Measuring Welfare with Consumer Surplus (Chapter 14)
Announcements

1. Clicker frequency needs to be reset every time you turn it on.
   - Hold down on-off until blue LED flashes.
   - Press A
   - Press B
   - Green means success, red means try again

2. Make sure your clicker is registered. (Go to iClicker.com). If you can’t read the ID tag, go to the Learning Lab on the 2nd floor of Kerr.
Measuring Welfare

Q: How do we evaluate the performance of our institutions (e.g. markets)?

A: We need some social-welfare criterion.

Q: How can we...

- Find a monetary measure of a consumer’s utility/happiness?
- Evaluate a consumer’s willingness to pay for a unit of a good?
- Evaluate whether or not a market maximizes welfare without government intervention?
- Quantify the effect of economic policy on consumers?

A: Use the concept of gains-from-trade
Example:

- Your friend took Econ 100B last spring and no longer need the text book. Values it at $10.
- You need one before you take Econ 100A. You value it at $160.
- It’s current allocation, with your friend, is inefficient.
- If you trade, there is a social gain of $160 - $10 = $150
- Who benefits from this gain? How is this $150 distributed?
- That depends upon the terms of the trade.
- Institutions are rules/regimes we have for determining how goods are allocated.
- Markets are particular kinds of institutions, in which buyers and sellers meet and agree on terms the terms of trade.
- What the terms will be, what the outcome will be, depends upon the features of the market.
Examples:

- Suppose you had to pay to download iTunes, but once you did, you could buy as many songs as you like for $1.
- You have to pay a cover charge to get into a bar. Once you’re in, beers are $3.50 a pint.
- Costco sells cheap goods in bulk, but you have to pay a membership fee.

What is the most you would pay to enter these markets?

You would pay up to the dollar value of the gains-to-trade you would enjoy once in the market.
Measuring Gains From Trade

Q: How can we put a dollar value on

a) the welfare gains resulting from a trade, or

b) the change in consumer welfare resulting from a price/policy change?

A:

a) *Consumer* and *Producer Surplus* are monetary approximations of gains from trade for consumers & producers, respectively. (Benefits - Costs)

b) Our measure: welfare effect of change is change in consumer, producer surplus

c) Other ways to measure (e.g. compensating, equivalent variation in book)
Willingness to Pay for 1 Unit

Q: How much would a consumer pay for a unit of a good?
A: **Reservation Price** = the *maximum* price that the consumer is willing to pay for a unit.

Example: suppose utility is *quasilinear*, i.e.

\[ U(b, d) = v(b) + d, \]

where \( b \) is the number of beers consumed and \( d \) is the amount of money (dollars) spend on other goods.

Successive reservation prices:

\[ r_1 = v(1) - v(0) \]
\[ r_2 = v(2) - v(1) \]
\[ \vdots \]
Reservation Prices & Demand

Example: if $r_4 \leq p \leq r_3$, the consumer will demand 3 beers.

Assumption: the more you have already consumed, the lower the reservation price for the next good. (Downsloping demand)
Willingness to Pay for $n$ Units

- Q: How much is the consumer willing to pay for $n$ beers?
- A: $v(n)$. Why? Use reservation prices to show:

$$r_1 + r_2 + r_3 = v(1) - v(0) + v(2) - v(1) + v(3) - v(2)$$

$$= v(3) - v(0) \text{ (assume } v(0) = 0)$$

This is called *gross benefit* or *gross gains from trade*.
Q: How much does the consumer spend for $n$ beers? 
A: Expenditure = $pn$
(Net) Gains from Trade = gross benefit − expenditures
in other words, net gain is $v(n) − pn$.

This is the minimum amount of money the consumer would need

to be paid to give up $n$ units of the good.
Gains From Trade

With continuous units (if you can drink beer straight from the tap):

![Reservation-price curve](image.png)
Consumer Surplus

- Estimating the reservation-price curve is difficult.
- As an approximation, we replace the reservation-price curve with the consumer’s ordinary demand curve.
Consumer Surplus

- Say what? Reservation-price curve ≠ demand curve? Why not?
- Reservation-price curve describes sequential purchases of single units
- Demand curve describes willingness-to-pay for \( q \) units purchased simultaneously?
- *But*... in our example, utility is quasilinear in income, so there are no income effects & CS is an exact measure of gains from trade.
How do we know that there are no income effects with quasilinear utility... 

\[ U(c, m) = v(c) + m \]

**Clicker Vote:** Which term shows us that there are no income effects?

A) \( U(c, m) \)
B) \( v(c) \)
C) \( m \) linear, no DMU(\( m \))

...and why does that matter?

Decision to buy \( n \)th unit is the same regardless of whether you’ve already spent money on 0 or \( n-1 \) units.
Consumer Surplus: Example

Suppose that the price of a beer is $4.25.

- Q: How many beers will the consumer buy?
  - A: 3
- Q: What is the consumer surplus?
  - A: $(10 + 8 + 6) - (3 \times 4.25) = $11.25$
Consumer Surplus: Example

What if the price increases to $5.50?

- Q: How many beers will the consumer buy?
  - A: 3
- Q: What is the consumer surplus?
  - A: $(10 + 8 + 6) - (3 \times 5.50) = $7.50

Higher price means lower consumer surplus even though quantity demanded may not change.
Change in Consumer Surplus

CS when price is $p$: 

- **Price**
- **Demand curve**
- **Consumer surplus**

Diagram showing the change in consumer surplus as the price changes from $p$ to $p'$. The shaded area represents the consumer surplus under the new price $p'$. The diagram also includes a demand curve for snuggly blankets.
Change in Consumer Surplus

CS when price is $p'$:

![Diagram showing change in consumer surplus with price $p'$ and demand curve.]
Region A = change in CS due to higher price for all units consumed
Region B = change in CS due to reduction in consumption
Q: What about gains from trade for the producer?
A: Changes in a firm’s welfare be measured in dollars as much as for the consumer

**Producer Surplus** = the area above the supply curve and under the price line.
Q: How can we measure the gain or loss caused by market intervention/regulation?

A: Use consumer and producer surplus: total surplus = \( CS + PS \).

Our benchmark will be competitive, free-market equilibrium.
Welfare in Competitive Markets

Any regulation that causes the units from $q_1$ to $q_0$ to be not traded destroys some of the gains from trade.

This loss is the net cost of regulation.
Welfare in Competitive Markets

Example: per unit tax of $t$

![Graph showing consumer surplus (CS), producer surplus (PS), and tax revenue. The graph includes price and quantity axes, with price $p_b$ and $p_s$, quantity $q_1$ and $q_0$, and the tax $t$. The graph also highlights the loss due to the tax.]
Welfare in Competitive Markets

Example: price floor \( p_f \)
Example: price ceiling $p_c$
Example: rationing (only $q_1$ units allowed to be traded)
From Individual Demands to Market Demand

Let $D_i(p)$ be the demand function of person $i$ and suppose that

$$D_1(p) = \max\{20 - p, 0\}$$
$$D_2(p) = \max\{10 - 2p, 0\}$$
The market demand is the horizontal sum (for a given $p$) of all individual demand:

$$D(p) = \sum_i D_i(p) = D_1(p) + D_2(p)$$