) Signaling is credible only if it induces **self-selection** among the better-informed parties.

ii) The cost of the signal must be sufficiently lower for parties with superior characteristics than for parties with inferior characteristics. Only those with superior characteristics will offer the signal (e.g., certification by the World Enology Institute).

iii) Costless signaling is not credible (e.g., labeling the wine as high quality).

3 **Advertising and reputation**. Three conditions for advertising to be a credible signal of product quality:

i) Investment must be large and sunk. A reversible investment (such as advertising) is not credible: since a seller of lower quality can also make the same investment, pass on inferior products and get its money back.

ii) Buyers must be able to detect poor quality fairly quickly.

iii) The information about the poor quality must spread and cut into the seller's future business.

H **Contingent Contracts**.

1 **Definition.** A contingent contract specifies actions under particular conditions.

i) An indirect way to resolve asymmetric information.

ii) Induces self-selection among the better-informed parties (e.g., sellers offering products of different quality).

iii) May serve as **signals**. E.g., sellers of better (higher-yielding) trees can distinguish themselves by selling for a share of the production, as opposed to cash (preferred by sellers of average or relatively low-yielding trees).

iv) May serve as **screens**. E.g., a potential buyer could take the initiative of offering the seller a choice between payment in a share of the production or straight cash, a seller of relatively high-yielding trees is more likely to choose the payment with a share of production.

Chapter 14

Incentives and Organization

A **Organizational Architecture**.
1 **Definition.** Organizational architecture comprises the distribution of ownership, incentive schemes, and monitoring systems. The vertical and horizontal boundaries of the organization are two aspects of the organizational architecture.
2 An efficient organizational architecture revolves four issues of internal management:
i) holdup;
ii) moral hazard;
iii) internal market power; and
iv) economies of scale, scope and experience.

B **Moral Hazard**.
1 **Definition**. Moral hazard exists when one party's actions affect but are not observed by another party, e.g., a salesperson is *subject to* moral hazard relative to her employer.
2 **Asymmetric information about actions**. Moral hazard arises when there is asymmetric information concerning some action of the better-informed party.
3 **Economic efficiency**.
i) The salesperson acts independently and chooses her effort to maximize her personal net benefit = her compensation – her cost of effort. The salesperson's effort generates a positive externality for her employer.
(1) Level of effort that maximizes her net benefit = her marginal compensation – her marginal cost of effort.
(a) The lower the salesperson's marginal compensation relative to the employer's marginal profit contribution, the lower will be the effort that the salesperson chooses relative to the economically efficient level. .
(b) If the salesperson's marginal compensation coincides exactly with the employer's marginal profit contribution, the salesperson would choose the economically efficient level of effort, and there will be no moral hazard.
4 **Degree of moral hazard.** The relevant parties would like to resolve the moral hazard/positive externality (in the sales context), so that the better-informed party/salesperson will make the economically efficient choice.
i) The degree of moral hazard is measured by the difference between the economically efficient action and the action chosen by the party subject to moral hazard.
(1) The greater the difference, the greater the degree of moral hazard, and the greater the added value (the excess of profit contribution over cost) to the

employer and the salesperson that can be realized by resolving the moral hazard.

C **Incentives**.

1 Two complementary approaches to resolve moral hazard: monitoring systems and incentive schemes.

i) They are complementary because all incentives must be based on actions that can be observed. The better the available information is, the wider the choice of incentive schemes.

2 **Monitoring systems**. These collect information about the actions of the party subject to moral hazard.

i) The simplest monitoring system (e.g., time clock, vehicle log, random checks by supervisors, customer reports) focuses on *objective* measures of performance such as hours on the job (not necessarily effort).

ii) Supervision by supervisors.

iii) Monitoring by customers.

3 **Incentive schemes** *align* the incentives of the party subject to moral hazard with those of the less-informed party by linking compensation to some observable measure of performance.

i) They depend on a link between the unobservable action and some observable measure of performance.

ii) The scope of incentive schemes depends on what indicators of the unobservable action are available, e.g. using information provided by monitoring systems.

iii) **Performance pay** is an incentive scheme that bases pay on some measure of performance (e.g., a 10% commission on sales volume).

(1) Note: With a fixed wage and no monitoring, a salesperson cannot affect her earnings in any way. So, her marginal compensation from effort will be zero. Her marginal compensation curve is the horizontal axis.

(2) With a 10% commission, the marginal compensation from effort will be positive. The height and slope of her marginal compensation curve depend on how her effort affects sales revenue.

(3) With a 15% commission, the marginal compensation curve would be higher, and would cross the marginal cost curve at a higher level of effort. The salesperson would increase effort.

(4) An incentive scheme is relatively stronger (resulting in higher level of worker's effort) if it provides a higher personal marginal compensation for effort.

iv) A **performance quota** is a minimum standard of performance, below which penalties (e.g., deferral of promotion, pay reduction, dismissal) apply.

(1) A performance quota is cost effective. It does not reward effort below or above the economically efficient level. If focuses the incentive at the economically efficient level of effort.

(2) The employer must identify the sales revenue that would result if the salesperson chose the economically efficient level of effort (say 250 units of effort).

(3) The marginal compensation curve has 3 parts;

(a) It follows the horizontal axis from 0 to 249 units of effort;

(b) It spikes up at 250 units; and
(c) Then follows the horizontal axis again from 251 units of effort and above.

4 **Risk and multiple responsibilities**. Two side-effects of incentives.

i) **Risk.**
(1) Incentive schemes resolve moral hazard by linking compensation to some observable measure of the unobservable action.
(2) Risk arises whenever the measure of the unobservable action is affected by factors other than the unobservable action, as the compensation would then depend on those other factors.
(a) A party who is subject to moral hazard and has imperfect information about those factors will face risk.
(b) Risk arises as she will be uncertain about her compensation.
(c) E.g., besides the salesperson's effort, actual sales may depend also on the general state of the economy, competition, traffic, weather, customers' orders, and other factors.
(3) An economically efficient incentive scheme must balance the incentive for effort with the cost of risk. The **cost of risk** depends on 3 factors:
(a) The **impact of extraneous factors**: if the measure is sensitive to these extraneous factors and the factors are subject to wide swings, the risk would be relatively higher.
(b) The degree of **risk aversion** of the party subject to moral hazard: if the party subject to moral hazard is risk neutral, the risk imposes no cost. The cost of risk increases with the degree of risk aversion.
(c) The **strength of the incentive scheme**: stronger incentives impose a heavier burden of risk on the party subject to moral hazard.
(4) Stronger schemes should be adopted if the extraneous factors are weaker and the party subject to moral hazard is relatively less risk adverse.

ii) **Relative performance incentives**. Incentive schemes based on *relative* performance (e.g., fixed wage plus a commission for sales revenue in excess of the average level for all salespersons) are an effective way of reducing risk due to common extraneous factors.
(1) Effect of common extraneous factors is cancelled out to the extent they affect all workers equally (e.g., a bad economy).
(2) Relative incentive schemes are most useful where common extraneous factors are important.

iii) A party may be subject to moral hazard with respect to **multiple responsibilities**, e.g., a salesperson may be responsible for initial sales as well as providing post-sales service.
(1) An incentive scheme should aim to balance the multiple responsibilities: there should be some investment in monitoring each of the unobservable actions and incentives based on the corresponding indicators.
(a) Balancing multiple responsibilities becomes harder when it is more difficult to measure performance on some responsibilities than others.
(b) An incentive scheme that focuses on one responsibility may aggravate the moral hazard with regard to the other responsibilities.
(2) If there are important responsibilities for which it is difficult to measure performance, a deliberate use of weak incentives is a way to achieve the appropriate balance among multiple responsibilities.

D **Holdup**.

1 **Definition**. Holdup is an action intended to exploit another party's dependence.
   i) Unlike moral hazard, holdup does *not* require asymmetric information.
   ii) The prospect of a holdup leads other parties to take precautions (to avoid dependence) which either reduce benefits or increase costs, reducing the overall value and economic efficiency.
   iii) There is an opportunity to add value and increase profit by resolving the holdup.

2 **Specific investments**.
   i) The **specificity** of an investment in an asset (e.g., physical asset like a computerized route planning system, or human capital) is the percentage of the investment that will be lost if the asset is switched to another use.
   ii) The costs of holdup will be higher if the relevant assets are more specific.
   iii) The prospect of holdup *deters* all forms of specific investments.
   iv) If holdup could be prevented, the relevant parties would increase specific investments and so add value and increase profit.

3 **Incomplete contracts**. A complete/more detailed contract would resolve holdup, but would be very costly to prepare.
   i) A complete contract specifies the actions of all parties under every possible contingency.
   ii) Generally, a contract should be more detailed if:
      (1) The potential benefits and costs at stake are larger;
      (2) Possible contingencies are more serious.

E **Ownership**. Another way to resolve holdup is through changing the ownership of the relevant assets.

1 **Ownership** means the rights to **residual control**, which are those rights that have not been contracted away (e.g., the right to enter into a second mortgage on the building after granting a first mortgage to a bank).
   i) Rights to residual control include the right to receive **residual income** from the asset, which is the income remaining after the payment of all other claims (e.g., the difference between rental income and expenses).
      (1) As the recipient of residual income, the owner gets the full benefit of changes in income (e.g., an increase in rent) and costs.
   ii) A transfer of ownership means shifting the rights of residual control to another party.
   iii) An owner has the full incentive to maximize the value of the assets.
      (1) If information about other parties' actions is asymmetric, they would be subject to moral hazard relative to the owner.
      (2) Even absent asymmetric information, other parties may hold up the owner and exploit the owner's dependence.

2 **Vertical integration**.
   i) Vertical integration is the combination of the assets for two successive stages of production under a common ownership.
      (1) With common ownership, the owner would have full incentive to maximize the value of the combined assets.

(2) With separate ownership, the owner of each asset would only maximize the value of its asset, and possibly at the expense of the owner of the other asset.

ii) Downstream vs upstream vertical integration.
(1) Downstream vertical integration: involving the acquisition of assets for a stage of production nearer to the final consumer. E.g., a food manufacturer acquiring a supermarket. The "sell or use" decision is a decision to vertically integrate downstream
(2) Upstream vertical integration: involving the acquisition of assets for a stage of production further from the final consumer. E.g., a food manufacturer acquiring a dairy farm. The "make or buy" decision is a decision to vertically integrate upstream.

iii) Vertical integration/disintegration changes the ownership of assets and alters the rights to residual control and residual income.
(1) These in turn affect the degree of moral hazard and the potential for holdup.

F **Organizational Architecture**.

1 Implications.
i) Vertical and horizontal boundaries are just 2 aspects of the organizational architecture which comprises:
(1) distribution of ownership,
(2) incentive schemes, and
(3) monitoring systems.

ii) The design of organizational architecture depends on a balance among four issues and the mechanisms by which these issues may be resolved:
(1) holdup,
(2) moral hazard,
(3) internal market power, and
(4) economies of scale, scope, and experience.

2 **Holdup** can be resolved by changing the ownership of relevant assets.
i) An external contractor has the power to withhold the services of its assets.
ii) Vertical integration can mitigate the potential for holdup. E.g., holdup by a delivery service can be resolved by vertical integration into the delivery business (an in house delivery service).

3 **Moral hazard**. Changes in ownership will also affect the degree of moral hazard.
i) Vertical integration changes ownership. Since an employee is subject to relatively greater moral hazard than an owner, vertical integration increases the degree of **moral hazard**.
ii) Giving ownership to the employee/internal supplier will resolve the moral hazard.
(1) If the employee owns the business, she receives the residual income. If she exerts an additional unit of effort, she will receive the entire marginal profit contribution.
(2) When balancing her marginal benefit with the marginal cost, the employee will choose the economically efficient level of effort.

4 **Internal market power**. Changes in ownership will affect the monopoly power of internal sources of input and monopsony power of internal users of outputs.

i) The internal supplier may acquire monopoly power. The organization should outsource (purchase services or supplies from external sources) whenever the internal provider's cost exceeds that of external sources.
ii) A policy to sell externally whenever the external price is higher than the internal transfer price can resolve the internal monopsony power.

5 **Economies of scale, scope, and experience**. Changes of ownership affect the extent of economies of scale, scope, and experience.
i) Economies of scale. The internal supplier may lack scale as compared with external suppliers. The external contractor would have better capacity utilization and hence a lower average cost. Then, it would be less costly to purchase the service from the external contractor.
ii) Experience curve. The internal supplier may have low cumulative volume as compared with external suppliers. The external contractor may push further down the experience curve and hence achieve lower average cost.
iii) Economies of scope. Economies of scope are the major factor in favor of wide horizontal organizational boundaries. If the company already produces one item, it can reduce total cost by producing the other one as well. However, if the company does not already produce either item, then economies of scope imply that it should outsource both.

6 **Balance**. The decision on organizational architecture depends on a balance among: the scope for holdup, the degree of moral hazard, internal market power, and the extent of economies of scale, scope, and experience. It also depends on other ways to resolve these issues – more detailed contracts, incentives and monitoring, outsourcing and external sales.
i) Vertical boundaries -- the "make or buy" decision:
(1) In favor of vertical integration: Holdup and economies of scope.
(2) In favor of outsourcing: Moral hazard, internal market power, and economies of scale, scope, and experience.
ii) Horizontal boundaries:
(1) In favor of horizontal integration: Economies of scope.
(2) Against horizontal integration: Moral hazard.

Chapter 15

Regulation

A **Economic Inefficiency and Government Regulation**. Possible sources of economic inefficiency (situations where marginal benefit diverges from marginal cost):
1 Market power;
2 Externalities;
3 Asymmetric information.

B **Natural Monopoly**.
1 **Definition**. A natural monopoly is a market where the average cost of production is minimized with a single supplier, e.g., distribution of electricity and water, broadband service.
i) A market is a natural monopoly when economies of scale or scope are large relative to market demand. The average cost of production is lowest when there is only one supplier.
ii) If a market is a natural monopoly, the government should prohibit competition and award an exclusive franchise to a single supplier.
iii) The monopoly might exploit its exclusive right to raise its price at the expense of its customers, forcing the marginal benefit above the marginal cost.
iv) The government can control the monopoly via:
(1) Government ownership and operation; or
(2) Regulation of commercial enterprise.
2 **Government ownership**.
i) A government-owned enterprise tends to be relatively inefficient.
(1) More prone to be coopted by employees, resulting in high wages and over staffing, inflating the cost of production.
(2) Must compete with other priorities for an allocation from the government budget and may not secure the economically efficient level of investment.
ii) **Privatization**. Privatization is the transfer of ownership from the government to the private sector. This does not mean allowing competition. A private enterprise may have an exclusive franchise and hence be a monopoly.
3 **Price regulation**.
i) ***Marginal cost pricing***: The provider must set the price equal to the marginal cost and to supply the quantity demanded, behaving like a perfectly competitive supplier.
(1) Production at economic efficient level: marginal benefit equals marginal cost.
(2) Two challenges.
(a) **Subsidy**. To allow the provider to break even, government subsidy may be required. However, with ***Average cost pricing***, no subsidy. The

provider must set the price equal to the average cost and supply the quantity demanded.

(b) **Cost information**. The franchise holder has a strong incentive to exaggerate its reported costs to attempt to set a higher price and increase its profit. This situation of information asymmetry, if not resolved, would result in economic inefficiency.

4 **Rate of return regulation**. This avoids the issue of costs by focusing on the franchise holder's profit. The regulator stipulates the franchise holder's maximum allowed profit in terms of a maximum rate of return on the value of the rate base. The franchise holder can set prices freely, provided that it does not exceed the maximum allowed profit.

i) **Rate base**: Assets or equity on which the franchise holder may earn the allowed rate of return.

ii) The franchise holder must reduce its prices if its rate of return exceeds the specified maximum.

iii) Three challenges.

(1) **Rate of return**. To determine the appropriate rate of return for the monopoly.

(a) There would be few comparable businesses.

(b) Typically, the rate base is large, and a small difference in the allowed rate of return will translate into a large sum of money.

(2) **Rate base**. To determine what assets are needed to provide the regulated service.

(a) The franchise holder will seek the widest possible definition to increase profit.

(3) **Overinvestment**.

(a) The franchise holder has an incentive to invest beyond the economically efficient level.

(b) By enlarging the rate base, the allowed rate of return will be applied to a larger base, leading to higher profit.

C **Potentially Competitive Market**.

1 **Definition**. A potentially competitive market is one where economies of scale or scope are small relative to market demand. Having two or more competing suppliers would not raise average costs.

i) In a potentially competitive market, with perfect competition, the invisible hand ensures economic efficiency.

ii) In a potentially competitive market, the government should promote competition.

iii) The government can promote competition via:

(1) Competition law; or

(2) Structural regulation.

2 **Competition law ("antimonopoly" or "antitrust" law)**. Regulated industries are subject to competition law specific to the industry.

i) Competition laws generally prohibit/restrict:

(1) Collusion – competitors colluding on price or other aspects of purchases or sales;

(2) Abuse of market power by businesses with market power;

(3) Harmful mergers or acquisitions that would create substantial market power; and

ii) Competition laws may also prohibit/restrict specific business practices such as control over resale prices and exclusive agreements.

3 **Structural regulation**. A natural monopoly may have upstream or downstream markets that are potentially competitive. E.g., in electricity, generation may be potentially competitive while distribution may be a natural monopoly.

i) The government must preserve the benefits of monopoly in one market while fostering competition in the other.

ii) Challenges.

(1) A monopoly franchise holder may also participate in the potentially competitive market, e.g., a holder of monopoly franchise over the distribution of electricity also has a monopsony over the purchase of electricity from generators.

(a) The government must regulate the franchiser's monopoly over the distribution of electricity as well as its monopsony over the purchases of electricity.

(2) If a holder of monopoly franchise over the distribution of electricity has vertically integrated upstream into the generation of electricity, it may have an incentive to favor its internal generator of electricity and discriminate against competing generators. It might also exploit superior information about technical and other issues to confound the regulator if the latter tries to intervene to ensure fair competition. The competing generators of electricity may be at a disadvantage in supplying the distribution monopoly.

iii) **Structural regulation** is a way to separate the natural monopoly from the potentially competitive market. Under structural regulation the regulator stipulates the conditions under which a business may produce vertically related goods and services, e.g., compulsory divestment of one of the businesses.

D **Asymmetric Information**.

1 If information asymmetry is not resolved, marginal benefit will diverge from marginal cost, and the allocation of resources will not be economically efficient (e.g., inflated demand for medical services).

2 **Direct government regulation.** The regulator could resolve the asymmetry by *regulating*:

i) **Disclosure of information** by the better informed party. The better-informed party is required by the government to disclose its information truthfully. Note: Information should be *objectively verifiable* (e.g., in the case of substituted gasoline).

ii) **Conduct** of the better informed party. The better informed party is regulated to limit the extent to which it can exploit its informational advantage. The regulator could stipulate requirements for written agreements and minimum cooling off periods (e.g., in the case of unsuitably risky investments).

iii) **Business structure** of the better informed party. By enforcing separation of different businesses, a regulator may reduce the opportunities for exploiting superior information:

(1) Separation of commercial banking activities from proprietary trading.

(2) Separation of medical advice and treatment from sale of pharmaceuticals.

(3) Separate representation of buyer and seller in real estate transactions.

3 **Self-regulation** is the regulation of members by an industry organization.

i) The trade organization may regulate various aspects of business, e.g., entry and exit, business structure, pricing, and advertising…etc.

ii) However, exclusive right to license practitioners granted by the government to the professional organization may be a cover to limit competition.

E **Regulation of Externalities**.

1 When some benefit or cost passes directly from source to recipient and not through a market, the invisible hand cannot work. Also, private action may fail to resolve widespread externalities involving large numbers of parties.

i) Government regulation may be the only solution.

ii) The economically efficient level of an externality balances the marginal benefit with marginal cost.

(1) Benefit of emissions: allowing the sources to avoid the cost of clean disposal.

(2) Cost of emissions: harm to the health of the victims.

2 **User fees or taxes**.

i) These allow all sources to emit pollutants as much as they like provided that they pay the appropriate fee or tax.

ii) The regulator sets the user fee for *all* sources of emissions at the social marginal cost of emissions.

(1) All sources would emit up to the level that their marginal benefit equals the fee. The marginal benefits of all sources would be equal.

(2) The marginal benefits of emissions equal the user fee which equals the social marginal cost of emissions.

iii) So the user fee implements the economically efficient rate of emissions.

3 **Standards or quotas**.

i) The regulator sets the standard/quota at the economically efficient rate of emissions.

ii) The regulator then sells the licenses through public auction to all sources.

(1) Each source would demand licenses according to its marginal benefit from emissions. The market demand is identical to the social marginal benefit curve.

iii) The equilibrium price of each license (where quantity demanded equals quantity supplied) equals the social marginal cost of emissions, same as a user fee determined by a competitive market.

4 **Congestion**.

i) Externality that varies with time.

(1) For economic efficiency, congestible facilities (e.g., bridges, tunnels, roads, and subways) should levy a **user fee** equal to the *marginal cost of use*, where the cost includes the externalities imposed on other users.

(2) As marginal cost varies with time of the day, so should the price.

ii) Externalities that vary geographically.

(1) With differences in marginal benefit and marginal cost, the economically efficient level of the externality would vary, so would the appropriate user fee or tax.

5 **Accidents**.

i) Accidents are a specific class of externalities, which are probabilistic.

ii) The economically efficient level of care balances the marginal benefit (in terms of reduced expected harm from accidents) to *society* with the driver's marginal cost of care. The marginal benefit to *society* includes the reduction in expected harm to other drivers, so exceeds the marginal benefit to the driver herself.
iii) The government assigns rights which then establish the basis for the relevant parties to resolve the externality.
(1) The law specifies the liability of the parties to an accident. **Liability** is the set of conditions under which one party must pay damages for causing harm to another.
(2) Each driver will choose the level of care to balance her marginal benefit of care (in terms of the reduced harm from accidents and the reduced expected liability for damages) against her marginal cost.
(3) With the appropriate liability and damages, the driver would choose the economically efficient level of care.

F **Public goods**.
1 A public good provides non-rival consumption or use.
i) Once produced, the marginal cost of serving an additional consumer is zero.
ii) By adding a consumer, as long as the consumer gets some benefit, the net benefit to society as a whole would increase.
iii) The economically efficient number of consumers is the total of all consumers who get some benefit from the good.
2 To provide public goods which are **not excludable**, and to achieve economic efficiency:
i) The **government** can provide the public good at no charge to consumers, e.g., national defense, environmental protection, GPS, weather reports…etc.
ii) **Charities** (supported by volunteers, contributions, and government subsidies (either directly or indirectly through tax exemptions)) can provide the public good at no charge to consumers, e.g., public health, open-source software…etc.
iii) **Private enterprise and non-profit organizations** can provide the public good with government subsidies (either directly or indirectly through tax exemptions), e.g., R&D.
(1) However, if the producers set a price for usage, usage would fall below the economically efficient level.