ECON3113
Microeconomic Theory I

Tutorial #7: (i) Summary of Demand Analysis

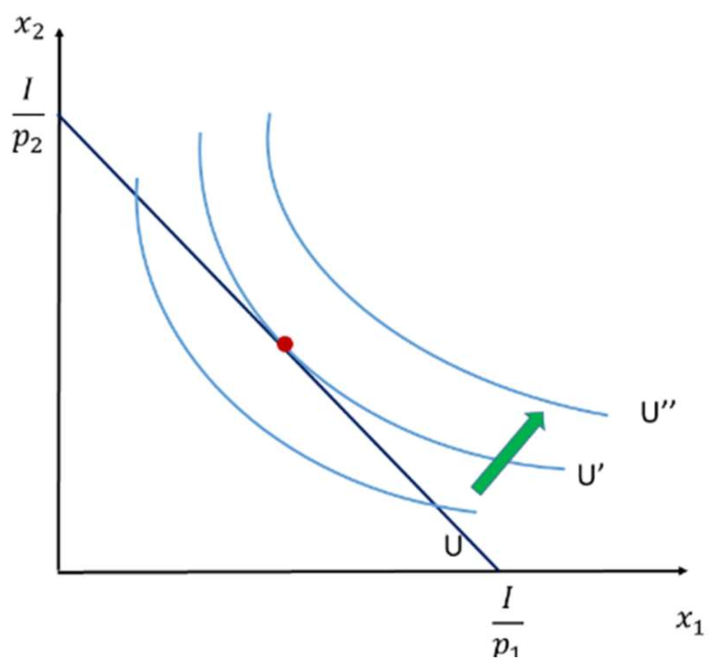
(ii) Online Assessment #2

Today's tutorial

- Summary of Demand Analysis
- Online Assessment #2

Constrained utility maximisation: the framework

- Superposing the budget line with the indifference curves.
- Look for the bundle/point in the budget set that lies on the indifference curve with the highest utility.



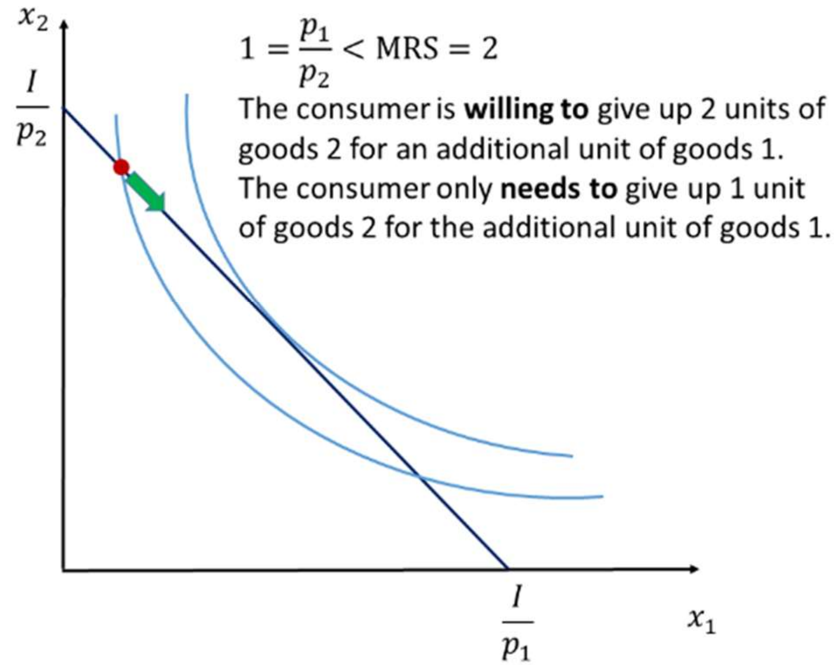
- We have:
  - $U(x, y)$
  - $I = P_x x + P_y y$
- Affordable bundles on or inside the budget constraint
- Tangency at: $MRS = \frac{P_x}{P_y}$

- Note: Limitations of this approach in lecture notes:
  - Corner solutions
  - Tangency not always optimal

Constrained utility maximisation: the framework

- Intuition of why the tangency condition works

- What bundle would make the consumer willing to stay put?
- Start with any bundle $(x_1, x_2) > (0, 0)$. If she wants to increase his consumption of goods 1 by one unit,
  - the amount of goods 2 she is *willing to* give up is MRS;
  - the amount of goods 2 she *has to* give up is $p_1 \times \frac{1}{p_2}$.
- She wants to consume more of goods 1 if $\frac{p_1}{p_2} < MRS$.



The homogeneity of demand functions

Theorem

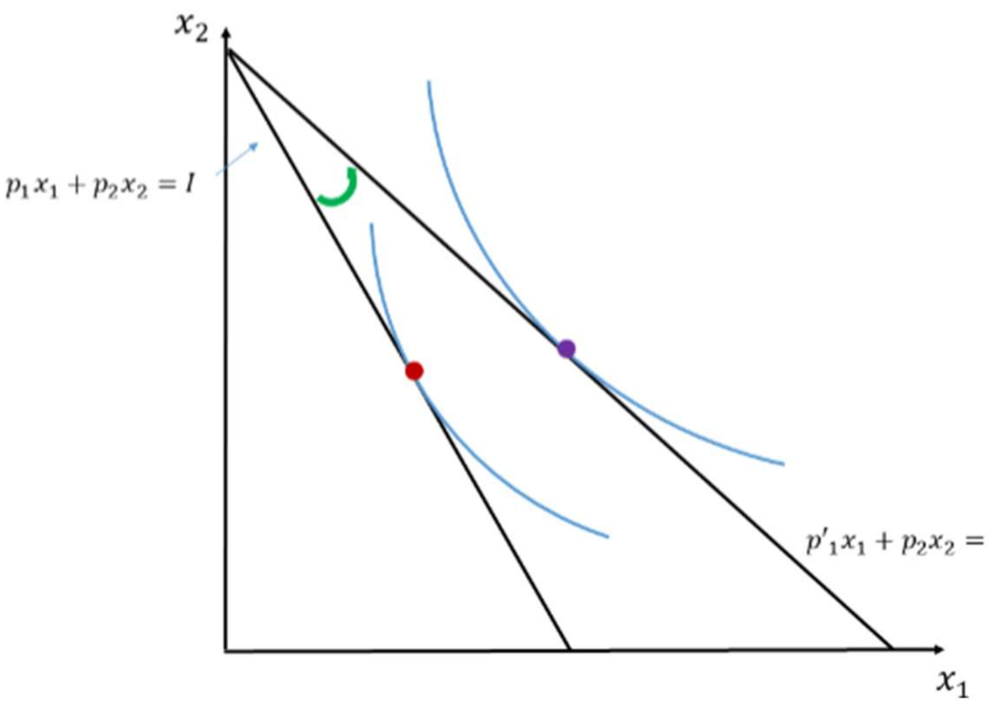
The demand functions are **homogeneous of degree zero**. *That is,* $x_i(\lambda p_1, \ldots, \lambda p_n, \lambda I) = x_i(p_1, \ldots, p_n, I)$ *for all* $\lambda > 0$.

Examples:

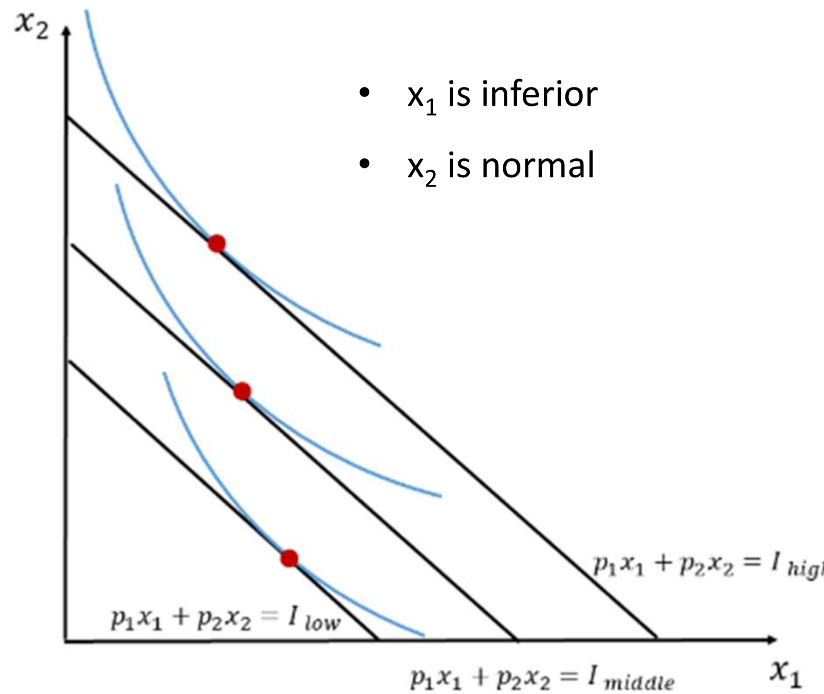
- For given I, P_x, P_y:
- Cobb Douglas $U(x, y) = x^{\alpha} y^{1-\alpha}$ $\qquad x^* = \alpha \dfrac{I}{P_x} \qquad y^* = (1-\alpha)\dfrac{I}{P_y}$
  - x^*, y^* invariant to scaling P_x, P_y, I by λ
- Quasi-Linear $U(x, y) = y + \ln(x)$ $\qquad x^* = \dfrac{P_y}{P_x} \qquad y^* = \dfrac{I}{P_y} - 1$
  - x^*, y^* invariant to scaling P_x, P_y, I by λ

Sensitivity of demand to changes in prices and income

Decrease in price of x_1

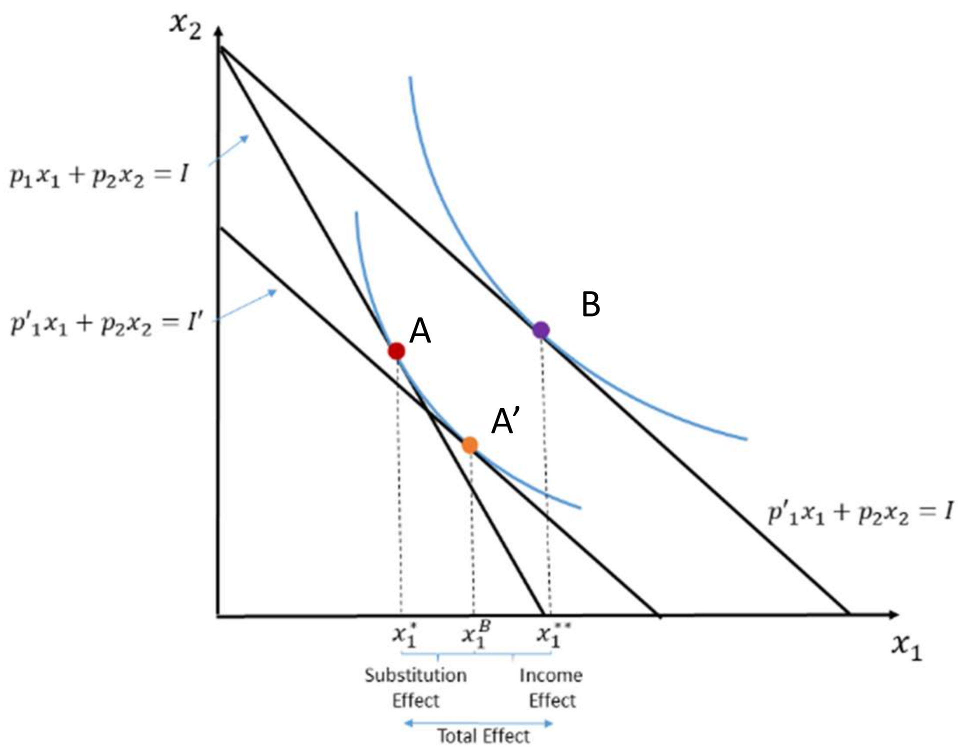


Increase in income



- x_1 is inferior
- x_2 is normal

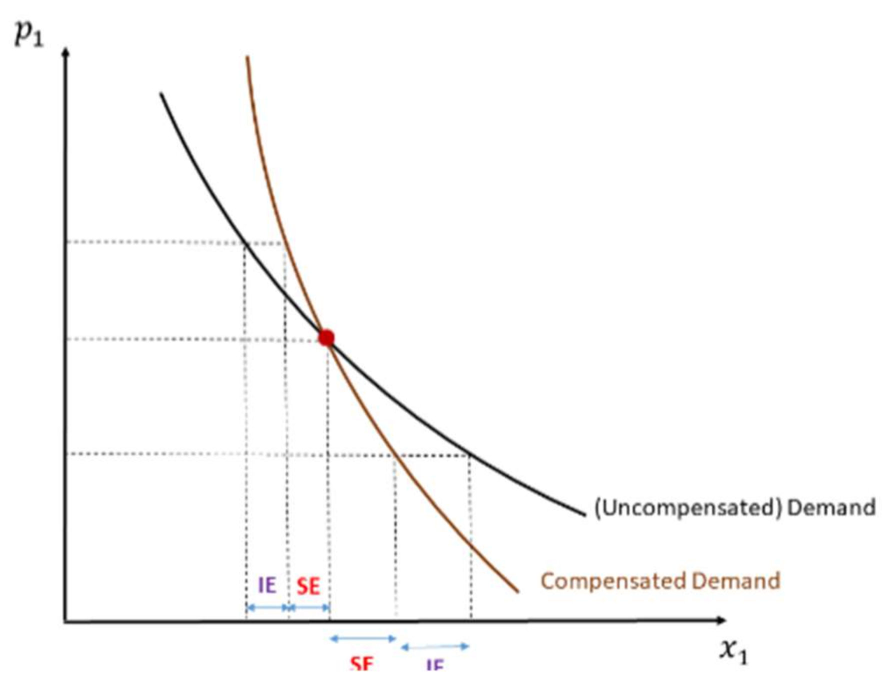
Decomposing a price change into income and substitution effect



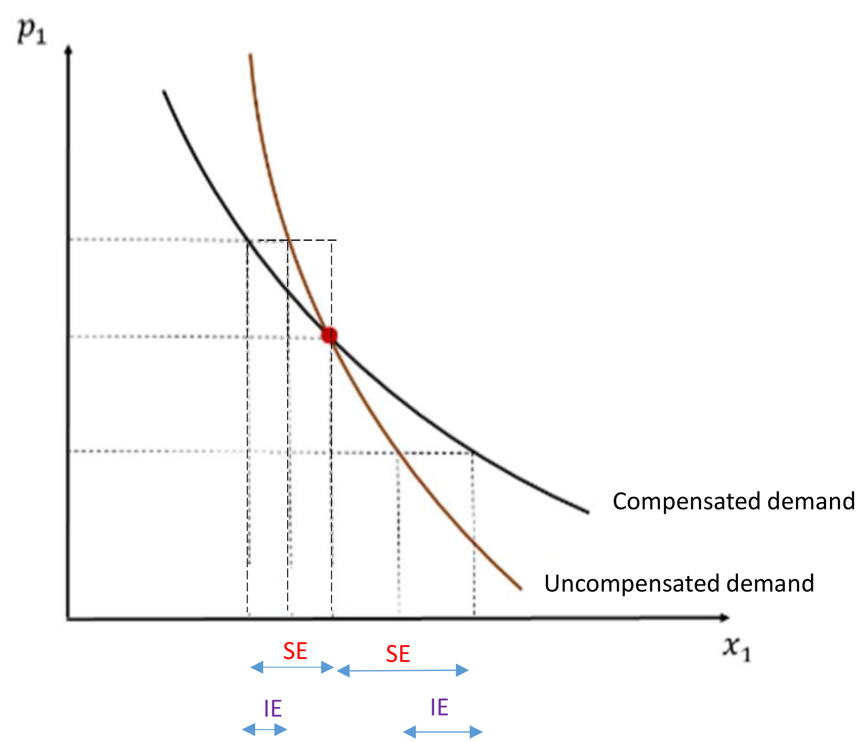
- Given a fall in the price of x_1 from p_1 to p_1':
- Equilibrium moves from A to B
- We can de-compose the move into two parts:
  - Rotate the budget constraint around existing indifference curve
    - From A to A'
    - The substitution effect
    - With DMRS the substitution effect is always negative
  - Shift the budget constraint to the new budget constraint
    - from A' to B
    - The income effect

Compensated and Uncompensated demand curves

Normal Good



Inferior Good



Definitions: Own and Cross Price Elasticities of Demand

Definition

Price elasticity of demand of a goods is the percentage change in its quantity demanded in response to a unit percentage change in its price. In notation,

$$\varepsilon_{x_1,p_1} = \frac{\triangle x_1 / x_1}{\triangle p_1 / p_1} = \frac{\triangle x_1}{\triangle p_1}\frac{p_1}{x_1} = \frac{\partial x_1 \left(p_1, p_2, I\right)}{\partial p_1}\frac{p_1}{x_1}.$$

Definition

Cross-price elasticity of demand of a goods is the percentage change in its quantity in response to a unit percentage change in the price of some other good. In notation,

$$\varepsilon_{x_1,p_2} = \frac{\triangle x_1 / x_1}{\triangle p_2 / p_2} = \frac{\triangle x_1}{\triangle p_2}\frac{p_2}{x_1} = \frac{\partial x_1 \left(p_1, p_2, I\right)}{\partial p_2}\frac{p_2}{x_1}.$$

Definitions: Income Elasticity of Demand

Definition

Income elasticity of demand of a goods is the percentage change in its quantity demanded in response to a unit percentage change in income. In notation,

$$\varepsilon_{x_1,I} = \frac{\triangle x_1 / x_1}{\triangle I / I} = \frac{\triangle x_1}{\triangle I} \frac{I}{x_1} = \frac{\partial x_1 (p_1, p_2, I)}{\partial I} \frac{I}{x_1}.$$

Definitions: Two conditions relating to price and income elasticities

- For a good x the sum of own and cross-price elasticities of demand plus income elasticity of demand $= 0$

$$\frac{\partial x_1}{\partial p_1} \times p_1 + \frac{\partial x_1}{\partial p_2} \times p_2 + \frac{\partial x_1}{\partial I} \times I = 0.$$

$$\Rightarrow \quad \varepsilon_{x_1,p_1} + \varepsilon_{x_1,p_2} + \varepsilon_{x_1,I} = 0.$$

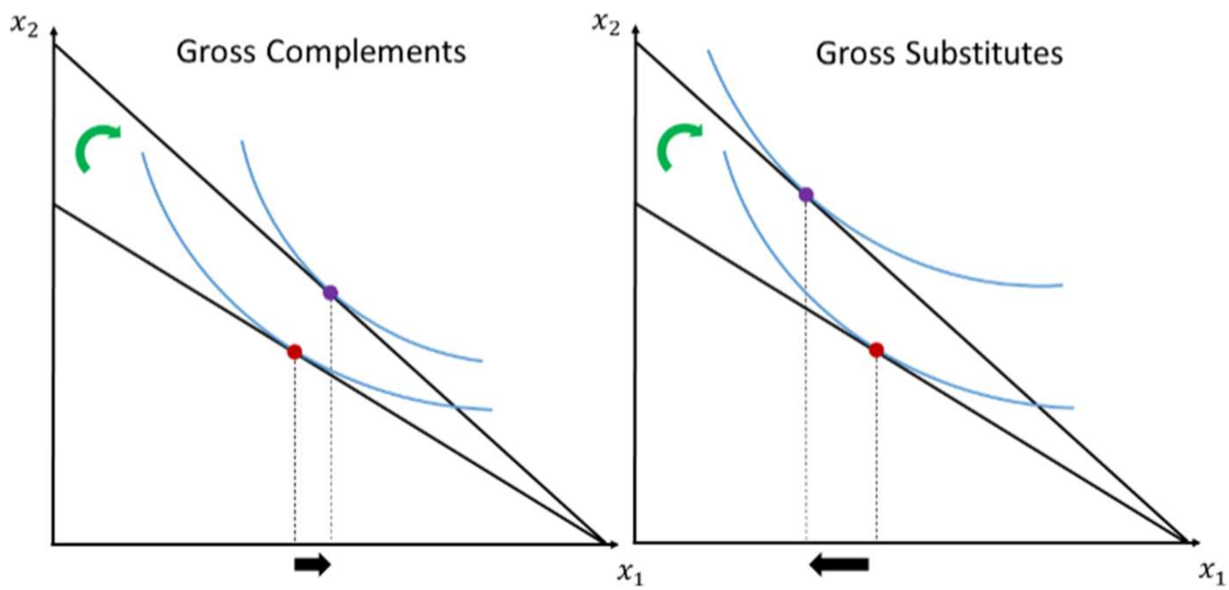
- For goods in the choice set, x_1 and x_2, the sum income elasticities of demand weighted by share of income spent on the good $= 1$

$$s_1\varepsilon_{x_1,I} + s_2\varepsilon_{x_2,I} = 1.$$

- In which:

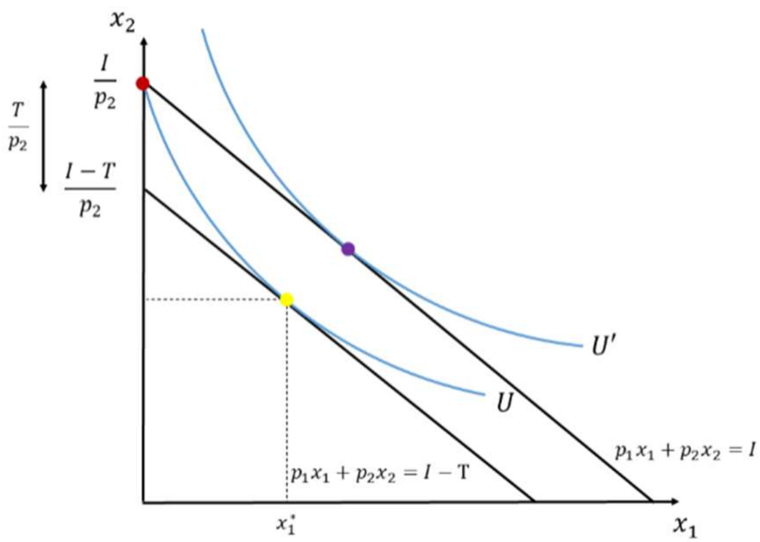
$$s_i = p_i x_i / I$$

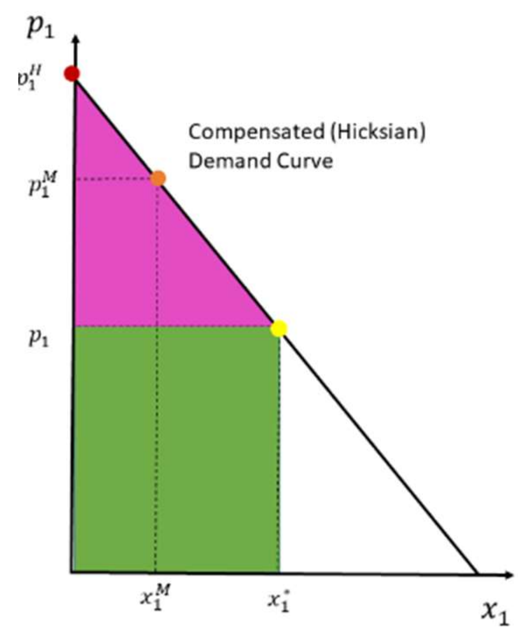
Gross Substitutes and Gross Complements



- Note the limitations of this definition: sometimes a good's price will depend on another good's price, but not vice versa eg quasi-linear demand functions:
  - $x = \frac{P_y}{P_x}$ $\qquad$ $y = \frac{I}{P_y} - 1$

Welfare Analysis: Consumer Surplus





- In order to have access to good 1, the consumer would pay at most T and reduce consumption of x_2 by $\frac{T}{P_2}$ in order to consume x_1^* of x_1
- This amount is equivalent to the area under the compensated demand curve for x_1, lying above P_1 between 0 and x_1^*

- Online Assessed Quiz #2

- Online Assessed Quiz #2 is available in Canvas/Quizzes
- You have 20 minutes to complete the quiz
- 6 questions on Lecture Notes #6
- Any problems during the quiz, let me know
- Good luck!