Uncertainty (continued) and Measuring Welfare with Consumer Surplus (Chapter 14)

January 11, 2011
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.
Outline

Diversification & Risk Sharing

Gains From Trade

Consumer Surplus

Quantifying Welfare Effects

Welfare in Competitive Equilibrium
I flip a fair coin. Heads: I pay you $120; tails: you pay me $100. Any takers?

CLICKER VOTE:

A  Accept
B  No thank you!
Proposed Gamble: II

What if I offered this same gamble at the beginning of every lecture (and you had to tell me today what you would choose each time)?

CLICKER VOTE:

A  Accept every time
B  Reject every time
C  Some combination
Analysis

Why is the same gamble more attractive when it is repeated?

• Each gamble has positive expected value
• Each coin toss is independent
• Law of Large Numbers: expected money from compound gamble = $N \times \text{EM} = \text{a big positive number}$
• Portfolio of gambles is diverse, so very little chance of net loss
Example:

- Two firms, A and B. Shares cost $10
- With prob = .5, $\Pi_A = 100$ and $\Pi_B = 20$
- With prob = .5, $\Pi_A = 20$ and $\Pi_B = 100$
- You have $100 to invest. How?
Example:

- Buy only firm A’s stock?
- $100/10 = 10$ shares
- Earn $1000 \text{ w/ prob .5 and } $200 \text{ w/ prob .5}
- Expected earning: $500 + $100 = $600
- Same for buying only B
Diversification

Example:

- Buy 5 shares of each firm?
- Earn $600 for sure
- Diversification has maintained expected earnings while lowering risk
- Typically there’s a tradeoff between earnings and risk
Recap

What are rational responses to risk?

- Buying insurance

- A diverse portfolio of contingent consumption goods (assets)
How do insurance companies operate?

- You buy insurance in response to risk
- Insurance company gets your premium, but now faces risk of having to pay claim
- To the extent that claims are independent, this is ok for them because they have a diverse portfolio of risks
- Same w/ home lenders: they get your mortgage payments, but lose if you default
- To diversify risk, lenders wad contracts/mortgages together into bundles, then sell them (in pieces) as relatively safe (diversified) securities
- Thus, our risk and insurance courses through the veins of the financial system
How do insurance companies operate?

So what can and does go wrong?

- Diversification works if risks are independent, but not if correlated.
- My proposed gamble: imagine if I decided outcome w/ one coin-toss at the end of the quarter. Takers?
- Risk of house burning down: Seattle vs. SoCal.
- Insurance companies are exposed to systemic risks.
- Wildfires, earthquakes, hurricanes can wipe out entire cities/regions at once.
- Natural disasters are disasters for insurers.
- Insurers know this: there is an enormous re-insurance industry.
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Measuring Welfare

Q: How do we evaluate the performance of our institutions (e.g. markets)?
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A: We need some social-welfare criterion.
Measuring Welfare

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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?
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A: Use the concept of gains-from-trade
Gains From Trade

Example:

- Your friend took Econ 100B last spring and no longer needs 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*.

[Reservation price diagram]
Expenditures

Q: How much does the consumer spend for $n$ beers?
A: Expenditure $= pn$
Gains From Trade

\((Net) \textit{Gains from Trade} = \text{gross benefit} - \text{expenditures}\)

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):
Outline

Diversification & Risk Sharing

Gains From Trade

Consumer Surplus

Quantifying Welfare Effects

Welfare in Competitive Equilibrium
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 \(\neq\) demand curve? Why not?
Consumer Surplus

- Say what? Reservation-price curve $\neq$ demand curve? Why not?
- Reservation-price curve describes sequential purchases of single units
- Demand curve describes willingness-to-pay for $q$ units purchased simultaneously?
**Consumer Surplus**

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- Demand curve describes willingness-to-pay for $q$ units purchased simultaneously?
- Q: What difference does it make?
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?
Consumer Surplus

• Say what? Reservation-price curve $\neq$ demand curve? Why not?
• Reservation-price curve describes sequential purchases of single units
• Demand curve describes willingness-to-pay for $q$ units purchased simultaneously?
• Q: What difference does it make? A: Income effects.
• But... in our example, utility is quasilinear in income, so there are no income effects & CS is an exact measure of gains from trade.
Quasilinear Utility & Income Effects: Huh?

- How do we know that there are no income effects with quasilinear utility...

\[ U(c, m) = v(c) + m \]
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- ...and why does that matter?
Quasilinear Utility & Income Effects: Huh?

• 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) \( m \)

• ...and why does that matter?
Quasilinear Utility & Income Effects: Huh?

• 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?
Quasilinear Utility & Income Effects: Huh?

• 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?

• Q: What is the consumer surplus?

[Graph showing the reservation price curve with a price of $4.25 and bars for beers demanded ranging from 1 to 6]
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?

\[
\text{Consumer Surplus} = (10 + 8 + 6) - (3 \times 4.25) = 11.25
\]
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?
- Q: What is the consumer surplus?

Higher price means lower consumer surplus, even though quantity demanded may not change.
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?

\[ \text{Consumer Surplus} = (10 + 8 + 6) - (3 \times 5.50) = 7.50 \]

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

CS when price is $p$:

![Graph showing consumer surplus](image)
Change in Consumer Surplus

CS when price is $p'$:
Change in Consumer Surplus

Region A = change in CS due to higher price for all units consumed
Region B = change in CS due to reduction in consumption
Suppose the inverse demand for cheese is given by \( P = 10 - Q \). If the price increases from $6 to $8, by how much does consumer surplus drop?

**Clicker Vote**

- A) 12
- B) 10
- C) 8
- D) 6
Change in Consumer Surplus: Now you try it!

Suppose the inverse demand for cheese is given by $P = 10 - Q$. If the price increases from $6 to $8, by how much does consumer surplus drop?

**Clicker Vote**

- A) 12
- B) 10
- C) 8
- D) 6
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.
Outline

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Welfare in Competitive Equilibrium
Welfare in Equilibrium

- 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.

The competitive, free-market equilibrium and the gains from trade generated by it.
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 $t$
Welfare in Competitive Markets

Example: price floor $p_f$
Welfare in Competitive Markets

Example: price ceiling $p_c$
Welfare in Competitive Markets

Example: rationing (only $q_1$ units allowed to be traded)