

Econ 301  
Spring, 2026  
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## LECTURE 1. SUPPLY AND DEMAND

- Demand.
  - Demand function.
  - Demand curve.
  - Movements along demand curve vs shifts of demand curve.

- Supply.
  - Supply function.
  - Supply curve.
  - Movements along demand curve vs shifts of demand curve.

- Price elasticity of demand.
  - Quantifying effect of marginal price change on demand.
  - Price elasticity generally changes along demand curve.
  - Use price elasticity to measure effect of price change on total expenditure.

- Price elasticity of supply.
  - Quantifying effect of marginal price change on supply.
  - Price elasticity generally changes along supply curve.
  - Use price elasticity to measure effect of price change on revenue.

- Tax incidence.
  - Effect of marginal increase in sales tax (collected from producers) on equilibrium price.
  - Effect of marginal increase in consumption tax (collected from consumers) on equilibrium price.
  - Burden of tax on producers and on consumers does not it depend on whether it's sales tax or consumption tax.

## LECTURE 2. CONSUMER CHOICE

- The budget constraint.
  - Consumption bundles.
  - The budget line.
  - The budget constraint or the budget set.

- Changes to the budget constraint.
  - Rotation of the budget line.
  - Convex (coupons) and concave (discounts) kinks to the budget line.
  - Parallel shifts of the budget line.
  - Budget line through endowment bundle.

- Consumer preference through ranking of pairs of bundles.
  - Rational preferences: completeness and transitivity of pairwise ranking.
  - Monotonicity.
  - Convexity.

- Consumer preference through indifference curves.
  - Indifference curve through every bundle.
  - No crossing of two indifference curves.
  - Direction of increasing preferences.
  - Convex to the origin.

- Consumer preference through utility function.
  - Greater (smaller) value of utility function represents more (less) preferred, and equal value represents indifference.
  - Preference represented by utility function is rational.
  - Increasing transformations of utility function represent same preference.

- Marginal rate of substitution.
  - Marginal rate of substitution as slope of indifference curve: derivation.
  - Convexity of preference and diminishing marginal rate of substitution.
  - Marginal rate of substitution for perfect complements and perfect substitutes.

- Marginal rate of substitution across indifference curves.
  - Cobb-Douglas: Same marginal rate of substitution for all bundles with a fixed ratio.
  - Quasi-linear: Same marginal rate of substitution for all bundles with a fixed quantity of the “nonlinear” good.

- Consumer choice problem.
  - Objective is to maximize utility.
  - Choice variable is consumption bundle.
  - Constraint is budget set.

- Optimality condition for an interior consumption bundle to solve consumer choice problem.
  - Ratio of marginal utility to price is equated across goods at the solution.
  - Equivalent condition: marginal rate of substitution at the solution equals price ratio.
  - Heuristic derivation.
  - Graphical derivation.

- Deriving optimality condition using Lagrange method.
  - Lagrange multiplier and Lagrange function.
  - First order conditions for solution to consumer choice problem.
  - Optimality condition.
  - Meaning of Lagrange multiplier.

- Solving consumer choice problem (short cut).
  - Applies when indifference curves do not have kinks or line segments (for example, Cobb-Douglas).
  - Solution satisfies optimality condition.
  - Solution is on the budget line.
  - Find solution from above two conditions.
  - Make sure solution is interior.

- Corner solutions to consumer choice problem.
  - Solution via short cut is invalid if it not feasible.
  - Use the heuristic derivation of optimality condition to argue for a corner solution.
  - Example: consumer choice with quasi-linear preference.

- Solutions to consumer choice problem without calculus.
  - Perfect complements: solution is found at the kink of an indifference curve on the budget line, regardless of the price ratio.
  - Perfect substitutes: solution is found at one corner of budget line that reaches the highest indifference line.

## LECTURE 3. CONSUMER DEMAND AND WELFARE

- Income elasticity of demand.
  - Quantifying income effect on consumer demand.
  - Deriving income elasticity of demand, by first deriving consumer demand function.
  - Normal good versus inferior good.
  - Relate income elasticity to income effect on share of consumption expenditure.

- Graphical decomposition of effect of a price increase on the demand for the good.
  - Negative substitution effect.
  - Income effect can be either negative (normal good), or positive (inferior good).
  - Ordinary good vs Giffen good.

- Expenditure minimization problem.
  - Objective is to minimize expenditure.
  - Choice variable is consumption bundle.
  - Constraint is to achieve a target utility level.
  - Solution is called compensated demand, and is used to quantify substitution effect.

- Solve expenditure minimization problem using short cut.
  - Same optimality condition as before: marginal rate of substitution equals the price ratio.
  - Solution achieves target utility level.
  - Find solution from above two conditions.

- Income tax vs consumption tax.
  - For same tax revenue, compare after tax bundles and after tax budget lines.
  - Consumers prefer income tax to consumption tax, as after-consumption tax bundle lies on after-income tax budget line.
  - Argument does not require us to derive the consumer demand.

- Consumer surplus.
  - A rough measure of consumer welfare in monetary terms, but equally applicable at individual and market levels.
  - Change to consumer welfare gives a rough measure of impact of a price change on consumer welfare.

- Compensating variation and equivalent variation.
  - Two precise measures of changes to consumer welfare, using compensated demand function.
  - Compute the two measures for given utility functions: Quasi-linear, Cobb-Douglas.

- Revealed preference
  - Observing a consumer choosing some bundle at a price vector reveals consumer prefers the chosen bundle to all bundles that cost less at observed prices.
  - Weak axiom of revealed preference (WARP): minimum requirement for rationality that allows for inferences of consumer preferences from consumer choice data.
  - Systematic checking for consistency with WARP.

- Use a revealed-preference argument to show substitution effect is negative.
  - A price increase in one good necessarily causes decrease in consumption of this good for consumer to reach the same utility level.
  - Argument does not require derivation of compensated demand.

## LECTURE 4. UNCERTAINTY

- Model of uncertainty.
  - A list of possible states of world.
  - A corresponding list of probabilities of the states – all non-negative numbers that sum up to 1.
  - Uncertainty and risk are interchangeable here.

- State-contingent bundle.
  - Under uncertainty, a consumer choice associates each state with a quantity of a single consumption good (money).
  - A state-contingent bundle consists of the list of quantities and the list of probabilities.
  - Quantities of the good across different states are never “consumed” at the same time.
  - If a choice leads to the same quantity for all states, it has no risk.

- Choice under uncertainty.
  - Consumer has a uni-variate utility function.
  - For any state-contingent bundle, consumer evaluates it by computing the expectation of the utility function, or the expected utility.
  - Between any two state-contingent bundles, consumer chooses the one with a greater expected utility.

- Preference under uncertainty.
  - Preference under uncertainty is captured by the utility function.
  - Multiplying any utility function by a positive constant and add another constant, we will get another utility function that represents the same preference.

- Different preferences uncertainty.
  - Risk neutrality: linear utility function, or constant marginal utility.
  - Risk aversion: concave utility function, or decreasing marginal utility.
  - Risk loving: convex utility function, or increasing marginal utility.

- Comparing risk aversion.
  - Certainty equivalent and risk premium.
  - For risk neutral consumers, certainty equivalent of any state-contingent bundle is equal to its expected value, and risk premium is zero.
  - For the same state-contingent bundle, a more risk-averse consumer has a smaller certainty equivalent and a greater risk premium.

- Optimal investment under uncertainty: direct approach.
  - An unconstrained problem of choosing investment to maximize expected utility.
  - Optimal investment is strictly positive if expected net return is positive, because expected utility is increasing at zero investment.

- Optimal investment: indirect approach.
  - Construct “budget line” by writing wealth in one state as function of wealth in the other state.
  - Optimality condition is marginal rate of substitution between wealth in the two states is equal to slope of budget line.
  - Use the budget line and optimality condition to find optimal investment.

- Optimal insurance.
  - Direct approach: unconstrained problem of choosing insurance quantity to maximize expected utility.
  - Indirect approach: construct the budget line and use optimality condition.
  - Optimal insurance achieves full insurance if insurance policy is actuarially fair (makes zero expected profit), and partial insurance if insurance policy is unfair (makes positive expected profit).

## LECTURE 5. PRODUCER BEHAVIOR

- Model of Producer.
  - Feasible choice set: all production plans that satisfy a production function.
  - Objective: maximize profit, difference between revenue and cost.
- Production function with capital and labor.
  - Marginal products of capital and of labor.
  - Diminishing marginal products.

- Isoquants.
  - Slope: marginal rate of technical substitution, equals ratio of marginal products.
  - Shape: monotonicity and convexity.
  - Expansion: increasing, constant, and decreasing returns to scale.

- One-step approach to profit maximization.
  - Choose input mixes and use the production function: unconditional factor demand functions.
- Two-step approach to profit maximization.
  - For fixed output target, cost minimization by choosing input mix: conditional factor demand functions, cost function.
  - Profit maximization by choosing output, using the cost function derived from first step.

- Short run cost minimization: can only choose one factor out of two.
  - Short run conditional factor demand function, and short run cost function.
  - Marginal cost, average cost and average variable cost.
  - Marginal cost meets average cost and average variable cost at their minimum, and from below.

- Long run cost minimization: choose both factors.
  - Optimality condition.
  - Long run conditional factor demands, and long run cost function.
  - Homogeneity of factor demand and cost functions.
  - Expansion path.

## LECTURE 6. PROFIT MAXIMIZATION

- Short run profit maximization by a competitive firm.
  - Output rule: if produce at all, choose quantity to equate marginal variable cost to output price.
  - Shut down rule: don't produce if output price is below minimum average variable cost.
  - Profit may be negative in short run.

- Long run profit maximization by a competitive firm.
  - Output rule: if produce at all, choose quantity to equate marginal cost to output price.
  - Shut down rule: don't produce if output price is below minimum average cost.

- One-step approach to profit maximization by competitive firm.
  - Optimality condition.
  - Unconditional factor demand functions.

## LECTURE 7. PARTIAL EQUILIBRIUM

- Market supply.
  - Short run supply: sum up individual short run supply curves.
  - Long run supply: firms can exit or enter, leading to zero profit and a flat supply curve at the long run minimum average cost.

- Market equilibrium.
  - Short run equilibrium: market demand curve meets short run market supply curve.
  - Long run equilibrium: market demand curve meets flat long run supply curve, and determines number of firms in the long run.

- Efficiency of partial equilibrium.
  - Consumer surplus.
  - Producer surplus.
  - Equilibrium maximizes sum of consumer surplus and producer surplus.
  - Deadweight loss of price floor and price ceiling.

## LECTURE 8. GENERAL EQUILIBRIUM: EXCHANGE

- Edgeworth box.
  - Endowments.
  - Preferences.
  - Resource constraints, and feasible allocations.
  - Budget constraints.
- Mutually beneficial trade.
  - Mutually acceptable allocations.

- Contract curve.
  - Pareto efficient allocations.
  - Contract curve: Pareto efficient allocations in Edgeworth box.
  - Deriving contract curve, by maximizing one consumer's utility subject to reaching a target utility level of the other consumer: optimality condition.
- Core: allocations that are both mutually acceptable and Pareto efficient.

- General equilibrium in Edgeworth box.
  - Excess demand and excess supply.
  - Equilibrium: both markets clear.
  - Walrus' law.
  - Finding equilibrium in Edgeworth box.

- First welfare theorem.
  - Proof of first welfare theorem in Edgeworth box using revealed preferences.
  - Proof of first welfare theorem in Edgeworth box using contract curve.
  
- Second welfare theorem.
  - Proof of decentralization.

## LECTURE 9. GENERAL EQUILIBRIUM: PRODUCTION

- Production possibility frontier for two goods.
  - Slope: marginal rate of transformation.
  - Comparing slopes of different producers: comparative advantage, expansion of joint frontier.
  - Joint production possibility frontier over more than one producer using comparative advantage: concave towards origin.

- Efficiency of general equilibrium with production.
  - Consumption efficiency: allocation of already produced goods is Pareto efficient.
  - Production efficiency: there is no other product mix on the production possibility frontier that gives consumers greater utility.

- Competitive equilibrium with two producer-consumers.
  - Profit maximization with two outputs, one input, and constant marginal rate of transformation.
  - Utility maximization with two goods and profits from production as income.
  - Market clearing: total consumption of each good equals to total output.

- Consumer surplus and producer surplus for two economies.
  - No trade.
  - Free trade.
  - Trade with import tariff.
  - Trade with import quota.