UGC-NET & SET Economics Micro Economics

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1. Theory of Consumer Behaviour

Consumer theory explains how a rational consumer allocates a given income among goods to maximise satisfaction. Three approaches dominate: cardinal utility, ordinal utility (indifference curves) and revealed preference.

Cardinal utility (Marshall)

- Utility is measurable in units (utils); marginal utility of money is constant.
- **Law of Diminishing Marginal Utility:** MU of a good falls as more of it is consumed.
- **Equilibrium (single good):** MUx = Px × MUm. **Many goods (equi-marginal principle):** MUx/Px = MUy/Py = … = MUm.
- **Consumer's surplus** = what the consumer is willing to pay minus what he actually pays (area under the demand curve above price). Hicks later gave compensating and equivalent variation versions.
- Criticisms: utility is not measurable; MUm is not constant; ignores the income effect.

Ordinal utility (Hicks–Allen indifference curve approach)

- Consumer can only **rank** bundles. Assumptions: completeness, transitivity, non-satiation, convexity.
- **Indifference curve (IC):** combinations giving equal satisfaction. Properties: downward sloping, convex to origin, never intersect, higher IC = higher satisfaction.
- **MRSxy** = −dY/dX = MUx/MUy; diminishing MRS gives convexity.
- **Budget line:** Px·X + Py·Y = M; slope = −Px/Py.
- **Equilibrium:** MRSxy = Px/Py (tangency) and IC convex at that point (second-order condition).
- Special cases: perfect substitutes (straight-line ICs, corner solution), perfect complements (L-shaped ICs, Leontief).

Price, income and substitution effects

- **Income Consumption Curve (ICC)** → Engel curve. Normal good: positive income effect; inferior good: negative.
- **Price Consumption Curve (PCC)** → demand curve.
- **Price effect = Substitution effect + Income effect.**
  - Hicksian decomposition: compensate income so the consumer stays on the original IC.
  - Slutsky decomposition: compensate income so the consumer can just buy the original bundle.
- Substitution effect is always negative (price ↑ → quantity ↓).

- **Giffen good:** strongly inferior good where the positive income effect outweighs the negative substitution effect → upward-sloping demand. All Giffen goods are inferior; not all inferior goods are Giffen.

Slutsky equation (total price effect = compensated effect − income effect):

$$\partial x_i/\partial p_j = \partial h_i/\partial p_j - x_j \cdot (\partial x_i/\partial M)$$

Revealed Preference Theory (Samuelson, 1938)

- Based on observed choices, not introspection. If bundle A is chosen when B was affordable, A is revealed preferred to B.
- **Weak Axiom (WARP):** if A is revealed preferred to B, B can never be revealed preferred to A. **Strong Axiom (SARP)** adds transitivity (Houthakker).
- Derives the law of demand for normal goods without utility assumptions.

Duality in consumer theory

Problem	Objective	Result
Primal	Max U(x) subject to p·x = M	Marshallian demand x(p, M); indirect utility V(p, M)
Dual	Min p·x subject to U(x) = U0	Hicksian demand h(p, U); expenditure function E(p, U)

- **Roy's identity:** $x_i = -(\partial V/\partial p_i)/(\partial V/\partial M)$.
- **Shephard's lemma:** $h_i = \partial E/\partial p_i$.

Elasticities and other key concepts

- Price elasticity $e_p = (dQ/dP)(P/Q)$; income elasticity; cross elasticity (substitutes +, complements −).
- **Engel aggregation:** $\Sigma\, s_i \cdot \eta_i = 1$ (s_i = budget share). **Cournot aggregation:** $\Sigma\, s_i \cdot e_{ij} = -s_j$.
- Demand functions are homogeneous of degree zero in prices and income (no money illusion).
- Lancaster's characteristics approach: consumers derive utility from characteristics of goods.
- Bandwagon, snob and Veblen effects (Leibenstein) — interdependent preferences.

Exam pointers: Slutsky vs Hicks substitution effect; Giffen vs inferior goods; WARP; Roy's identity and Shephard's lemma are frequent MCQs.

2. Theory of Production and Costs

A production function Q = f(L, K) gives the maximum output obtainable from given inputs with a given technology; cost theory translates it into money terms.

Short run: Law of Variable Proportions

One factor variable, others fixed. Three stages:

1. **Stage I:** TP rises at an increasing rate; AP rising; MP > AP. Irrational (fixed factor under-used).
2. **Stage II:** TP rises at a decreasing rate; MP and AP falling, MP ≥ 0. **Rational stage of production.**

3. **Stage III:** TP falls; MP negative. Irrational.

MP cuts AP at AP's maximum.

Long run: Returns to scale

- All inputs change in the same proportion. Increasing, constant or decreasing returns.
- Causes of IRS: indivisibilities, specialisation, internal and external economies (Marshall).
- For a function homogeneous of degree n: n > 1 IRS, n = 1 CRS, n < 1 DRS.

Isoquants and producer equilibrium

- **Isoquant:** combinations of L and K giving equal output; convex due to diminishing **MRTS** = MPL/MPK.
- **Isocost line:** wL + rK = C; slope −w/r.
- **Least-cost combination:** MRTS = w/r, i.e. MPL/w = MPK/r.
- **Expansion path:** locus of tangencies as outlay rises; ridge lines bound the economic region.
- **Elasticity of substitution** σ = % change in (K/L) ÷ % change in MRTS.

Important production functions

Function	Form	Key properties
Cobb–Douglas	$Q = A \cdot L^{\alpha \cdot K} \beta$	Returns to scale = α + β; σ = 1; α, β = output elasticities and factor shares
CES (Arrow–Chenery–Minhas–Solow, 1961)	Q = A[δK^(−ρ) + (1−δ)L^(−ρ)]^(−v/ρ)	σ = 1/(1+ρ), constant but not necessarily 1
Leontief	Q = min(L/a, K/b)	σ = 0; L-shaped isoquants
Linear	Q = aL + bK	σ = ∞; perfect substitutes
VES / Translog	Flexible forms	σ varies with factor ratio

Euler's theorem: for a linearly homogeneous function, Q = L·MPL + K·MPK (product exhaustion).

Cost concepts

- Explicit vs implicit costs; opportunity cost; private vs social cost; sunk cost; accounting vs economic cost.
- **Short run:** TC = TFC + TVC. AFC falls continuously (rectangular hyperbola). AVC, ATC and MC are U-shaped due to the law of variable proportions. MC cuts AVC and ATC at their minimum.
- **Long run:** LAC is the envelope of SACs (Viner), U-shaped due to economies and diseconomies of scale. Only at the optimum plant does LAC touch the minimum of a SAC.
- **Modern theory of costs:** L-shaped LAC (empirical studies — Johnston); saucer-shaped AVC with reserve capacity.
- Economies of scope: cheaper to produce two goods together than separately.
- **Learning curve:** unit cost falls with cumulative output (Arrow's learning by doing).

Duality in production

- Cost minimisation is the dual of output maximisation. Conditional factor demand = $\partial C/\partial w$ (Shephard's lemma).
- The cost function of a Cobb–Douglas technology is also Cobb–Douglas in factor prices.

Exam pointers: Stage II as rational stage; σ values of different functions; properties of Cobb–Douglas; Euler's theorem; envelope curve.

3. Decision Making under Uncertainty; Attitude towards Risk

Under risk, the decision-maker knows the possible outcomes and their probabilities; under uncertainty (Knight), probabilities are unknown. Choices are explained by **expected utility**, not expected money value.

Expected value and the St. Petersburg paradox

- Expected monetary value $E(X) = \Sigma\, p_i \cdot x_i$.
- St. Petersburg paradox: a gamble with infinite expected value for which no one pays much. Daniel Bernoulli (1738) resolved it with diminishing marginal utility of wealth (log utility).

Von Neumann–Morgenstern Expected Utility Theory

$$EU = \Sigma\, p_i \cdot U(x_i)\ (i = 1 \ \ldots\ n)$$

- Axioms: completeness, transitivity, continuity, independence. Utility is **cardinal up to a positive linear transformation**.
- A lottery is preferred if it gives higher expected utility.

Attitudes towards risk

Attitude	Utility function	Relation	Certainty equivalent
Risk averse	Concave (U'' < 0)	U(E(X)) > E(U(X))	CE < E(X)
Risk neutral	Linear (U'' = 0)	U(E(X)) = E(U(X))	CE = E(X)
Risk loving	Convex (U'' > 0)	U(E(X)) < E(U(X))	CE > E(X)

- **Risk premium** = E(X) − CE: what a risk-averse person would pay to avoid risk.
- **Friedman–Savage hypothesis (1948):** utility curve concave at low and high incomes, convex in between — explains why people buy both insurance and lottery tickets.

Measures of risk aversion (Arrow–Pratt)

- Absolute risk aversion: ARA = −U''(W)/U'(W).
- Relative risk aversion: RRA = −W·U''(W)/U'(W).
- CARA utility: U = −e^(−aW); CRRA utility: U = W^(1−ρ)/(1−ρ) or log W.

Reducing risk

- **Insurance:** a risk-averse person fully insures at an actuarially fair premium.
- **Diversification:** spreading investment across imperfectly correlated assets (Markowitz portfolio theory).
- Hedging, futures contracts, acquiring information (value of information).

Decision criteria under uncertainty (no probabilities)

- **Maximin (Wald):** best of the worst outcomes (pessimist).
- **Maximax:** best of the best (optimist).
- **Minimax regret (Savage):** minimise the maximum opportunity loss.
- **Hurwicz criterion:** weighted average of best and worst (coefficient of optimism).

- **Laplace criterion:** equal probabilities to all states.

Paradoxes and behavioural critique

- **Allais paradox:** violates the independence axiom.
- **Ellsberg paradox:** ambiguity aversion.
- **Prospect theory (Kahneman & Tversky, 1979):** value function concave for gains, convex for losses, steeper for losses (loss aversion); reference dependence.

Exam pointers: concave utility = risk aversion; Arrow–Pratt measure; Friedman–Savage; maximin vs minimax regret; Allais paradox.

4. Game Theory – Non-Cooperative Games

Game theory studies strategic interaction where each player's payoff depends on others' choices. Founded by von Neumann & Morgenstern, *Theory of Games and Economic Behavior* (1944); John Nash (1950–51) extended it to non-cooperative games.

Elements of a game

- Players, strategies, payoffs, information, order of moves.
- **Normal (strategic) form:** payoff matrix — simultaneous games.
- **Extensive form:** game tree — sequential games.
- **Cooperative games** allow binding agreements (core, Shapley value); **non-cooperative** games do not.
- Zero-sum vs non-zero-sum (variable-sum) games.

Solution concepts

- **Dominant strategy:** best regardless of what the rival does. Dominant-strategy equilibrium: all play dominant strategies.
- **Iterated elimination of strictly dominated strategies.**
- **Nash equilibrium:** each player's strategy is a best response to the others'; no one gains by deviating unilaterally. Every dominant-strategy equilibrium is a Nash equilibrium, not vice versa.
- **Mixed strategy:** randomising over pure strategies. Nash's theorem: every finite game has at least one Nash equilibrium (possibly in mixed strategies).
- **Minimax theorem (zero-sum, von Neumann):** maximin value = minimax value; a **saddle point** gives a pure-strategy solution.

Prisoner's Dilemma

	B: Confess	**B: Deny**
A: Confess	(−5, −5)	(0, −10)
A: Deny	(−10, 0)	(−1, −1)

- Confess is dominant for both → (Confess, Confess) is the Nash equilibrium but is **Pareto-inefficient**: individual rationality conflicts with collective rationality.
- Applications: cartel cheating, arms race, advertising wars, free-riding on public goods.

Other classic games

- **Battle of the Sexes:** two pure-strategy Nash equilibria; coordination problem.
- **Matching Pennies:** no pure-strategy equilibrium; only mixed.
- **Chicken / Hawk–Dove:** two asymmetric equilibria.
- **Stag Hunt:** assurance game; risk-dominant vs payoff-dominant equilibria.

Sequential (dynamic) games

- Solved by **backward induction**.
- **Subgame Perfect Nash Equilibrium (Selten):** Nash in every subgame — rules out non-credible threats (e.g., entry-deterrence game).
- First-mover advantage (Stackelberg); commitment and credible threats.

Repeated games

- Finitely repeated PD: defection in every round (backward induction).
- Infinitely repeated: cooperation can be sustained (**Folk theorem**) through trigger strategies — **grim trigger**, **tit-for-tat** (Axelrod's tournaments).

Games with incomplete information

- **Bayesian Nash equilibrium (Harsanyi):** players hold beliefs about others' types.
- **Perfect Bayesian equilibrium:** dynamic games with incomplete information (signalling games).
- Nobel Prize 1994: Nash, Harsanyi, Selten.

Exam pointers: solve 2×2 matrices quickly; check for dominant strategies first; distinguish Nash equilibrium from Pareto optimum; SPNE uses backward induction.

5. Market Structures: Competitive and Non-Competitive Equilibria and their Efficiency Properties

Profit maximisation requires **MR = MC** (first-order) and **MC cutting MR from below** (second-order). Market structures differ in the number of firms, nature of the product and entry conditions.

Comparison of market structures

Feature	Perfect competition	Monopoly	Monopolistic competition	Oligopoly
Sellers	Very many	One	Many	Few
Product	Homogeneous	No close substitute	Differentiated	Homogeneous or differentiated
Entry	Free	Blocked	Free	Barriers
Firm's demand curve	Horizontal (P = AR = MR)	Downward sloping	Downward sloping, elastic	Kinked / indeterminate
Long-run profit	Normal only	Supernormal possible	Normal only	Supernormal possible
Efficiency	Allocative (P = MC) and productive (min LAC)	Neither; deadweight loss	Excess capacity	Generally inefficient

Perfect competition

- Short-run equilibrium: P = MC; firm may earn profits or losses. **Shut-down point:** P = min AVC.

- Short-run supply curve = MC curve above AVC.
- Long run: P = MC = min LAC; normal profit.
- Industry supply: constant-, increasing- and decreasing-cost industries.

Monopoly

- MR = P(1 − 1/|e|); a monopolist never operates on the inelastic part of demand.
- **Lerner index** of monopoly power = (P − MC)/P = 1/|e|.
- No unique supply curve.
- **Deadweight loss** (Harberger triangle); X-inefficiency (Leibenstein); rent-seeking (Tullock, Posner).
- **Price discrimination:** first degree (perfect; extracts full consumer surplus), second degree (block pricing), third degree (separate markets; higher price in less elastic market; MR1 = MR2 = MC).
- Natural monopoly; bilateral monopoly; regulation (marginal-cost vs average-cost pricing).

Monopolistic competition (Chamberlin, 1933)

- Product differentiation and selling costs; group equilibrium.
- Long run: tangency of demand (AR) with LAC on its falling part → P = AC > MC → **excess capacity**.
- Joan Robinson's *Economics of Imperfect Competition* (1933) developed parallel ideas.

Oligopoly models

- **Cournot (1838):** firms choose quantities simultaneously; with zero costs, each duopolist produces 1/3 of competitive output; total = 2/3.
- **Bertrand (1883):** firms choose prices; with identical products, P = MC (Bertrand paradox).
- **Stackelberg:** leader–follower in quantities; leader produces more and earns more.
- **Edgeworth:** capacity constraints → price oscillation, no stable equilibrium.
- **Sweezy kinked demand curve (1939):** explains price rigidity; discontinuous MR.
- **Collusive models:** cartels (joint profit maximisation, market sharing); price leadership (dominant firm, low-cost, barometric).
- **Baumol's sales maximisation**, Williamson's managerial utility, Marris's growth model — alternative objectives of the firm.
- **Limit pricing** (Bain, Sylos-Labini): price set to deter entry.
- **Contestable markets** (Baumol, Panzar, Willig): with free entry and costless exit, even a monopoly behaves competitively.

Measures of concentration

- Concentration ratio (CR4), Herfindahl–Hirschman Index (sum of squared market shares), Lerner index.

Exam pointers: Cournot output shares; kinked demand; Lerner index; excess capacity theorem; condition for third-degree discrimination.

6. Factor Pricing

Factor prices (rent, wages, interest, profit) are determined by demand for and supply of factors; factor demand is a **derived demand** — derived from the demand for the goods they help produce.

Marginal Productivity Theory (J.B. Clark)

- A competitive firm hires a factor until its price equals the value of its marginal product: **w = VMPL = P × MPL**.
- With an imperfect product market: w = MRPL = MR × MPL.
- Factor demand curve = downward-sloping part of MRP below ARP.
- Criticisms: assumes perfect competition, homogeneous factors and full employment; explains only the demand side.
- **Product exhaustion problem:** by Euler's theorem, with CRS paying each factor its MP exactly exhausts output (Wicksteed, Clark).

Hicks–Marshall laws of derived demand

Demand for a factor is more elastic when: (1) demand for the final product is more elastic; (2) the factor is easily substitutable; (3) its share in total cost is large (with qualification); (4) supply of co-operating factors is elastic.

Rent

- **Ricardian rent:** payment for the original and indestructible powers of the soil; differential rent from differences in fertility and location; rent arises at extensive and intensive margins. Rent is price-determined, not price-determining.
- **Modern theory (Pareto, Joan Robinson):** rent = surplus over **transfer earnings** (opportunity cost). Any factor can earn rent; with perfectly inelastic supply, the entire earning is rent.
- **Quasi-rent (Marshall):** short-run surplus earned by fixed factors (machines) = TR − TVC.

Wages

- Subsistence theory (Ricardo, Iron Law), Wage Fund theory (J.S. Mill), Residual Claimant theory (Walker), marginal productivity theory.
- **Backward-bending supply curve of labour:** at high wages, the income effect outweighs the substitution effect.
- **Monopsony:** employer pays w < MRP (exploitation, Joan Robinson); a minimum wage can raise both wage and employment.
- Collective bargaining, bilateral monopoly, efficiency wage theory.

Interest

Theory	Proponent	Interest as
Abstinence	Senior	Reward for abstaining from consumption
Agio / time preference	Böhm-Bawerk, Fisher	Premium of present over future goods
Classical	Marshall, Pigou	Price equating saving and investment
Loanable funds	Wicksell, Robertson, Ohlin	Price equating supply (S + ΔM + dishoarding) and demand (I + hoarding) for loanable funds
Liquidity preference	Keynes	Reward for parting with liquidity; a monetary phenomenon
IS–LM	Hicks, Hansen	Determined jointly with income by real and monetary forces

Profit

- **Dynamic theory (J.B. Clark):** profit arises from change in a dynamic economy.
- **Innovation theory (Schumpeter):** reward for innovation by the entrepreneur.

- **Risk-bearing theory (Hawley).**
- **Uncertainty-bearing theory (Frank Knight, 1921):** reward for bearing uninsurable uncertainty, as distinct from insurable risk.
- Monopoly profit (Kalecki's degree of monopoly).

Macro theories of distribution

- Ricardo (rent, wages, profit among classes); Marx (surplus value); Kalecki (degree of monopoly); **Kaldor** — share of profits depends on the investment–income ratio and the saving propensities of capitalists and workers.

Exam pointers: quasi-rent; transfer earnings; Knight's risk vs uncertainty; Euler's theorem and product exhaustion; monopsonistic exploitation.

7. General Equilibrium Analysis

Partial equilibrium (Marshall) studies one market in isolation (ceteris paribus); **general equilibrium (Walras, 1874)** studies all markets simultaneously and their interdependence.

Walrasian general equilibrium

- n markets, n prices; demand = supply in every market simultaneously.
- **Walras' Law:** the value sum of excess demands across all markets is identically zero. If n − 1 markets are in equilibrium, the nth must be too → only n − 1 independent equations; one good serves as **numéraire**, so only relative prices are determined.
- **Tâtonnement:** an auctioneer adjusts prices in response to excess demand; no trading at disequilibrium prices.
- Counting equations and unknowns does not guarantee existence.

Existence, uniqueness and stability

- **Existence:** proved by **Arrow and Debreu (1954)** and McKenzie using fixed-point theorems (Brouwer, Kakutani). Conditions: convex preferences and technology, continuity, no increasing returns.
- **Uniqueness:** requires gross substitutability.
- **Stability:** Walrasian (price adjustment to excess demand) vs Marshallian (quantity adjustment to excess demand price); Hicksian perfect and imperfect stability; Samuelson's dynamic stability.

The 2 × 2 × 2 model and the Edgeworth box

- Two consumers, two goods, two factors.
- **Exchange efficiency:** MRSxy(A) = MRSxy(B) along the **contract curve**.
- **Production efficiency:** MRTS(X) = MRTS(Y) along the production contract curve → derives the **Production Possibility Curve**; slope = MRTxy = MCx/MCy.
- **Overall (top-level) efficiency:** MRSxy = MRTxy.
- **Core:** allocations no coalition can improve upon. Edgeworth's conjecture (Debreu–Scarf, 1963): as the economy grows, the core shrinks to the set of competitive equilibria.

Production general equilibrium

- Grand utility possibility frontier derived from points on the PPC.

- Under perfect competition all three marginal conditions are met automatically.

Applications and extensions

- Computable General Equilibrium (CGE) models for tax and trade policy analysis.
- Leontief input–output model as a simplified linear general equilibrium model.
- Sraffa's *Production of Commodities by Means of Commodities* (1960) — critique of neoclassical capital theory.

Exam pointers: Walras' law and numéraire; Arrow–Debreu existence proof; contract curve conditions; MRS = MRT for overall efficiency.

8. Efficiency Criteria: Pareto-Optimality, Kaldor–Hicks and Wealth Maximization

Efficiency criteria judge whether a change in resource allocation improves social welfare without (or with) interpersonal comparison of utility.

Pareto optimality (Vilfredo Pareto, 1906)

- A situation is **Pareto optimal** when no one can be made better off without making someone else worse off.
- A **Pareto improvement** makes at least one person better off and no one worse off.
- Marginal conditions: (1) exchange — equal MRS for all consumers; (2) production — equal MRTS for all producers; (3) product-mix — MRS = MRT.
- Limitations: infinitely many Pareto optima (all points on the contract curve); silent on distribution; cannot rank changes that hurt anyone; status-quo bias.

Compensation principle (New Welfare Economics)

Criterion	Test	Remarks
Kaldor (1939)	Gainers *could* compensate losers and still be better off	Hypothetical compensation; no payment required
Hicks (1939)	Losers *cannot* bribe gainers to prevent the change	Mirror image of Kaldor
Scitovsky double criterion (1941)	Kaldor test satisfied for the move AND not satisfied for the reverse move	Removes the Scitovsky paradox (reversal)
Little's criterion (1950)	Kaldor/Hicks test + distribution must not worsen	Brings in value judgement on distribution
Samuelson (1950)	Utility possibility curve of new situation must lie wholly outside the old	Most stringent; needs whole frontier comparison

- **Scitovsky paradox:** under Kaldor–Hicks, a move from A to B and back from B to A may both appear as improvements.
- **Kaldor–Hicks efficiency** is the basis of **cost–benefit analysis**: a project is worthwhile if total gains exceed total losses.

Wealth maximization (Richard Posner)

- Associated with **Law and Economics**: legal rules should allocate rights to whoever values them most (measured by willingness to pay), maximising total social wealth.

- Close to Kaldor–Hicks efficiency; criticised because willingness to pay depends on ability to pay (favours the rich) and ignores distribution and rights.
- Links with the **Coase theorem** — with zero transaction costs, bargaining reaches an efficient outcome irrespective of the initial assignment of rights.

Other welfare yardsticks

- **Bergson–Samuelson social welfare function** — explicit value judgements to choose among Pareto optima.
- **Theory of Second Best (Lipsey & Lancaster, 1956):** if one Pareto condition cannot be met, satisfying the others need not raise welfare.

Exam pointers: match each criterion to its author and year; Scitovsky reversal paradox; Posner and wealth maximization; second-best theorem.

9. Welfare Economics: Fundamental Theorems and Social Welfare Function

Welfare economics evaluates economic states from society's point of view. It evolved from Old Welfare Economics (Pigou, cardinal utility) to New Welfare Economics (Pareto, compensation tests) and Social Choice Theory (Arrow, Sen).

Pigouvian (old) welfare economics

- *Economics of Welfare* (1920): economic welfare rises with national dividend (output) and more equal distribution (via diminishing MU of money).
- Divergence between private and social marginal net product → taxes and subsidies (**Pigouvian tax**).

Fundamental Theorems of Welfare Economics

Theorem	Statement	Key assumptions
First	Every competitive equilibrium is Pareto optimal	Complete markets, no externalities, no public goods, perfect information, local non-satiation
Second	Every Pareto optimal allocation can be achieved as a competitive equilibrium after suitable lump-sum redistribution of initial endowments	Plus convexity of preferences and technology

- First theorem is the formal version of Adam Smith's **invisible hand**.
- Second theorem separates **efficiency** from **equity**: redistribute endowments, then let markets work.
- Failures (externalities, public goods, asymmetric information, increasing returns) break the first theorem → market failure.

Social Welfare Function (SWF)

- **Bergson (1938) – Samuelson (1947):** $W = W(U1, U2, \ldots, Un)$; social indifference curves; tangency with the **grand utility possibility frontier** gives the **constrained bliss point** (optimum optimorum).
- Forms:
  - **Utilitarian (Bentham):** $W = \Sigma Ui$ — sum of utilities; indifferent to distribution.

  - **Rawlsian (maximin):** W = min(U1, …, Un) — welfare of the worst-off person (*A Theory of Justice*, 1971).
  - **Nash SWF:** W = ΠUi.
  - **Atkinson / Bernoulli–Nash:** inequality-averse forms.

Arrow's Impossibility Theorem (1951)

- *Social Choice and Individual Values*: no social welfare function (rule aggregating individual rankings) can satisfy simultaneously:
  1. Unrestricted domain (universality)
  2. Pareto principle (weak)
  3. Independence of irrelevant alternatives
  4. Non-dictatorship
  5. (Plus completeness and transitivity of social ordering)
- **Condorcet voting paradox:** majority voting may produce intransitive (cyclical) social preferences.
- Resolution routes: single-peaked preferences (Black's median voter theorem), allowing interpersonal comparisons (Sen).

Amartya Sen's contributions

- *Collective Choice and Social Welfare* (1970); **liberal paradox** (impossibility of a Paretian liberal).
- Capability approach; entitlement approach to famines; Nobel Prize 1998.

Exam pointers: statements of the two fundamental theorems; Arrow's conditions; Rawlsian vs utilitarian SWF; Sen's Paretian liberal.

10. Asymmetric Information: Adverse Selection and Moral Hazard

Asymmetric information exists when one party to a transaction knows more than the other. It leads to market failure. Nobel Prize 2001: **George Akerlof, Michael Spence, Joseph Stiglitz**.

Adverse selection (hidden information — before the contract)

- **Akerlof's "Market for Lemons" (1970):** sellers know car quality, buyers do not; buyers pay average price; good-car owners withdraw; average quality falls further → market may collapse ("bad drives out good", similar to Gresham's law).
- Insurance: high-risk people are more likely to buy insurance → premiums rise → low-risk people drop out.
- Credit markets: **Stiglitz–Weiss (1981)** credit rationing — banks do not raise interest rates to clear the market because higher rates attract riskier borrowers.
- Labour market: employers cannot observe worker productivity.

Remedies for adverse selection

- **Signalling (Spence, 1973):** informed party sends a costly signal — education signals productivity; warranties and guarantees signal quality; brand names, reputation.
- **Screening (Rothschild–Stiglitz, 1976):** uninformed party designs a menu of contracts so that types self-select (e.g., insurance with different deductibles).

- Compulsory insurance, certification, licensing, disclosure regulations.

Moral hazard (hidden action — after the contract)

- After a contract, one party changes behaviour because the other bears the cost: insured persons take less care; bailed-out banks take excess risk ("too big to fail").
- **Principal–agent problem:** principal (shareholder, employer) cannot fully monitor the agent (manager, worker), whose interests differ.

Remedies for moral hazard

- Co-payments, deductibles and co-insurance.
- Incentive contracts: performance pay, stock options, profit-sharing, sharecropping.
- **Efficiency wages (Shapiro–Stiglitz, 1984):** wages above market-clearing to deter shirking — explains involuntary unemployment.
- Monitoring, collateral, reputation, repeated interaction.

Comparison

Aspect	Adverse selection	Moral hazard
Timing	Before the contract	After the contract
Nature	Hidden information / hidden type	Hidden action
Example	Used-car market, health insurance buyers	Careless driving after car insurance
Remedies	Signalling, screening, mandates	Deductibles, incentives, monitoring

Exam pointers: Akerlof's lemons; Spence's signalling; Rothschild–Stiglitz screening; Stiglitz–Weiss credit rationing; principal–agent problem; 2001 Nobel laureates.