

Economics 101A

(Lecture 23)

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Outline

1. General Equilibrium: Introduction
2. Edgeworth Box: Pure Exchange
3. Barter
4. Walrasian Equilibrium

1 General Equilibrium: Introduction

- So far, we looked at consumers
 - Demand for goods
 - Choice of leisure and work
 - Choice of risky activities

- We also looked at producers:
 - Production in perfectly competitive firm
 - Production in monopoly
 - Production in oligopoly

- We also combined consumers and producers:
 - Supply
 - Demand
 - Market equilibrium
- Partial equilibrium: one good at a time
- General equilibrium: Demand and supply for all goods!
 - supply of young worker $\uparrow \implies$ wage of experienced workers?
 - minimum wage $\uparrow \implies$ effect on higher earners?
 - steel tariff $\uparrow \implies$ effect on car price

2 Edgeworth Box: Pure Exchange

- Nicholson, Ch. 13, pp. 458-460
- 2 consumers in economy: $i = 1, 2$
- 2 goods, x_1, x_2
- Endowment of consumer i , good j : ω_j^i
- Total endowment: $(\omega_1, \omega_2) = (\omega_1^1 + \omega_1^2, \omega_2^1 + \omega_2^2)$
- No production here. With production (as in book), (ω_1, ω_2) are optimally produced

- Edgeworth box
- Draw preferences of agent 1
- Draw preferences of agent 2

- Consumption of consumer i , good j : x_j^i

- Feasible consumption:

$$x_i^1 + x_i^2 \leq \omega_i \text{ for all } i$$

- If preferences monotonic, $x_i^1 + x_i^2 = \omega_i$ for all i
- Can map consumption levels into box

3 Barter

- Consumers can trade goods 1 and 2
- Allocation $((x_1^{1*}, x_2^{1*}), (x_1^{2*}, x_2^{2*}))$ can be outcome of barter if:

- **Individual rationality.**

$$u_i(x_1^{i*}, x_2^{i*}) \geq u_i(\omega_1^i, \omega_2^i) \text{ for all } i$$

- **Pareto Efficiency.** There is no allocation $((\hat{x}_1^1, \hat{x}_2^1), (\hat{x}_1^2, \hat{x}_2^2))$ such that

$$u_i(\hat{x}_1^i, \hat{x}_2^i) \geq u_i(x_1^{i*}, x_2^{i*}) \text{ for all } i$$

with strict inequality for at least one agent.

- Barter outcomes in Edgeworth box
- Endowments (ω_1, ω_2)
- Area that satisfies individual rationality condition
- Points that satisfy pareto efficiency
- **Pareto set.** Set of points where indifference curves are tangent

- **Contract curve.** Subset of Pareto set inside the individually rational area.
- Contract curve = Set of barter equilibria
- Multiple equilibria. Depends on bargaining power.
- Bargaining is time- and information-intensive procedure
- What if there are prices instead?

4 Walrasian Equilibrium

- Nicholson, Ch. 13, pp. 472-475; 482-484.

- Prices p_1, p_2

- Consumer 1 faces a budget set:

$$p_1x_1^1 + p_2x_2^1 \leq p_1\omega_1^1 + p_2\omega_2^1$$

- How about consumer 2?

- Budget set of consumer 2:

$$p_1x_1^2 + p_2x_2^2 \leq p_1\omega_1^2 + p_2\omega_2^2$$

or (assuming $x_i^1 + x_i^2 = \omega_i$)

$$p_1(\omega_1 - x_1^1) + p_2(\omega_2 - x_2^1) \leq p_1(\omega_1 - \omega_1^1) + p_2(\omega_2 - \omega_2^1)$$

or

$$p_1 x_1^1 + p_2 x_2^1 \geq p_1 \omega_1^1 + p_2 \omega_2^1$$

- **Walrasian Equilibrium.** $((x_1^{1*}, x_2^{1*}), (x_1^{2*}, x_2^{2*}), p_1^*, p_2^*)$ is a Walrasian Equilibrium if:

- Each consumer maximizes utility subject to budget constraint:

$$(x_1^{i*}, x_2^{i*}) = \arg \max_{x_1^i, x_2^i} u_i((x_1^i, x_2^i))$$
$$s.t. p_1^* x_1^i + p_2^* x_2^i \leq p_1^* \omega_1^i + p_2^* \omega_2^i$$

- All markets clear:

$$x_j^{1*} + x_j^{2*} \leq \omega_j^1 + \omega_j^2 \text{ for all } j.$$

- Compare with partial (Marshallian) equilibrium:
 - each consumer maximizes utility
 - market for good i clears.
 - (no requirement that all markets clear)

- How do we find the Walrasian Equilibria?

- **Graphical method.**

1. Compute first for each consumer set of utility-maximizing points as function of prices
2. Check that market-clearing condition holds

- *Step 1.* Compute optimal points as prices p_1 and p_2 vary

- Start with Consumer 1. Find points of tangency between budget sets and indifference curves

- Figure

- **Offer curve** for consumer 1:

$$(x_1^{1*}(p_1, p_2, (\omega_1, \omega_2)), x_2^{1*}(p_1, p_2, (\omega_1, \omega_2)))$$

- Offer curve is set of points that maximize utility as function of prices p_1 and p_2 .

- Then find offer curve for consumer 2:

$$(x_1^{2*}(p_1, p_2, (\omega_1, \omega_2)), x_2^{2*}(p_1, p_2, (\omega_1, \omega_2)))$$

- Figure

- *Step 2.* Find intersection(s) of two offer curves
- Walrasian Equilibrium is intersection of the two offer curves!
 - Both individuals maximize utility given prices
 - Total quantity demanded equals total endowment

- Relate Walrasian Equilibrium to barter equilibrium.
- Walrasian Equilibrium is a subset of barter equilibrium:
 - Does WE satisfy Individual Rationality condition?
 - Does WE satisfy the Pareto Efficiency condition?
- Walrasian Equilibrium therefore picks one (or more) point(s) on contract curve.

5 Next lecture

- Example of Walrasian Equilibrium
- Theorems on welfare