ECO111 : Lecture 16

7 September 2024

Marginal Rate of Substitution (MRS)

- The rate at which a consumer is willing to give up units of good *y* as she receives an additional unit of good *x*, in order to keep her utility level constant. Formally, the MRS of good *x* for *y* is given by the ratio of marginal utilities

$$MRS_{x,y} = \frac{MU_x}{MU_y}$$

- Intuitively, '*if you could receive 1 more unit of good x, how many units of good y would you be willing to give up to keep your utility level unchanged?*'

Marginal rate of substitution of x for y = Ratio of marginal utility of x to marginal utility of y
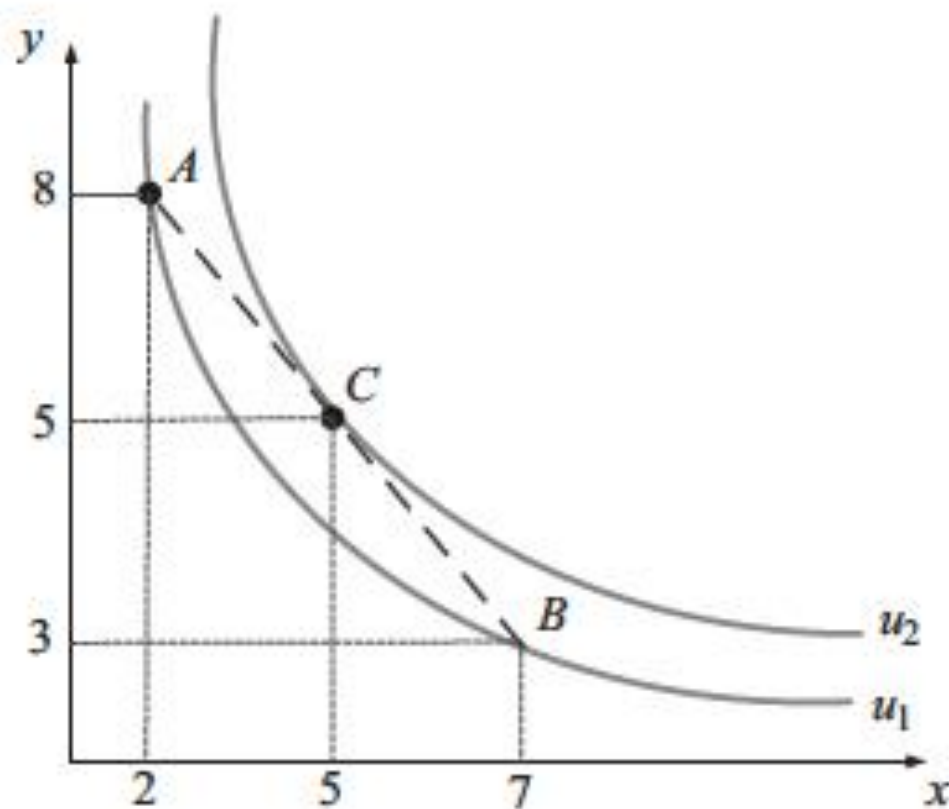
$$U(x, y) = \bar{U}$$

$$\frac{\partial U}{\partial x} dx + \frac{\partial U}{\partial y} dy = 0$$

$$MU_x dx + MU_y dy = 0$$

$$-\frac{dy}{dx} = \frac{MU_x}{MU_y}$$

$$MRS_{xy} = \frac{MU_x}{MU_y}$$

Marginal Rate of Substitution

Diminishing MRS

- Preference for variety
- Decreasing willingness to substitute

Some special utility functions

- Perfect substitutes
  - U(x, y) = Ax + By; where A and B are constants
  - Downward sloping linear indifference curves
  - MRS$_{xy}$ = $\frac{A}{B}$ = $\frac{MU_x}{MU_y}$

- Perfect compliments
  - U(x, y) = min{Ax, By}; where A and B are constants
  - L shaped indifference curves
  - No definitive MRS. Why?

Production Function

- Lets look at a simplified model of production.

- Suppose the consumer has consumption preferences over the goods they produce

- For example, agriculture production by farmers in developing countries, the grades you produce in each of your course, etc

- Here the time farmers spending producing a good or the hours you spent studying affects the outcome i.e., food and grades respectively

- We are simplifying our model by considering only one input that goes into production, which is labor.

Contd…

- Production function describes the amount of output that can be produced by any given amount or combination of input(s).

- The function essentially describes the different technologies that are available for production of the same good. Why?

- **Marginal Product of labor** is the additional grade or output that can be produced by increasing the labor input by 1 unit

- Marginal product of any input is the additional output that can be produced by increasing that particular input by 1 unit *ceteris paribus.*
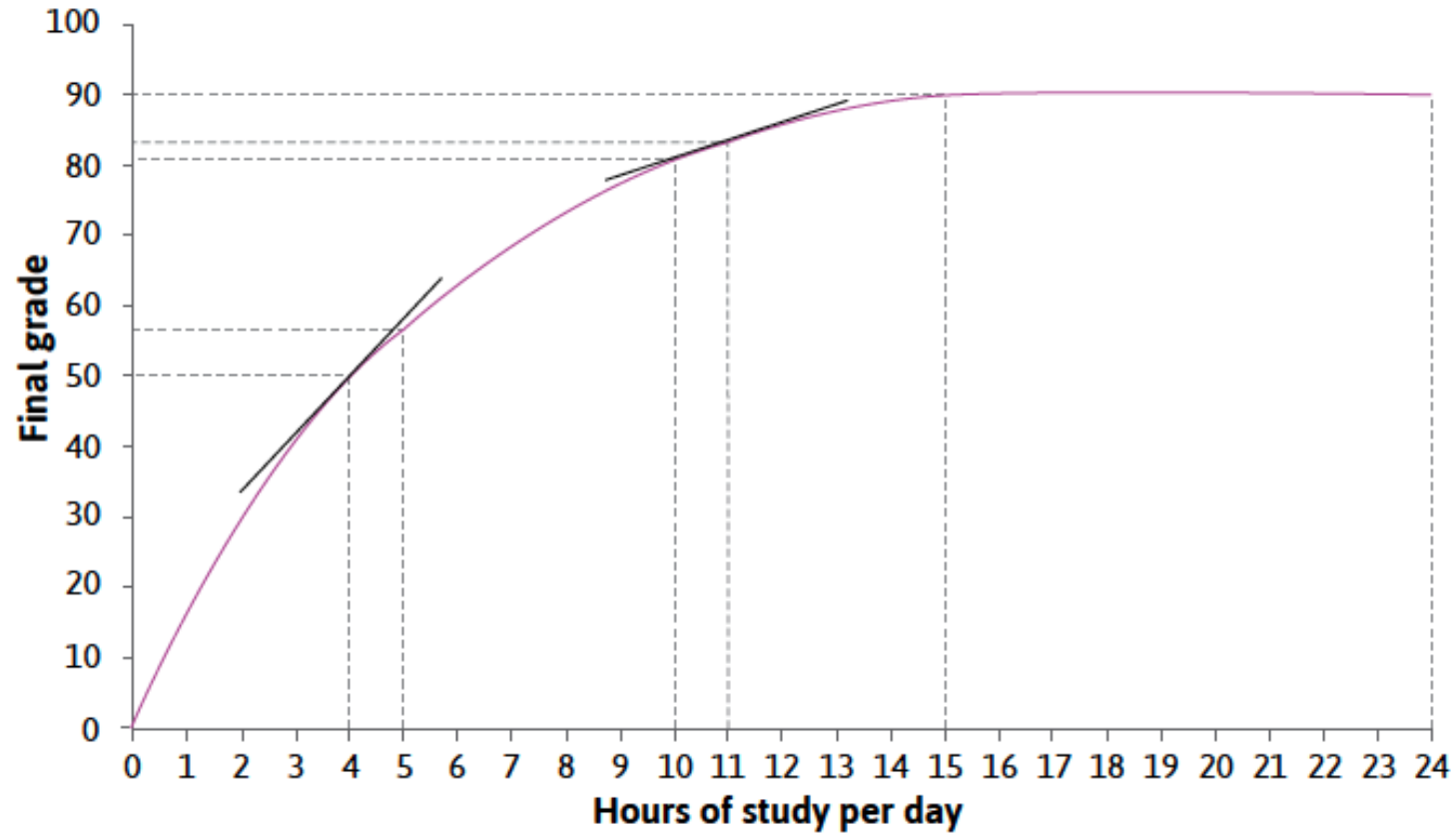
Study hours	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15 or more
Grade	0	20	33	42	50	57	63	69	74	78	81	84	86	88	89	90

Diminishing Marginal Product

- A property of some production function according to which each additional unit of input results in a smaller increment in total output than did the previous unit.
    - Limitation by other inputs
    - Overutilization of the input

Feasible frontier and Feasible set

- Feasible frontier is the curve made of points that defines the maximum feasible quantity of one good for a given quantity of the other.

- Feasible set is all the combinations of the things under consideration that a decision maker could choose from given the economic, physical or other constraints that they face.

- Could think of it from both consumption and production point of view.
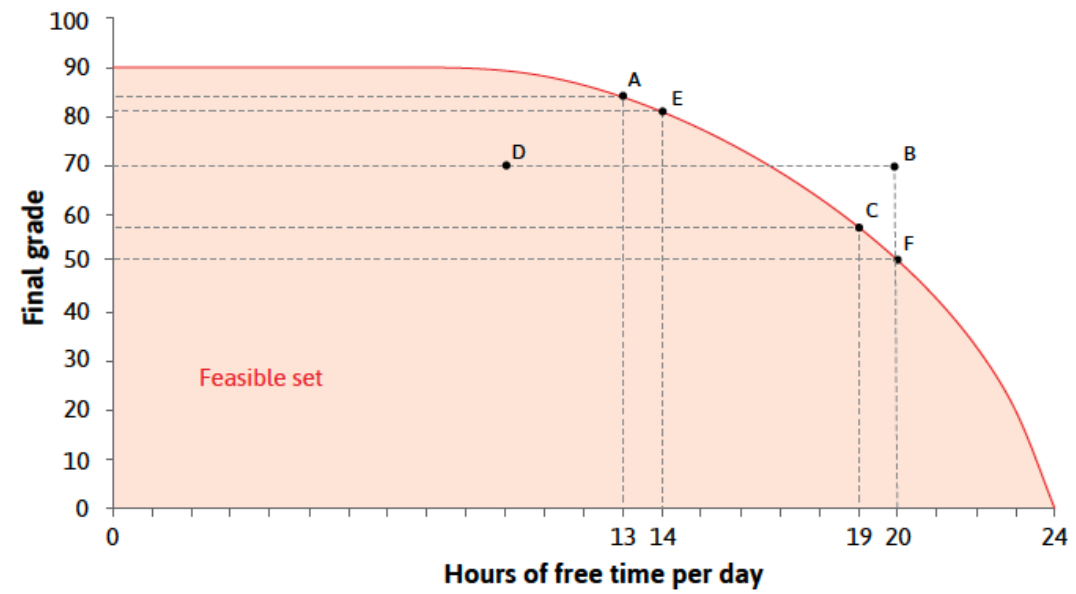
|	A	E	C	F
Free time	13	14	19	20
Grade	84	81	57	50
Opportunity cost		3		7

Marginal rate of transformation

- A measure of the trade-offs a person in what is feasible.
- Given the constraints a person faces, the MRT is the quantity of some good that must be sacrificed to acquire one additional unit of another good.
- It is the slope of the feasible frontier at any given point.

MRT and MRS

- MRS is about a person's utility maximizing objective
- MRT is about the constraints a person faces – tradeoff a person is constrained to make by the feasible frontier.

Determinants of Consumption

- Now, suppose the same individual i has preferences over the grade they get and the free time they get or leisure. So, the individual (here consumer) has a consumption bundle of grade and leisure.

- The indifference curves for the consumption of these two goods by the individual is shown below
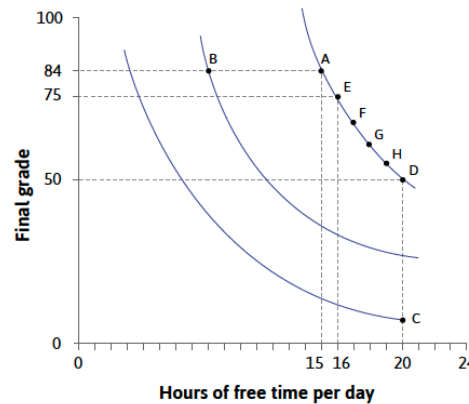
	A	E	F	G	H	D
Hours of free time	15	16	17	18	19	20
Final grade	84	75	67	60	54	50

- Given the constraints by the feasible frontier, maximize i's utility.
- This is how decisions are made when there is limited resources.
- At this point MRS = MRT