WHAT IS ECONOMICS?
The study of the role of markets and individual incentive-driven mechanisms used for allocating scarce resources among different competing uses

THE SCARCITY PRINCIPLE
• More of a good thing means less of another
• If society’s resources are insufficient to meet all its wants, decisions must determine what and how much to produce.

QUESTIONS: Positive and normative
Models As Abstractions From Reality
1. Demand
2. Supply
3. Equilibrium

How are these choices made?
• Private or individual choices
• Public or collective choices
Mechanisms for allocating and distributing scarce resources

In a market economy
• Property rights and voluntary exchange
• Prices are the key variable:
  – Price acts as an allocation device among consumers
  – Price changes signal to consumers and producers to alter behaviour and help the system to achieve equilibrium
• Individual decisions, interactions with and effects on others

What is market price theory?
A tool for understanding social phenomena
• Models: Supply, demand, equilibrium
• Agents and markets
  – Incentives
  – Constraints

Modelling Method
• agents (individuals or households, firms)
• Rational and self-interested
• Property rights and voluntary actions

Optimisation Principle:
– individual maximises utility
– firm maximises profits (or minimises costs)

Basic Economic Concepts
• Demand curve: quantity that consumers wish to purchase at each price, holding constant consumers’ incomes, consumers’ tastes, and prices of other goods
• Supply curve: quantity that producers wish to provide at each price, holding constant technology and prices of inputs
• Market equilibrium: combination of price and quantity such that quantity demanded equals quantity supplied

The demand curve and relevant variables
• Price
• Income
• Subsidies, Taxes
• Movements along the demand curve
• Movements of the demand curve
– Objects of choice
  • **individual** (or household)
    – consumption of goods
    – hours worked (consumption of leisure)
  • **firm**
    – production level of output
    – combination of inputs (labour, capital)

– **Constraints**
  • individual (or household): money income
  • firm: production technology

**CONSUMER THEORY:**
• Rational: Well-defined goals.
  Tries best to achieve them
• Preferences
• Utility (function): Cardinal and ordinal
• Indifference curves
• Budget set, budget constraint
• Consumer optimum

**Utility and Preference**
• X and Y — commodities
• x and y — quantities of X and Y
• \( D = (x_0, y_0) \) — consumption bundle,
  comprising quantities \( x_0 \) of X and \( y_0 \) of Y

**Laws of Preference**
• “De gustibus non est disputandum”
  – No accounting for tastes
1. **Axiom of Comparison**
  – Every consumer can compare consumption bundles A and B, and rank them in exactly one of three ways:
    • A is preferred to B, or \( A > B \)
    • B is preferred to A, or \( B > A \)
    • Indifference between A and B,
2. **Axiom of transitivity**
  – Consider 3 consumption bundles A, B, C
    • If A is preferred to B (\( A > B \)), and B is preferred to C (\( B > C \)), then A must be preferred to C (\( A > C \))
    • Similarly, if \( B > A \) and \( C > B \), then \( C > A \)

**Types of commodities**
• **Goods** are commodities for which more is preferred to less
• **Bads** are commodities for which less is preferred to more
  • If X and Y are goods, then A is the most preferred bundle, and D is the least preferred

**Diagram**

- A = (\( x_1, y_1 \)), B = (\( x_0, y_1 \)); C = (\( x_1, y_0 \))
- Just 2 commodities?
- Axioms give a rank ordering of preferences:
  All consumption bundles can be ranked consistently in order of individual preferences
  Ranking associated with preference or utility
In finding most preferred bundle, the consumer is said to maximise utility.

Individual’s preferences represented by utility function: \( U(x, y) \)

Utility depends on consumption of \( X \) and \( Y \)

- Two concepts of utility
  - Cardinal utility
  - Ordinal utility

**CARDINAL UTILITY**

- (Here mainly for introducing concept of marginal utility)
- Economists used to want to measure utility—just as length or temperature. Utility units *utils*
- Take a simpler version: \( U = g(x) \)
- Measuring utility in utils, graph describes diminishing marginal utility of \( X \)
- Define marginal utility of \( X \) as the change in utility due to an infinitesimally small change in the quantity of \( X \) consumed

**ORDINAL UTILITY**

- Ordinal utility satisfies the two preference axioms, allows a consistent ranking of choices, but does not require (or permit) comparing absolute magnitudes of utility difference
- In other words, we know the sign (+/-) but not the absolute magnitude of the marginal utility

**INDIFFERENCE CURVES**

1. Negative slope
2. Cannot cross one another
3. Drawn through every point in \((x, y)\) space
4. Convex to the origin
   - Intuitive psychological argument
   - Observed diversity in consumption expend.

**BUDGET CONSTRAINT** \( M = px \cdot x + py \cdot y \)
- \( M \) = Money income
- \( px \) = Price of \( X \)
- \( py \) = Price of \( Y \)

**CONSUMER CHOICE PROBLEM**

- Maximise \( U(x, y) \) subject to \( M = px \cdot x + py \cdot y \)

**Geometric solution**

- Result: Demand curves
  - \( x(M, px, py) \)
  - \( y(M, px, py) \)
• Consumer optimum is that point on budget line that reaches the highest possible indifference curve
• With convex indifference curves, two types of optima possible: Also called solutions
  – interior, i.e., all goods consumed
  – corner, i.e., one commodity not consumed
RATIONAL SPENDING RULES
• Nominal quantities are irrelevant. What matters are ratios, \( M/p_x, M/p_y, p_x/p_y \)
  – Budget sets (location and slope)
  – Preferences
• If cardinal utility, at point \( E \), \( MRS = p_x/p_y \)
• Call this the consumption balance equation
• Allocate spending across goods such that marginal utility per pound sterling is identical across all goods: \( U_x/p_x = U_y/p_y \)
What if \( U_x/p_x > U_y/p_y \) at point A or B?
• Consumer wishes to purchase more \( X \) and less \( Y \) … at point B

PRICE EXPANSION PATH AND THE DEMAND CURVE
• The price expansion path for \( X \) is the locus of points representing optimal consumption bundles of \( X \) and \( Y \) for a given level of income as the price of \( X \) varies
• An individual’s demand curve for \( X \) can be derived from the corresponding price expansion path
• For simplicity, fix the price of \( Y \) at unity (\( P_y = 1 \)) and hold income constant at \( M = M_0 \)

• As \( P_x \) falls, consumer moves to higher and higher indifference curves
• So consumer’s utility increases as she moves south-east down her demand curve from \( a \) to \( e \)

CONSUMER SURPLUS AND DEMAND CURVE
Two views of information in demand curve:
– quantity demanded at each price (hence individual demand curves summed horizontally to derive industry or market demand)
– maximum price consumers will pay for an additional unit of the commodity

INCOME AND SUBSTITUTION EFFECTS
• A fall in \( P_x \) has two consequences:
  – Income effect: consumer can acquire the same commodity bundle as before the price fall, but for lower total expenditure. So, income left over for more \( X \) and \( Y \)
  – Substitution effect: when \( P_x \) falls, consumer would like more \( X \) as it has become cheaper relative to \( Y \),
• An increase in \( P_x \) also has income and substitution effects (in the opposite direction to where \( P_x \) falls)
• Decomposition of the effects of a price change into income and substitution effects

HICKS decomposition

HICKS DECOMPOSITION OF INCOME AND SUBSTITUTION EFFECTS

• While the PEP exhibits a negative slope over one range of \( P_x \) and a positive slope over another range of \( P_x \), the demand curve has its slope negative throughout (standard case)
FROM INDIVIDUAL TO MARKET DEMAND CURVES

- Market demand for X is obtained by summing the quantity demanded of X by each consumer at each price of X, i.e., by horizontally summing individual demand curves for X.

THEORY OF THE FIRM
Proceed in four steps:
– Nature of the Firm
– Theory of Production
– Theory of Costs
– Theory of Supply

THEORY OF PRODUCTION
- The firm produces a single output (Q) using two inputs: labour (L) and capital (K).
- The flow of output produced is related to the flow of inputs by the production function
  $$q = q(l, k)$$
  where q = output/unit time
  l = people-days labour/unit time
  k = flow of capital services (machine-days)/unit time

- Eq. (1) is general, indicating maximum output achievable for given quantities of L and K with fixed technology.
- Often convenient to use special forms of the production function. Among them:
  – (i) Fixed coefficients
  – (ii) Variable coefficients: increasing then diminishing marginal products
- The second is what underlies textbook cost theory.

Assuming workers and machines infinitely divisible, define the marginal product of labour as the change in output from an additional unit of labour, ceteris paribus. The marginal product of capital is the change in output resulting from an additional unit of capital, ceteris paribus.

FIXED COEFFICIENTS
- Labour and capital must always be used in fixed proportions to produce output, e.g., 2 workers and 1 machine to produce 1 unit of output.
- Thus, to produce a given level of output, specific amounts of each input will be needed, e.g., 10 workers to produce 5 units of output, provided at least 5 machines in place.

- Firms maximise profits—the difference between revenue and costs.
- Revenue is price times quantity sold.
- Costs are opportunity costs, not accounting costs.
- Opportunity cost of a productive factor (unskilled labour, machine-hours, entrepreneurship) is highest return in alternate use of the factor.
- Returns may be pecuniary, e.g., the wage at another job, or non-pecuniary, e.g., subjective enjoyment of leisure.
VARIABLE COEFFICIENTS
Form of production function underlying standard theory of the firm has three properties:

(i) The marginal product of each factor first increases then decreases, but always remains positive
(ii) Marginal product of a factor depends on the quantities used of all factors
Usual assumption: If $k$ increases holding $l$ constant, then MPL rises
Properties (i) and (ii) are shown in total product curves for labour below:

Returns to Scale
- Refers to change in output from an equiproportional change in all inputs

- **Constant returns to scale** (CRS) is when the proportional change in output is the same as the proportional change in inputs
  [What happens to average products?]

- **Increasing returns to scale** (IRS) occurs when the proportional change in output exceeds the equiproportional change in inputs
  - Increases in size of the labour force ($l$) and in plant size ($k$) allow greater specialisation and thus division of labour (raising average labour productivity), e.g., Adam Smith’s pin factory

- **Decreasing returns to scale** (DRS) occurs when the proportional change in output is less than the equiproportional change in inputs
  - Why does DRS exist? If a plant is exactly duplicated, expect can always double output, i.e., should always have CRS...

- ... not if there is some productive factor (left implicit in production function) that remains fixed, e.g., entrepreneurial input
- Congestion

Summarise variable scale properties of production function as follows:

\[ \lambda'q = q(\lambda l, \lambda k), \lambda > 1 \quad (4) \]

- IRS: $\lambda < \lambda'$
- DRS: $\lambda > \lambda'$
- CRS: $\lambda = \lambda'$

Assumptions, continued
(iii) Production function displays first increasing and then decreasing returns to scale over different ranges of output
(Previous statements all about changes in one factor input at the margin; returns to scale concerns change in all factor inputs simultaneously)
Isoquants
• Locus of technically efficient input combinations (l, k) available from a given technology to produce a given level of output

PROPERTIES OF ISOQUANTS
• Negative slope
• Non-intersection
• Coverage of (l, k) space
• Convex to origin

MARGINAL RATE OF TECHNICAL SUBSTITUTION OF K FOR L (MRTS)
• The slope of an isoquant at any point shows the MRTS: the amount of K a firm must give up in exchange for an additional unit of L, such that the same quantity of output can be produced

• From production function, key decisions:
  – How much output to produce?
  – What combination of labour and capital to use in producing given quantity of output?

• COST
  – total, fixed (sunk), variable
  – marginal, average
  – short run, long run

• SUPPLY
  – firm, industry
  – short run, long run

THEORY OF COSTS
• When two inputs (l, k) are used in production, TOTAL COSTS are

\[ C = wl + rk \]

where w = wage rate
r = capital’s rental price (or user cost)
l = quantity of labour
k = quantity of capital

In the short run, at least one input is fixed, while in the long run, all inputs can vary
• Call the first type are fixed factors; the latter, variable factors (yet a third, quasi-fixed)
• Let’s start with short-run costs

VARIABLE \( V = C - F = wL(q) \)
MARGINAL \( MC = w \frac{Lq}{MPL} \)
AVERAGE (TOTAL) \( AC = \frac{C}{q} = \frac{F}{q} + wL(q)/q = \frac{F}{q} + w/\text{APL} \)
AVERAGE VARIABLE \( AVC = (C-F)/q = w/\text{APL} \)
AVERAGE FIXED \( AFC = F/q \)

RATIONAL PROVISION RULES
• Get profits up and costs down
• When the price of what you provide rises, you provide more; when its cost to make rises, you provide less…
  • … subject to qualifications
  – How to make it; what to adjust

– Shut down the business; keep it going
– Long run versus short run
• Fixed costs (already sunk) don’t matter
• Short run
  – MC falls, then rises
  – Similarly AVC and AC
  – MC passes through AVC and AC at the latter’s minimum points
• Long run
  – LRAC falls, then rises
  – There is a minimum LRAC point associated with that that is an optimal plant size k.
CHOICE OF OPTIMAL OUTPUT BY COMPETITIVE FIRM
Assume:
(i) The firm produces a single homogeneous output \( q \)
(ii) The industry comprises many identical small firms, each producing a trivial fraction of industry output. Therefore, the price of output is **exogenous** to the individual firm, i.e., firms are **price-takers**
(iii) In the **short-run**, a firm’s size of plant \( k \) is fixed; it can neither enter nor leave the industry
(iv) In the **long-run**, firms can vary their use of both capital and labour; they can freely enter or leave the industry
(v) Each firm’s objective is to maximise profits

Output level satisfying \( p = MC \) is the optimal level of output for the firm in the short-run, subject to **two conditions**...
(i) **MC must be rising at the level of output where \( p = MC \)**
Why? Intuitively, if \( MC \) is falling where \( p = MC \), then with \( p \) fixed, \( \uparrow q \rightarrow \uparrow \pi \), so cannot yet be profit-maximising
(ii) **Profits with \( p = SRMC \) producing something must exceed that producing nothing. Thus, \( p > AVC \). Why?**
Thus, rule for optimal output level in short run:
– produce where \( p = SRMC \), so long as \( p \geq AVC \)
– if \( p < AVC \), shut down and leave the industry

• AVC not AC — fixed (sunk) costs don’t matter

PRODUCER SURPLUS AND SUPPLY CURVE
Similarly, two views of information in supply curve:
– **quantity supplied at each price** (hence firms’ marginal cost curves summed horizontally to derive industry supply)
– **minimum price** firms will accept to produce an additional unit of the commodity

OUTPUT DETERMINATION IN THE LONG-RUN
• When the firm can vary both capital and labour, rule for optimal output level is
– produce where \( p = LRMC \), so long as \( p \geq LRAC \)
– If \( p < LRAC \), shut down and leave the industry

FROM FIRM TO INDUSTRY: THE SHORT RUN
• Industry supply curve is horizontal summation of firms’ SRMC curves above minimum AVC
• Industry demand curve is horizontal summation of consumers’ demand curves
• Equilibrium price is given by intersection of industry demand and supply curves
• (Relationship between MARKET EQUILIBRIUM and OPTIMUM of a single firm in the short-run?)

• Notation:
  – q = output of a single representative firm
  – Q = output of the industry
  – P_s = price of output in the short-run

• Short run, the firm is earning above-normal profits at its optimal level of output q_s.
  • Why? Because P_s = SRMC > SRAC
  • Possible in short run, when number of firms in industry is fixed, so that firms elsewhere attracted by above-normal profits in industry Q cannot (yet) enter this industry.

• However, with free entry, above-normal profits will be impossible in long run.

MAIN CONCLUSIONS

• COST
  1. Long-run total and average cost curves are lower envelopes of short-run ones.

• SUPPLY
  1. Firm: Price equals marginal cost, except if shutdown (when price below minimum average variable cost
  2. Industry: Like firm in short run
  3. Industry: Horizontal supply in long run

COMPETITIVE EQUILIBRIUM AND GAINS FROM TRADE

• Until now, positive microeconomics
  • How price and output are determined, and effects on them of exogenous variables like

  incomes or other prices (in substitutes or complements)

• Turn to different questions:
  – How does society benefit from using the competitive market mechanism to allocate resources in industry X?
  – What are the social gains from allowing producers and consumers of X to trade freely with each other?
  – Is it possible to measure these gains objectively, i.e., in monetary terms?

• These issues are concerns in welfare economics

Proposition

Equilibrium price in a perfectly competitive market reflects:
  (i) value to society (consumers) of the last unit of the commodity purchased

(ii) resource cost to society (firms) of the last unit of the commodity produced

TOTAL GAINS FROM TRADE

• Total net gain from trade in X is the sum of consumer surplus and producer surplus, i.e., area of triangle PminPCB

• Q: What resource allocation mechanism maximises net gains from trade?

• A: A competitive market where price adjusts to equate demand and supply

• Market equilibrium not only explains how price and output of X are determined, but—subject to caveats (the absence of externalities)—such an allocation is economically efficient
INVERTED U SHAPE?
• To sell more output, monopolist has to lower price
• Lowering price has two opposing effects on total revenue:
  – increase in quantity demand for the product, so firm sells more with a positive impact on revenue
  – reduces revenue from all units of output that would have been sold anyway (the intra-marginal units)

• Monopolist makes super-normal profits equal to \((PM - AC)qM\) (yellow shaded area in previous slide)

Monopolist produces less output and charges higher price than a perfectly competitive industry with identical cost and demand
• Compared to perfectly competitive outcome, monopoly entails transfer of consumer surplus to the producer...
• ... efficiency loss equal to sum of CS and PS lost through reduction in trade...

DISCRIMINATING MONOPOLY
• Thus far simple monopoly where firm charges a single price to all consumers
• Turn to discriminating monopoly where the firm charges different prices for different units of output

Three types of discriminating monopoly may be distinguished
(i) First degree (or perfect) price discrimination—when monopolist sells different units of output for different prices, and these prices vary from customer to customer (rare in practice, but conceptually informative)
  • Allows seller to extract entire consumer surplus, i.e., appropriates all the gains from trade
(ii) Second degree price discrimination—when monopolist sells different units of output at different prices, but everyone who buys the same amount of the commodity pays the same price
  • Example: Bulk discounts in supermarkets. Wholesale/retail
(iii) Third degree price discrimination—when monopolist sells output to different people at different prices, but every unit of output sold to a given customer sells for the same price
  • Example: Economy and business class air tickets on a given route (marginal cost differences?)