1 Supply and demand

1.1 Lecture 2: Supply and Demand

1.1.1 Supply and demand diagrams:

- **Demand Curve** measures willingness of consumers to buy the good
- **Supply Curve** measures willingness of producers to sell
- Intersection of supply and demand curve is market equilibrium.
- Supply and demand curves can shift when there are
  - shocks to the ability of producers to supply
  - shocks in consumer tastes
  - shocks to the price of complement/substitute goods. A rise in the price of a substitute good for good X raises the demand for the X.
- Interventions in market can lead to disequilibrium:
  - for example, imposing a minimum wage means that more people will want to work than employers want to hire at the minimum wage. This creates unemployment.
- The cost of these interventions is found in reduced efficiency (trades that are not made); there may be benefits in greater equity.

1.1.2 TO KNOW- Conceptual Understanding

- Explain the difference between a movement along the demand (supply) curve and a shift of the demand (supply) curve
- Describe factors that shift supply and demand curves
- Know "what's wrong" with excess supply or excess demand

1.1.3 TO KNOW- Graphical and Math Understanding

- Find a market equilibrium given a demand and supply curve- (a) graphically and (b) using algebraic expressions
- Analyze the effect of a price ceiling in a graph
- Analyze the effect of a price floor in a graph

1.2 Lecture 3: Applying supply and demand

1.2.1 Elasticity

- Price elasticity of demand is defined

$$\epsilon = \frac{\frac{\partial Q}{Q}}{\frac{\partial P}{P}}$$

- **Perfectly inelastic demand** is $\epsilon = 0$ and **perfectly elastic demand** is $\epsilon = -\infty$.
- The elasticity affects consumers' response to a shift in price: if the elasticity is between 0 and -1, then firms can raise revenues by raising the price (since consumers will still buy the good in significant quantities); if $\epsilon < -1$, then raising the price results in a decline in firm revenue.
- Accurately estimating an elasticity requires a shift along the supply curve (e.g., a tax on suppliers).
- Perfectly inelastic demand is characteristic of a good with no substitutes; perfectly elastic demand is a good with perfect substitutes

1.2.2 TO KNOW- Conceptual Understanding

- Explain what the elasticity of demand/supply imply about changes in equilibria.

1.2.3 TO KNOW- Graphical and Math Understanding

- Given an algebraic expression for demand, calculate the price elasticity of demand at any point along the curve
- Given an algebraic expression for supply, calculate the price elasticity of supply at any point along the curve
- Analyze the effect of a specific tax in a graph
- Analyze the effect of a specific tax using algebra

2 Consumer Theory

2.1 Lecture 4: Preferences and utility

2.1.1 Preferences

- We impose three assumptions about consumer preferences: preferences are complete, transitive and non-satiated.
- These yield four assumptions about utility curves:

  - consumers prefer higher indifference curves,
  - they are downward-sloping,
  - they never cross
  - there is one indifference curve through every consumption bundle.

2.1.2 Utility

- Utility function is a function that transfers bundles of goods into a scale of utils; however, it provides only an ordinal ranking, not a cardinal one.
- A general assumption employed is diminishing marginal utility: consumers receive less utility from each unit of a good they consume.
- The slop of the indifference curve is called the **marginal rate of substitution**
  - MRS is the ratio of marginal utilities;

$MRS = -\frac{MU_x}{MU_Y} = -\frac{\frac{\partial U}{\partial X}}{\frac{\partial U}{\partial Y}}$

  - diminishing as you move along the indifference curve.

2.1.3 TO KNOW- Graphical and Math Understanding

- Prove that indifference curves never cross using a figure
- Prove that indifference curves are downward sloping using a figure
- Explain why consumers prefer high indifference curves using a figure
- Draw indifference curves corresponding to perfect complements and perfect substitutes
- Know how to sketch an indifference curve given a verbal description of a consumer's preferences
- Calculate marginal utilities given a utility function
- Calculate marginal rate of substitution given a utility function

2.2 Lecture 5: Budget constraints and constrained choice

2.2.1 Budget Constraint

- Budget constraint over two goods X and Y is defined

$I = p_X X + p_Y Y.$

- Slope of the budget constraint is defined as **marginal rate of transformation**: rate at which you can transform one good into the other in the marketplace.

$MRT = -\frac{p_X}{p_Y}$

- Shifts in price and income alter the position and slope of the budget constraint.

2.2.2 Constrainted Optimization

- The optimal bundle that a consumer can choose is defined by the point of tangency between the indifference curve and the budget line:

$MRS = -\frac{MU_x}{MU_Y} = -\frac{\frac{\partial U}{\partial X}}{\frac{\partial U}{\partial Y}} = -\frac{p_X}{p_Y} = MRT$

- This is equivalent to equating the marginal cost and benefit of consuming each good.

- The above equation defines an interior solution (in which the consumer consumes some of each good); if indifference curves are flat, there can also be **corner solutions** in which the consumer only consumes one good.

2.2.3 TO KNOW- Graphical and Math Understanding

- Know how to write down a budget constraint given prices and income

- Show graphically how to find the bundle that maximizes the consumer's utility subject to the budget constraint

- Solve for the optimal bundle mathematically for a consumer given a utility function, prices of the two goods, and income; be sure to check for corner solutions

2.3 Lecture 6: Deriving demand curves

- We can use the constrained optimization problem to derive the demand curve. In other words, as we change prices of goods, we can observe how quantities demanded for those goods change, thereby tracing out the demand curve (the relationship between quantity and price demanded)

2.3.1 Changes in income

- As you change income, you can trace out the relationship between income and consumption- the **Engel Curve**

- This also allows us to define the income elasticity of demand:

$\gamma = \frac{\frac{\partial Q}{Q}}{\frac{\partial Y}{Y}}$

- **Normal goods**- the income elasticity is positive, so as income rises, you consume the same or more of these goods
- **Inferior goods**- consumption declines when income increases
- **Necessities are goods** with $\gamma < 1$ - goods where you spend a smaller share of your income on them as income goes up - like food
  - Not saying that you buy less food as income rises - only that you spend a smaller fraction of your income on food as income rises
- **Luxuries** are goods with $\gamma > 1$ - goods where you spend a larger share of your income on them as income rises - like cars, jewelry

2.3.2 Changes in prices

- An increase in price, has two effects:
  - it makes the consumer relatively poorer **(income effect)**
  - and it also makes this specific good less attractive relative to alternatives **(substitution effect)**.
- The substitution effect can be interpreted as the shift in goods consumed from the original point to the optimal point for a budget constraint that has the new slope, but is tangent to the old indifference curve.
- Substitution effect is always negative, but income effect can be positive.
- Accordingly, the overall effect of a price increase on consumption of a good can be negative (for a **normal good**) or positive, if the good is **inferior** and the income effect is larger than the substitution effect.
- A good with a positive own-price elasticity is known as a **Giffen good**.

Price Change	Substitution Effect	Income Effect	Total Effect
Normal Good			
Price Rises	≤ 0	≤ 0	≤ 0
Price Falls	≥ 0	≥ 0	≥ 0
Inferior Good			
Price Rises	≤ 0	≥ 0	????
Price Falls	≥ 0	≤ 0	????

2.3.3 TO KNOW- Conceptual Understanding

- Explain what quantities observed after price changes imply about the income and subsitution effects

2.3.4 TO KNOW- Graphical and Math Understanding

- Graph budget constraint lines and show how the line shifts or rotates when a price of a good changes or the agent's income changes
- Derive a demand curve mathematically given a utility function, the price of one of the goods, and an income level
- Derive an Engel curve mathematically given a utility function and the price of both goods
- Show and calculate the effect of a price change in a graph showing a consumer's optimal bundle; decompose the effect graphically into the income and substitution effect

2.4 Lecture 7: Income / substitution effects and labor supply

- Income and substitution effects can be used to analyze labor supply:
  - leisure (time not spent working) is a consumption good
  - the price of that good is the wage, since that is the opportunity cost of time not spent working.
  - When the wage rate increases, this also has both an income effect and a substitution effect.
    - Income effect: each worker is now richer, and may want to work less (consume more leisure).
    - Substitution effect: returns to working are higher, each worker may want to work more.
    - If the income effect more than offsets the substitution effect, labor supply may go down when income increases.

2.4.1 TO KNOW- Graphical and Math Understanding

- Calculate the income and substition effects due to changes in wages
- Show the effect of a change in wage in a graph of the labor supply decision; decompose the effect graphically into the income and substitution effect

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