

Chapter 1: Basic general equilibrium model in macroeconomics

Reference: Williamson (Ch.4-5 and Ch.9-10), DLS (Ch. 2, 3, 5)

Objectives:

- 1) To understand basic set up of general equilibrium in macroeconomics
 - 2) Interpretation of resulting equilibrium by mathematics
 - 3) Understand the First fundamental welfare theorem.
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1. Static one-period Equilibrium model

Two types of the agent in the model: **Household and firm**

- Assumption: *homogenous households/firms*
- Implication: *Representative agent*

Interaction between the two agents:

- **Best explained by circular flow**

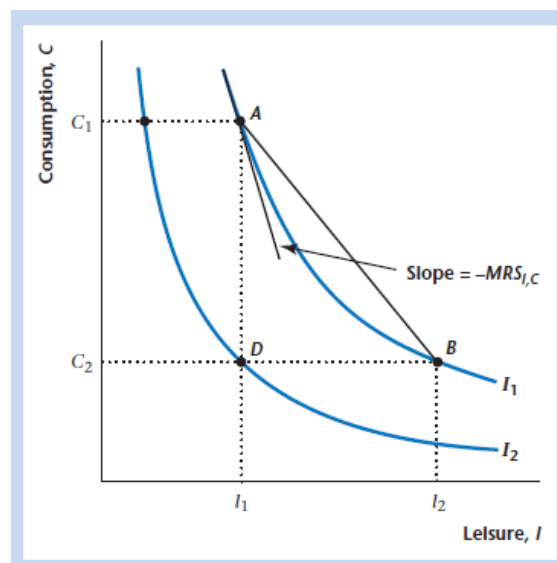
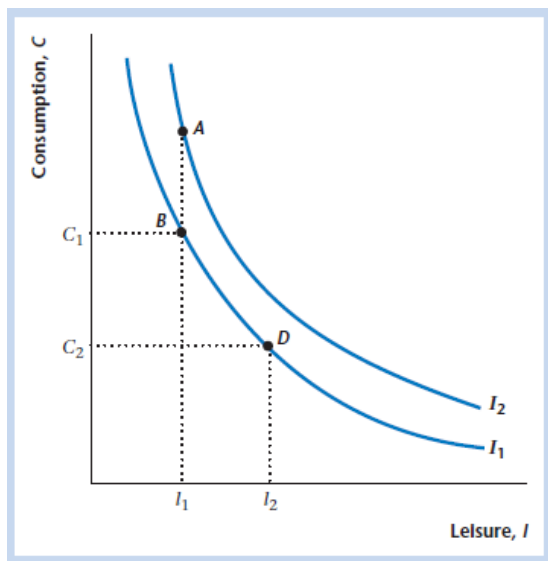
Households → consume and work

→ we need an organizing framework that explains how a representative household makes the decision.

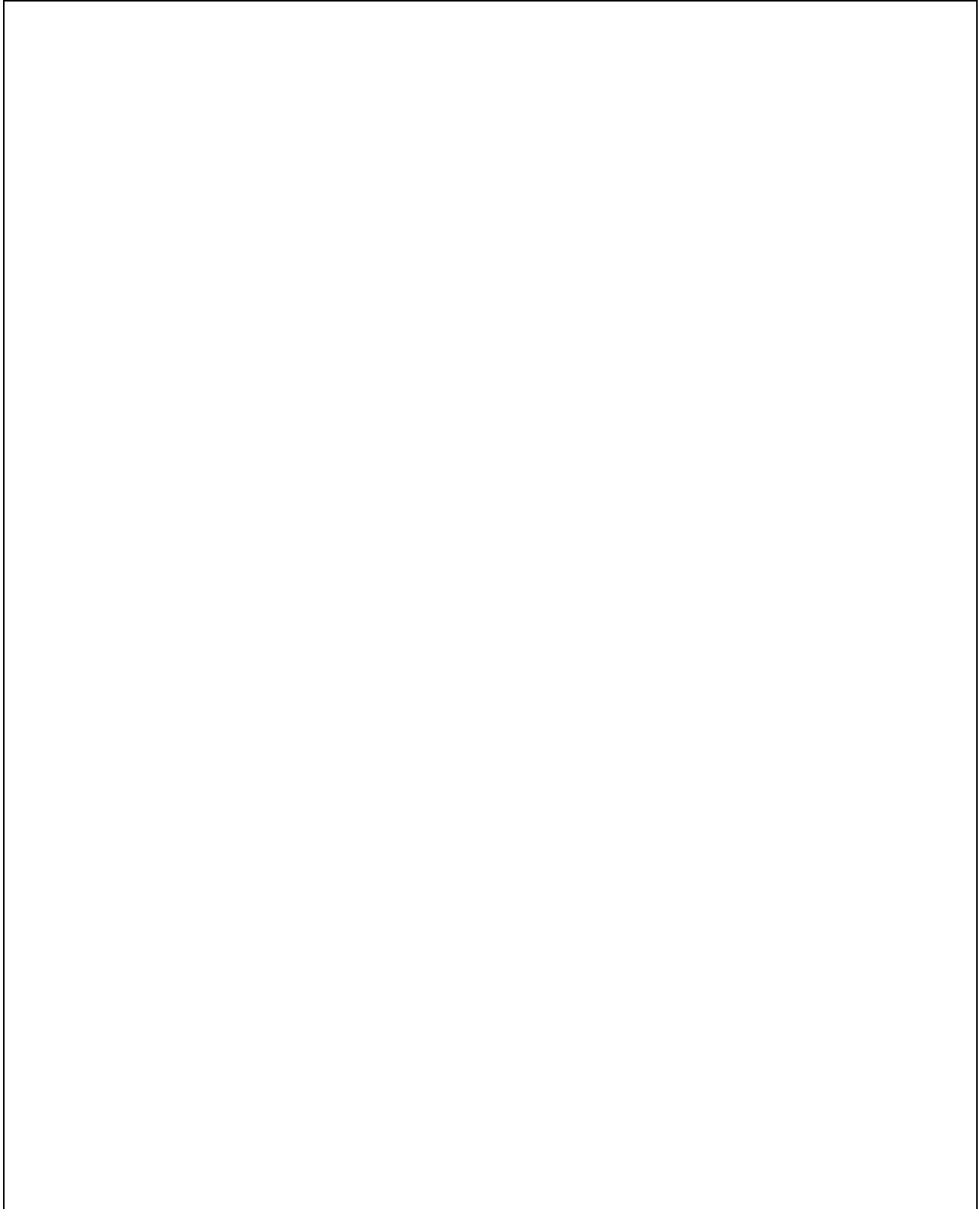
Assumption: (i) Household derives utility from consumption and leisure:

$$U(c, l)$$

(ii) Preference set defined over “C” and “l” follows the standard preference relation used in ec311; **increasing** and **convex to the origin (???)**



Household's choice? Constraint?

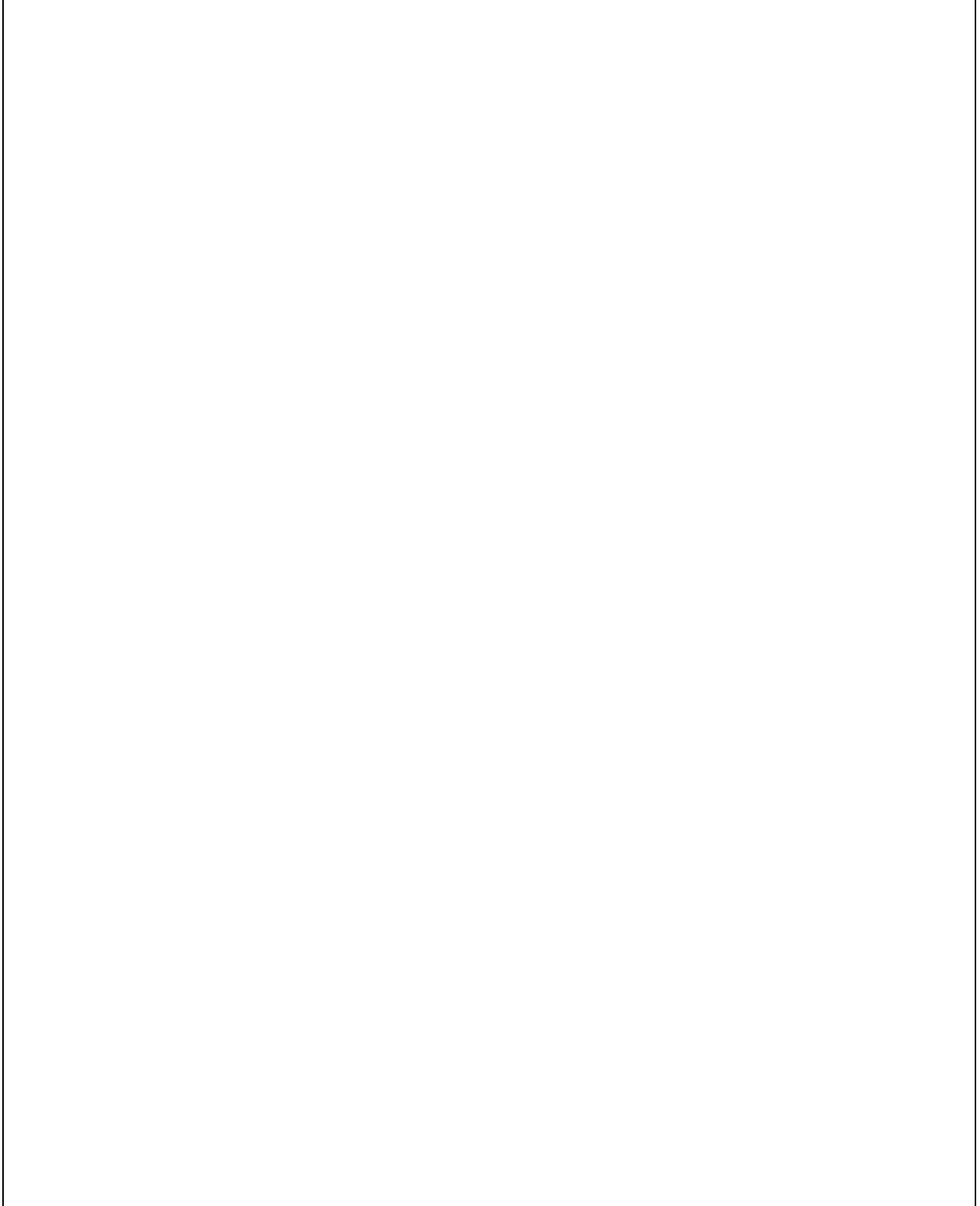


Budget constraint under various assumptions

Exercise 1: Consumption tax (τ_c)

Exercise 2: Payroll income tax (τ_w)

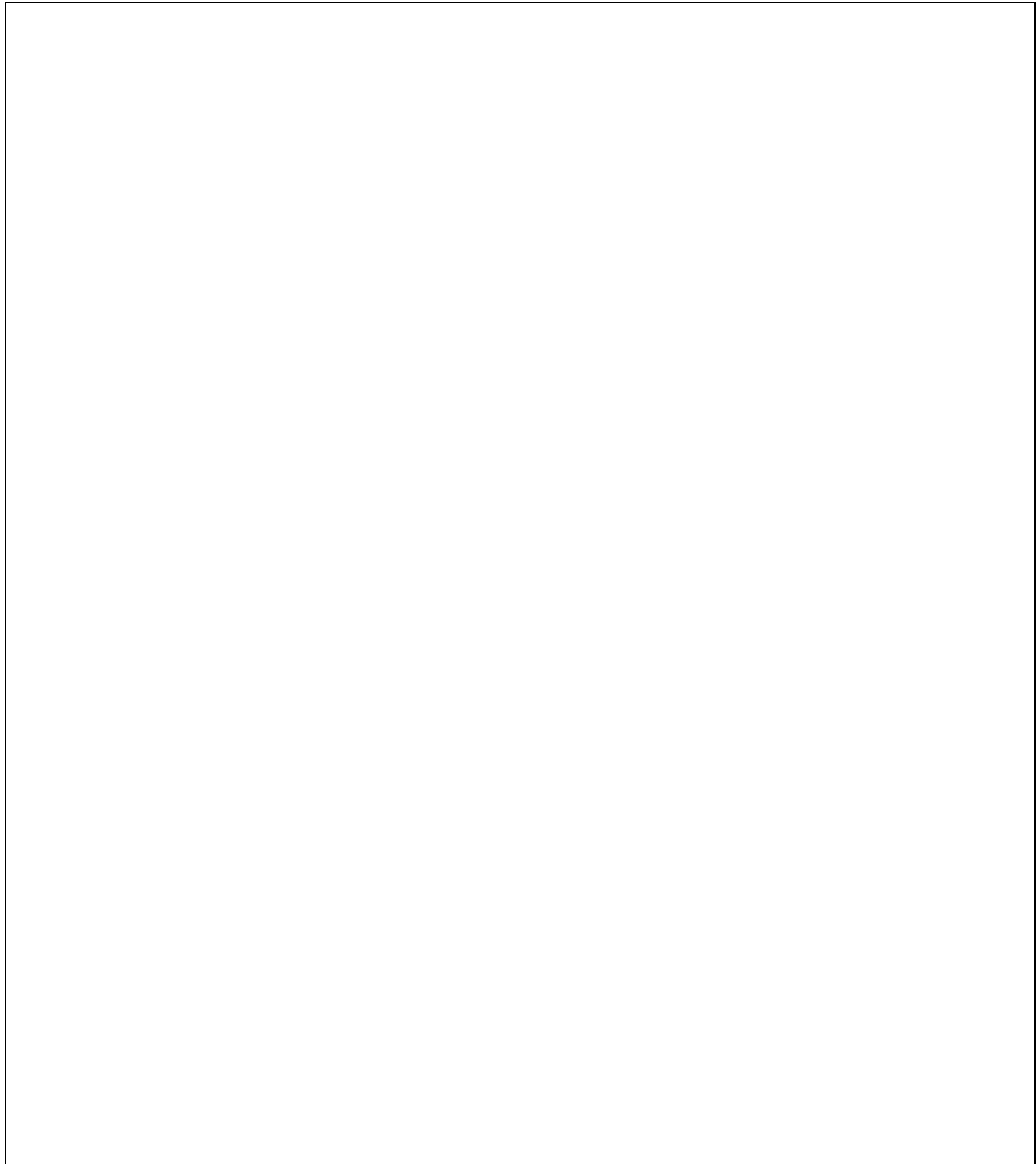
Household optimization problem:

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Resulting outcome from Household's maximizing utility problem:

The labor supply curve ➔ mirror image is Demand for consumption goods

Effect of wage changes on Labor supply: *income and substitution effect*



- Firm** → production unit
- own a production technology

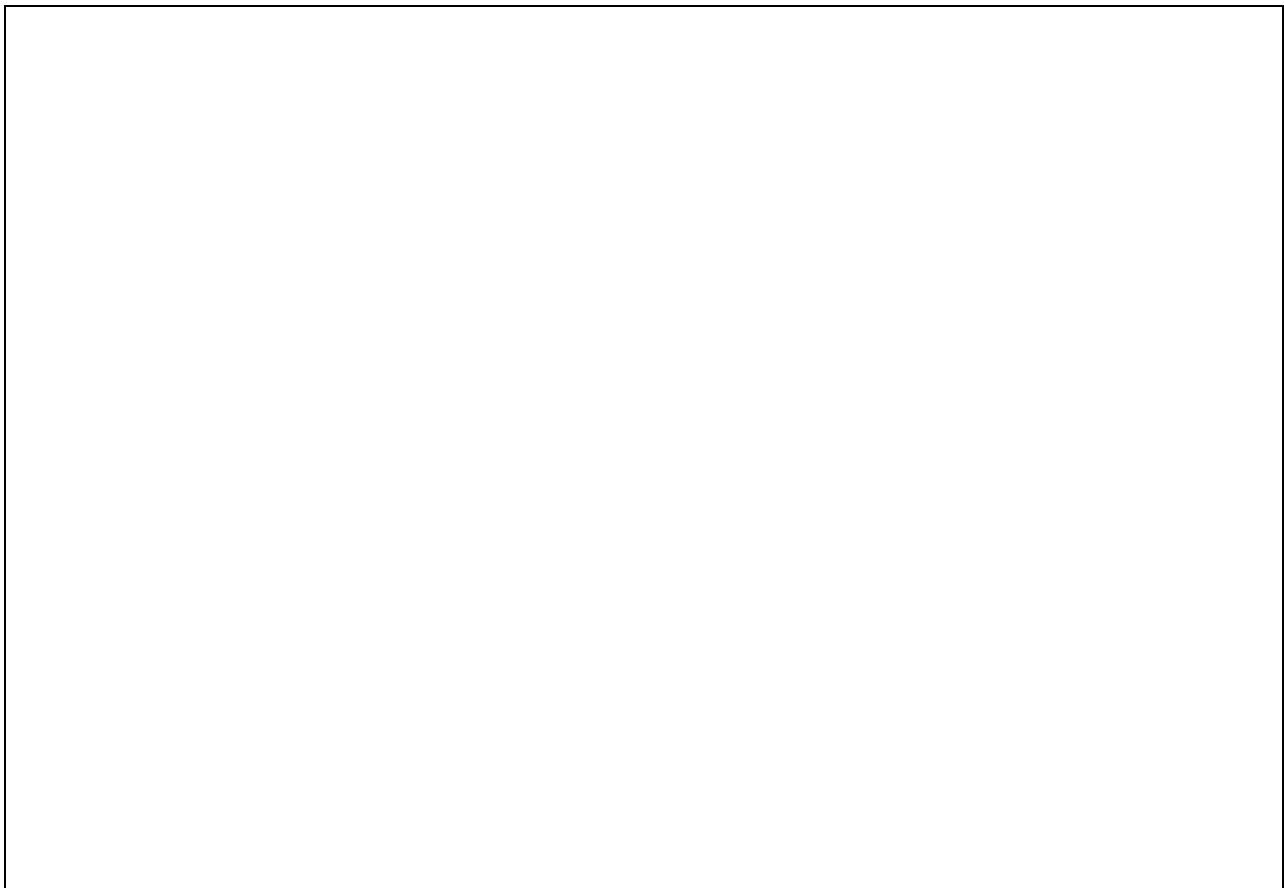
Production technology is represented by production function:

$$Y = F(K, L, z) = z f(K, L)$$

- z is the level of technology
- K is the existing amount of capital (machine)
- N is the number of labor (measured in hours work)

Assumption: (i) Both A and K are exogenously given! (Extension is possible!)

(ii) Production function is increasing and concave in "N". (??)



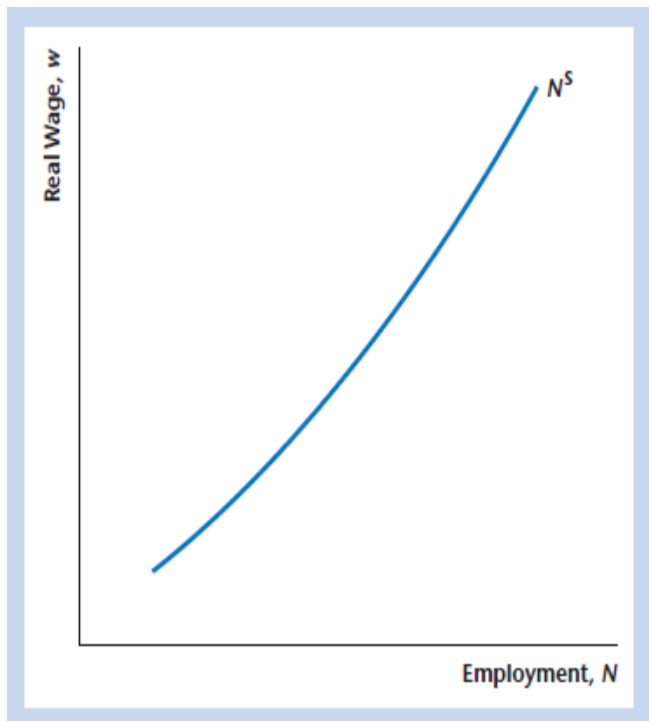
(iii) Firm operate in a perfectly competitive market (take **prices!!** as given)

- **Both consumption goods price (p) and wage (w)**

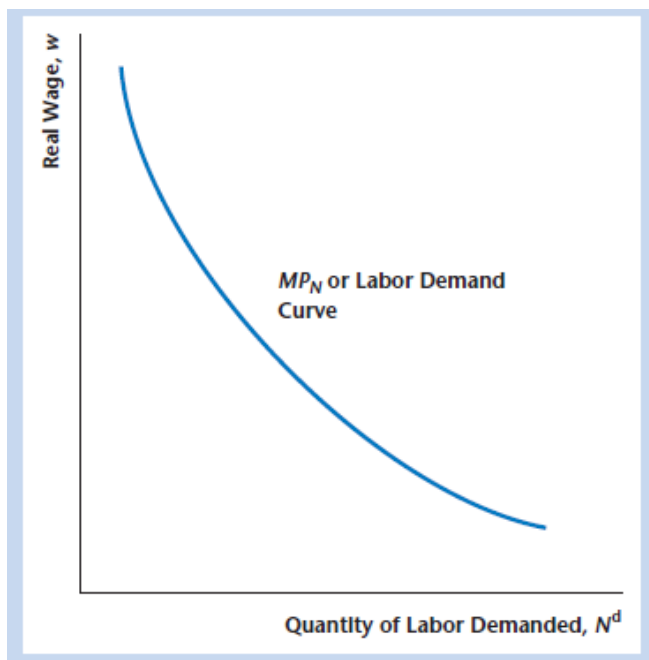
What does firm do? / Decision criteria / Decision rule

Sum UP: Optimizing behavior results in:

- (i) Household: Demand for consumption goods and Supply for labor



- (ii) Firm: Supply for consumption goods and Demand for labor



Note: All these depend on " w/p "

Question: At what price do people trade?

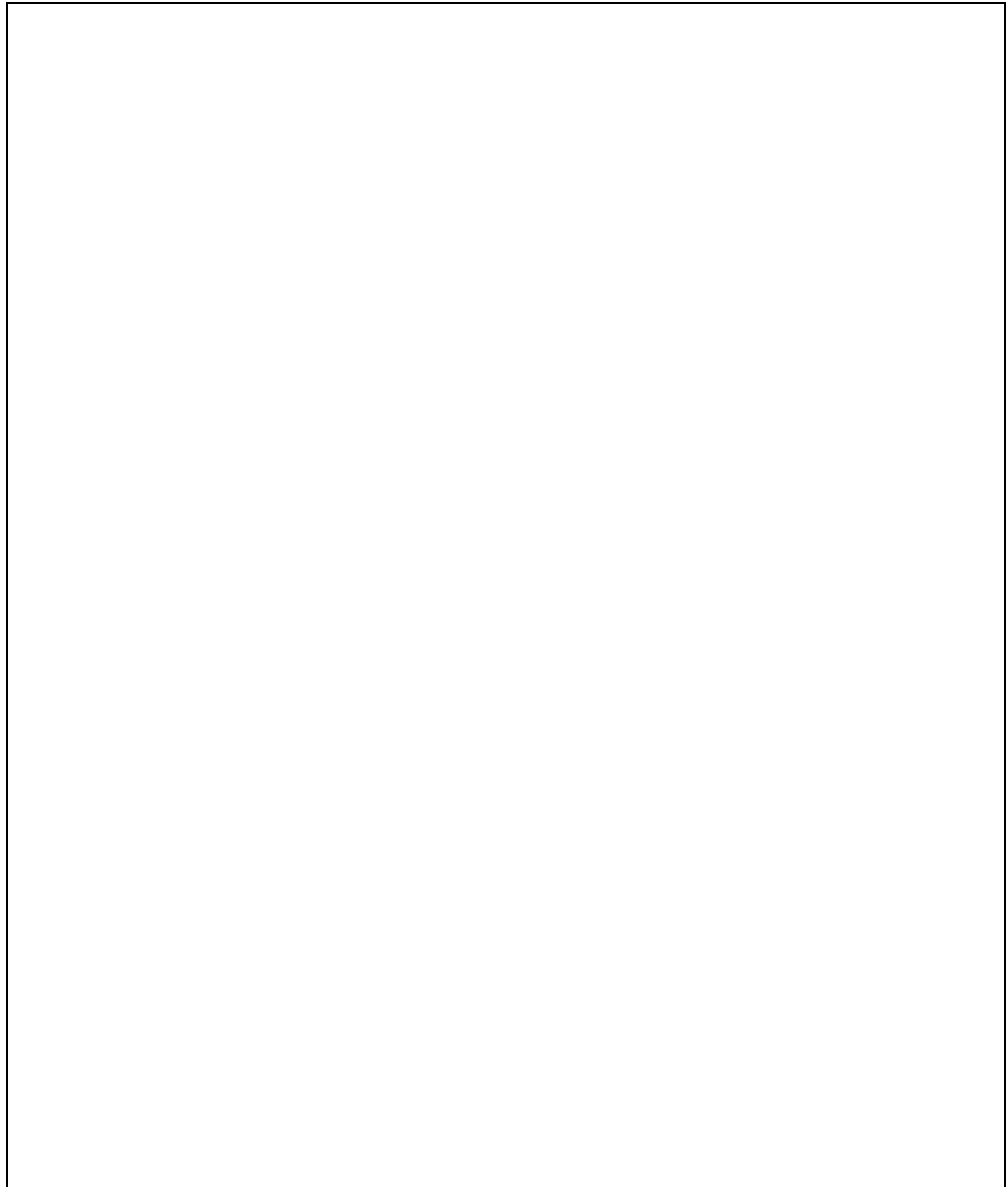
Competitive equilibrium (formally defines)

A competitive equilibrium under a price-taking economy comprises of allocation $\{L^e, N^e, C^e, Y^e\}$ and prices system $\{W^e, P^e\}$ such that

- (i) Given $\{W^e, P^e\}$, the allocation L^e, C^e maximizes household utility.
- (ii) Given $\{W^e, P^e\}$, the allocation N^e, Y^e maximizes household utility.
- (iii) All the markets are cleared: $C^e = Y^e$ and $N^e = H - L^e$.

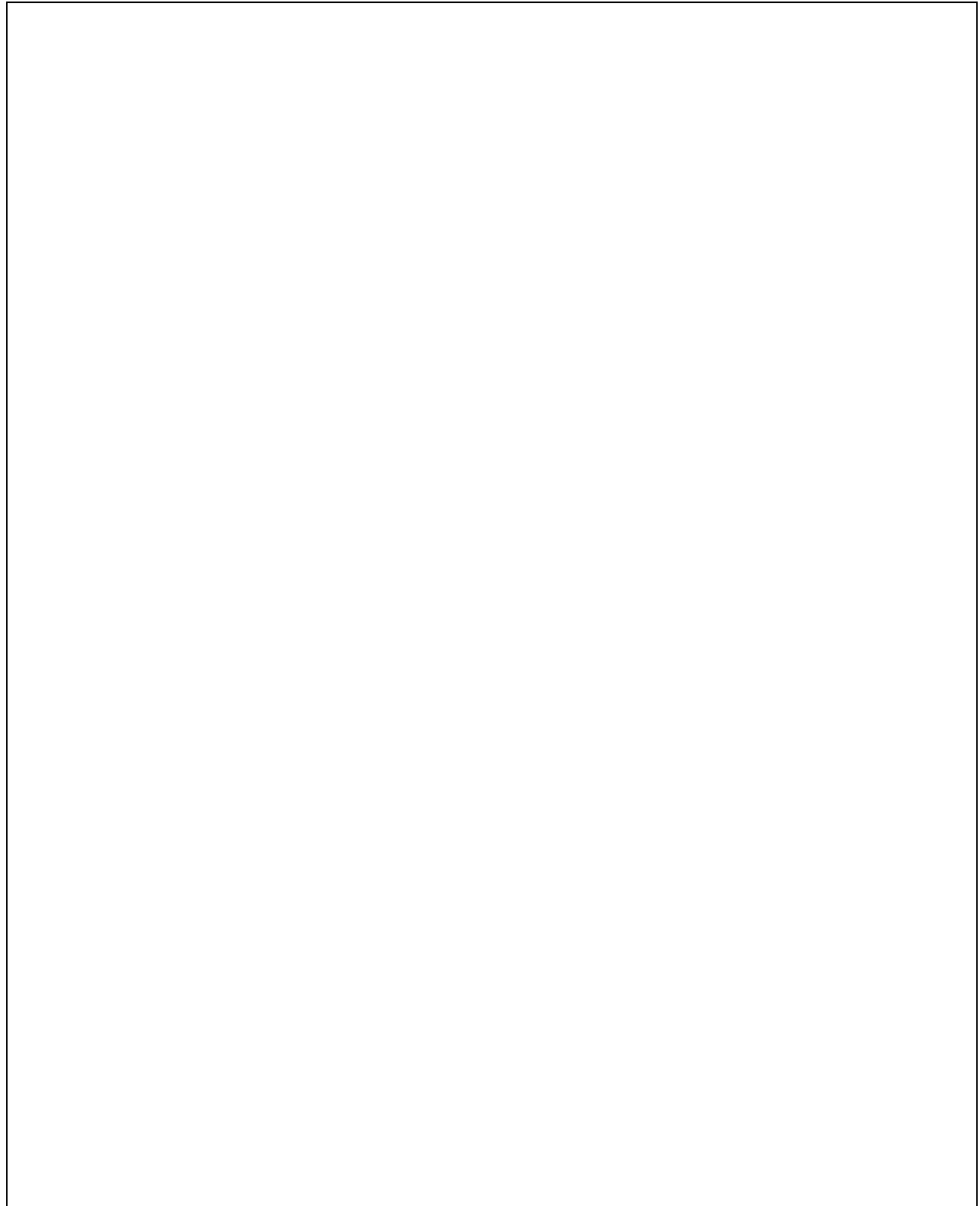
2. Mathematics of competitive equilibrium?

- Household's problem: $U = \ln C + \ln(L)$



- Firm's problem: $Y = Al^\alpha$; $0 < \alpha < 1$

- Equilibrium



3. First Fundamental Welfare theorem

- *Desirability* of Competitive equilibrium

Theorem: (First fundamental welfare theorem)

Perfectly competitive equilibrium with price taking is **PARETO optimum**.

Pareto optimum

Definition: An allocation is said to be Pareto optimal if there does not exist another allocation that PARETO dominate the allocation.

What is PARETO domination?

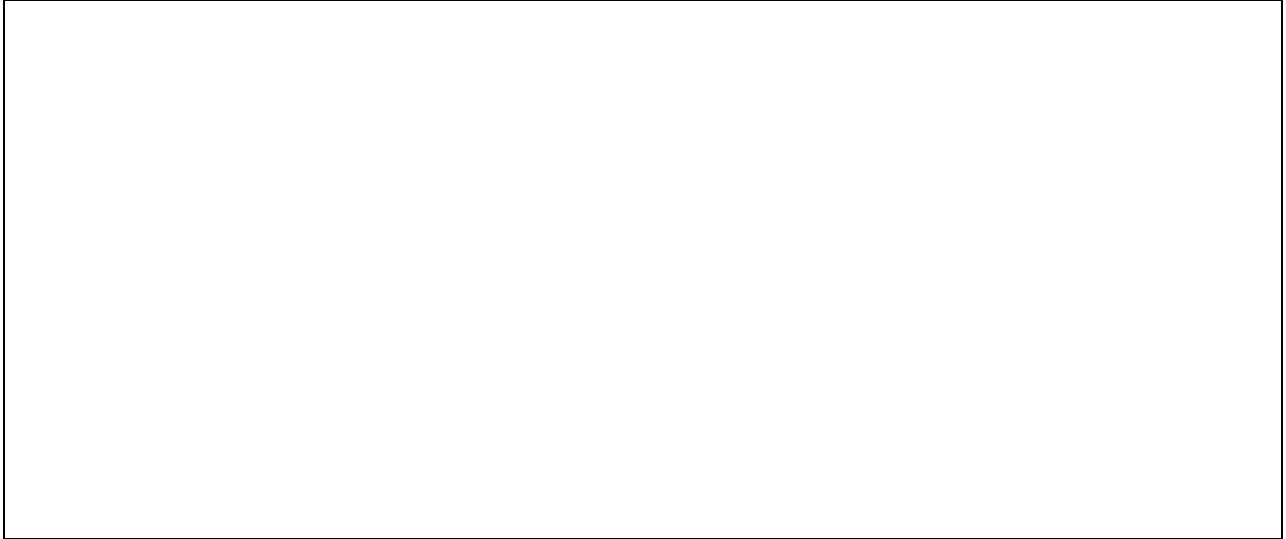
Some households are better-off.

NO one worse-off

How do we define a Pareto allocation under our representative-agent model?

- Pareto optimal under representative agent is the social planner problem

Social planner problem



Question:

Under which conditions/situations, competitive equilibrium fails to be PARETO optimal?

Who cares?