Economics 201B–Second Half

Lecture 1, 3/9/10

Overview of General Equilibrium Theory

Edgeworth Box Model

General Equilibrium

Strategic

Holy Grail, 201Ω

$\nearrow$ $\nwarrow$

Partial Equilibrium	General Equilibrium
Strategic	Price-Taking
201A, 201B(1^{st} half)	201B (2^{nd} half)
IO	

$\nwarrow$ $\nearrow$

Partial Equilibrium

Price-Taking

201A(1^{st} half)

Price-Taking: Assumes competitive market, each agent is negligible, so agents take prices as given.

Benchmark against which one compares:

- Distortion from Monopoly or Oligopoly: Industrial Organization
- Distortion arising from Taxes: Public Finance
- Effects of Welfare Payments on Labor Supply
- Externalities
- Most of Finance is competitive
- Freshwater Macro

Features:

- Very successful model of *exchange* (taken production decisions as given, explains how consumption is allocated)
- Less succesful model of *production* (should be strategic)
- Method of analyzing effects of policy changes, such as trade liberalization or tax changes

Focus on *Proofs* and *Precision:*

- Further develop skills needed to read journal articles
- Specify model completely
- Know what you know
- Know what you don't know; public discourse is incomplete or misleading

Problem Sets:

- Most important part of course
- Work together
- Write up solutions on your own

Fundamental Notion: *Walrasian Equilibrium, AKA Competive Equilibrium*

Vector of prices and allocations of goods and production plans such that

- Consumers maximize utility, taking prices as given
- Firms maximize profit, taking prices as given
- All markets clear (Supply = Demand)

Four Fundamental Questions: (Gérard Debreu made fundamental contributions to all four 1950-1975. *Theory of Value*, 1959, won him a Nobel Prize, but not tenure at Yale, so he came to Berkeley)

1. *Existence:* Arrow-Debreu 1954, Debreu 1959.
   - As soon as equilibrium notion is defined, must resolve the existence question for a reasonably broad class of models as a basic consistency check.
   - If existence fails, qualitative results on equilibrium have no foundation.
   - Now, you can't publish a model and solution concept without showing existence.
   - Requires Convexity of Preferences (not great assumption) and Technology (horrible assumption). We'll discuss what happens without convexity.

2. *Welfare Theorems:*

   - *Pareto Optimality:* There is no way to rearrange things to make everyone better off.
   - *First Welfare Theorem:* Every Walrasian Equilibrium is Pareto Optimal. Adam Smith–Arrow–Debreu
     - True in great generality
     - Main assumption–price-taking–is hidden in defintion of Walrasian Equilibrium
     - Fails with
       * Externalities
       * Incomplete Markets
       * Overlapping Generations
   - *Second Welfare Theorem:* Every Pareto Optimum is a Walrasian Equilibrium with Income Transfers. Debreu (1959)
     - Walrasian Equilibrium is not biased to certain Pareto Optima over others
     - Informational Efficiency: Even though government can't compute Pareto Optima, it can achieve any Pareto Optimum by allocating income and relying on First Welfare Theorem to generate Pareto Optimality
     - Needs Convexity of Preferences and Technology. We'll look at what happens if convexity fails.
     - Income Transfers need lump sum taxes

3. *Uniqueness and Determinacy:* Does an economy have a unique Walrasian Equilibrium: **No!** Basic assumptions do not imply uniqueness. Best work in literature uses assumptions on *distribution* of characteristics: Hildenbrand–Grandmont–Quah.

   - Next Best: *Determinacy* Debreu (1970).
     - For "*most*" economies,
       - there are only finitely many equilibria
       - the equilibria move in a smooth was as the parameters of the economy change
     - A foundation for comparative statics: Effect of
       - tax change
       - change in minimum wage
       - tariff reduction
     - Most of the central policy questions are comparative statics questions.
     - There are nondifferentiable approaches to monotone comparative statics (Milgrom, Shannon, others)

4. *Is the price-taking assumption justified?* Most prominent formulation is *core convergence* Edgeworth 1881–Shubik 1959–Debreu-Scarf 1964; much additional work through mid-1980s.

   - Core is institution-free model of what outcomes could reasonably result from trade
   - Core convergence means roughly "Every core allocation is nearly Walrasian"

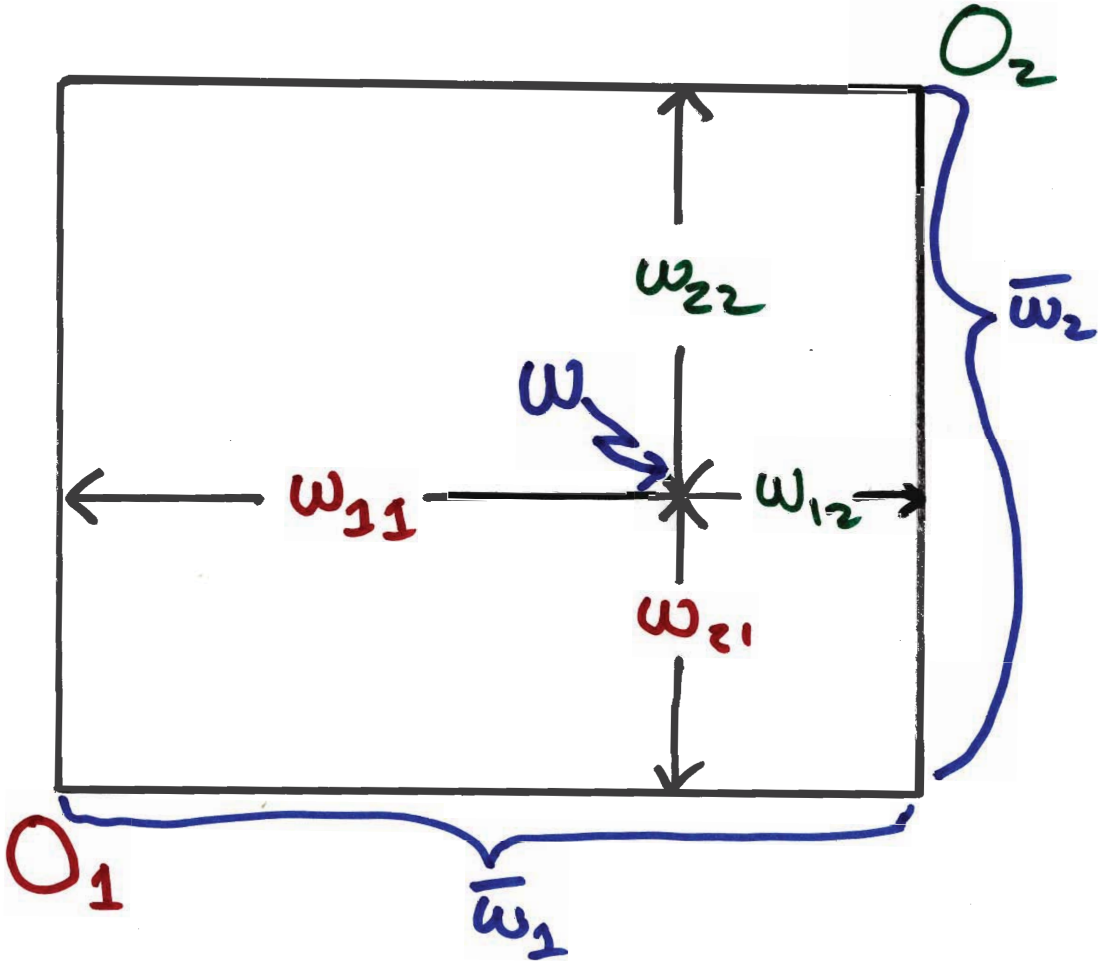
End of Overview

First Model: Edgeworth Box (2 persons, 2 goods, exchange economy) Either

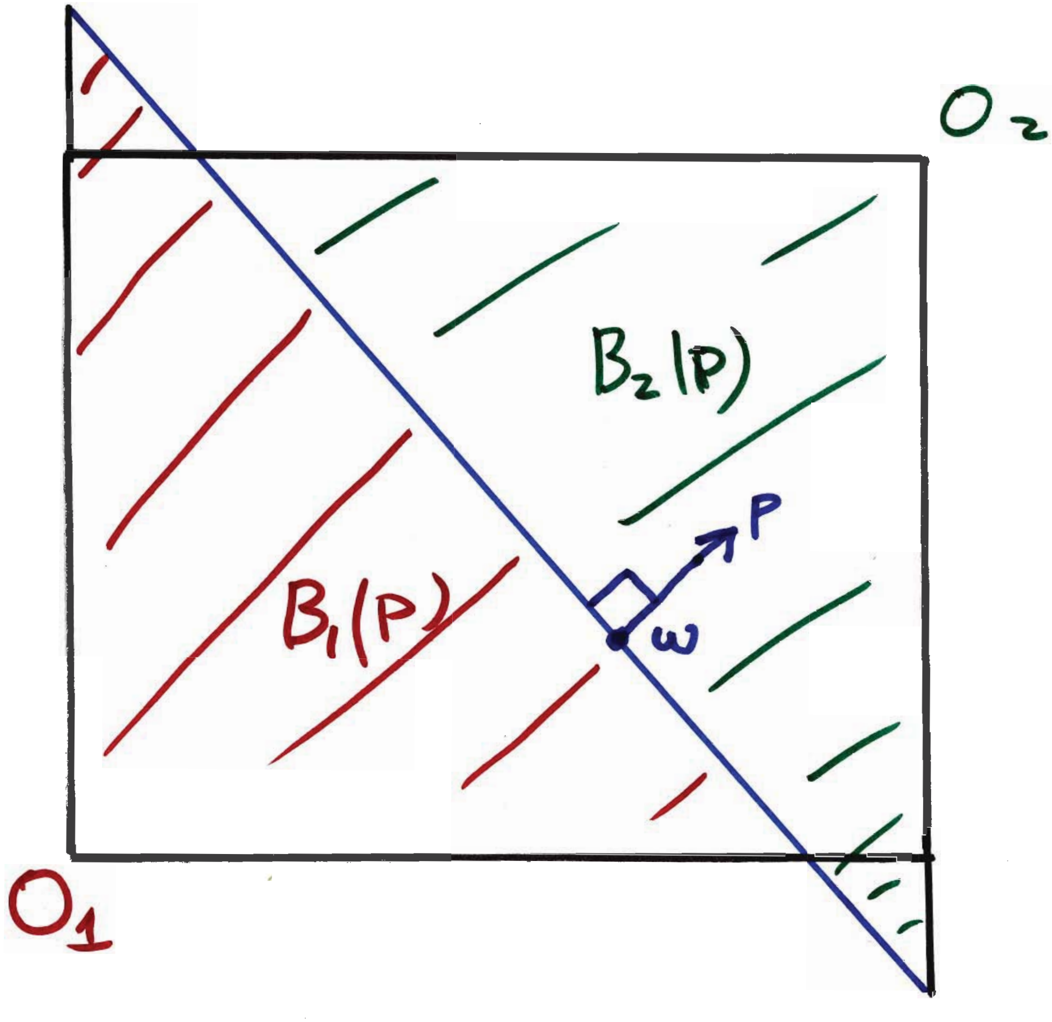
- No production; or
- Production decisions made exogenously, focus on the question of how consumption is allocated

Features:

- 2 consumers $i = 1, 2$
- 2 goods $\ell = 1, 2$
- Consumption *space* is $\mathbf{R}^2$. Each agent's consumption *set* is $\mathbf{R}^2_+$.
- Not interested in minimal assumptions just yet.



O_2
ω_{22}
$\bar{\omega}_2$
ω
ω_{11}
ω_{12}
ω_{21}
O_1
$\bar{\omega}_1$



O_2
$B_2(p)$
p
w
$B_1(p)$
O_1

- i's endowment $\omega_i \in \mathbf{R}^2_+$; $\omega_{\ell i}$: i's endowment of good ℓ

- social endowment: $\bar{\omega} = \omega_1 + \omega_2$; social endowment of good ℓ: $\bar{\omega}_\ell = \omega_{\ell 1} + \omega_{\ell 2}$: $\bar{\omega} = (\bar{\omega}_1, \bar{\omega}_2)$

- An *allocation* $x \in \left(\mathbf{R}^2_+\right)^2$ is

  - *feasible* if $x_1 + x_2 \leq \bar{\omega}$

  - *exact* if $x_1 + x_2 = \bar{\omega}$. Every exact allocation is a point in the Edgeworth Box, and vice versa.

    Book says *non-wasteful*, I don't like this because it assumes goods are goods and not bads.

- Agent i is endowed with a preference relation $\succeq_i$ on $\mathbf{R}^2_+$ which is

  1. *complete*: $x, y \in \mathbf{R}^2_+ \Rightarrow (x \succeq_i y \vee y \succeq_i x)$

  2. *transitive*: $(x \succeq_i y \wedge y \succeq_i z) \Rightarrow x \succeq_i z$

  3. *strictly convex*:

  $$(y \succeq_i x, z \succeq_i x, y \neq z) \Rightarrow \forall_{\alpha \in (0,1)} \alpha y + (1-\alpha) z \succ_i x$$

  4. *continuous*:

  $$(x^n \succeq_i y^n, x^n \to x, y_n \to y) \Rightarrow x \succeq_i y$$

  5. strongly monotone: $y \geq x, y \neq x \Rightarrow y \succ_i x$

($x \succ_i y$ means $x \succeq_i y$ and $y \not\succeq_i x$)

- *Price* $p \in \mathbf{R}^2_+$

- *Budget Set:* $B_i(p) = \{x \in \mathbf{R}^2_+ : p \cdot x \leq p \cdot \omega_i\}$ Observe that $B_i(p)$ may extend outside the Edgeworth Box.

- *Pareto Optimality in Edgeworth Box* An exact allocation x is

  - Pareto Optimal if there is no other exact allocation x' with

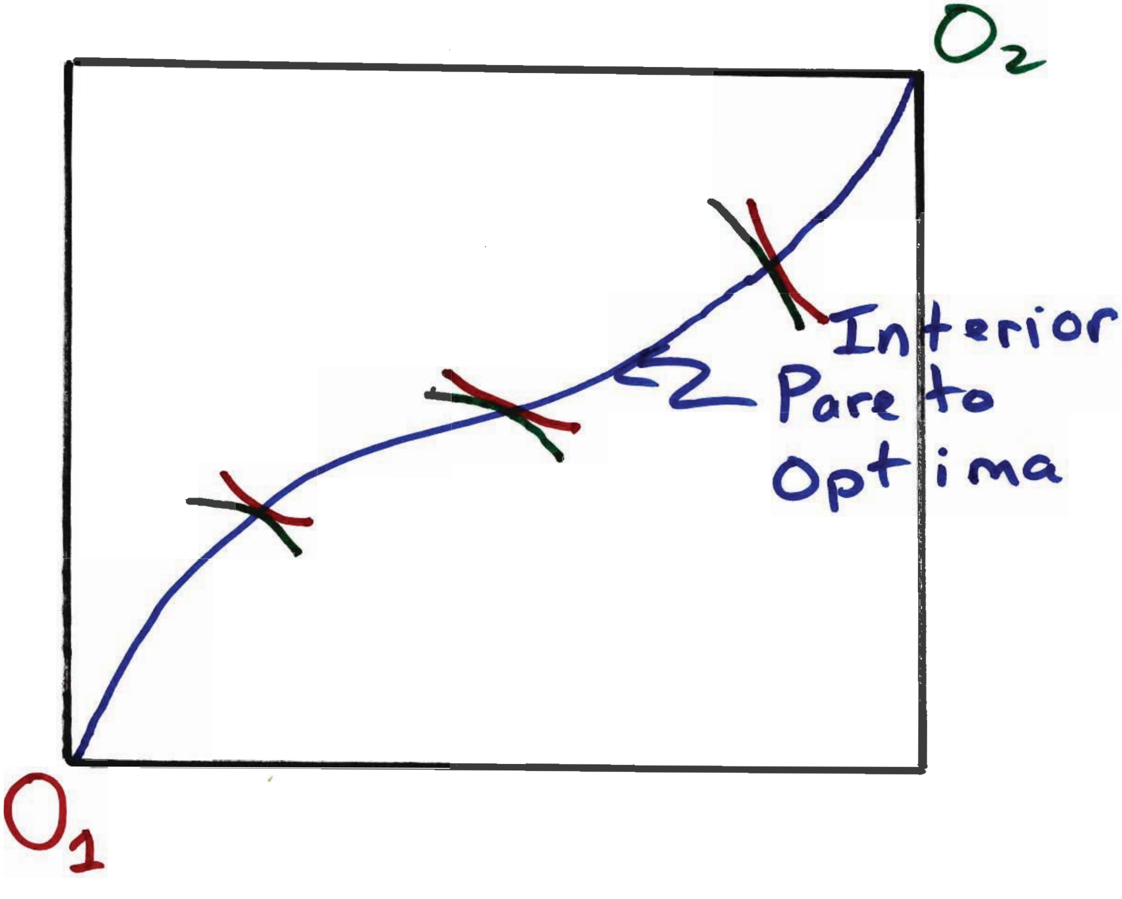
$$\begin{aligned} x'_i &\succeq_i x_i \text{ for both } i \\ x'_i &\succ_i x_i \text{ for some } i \end{aligned}$$

  - Weakly Pareto Optimal if there is no other exact allocation x' with

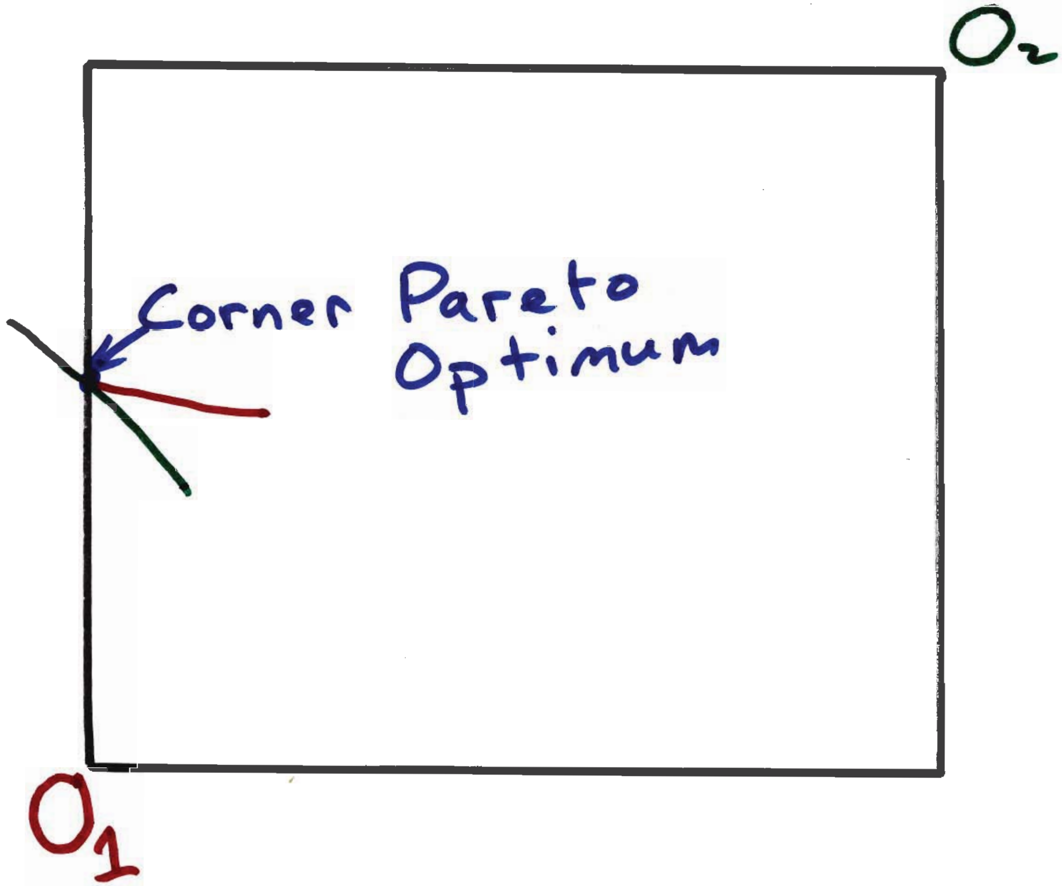
$$x'_i \succ_i x_i \text{ for both } i$$

- If preferences are smooth, interior Pareto Optima are points of tangency of indifference curves, so can be computed by equating Marginal Rates of Substitution. But observe:

  - If a Pareto Optimum lies on the boundary of the Edgeworth Box, tangency typically fails, and Marginal Rates of Substitution are typically not equated across agents.



O_2
Interior
Pareto
Optima
O_1

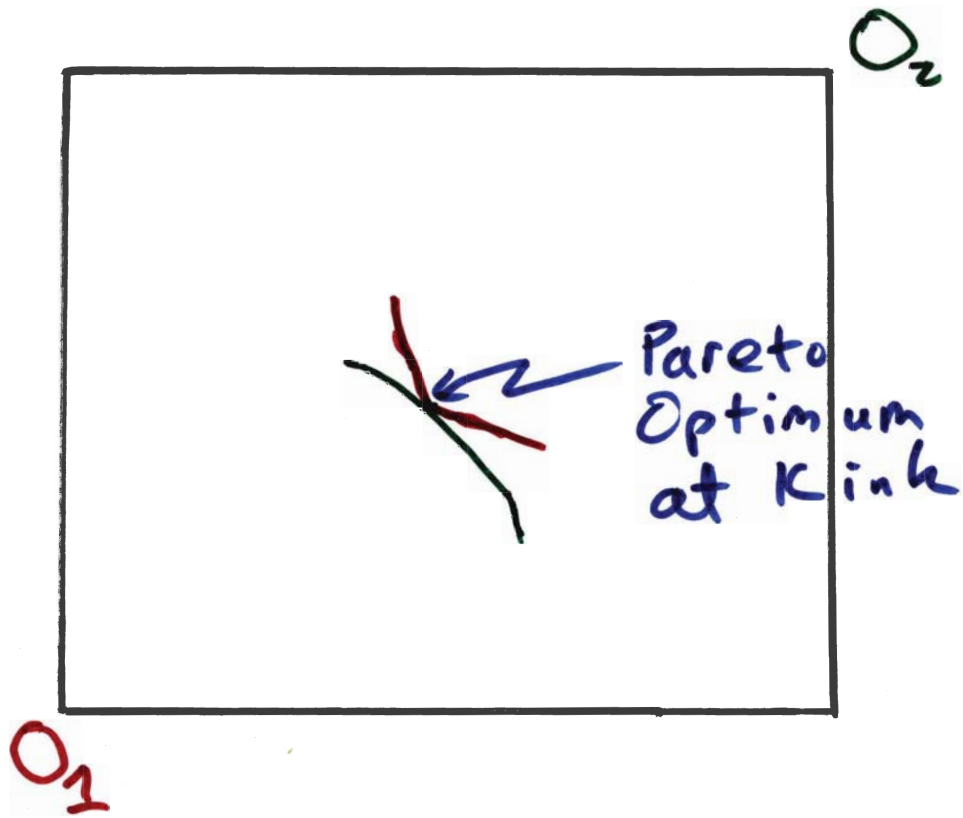


O_2
Corner Pareto Optimum
O_1

  - If preferences are not smooth (for example, they have kinks), then Pareto Optima need not be points of tangency. Indeed, Pareto Optima are more likely to be at the kink points than at points where the preference is smooth.

- *Boundary consumptions do matter.* A typical person consumes **zero** quantity of nearly all goods. So Pareto Optimality will not be characterized by the common tangency equating Marginal Rates of Substitution, unless one focuses on very aggregated goods (food, shelter, energy instead of artichokes, nursing home, premium unleaded)

- *Kinks arise naturally from decision-theory models.* For example, loss aversion is represented by a kink in the utility function around the status quo.



O_2
Pareto
Optimum
at Kink
O_1