LECTURE 9
WELFARE ANALYSIS
February 16, 2016

I. OVERVIEW

II. CONCEPT OF ECONOMIC SURPLUS
   A. Consumer Surplus
   B. Producer Surplus

III. ALLOCATIVE EFFICIENCY
   A. Definition
   B. Conditions for allocative efficiency
   C. Are competitive market outcomes efficient?

IV. EQUITY AND EFFICIENCY
   A. Equity concerns
   B. Can we have both efficiency and equity?

V. WELFARE ANALYSIS OF A PRICE CEILING
   A. Example: Rent control
   B. Deadweight loss related to the reduced quantity bought and sold
   C. Misallocation among consumers
   D. Empirical evidence on misallocation (Glaeser and Luttmer)
   E. Equity Effects

VI. WELFARE ANALYSIS OF A TAX
   A. Example: Gas tax
   B. Deadweight loss and its determinants
   C. No misallocation among consumers
Announcements

- **Midterm 1 Logistics:**
  - Tuesday, February 23rd, 3:30–5:00
  - Sections 102, 104, 107, 108 (GSIs Pablo Muñoz and David Green) go to 245 Li Ka Shing Center (corner of Oxford and Berkeley Way).
  - Everyone else come to usual room (2050 VLSB).
  - You do **not** need a blue book; just a pen.
Announcements (continued)

• Midterm 1 Format:
  • Sample midterm.
  • Problems; true/false/uncertain questions; multiple choice.

• Midterm Coverage:
  • Everything up through lecture on Thursday, February 18.
  • Lecture, section, textbook, and additional readings.
Announcements (continued)

• Hints for Studying:
  • Start now!
  • Review lecture notes and slides; study problem set suggested answers.
  • Pose yourself problems.

• Places to Get Help:
  • Professor and GSI office hours.
  • Review session on Friday, February 19, 4:30–6:00 p.m. in 155 Dwinelle.
I. Overview
II. CONCEPT OF ECONOMIC SURPLUS
Economic Surplus

• A measure of the amount by which buyers and sellers benefit from participating in the market.

• The total economic surplus is the sum of:
  • Consumer surplus
  • Producer surplus
  • Government revenue (if relevant)
Demand

Individual Consumer

Market

Utility Maximization: \( \frac{MU_x}{P_x} = \frac{MU_y}{P_y} \)
Marginal Benefit (or Reservation Price)

- The dollar value to consumers of another unit of a good.
- What they would be willing to pay for one more unit.
Consumer Surplus

The diagram illustrates the concept of consumer surplus. The area highlighted with red lines represents the consumer surplus. It is the difference between the maximum price consumers are willing to pay and the actual market price. In this case, the price is $P_1$ and the quantity is $Q_1$. The consumer surplus is the shaded region above the demand curve and below the price line at $P_1$. The demand curve is labeled $D_{1,MB}$ and the supply curve is labeled $S_1$. The point of intersection is at $Q_1$. The diagram visually explains how consumer surplus is calculated in a market.
Profit Maximization: \( MR = MC = P \)
Producer Surplus

Producer Surplus = Total Revenue − Variable Cost
III. ALLOCATIVE EFFICIENCY
Total Surplus = Consumer Surplus + Producer Surplus

Area between the MB and MC curves up to the level bought and sold.
Allocative Efficiency
(Also Called Pareto Efficiency)

• The total surplus is as large as possible.
Conditions for Allocative Efficiency

• The good is produced up to the point where $MB = MC$.

• The good is allocated to the consumers with the highest $MB$.

• The good is produced by the producers with the lowest $MC$. 
At $Q_1$, $MB = MC$. 

Producer Surplus

Consumer Surplus
IV. EQUITY AND EFFICIENCY
Equity Issues

• Willingness to pay (which underlies consumer surplus) depends in part on income.

• Economists’ measure of welfare doesn’t take into account that consumers may enter the market with vastly different incomes.
Equity and Efficiency

• Allocative efficiency is still a worthy goal.

• Interfering with the price system to improve equity may be costly. (And may not improve equity much.)

• There are ways to improve equity without sacrificing what is good about the price system.
V. WELFARE ANALYSIS OF A PRICE CEILING
Effects of a Price Ceiling

![Diagram showing supply and demand curves with a price ceiling.](attachment:image.png)

- **S\(_1\)**: Supply curve
- **D\(_1\)**: Demand curve
- **P\(_C\)**: Price ceiling
- **P\(_1\)**: Price at equilibrium
- **Q\(_S\)**, **Q\(_1\)**, **Q\(_D\)**: Quantities supplied, demanded, and the shortage at price ceiling

**Shortage**
Welfare Analysis of a Price Ceiling

Free Market ($Q_1$) | Price Ceiling ($Q_S$)
--- | ---
Consumer Surplus | $a+b$ | (less than) $a+c$
Producer Surplus | $c+d+e$ | $e$
Total Surplus | $a+b+c+d+e$ | $a+c+e$
Deadweight Loss | $b+d$ (+ misallocation)
Deadweight Loss

• Any shortfall in total surplus from its maximum level.

• The deadweight loss of a price ceiling is surely larger than b+d because there is misallocation among consumers.

  • Consumer surplus is, in fact, less than a+c because the good is allocated in some way other than by price.
Glaeser and Luttmer
“The Misallocation of Housing under Rent Control”

• **Look at the overlap percentage:** The fraction of time a member of the group we expect to consume fewer rooms actually consumes more than a member of the group we expect to consume more.

• **Empirical strategy:** Look at the *difference* in the overlap percentage between a city with rent control (NYC) and a number of cities without rent control.
### Table 2—Average Overlap in Housing Consumption Between Population Groups

<table>
<thead>
<tr>
<th></th>
<th>New York City renters</th>
<th>U.S. free-market renters</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Observations</td>
<td>Overlap</td>
</tr>
<tr>
<td>Group A: High school dropout$^b$</td>
<td>3,174</td>
<td>0.470</td>
</tr>
<tr>
<td>Group B: College or more</td>
<td>2,450</td>
<td>(0.008)</td>
</tr>
<tr>
<td>Group A: Households without children</td>
<td>6,794</td>
<td>0.229</td>
</tr>
<tr>
<td>Group B: Households with children</td>
<td>3,206</td>
<td>(0.005)</td>
</tr>
<tr>
<td>Group A: Age ≤ 35$^a$</td>
<td>2,859</td>
<td>0.279</td>
</tr>
<tr>
<td>Group B: Age &gt; 35 and ≤ 60</td>
<td>4,280</td>
<td>(0.006)</td>
</tr>
<tr>
<td>Group A: 1 person households</td>
<td>3,758</td>
<td>0.150</td>
</tr>
<tr>
<td>Group B: 3+ person households</td>
<td>3,621</td>
<td>(0.005)</td>
</tr>
<tr>
<td>Group A: Per capita income in bottom $\frac{1}{3}$</td>
<td>3,338</td>
<td>0.457</td>
</tr>
<tr>
<td>Group B: Per capita income in top $\frac{1}{3}$</td>
<td>3,300</td>
<td>(0.007)</td>
</tr>
</tbody>
</table>

Source: Glaeser and Luttmer, “The Misallocation of Housing under Rent Control.”
Effect of a Tax

The diagram illustrates the effect of a tax on the market. The supply curve shifts from $S_1$ to $S_2$, causing the price to rise from $P_1$ to $P_2$ and the quantity demanded to decrease from $Q_1$ to $Q_2$. The tax is indicated by the vertical line from the point of intersection of $S_2$ and $D_1$ to the price axis.
Welfare Analysis of a Tax (Version 1)

<table>
<thead>
<tr>
<th>Consumer Surplus</th>
<th>Free Market (Q_1)</th>
<th>a+b+c+d</th>
</tr>
</thead>
<tbody>
<tr>
<td>Producer Surplus</td>
<td></td>
<td>e+f+g+h+i</td>
</tr>
<tr>
<td>Government Revenue</td>
<td></td>
<td>e+f+g+h+i</td>
</tr>
<tr>
<td>Total Surplus</td>
<td></td>
<td>a+b+c+d+e+f+g+h+i</td>
</tr>
<tr>
<td>Deadweight Loss</td>
<td></td>
<td>d+g</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Tax (Q_2)</th>
<th></th>
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<tbody>
<tr>
<td>a</td>
<td></td>
</tr>
<tr>
<td>h+i</td>
<td></td>
</tr>
<tr>
<td>b+c+e+f</td>
<td></td>
</tr>
<tr>
<td>a+b+c+e+f+h+i</td>
<td></td>
</tr>
<tr>
<td>d+g</td>
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Welfare Analysis of a Tax (Version 2)

<table>
<thead>
<tr>
<th></th>
<th>Free Market (Q₁)</th>
<th>Tax (Q₂)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consumer Surplus</td>
<td>a+b+c+d</td>
<td>a</td>
</tr>
<tr>
<td>Producer Surplus</td>
<td>e+f+g</td>
<td>b+e</td>
</tr>
<tr>
<td>Government Revenue</td>
<td></td>
<td>c+f</td>
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