

## LECTURE 2

### I. INTRODUCTION

- should the government intervene?

### II. COMPETITIVE ECONOMY AND EFFICIENCY

- A. Edgeworth box, definition
  - Example 1
  - why is the “Edgeworth box” a box?
  - terms of trade
- B. The price line, definition
- C. Equilibrium -- when do consumers reach equilibrium?
  - Example 2, edgeworth box
  - Example 3, same as ex. 2, but with new utility function
- D. Some Common Questions

### III. THE FUNDAMENTAL WELFARE THEOREM

- A. Definition
- B. Market Failures
  - \* Failure of Competition
  - \* Public Goods
  - \* Externalities
  - \* Incomplete Markets
  - \* Information failures
- C. Market Failures, examples

### IV. CONSUMER SURPLUS AND DEADWEIGHT LOSS

- A. Consumer Surplus
- B. DWL . . .when **MSB does not equal MSC**
  - Figure 2-2: Find DWL at  $Q^*$  and  $Q^{**}$

Readings: Rosen, chapter 3 including appendix (skip pp. 40-44)

You may want to review the following problems:

Midterms: Winter 1996, Question 1

## I. INTRODUCTION

- A. In United States, private market produces most goods and services.
- B. Generally, economics suggests free market is a good thing, will end up at an "efficient" solution.
- C. Under what circumstances should the government intervene?
- D. Welfare economics provides framework for thinking about the government intervention. Will intervention:
  - 1. Have good distributional consequences; i.e. who wins, who loses
  - 2. Increase efficiency,
  - 3. Be too costly?

## II. COMPETITIVE ECONOMY AND EFFICIENCY

- A. Edgeworth box: exchange of 2 goods between 2 people, graphically. Throughout this discussion, the people will be Jerry and George, and the goods will be food and clothing.

*Why is this a box ?*

- Limited amount of each good. Each point in the box uses all the goods. Each point shows bundles for both consumers.
- Can draw indifference curves in the box.
- The corners of the box -- who has what?

- B. *Are there gains from trade at initial endowment?*

Yes, if MRS of Jerry and George are not equal.

- C. *When will they stop trading?*

- When MRS are equal for Jerry and George. Many bundles satisfy this condition. Some of these bundles are outside of the "lens-shape" area. Since trade has to be voluntary and mutually beneficial, these will not be chosen given the initial endowments even though they are efficient.

- D. *The price line* -- tradeoff between two goods. Can think of as a barter economy where exchange goods. Thus the price of food is how much clothing a person must give up.

E. *Equilibrium*: Even though there are only 2 people, they act as price takers -- e.g, they act as if they can buy or sell as much food or clothing as

they want at given prices. Thus each sets  $MRS = \frac{P_F}{P_C}$ . If, prices are given, the individuals maximize utility and the point is feasible, we have found a competitive equilibrium.

Note: Given the prices, each person individually chooses bundles that maximize utility, and consume all goods in the economy.

### Example 1

Consider Jerry and George, who consume two goods, food and clothing.

$$U_J = \min\left\{F, \frac{C}{2}\right\}$$

$$U_G = 4F + 3C$$

Total amount of food:  $F=100$

Total amount of clothes:  $C=200$

PART I: Draw the edgeworth box and some indifference curves.

Note: What are the special features of the utility functions?

**\*\*\* SEE FIGURE 2-1 \*\*\***

PART II: Jerry's and George's endowments are given below, solve for the competitive equilibrium.

$$F_J=60, C_J=80$$

$$F_G=40, C_G=120$$

\* *What is the equilibrium allocation?*

Simple utility maximization. For Jerry to maximize utility:

$$(1) \quad F^* = \frac{C^*}{2}$$

Any other allocation wastes resources. Food and clothing for Jerry are consumed in fixed proportions. MRS is not well defined for L-shaped indifference curves.

*\* How do we figure out the equilibrium price ratio, since prices are not given?*

$$MRS = \frac{MU_F}{MU_C} = \frac{P_F}{P_C}$$
 In equilibrium, For George's utility function, the MRS is always equal to  $\frac{4}{3}$ . This sets the price ratio. When one of the utility functions is "perfect substitutes," it sets the price ratio.

Now we have the price ratio. Next, assume that Jerry sells his food and clothes, so that he has income. Since only relative prices matter, set  $P_F=4$ ,  $P_C=3$  (the combination of  $P_F=8$ ,  $P_C=6$  would give the same solution). Jerry's income is:

$$(2) \quad I = P_F F + P_C C = 4 * 60 + 3 * 80$$

Thus, Jerry's budget constraint is:

$$(3) \quad I = P_F F^* + P_C C^* = 4F^* + 3C^* = 480$$

If we then substitute equation (1) into (3) we get:

$$(4) \quad 2C^* + 3C^* = 480, \text{ so } C_J^*=96, \text{ and } F_J^*=48.$$

Thus, Jerry gives up some food and gets some clothing.

*\* How do we figure out George' allocation?*

George's whole indifference curve is tangent to the budget set. George is willing to move to any point on this price line.

$$C_G^*=104, F_G^*=52.$$

George has more food and less clothing.

Both have maximized utility, given the prices, and all of the food and clothing is consumed.

## Example 2

Change Jerry's utility to  $U_J = F^{\frac{3}{2}} C^{\frac{3}{2}}$ .

Resolve PART II where  $F_J=40$ ,  $C_J=80$ ,  $F_G=60$ ,  $C_G=120$ .

Jerry's income is  $I_J=400$ , while  $P_F=4$ ,  $P_C=3$ . From Cobb-Douglas utility,

$$F_J^* = \frac{1}{2} \left( \frac{I}{P_F} \right) = \frac{1}{2} \left( \frac{400}{4} \right) = 50 \quad C_J^* = \frac{1}{2} \left( \frac{I}{P_C} \right) = \frac{1}{2} \left( \frac{400}{3} \right) = \frac{200}{3} .$$

George gets the remainder:  $F_G^* = 50$ ,  $C_G^* = \frac{400}{3}$ . George' utility is unchanged: 600 before, 600 after.

E. Define Pareto efficiency

- An allocation is pareto efficient if the only way to make one person better off is to make another person worse off.
- Pareto efficiency does not equal "fair" to everyone But efficiency will be the benchmark for "good economic outcome."

### Common questions on Edgeworth boxes:

1) *Must prices be given?*

- \* With perfect substitutes, no. The MRS is constant, which determines the price ratio.
- \* With most utility functions, yes. As an exercise, draw a picture which shows that with "standard" indifference curves, two different price lines could lead to two different equilibria, even with the same initial endowments.

2) *What information do you need to solve the competitive equilibrium?*

- \* Usually prices, endowments, and preferences.

3) *After we find the price ratio (from the perfect substitutes utility function), why do we first solve for the other utility function?*

$$MRS = \frac{P_F}{P_C}$$

- \* Since the  $\frac{P_F}{P_C}$  is constant for George, any bundle on the budget constraint gives him the same utility. The bundle is not

unique.

4) *Why is it different for Jerry, who had a perfect complements utility function?*

\* With the price ratio fixed, Jerry has one utility maximizing bundle.

5) *If George's utility is exactly the same before and after the trade, why does he trade?*

\* You can imagine that Jerry offers a bundle that is very close to the utility maximizing bundle, except that it gives George slightly higher utility. In that case, George would definitely trade.

6) *What steps are needed to solve the competitive equilibrium?*

\* If prices are not given, see if one of the utility functions is perfect substitutes.

\* Assuming that one of the utility functions is perfect substitutes, find the market prices from the constant MRS.

\* Compute the income for the other person, by hypothetically selling their endowment at market prices.

\* From prices, income, and preferences, solve for the person's utility maximizing bundle.

\* Then the person with perfect substitutes utility gets the rest of the goods.

7) *How do we find demand curves from Cobb Douglas utility?*

\* See Lecture 1 for a derivation. You should be write down the demand curves without "reinventing the wheel."

### III. THE FUNDAMENTAL WELFARE THEOREM

\* *When do competitive markets lead to economic efficiency?*

#### A. The Fundamental Welfare Theorem:

Under certain assumptions, competitive markets lead to a pareto efficient allocation

- Edgeworth box illustrates set of pareto efficient points
- Implies that free markets are amazingly productive!

B. *What are the assumptions that violate the theorem?*

- \* **Failure of competition:** monopoly and oligopoly
  - Can occur with increasing returns to scale/fixed costs.
  - Or artificial barriers to entry.
- \* **Public goods:** national defense, renting a video movie a dorm lobby.
  - No additional cost for another individual to enjoy benefits of the good.
  - Hard to exclude individuals.
  - Incentive to hide valuations.
- \* **Externalities:** actions that impose cost (or benefit) on others without appropriate compensation.
  - Negative externalities: Examples of negative externalities are smoking cigarettes and "The Club" antitheft device.
  - Positive externalities: include students who ask questions in class and the "LoJack" antitheft device.

Note: Essential problem is that the price system fails to provide the correct signals about the cost of a commodity.
- \* **Incomplete markets:** whenever private markets fails to provide a good or service, even though the cost of providing the good is less than what individuals are willing to pay.
  - Example: Until 1965, very difficult for students to get loans to finance their college education. Then government passed legislation providing government guarantees on student loans. Hard to borrow against "future income."
- \* **Information failures:** firms might lie about their product. Regulation, however, might be unnecessary, irrelevant and costly. Information provision is a public good, so private market will under supply info.

C. Market Failures: Yes or no? Is government intervention required?

- Mandatory seat belt laws

- Auto pollution: negative externality.
- Police protection: public good.
- Unemployment insurance: incomplete markets. An insurance firm on its own would be reluctant to provide unemployment insurance because of adverse selection. Who would be the most likely to take up the coverage?
- Health insurance for the elderly: again, adverse selection and incomplete markets.

#### IV. CONSUMER SURPLUS AND DEADWEIGHT LOSS

- A. Pareto efficiency tells whether consumers better off, but not by *HOW MUCH*?
- B. Consumer surplus puts a dollar figure on the improvement in a consumer's welfare.
- C. Demand curve represents consumer's marginal willingness-to-pay. But consumer only pays market price. Consumer Surplus is the sum that individuals would have been willing to pay minus the sum that they actually pay.
- D. If MSB does not equal MSC, then there is deadweight loss.  
 MSB= Marginal Social Benefit  
 MSC= Marginal Social Cost

**\*\*\* SEE FIGURE 2-2 \*\*\***

Where is DWL at  $Q^*$ ? Where is DWL at  $Q^{**}$ ?

# Lecture 2, Figure 1

Origin for  
George

280  
units

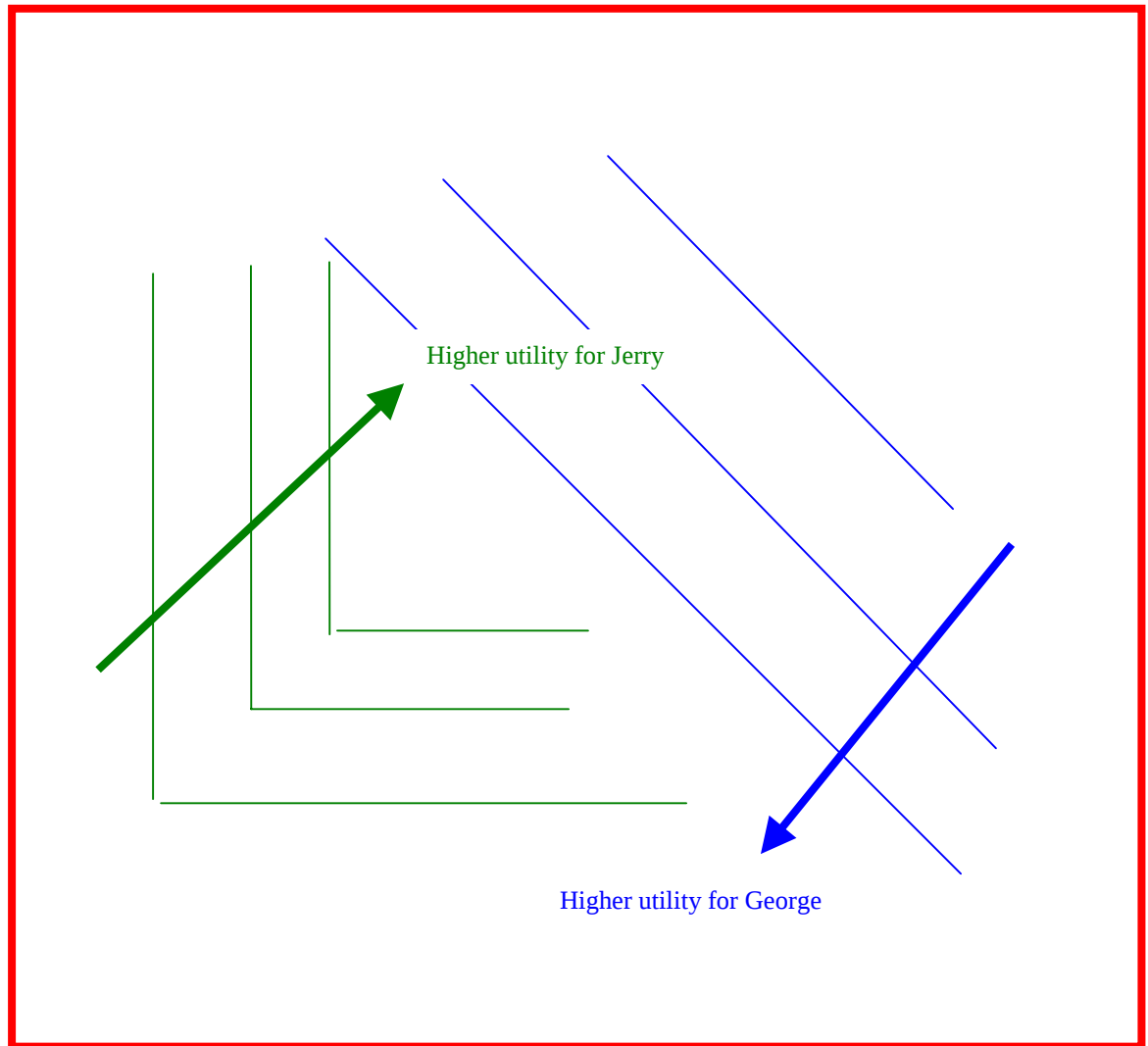
Jerry's  
Clothes

Origin for Jerry

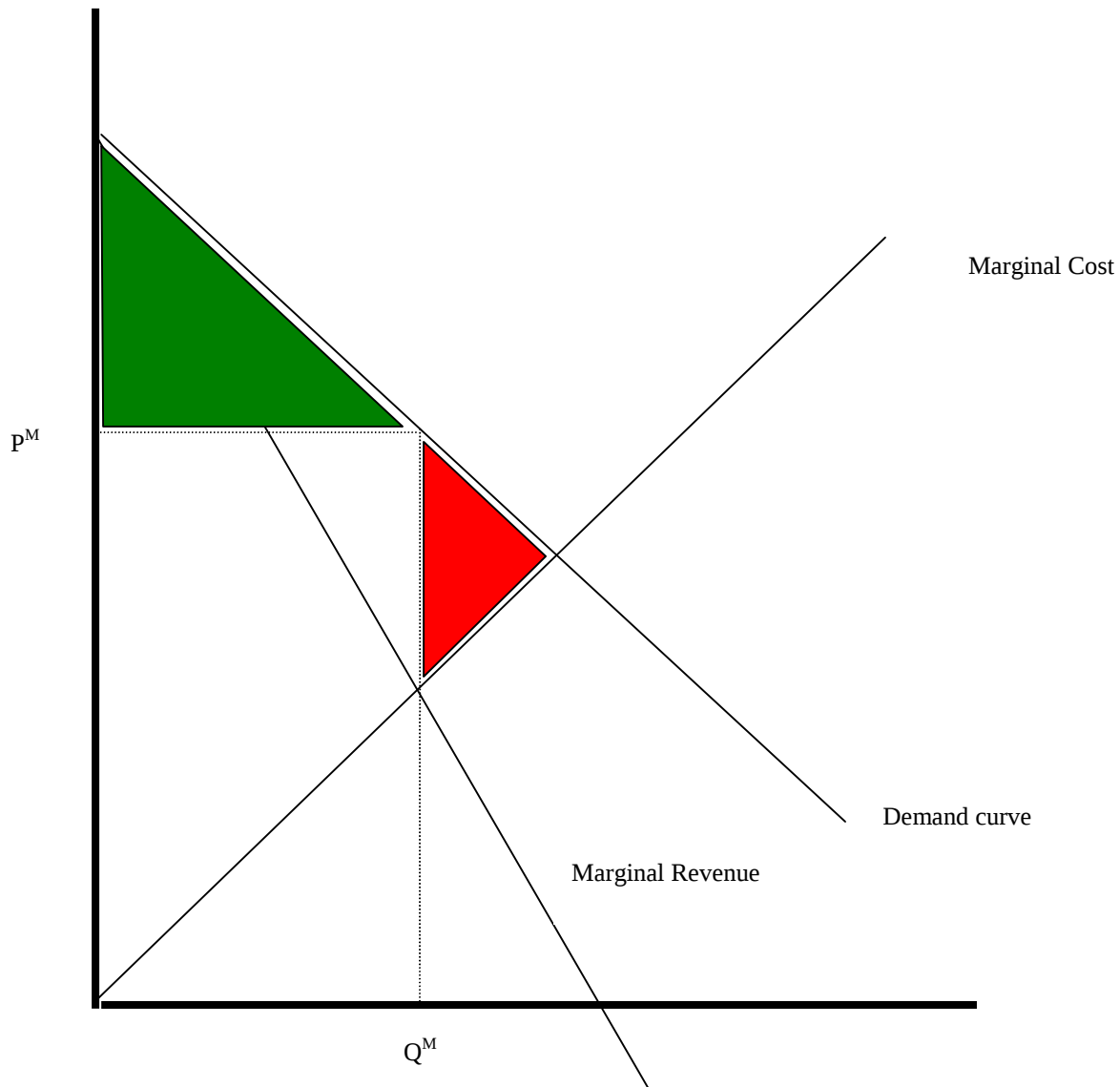
Jerry's Food

100  
units

Jerry's indifference curves in GREEN  
George's indifference curves in BLUE



## Lecture 2, Figure 2 – Deadweight loss from a monopolist



Red triangle indicates deadweight loss (DWL)

Green triangle indicates consumer surplus