

# ECO206 Microeconomic Theory

## Lecture Notes

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## 1 Lecture 1 May. 8 2018

### 1.1 Budget Constraint

- Exogenous income
- Endogenous income:

**Bundle** Combination of goods. If we have  $n$  goods, then  $x_1^A$  represents a quantity ( $x$ ) of good 1 in bundle  $A$ .

$$A = (x_1^A, x_2^A, \dots, x_n^A)$$

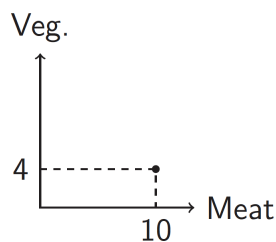


Figure 1: Consumption bundle

### 1.1.1 Types of Income

**Exogenous income** Cash(i.e. \$) in your pocket to spend.

**Endogenous income** Bundle of goods you can sell to get money. e.g. *Assets, Skills, Time*, etc.

### 1.1.2 Exogenous Income

Consumer walk into market with a fixed amount of **cash**, budget constraint.

$$\vec{x} \cdot \vec{p} \leq I$$

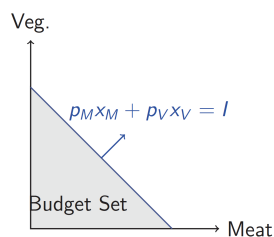


Figure 2: Budget constraint

### 1.1.3 Endogenous Income

**Framework** Consumer walks into a market **without cash**, but with **endowment**  $(\omega_M, \omega_V)$ . And consumer can sell the endowment at market prices, the value of the endowment is

$$p_M \omega_M + p_V \omega_V$$

**Hypothetical income** Income/Cash from selling the *entire* bundle endowed.

**Budget Constraint equation**

$$p_M x_M + p_V x_V \leq I_{\text{hypothetical}} = p_M \omega_M + p_V \omega_V$$

Intercepts: if spend all income on one good.

- x-axis(meat) =  $\frac{p_M \omega_M + p_V \omega_V}{p_M} = \omega_M + \frac{p_V}{p_M} \omega_V$
- y-axis(veg) =  $\frac{p_M \omega_M + p_V \omega_V}{p_V} = \omega_V + \frac{p_M}{p_V} \omega_M$

**Assumption** consumers are price takers.

**Affordable** means *spending*  $\leq$  *income* and  $\vec{x} \in \mathbb{R}_+^n$

**1.2 Opportunity Cost**

**OC/MRT** Rate at which one good can be traded for another though the market, expressed in units of a good.

To get another unit of good 1 how many unit of good 2 do I need to give up?

$$\frac{dy}{dx} = -\frac{p_x}{p_y}$$

**1.3 Changes that affect the budget constraint****1.3.1 Pure income change**

keeping relative prices constant. i.e.  $\frac{p_1}{p_2} = \bar{p}$

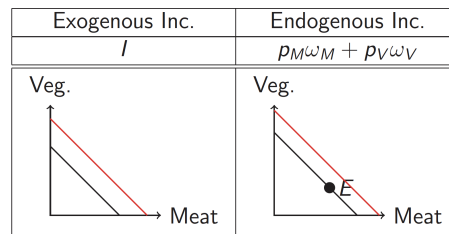


Figure 3: Pure income change

**Note** Changes in prices(relative price holds) will change the budget constraint in exogenous income budget, but will *not* affect the endogenous income constraint.

**Conclusion** To change budget constraint defined with endogenous income, we need **endowment changes**.

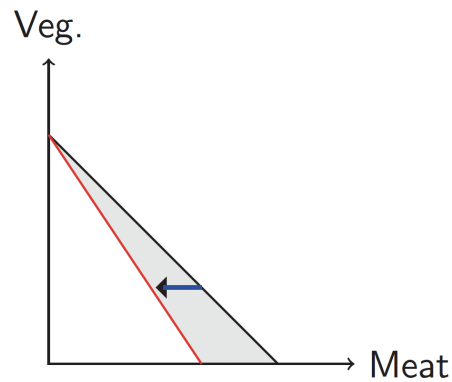


Figure 4: Relative price change

### 1.3.2 Price change

#### 1.3.3 Endogenous income price change

**Intuition** Rotation about the endowment.

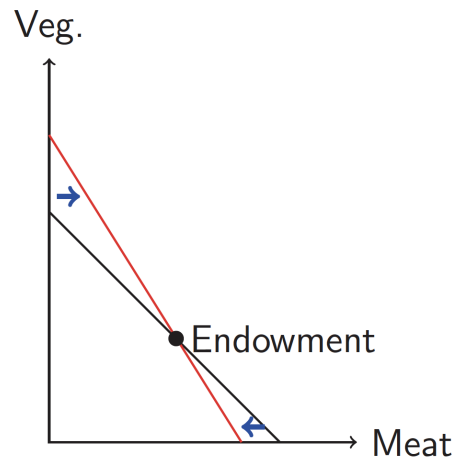


Figure 5: Endogenous income price change

## 2 Lecture 2 May. 9 2018

**Tophat** Assume endogenous income and 2 goods - meat and vegetables. When the price of meat goes up, can you afford more bundles? Explain your reasoning briefly.

**Key points**

1. Relative price  $\rightarrow$  Exchange rate.
2. Holding fixed amount of meat, consider the quantity of veg could be consumed.
3. Endowment point.

## 2.1 Tastes as Binary Relations

**Strictly preferred** Consider bundles  $A = (x_1^A, x_2^A)$  and  $B = (x_1^B, x_2^B)$ , we denote Bundle A is strictly preferred as B as,

$$(x_1^A, x_2^A) \succ (x_1^B, x_2^B)$$

**At least as good as** Consider bundles  $A = (x_1^A, x_2^A)$  and  $B = (x_1^B, x_2^B)$ , we denote Bundle A is at least as good as B as,

$$(x_1^A, x_2^A) \succcurlyeq (x_1^B, x_2^B)$$

**Indifference** Consider bundles  $A = (x_1^A, x_2^A)$  and  $B = (x_1^B, x_2^B)$ , we denote Bundle A is indifferent to B as,

$$(x_1^A, x_2^A) \sim (x_1^B, x_2^B)$$

## 2.2 Rationality Assumptions on Preference Relation

**Completeness** Let  $X$  denote the consumption set, then we say a preference relation  $\succcurlyeq$  satisfies completeness if and only if

$$\forall \vec{x}_1, \vec{x}_2 \in X, \vec{x}_1 \succcurlyeq \vec{x}_2 \vee \vec{x}_1 \preccurlyeq \vec{x}_2$$

**Transitivity** Let  $X$  denote the consumption set, then we say a preference relation  $\succcurlyeq$  satisfies transitivity if and only if

$$\forall \vec{x}_1, \vec{x}_2, \vec{x}_3 \in X, (\vec{x}_1 \succcurlyeq \vec{x}_2 \wedge \vec{x}_2 \succcurlyeq \vec{x}_3) \implies \vec{x}_1 \succcurlyeq \vec{x}_3$$

**Rational tastes** If those two assumption hold, we say the individual has rational tastes.

## 2.3 Convenience Assumptions

**(Strict) Monotonicity** Let  $X$  denote the consumption set, a preference relation  $\succcurlyeq$  satisfies monotonicity if and only if

$$\forall \vec{x}_1, \vec{x}_2 \in X, (\vec{x}_1 \geq \vec{x}_2 \implies \vec{x}_1 \succcurlyeq \vec{x}_2) \wedge (\vec{x}_1 \gg \vec{x}_2 \implies \vec{x}_1 \succ \vec{x}_2)$$

**(Weak) Convexity** *Intuitively, Averages are better than extremes, or at least no worse.* Let  $X$  denote the consumption set, a preference relation  $\succsim$  satisfies (weak) convexity if and only if

$$\forall \vec{x}_1, \vec{x}_2 \in X, \vec{x}_1 \sim \vec{x}_2 \implies \lambda \vec{x}_1 + (1 - \lambda) \vec{x}_2 \succsim \vec{x}_1, \forall \lambda \in [0, 1]$$

**Continuity** *Intuitively, no sudden preference switching,* mathematically, let consumption set  $X \subseteq \mathbb{R}_+^n$ ,  $\forall \vec{x} \in X$ , the "no better than" set,  $\preceq(\vec{x})$  and the "no worse than" set,  $\succeq(\vec{x})$  are closed in  $\mathbb{R}_+^n$ .<sup>1</sup>

## 2.4 Indifference Curve

**Definition** Let consumption bundle  $A \in X \subseteq \mathbb{R}_+^n$ , the indifference curve corresponding to consumption bundle  $A$  is defined as

$$\sim(A) = \{\vec{x} \in X \mid \vec{x} \sim A\}$$

### Properties

1. IC slopes downwards  $\iff$  monotonicity.
2. ICs does not cross (for individual preference).
3. Direction of increasing preference.

## 2.5 Utility Function

**Definition** A real-valued function  $u : \mathbb{R}_+^n \rightarrow \mathbb{R}$  is called a **utility function** representing the preference relation  $\succsim$ , if for all  $\vec{x}_0, \vec{x}_1 \in \mathbb{R}_+^n$ ,  $u(\vec{x}_0) \geq u(\vec{x}_1) \iff \vec{x}_0 \succsim \vec{x}_1$ .

**Marginal Rate of Substitution (MRS)** Consider the scenario with two commodities, intuitively, MRS could be interpreted as the quantity of one commodity must be forgone for one unit increment in the other commodity, holding the utility value constant. Graphically, MRS is the (absolute value of) slope of indifference curve. Mathematically, MRS can be computed as<sup>2</sup>

$$\frac{dy}{dx} = - \frac{\frac{\partial u(\cdot)}{\partial x}}{\frac{\partial u(\cdot)}{\partial y}}$$

<sup>1</sup>The mathematical definition is not required in ECO206.

<sup>2</sup>The negative sign indicates *forgoing*.