Economics 101A
(Lecture 25, Revised)

Stefano DellaVigna

November 26, 2002
Outline

1. Oligopoly: Stackelberg

2. General Equilibrium: Introduction

3. Edgeworth Box: Pure Exchange

4. Barter
1 Oligopoly: Stackelberg

- Setting as in problem set.

- 2 Firms

- Cost: $c(y) = cy$, with $c > 0$

- Demand: $p(Y) = a - bY$, with $a > c > 0$ and $b > 0$

- Difference: Firm 1 makes the quantity decision first
Solution:

Solve first for Firm 2 decision as function of Firm 1 decision:

$$\max_{y_2} (a - by_2 - by_1^*) y_2 - cy_2$$

F.o.c.:

$$a - 2by_2^* - by_1^* - c = 0$$

or

$$y_2^* = \frac{a - c}{2b} - \frac{y_1^*}{2}. \quad p_D^* = a - bY_D^* = a - b \left( 2\frac{a - c}{3b} \right) = \frac{1}{3}a + \frac{2}{3}c.$$
• Firm 1 takes this response into account in the maximization:

\[
\max_{y_1} (a - by_1 - by_2^* (y_1)) y_1 - cy_1
\]

or

\[
\max_{y_1} \left( a - by_1 - b \left( \frac{a - c}{2b} - \frac{y_1}{2} \right) \right) y_1 - cy_1
\]

• F.o.c.:

\[
a - 2by_1 - \frac{(a - c)}{2} + by_1 - c = 0
\]

or

\[
y_1^* = \frac{a - c}{2b}
\]

and

\[
y_2^* = \frac{a - c}{2b} - \frac{y_1^*}{2} = \frac{a - c}{2b} - \frac{a - c}{4b} = \frac{a - c}{4b}.
\]
• Total production:

\[ Y^*_D = y_1^* + y_2^* = 3\frac{a - c}{4b} \]

• Price equals

\[ p^* = a - b \left( \frac{3a - c}{4b} \right) = \frac{1}{4}a + \frac{3}{4}c \]

• Compare to monopoly:

\[ y^*_M = \frac{a - c}{2b} \]

and

\[ p^*_M = \frac{a + c}{2}. \]

• Compare to Cournot:

\[ Y^*_D = y_1^* + y_2^* = 2\frac{a - c}{3b} \]

and

\[ p^*_D = \frac{1}{3}a + \frac{2}{3}c. \]
• Figure

• Compare with Cournot outcome
2 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↑ \(\rightarrow\) wage of experienced workers?

  – minimum wage↑ \(\rightarrow\) effect on higher earners?

  – steel tariff↑ \(\rightarrow\) effect on car price
3 Edgeworth Box: Pure Exchange

- Nicholson, Ch. 16, pp. 422-425

- 2 consumers in economy: \( i = 1, 2 \)

- 2 goods, \( x_1, x_2 \)

- Endowment of consumer \( i \), good \( j \): \( \omega_{ij} \)

- Total endowment: \( (\omega_1, \omega_2) = (\omega_{11} + \omega_{12}, \omega_{21} + \omega_{22}) \)

- Draw Edgeworth box
• Draw preferences of agent 1

• Draw preferences of agent 2
• Consumption of consumer $i$, good $j$: $x^i_j$

• Feasible consumption:
\[ x^1_i + x^2_i \leq \omega_i \text{ for all } i \]

• If preferences monotonic, $x^1_i + x^2_i = \omega_i$ for all $i$

• Can map consumption levels into box
4 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.**
  \[ u_i(x_1^i, x_2^i) \geq u_i(\omega_1, \omega_2) \text{ for all } i \]

- **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 \((\omega_1, \omega_2)\)

• 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?