

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*

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.

Gains From Trade

- 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:

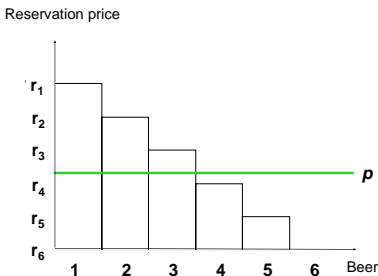
$$r_1 = v(1) - v(0)$$

$$r_2 = v(2) - v(1)$$

$$\vdots$$

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*)

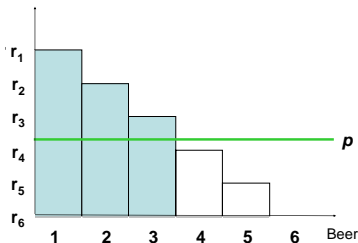
Willingness to Pay for n Units

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

$$\begin{aligned}r_1 + r_2 + r_3 &= v(1) - v(0) + v(2) - v(1) + v(3) - v(2) \\ &= v(3) - v(0) \text{ (assume } v(0) = 0\text{)}\end{aligned}$$

This is called *gross benefit* or *gross gains from trade*

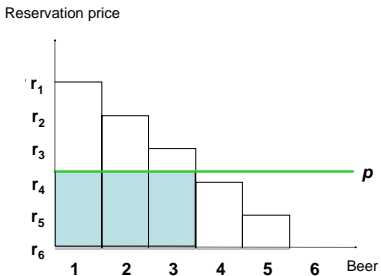
Reservation price



Expenditures

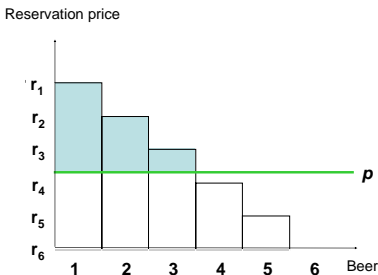
Q: How much does the consumer spend for n beers?

A: Expenditure = pn



Gains From Trade

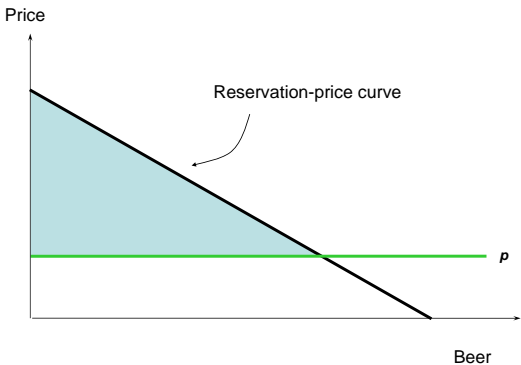
(Net) Gains from Trade = gross benefit – expenditures
 in other words, net gain is $v(n) - pn$.



This is the minimum amount of money the consumer would need to be paid to give up n units of the good.

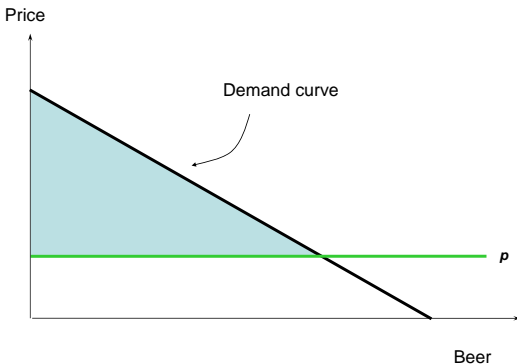
Gains From Trade

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



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?
- 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. . .

$$U(c, m) = v(c) + m$$

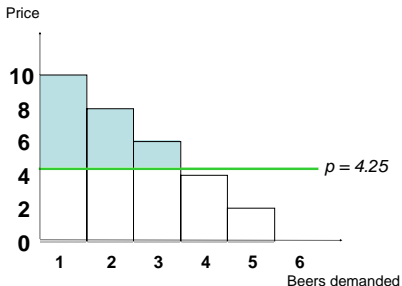
Clicker Vote: Which term shows us that there are no income effects?

- 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.

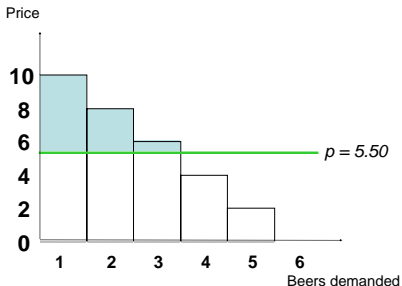
- Q: How many beers will the consumer buy?
- A: 3
- Q: What is the consumer surplus?
- A: $(10 + 8 + 6) - (3 \times 4.25) = \11.25



Consumer Surplus: Example

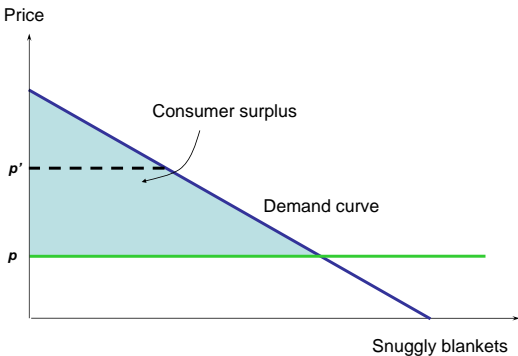
What if the price increases to \$5.50?

- 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



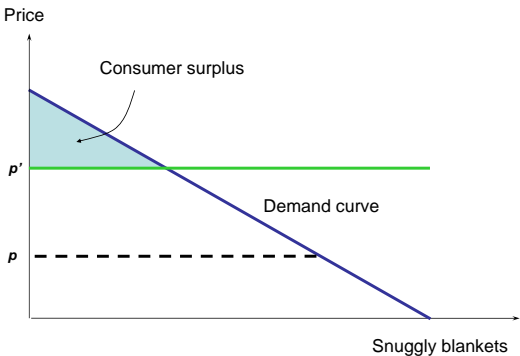
Change in Consumer Surplus

CS when price is p :



Change in Consumer Surplus

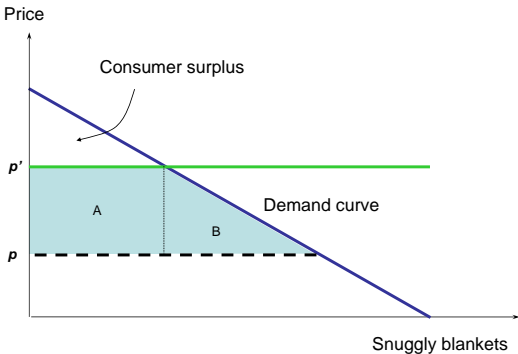
CS when price is p' :



Change in Consumer Surplus

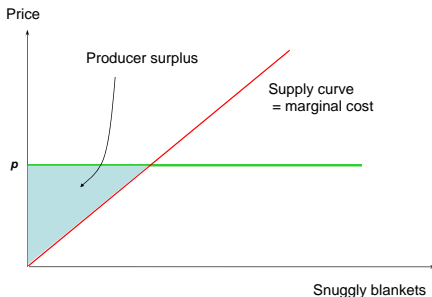
Region A = change in CS due to higher price for all units consumed

Region B = change in CS due to reduction in consumption



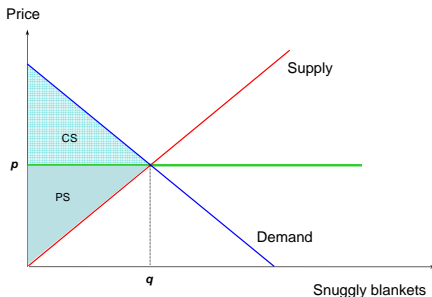
Producer Surplus

- 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.



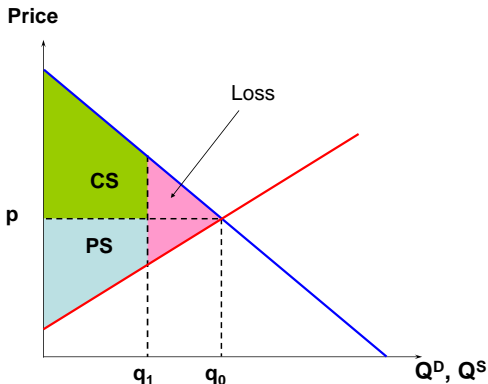
Welfare in Equilibrium

- 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



Welfare in Competitive Markets

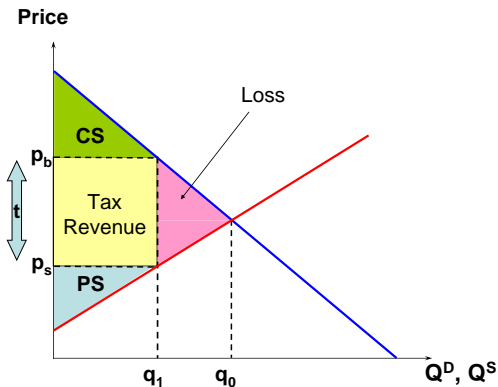
Any regulation that causes the units from q_1 to q_0 to be not traded destroys some of the gains from trade.



This loss is the net cost of regulation.

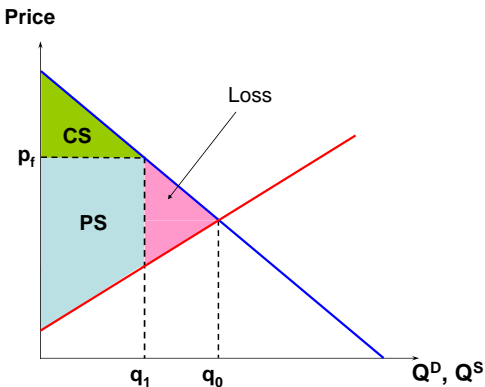
Welfare in Competitive Markets

Example: per unit tax of \$ t



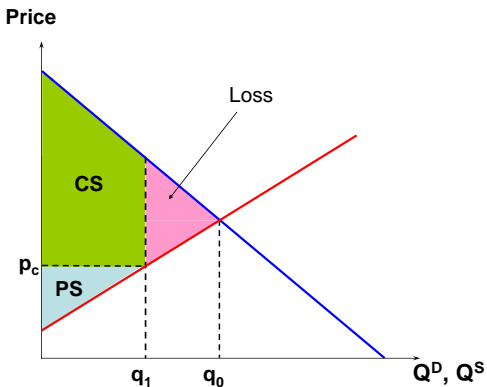
Welfare in Competitive Markets

Example: price floor p_f



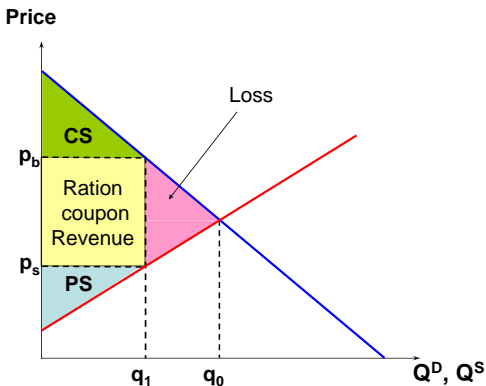
Welfare in Competitive Markets

Example: price ceiling p_c



Welfare in Competitive Markets

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

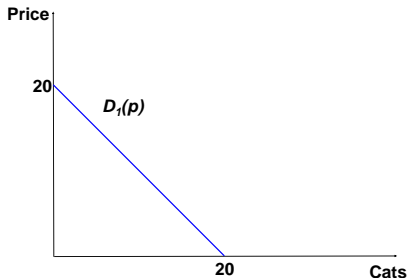


From Individual Demands to Market Demand

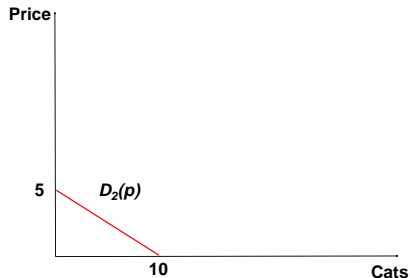
Let $D_i(p)$ be the demand function of person i and suppose that

$$D_1(p) = \max\{20 - p, 0\}$$

$$D_2(p) = \max\{10 - 2p, 0\}$$



Demand of Agent 1



Demand of Agent 2

From Individual Demands to Market Demand

The market demand is the horizontal sum (for a given p) of all individual demand:

$$\begin{aligned} D(p) &= \sum_i D_i(p) \\ &= D_1(p) + D_2(p) \end{aligned}$$

