Consumer and producer surplus are the main measures of the net welfare changes a policy generates.

Most government action generally won't prevent markets from forming or destroy markets, but will change the size of the surpluses and behavior in the market.

<u>Simple example involving only consumer surplus changes</u>

Q: Should Ann Arbor levy a $2.00 tax on pizza and give the proceeds to SPP? (Note that we know almost to a certainty that SPP wins, but that's not the interesting question—this may be a loser from society's perspective. PERSPECTIVE IS EVERYTHING.)

Benefit: amount of revenue that SPP receives.
Consumption: 1000 pizzas consumed/day
Price: $10/day
Tax: $2/pizza

Cost to consumers? Some will say $2*1000 = $2000, but that's not right for a couple of reasons:

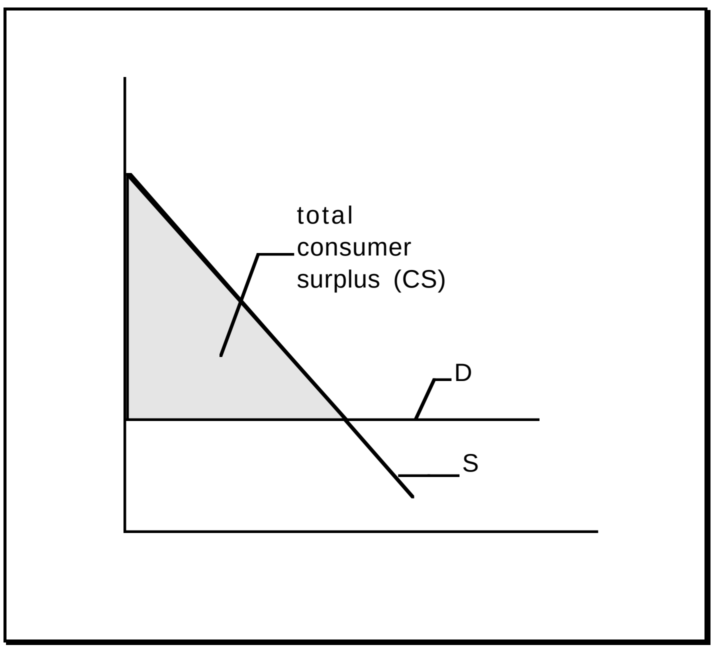
1. If producers bear a portion of the tax, the per-pizza price will rise by less than the tax. For this purpose, let's assume this away. To do that, the supply curve must be horizontal (the price that producers receive is fixed).
2. For consumers to bear the full $2000 load, their post-tax consumption must not differ from their pre-tax consumption. This is unrealistic: demand is likely to fall as the price rises.
    - There is some additional cost to us represented by the loss in utility of those pizzas, but that's incorporated in the demand curve.

We can say that the $2000 is an upper bound: If we tax pizzas as described and give consumers a lump-sum subsidy of $2000, they would be exactly where they were before and presumably consumption wouldn't change. Any more than this lump sum would make them better off.

If we know that demand falls to 600 pizzas as a result of this tax, then the amount of tax they pay = $2*600 = $1200. This might be one way of estimating the effect of the tax. Would we want to apply that technique in all cases? NO: if consumer demand dropped to zero, the tax paid is also zero, but there's still been a loss of utility (pizza is a good thing, and we'd prefer some consumption to none).

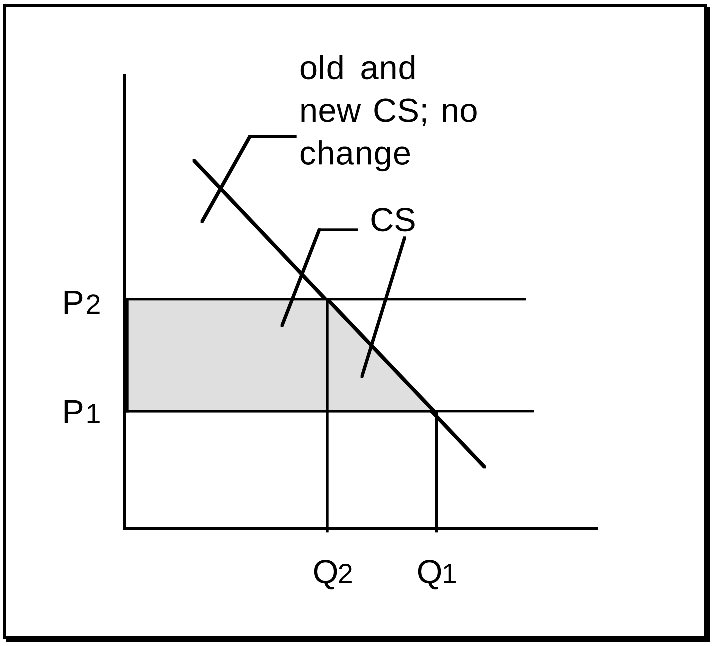
We can say that the $1200 is a lower bound on the cost to consumers. Why? Clearly they're losing $1200, but they're also losing the utility associated with the 400 pizzas they're not purchasing anymore. Another explanation: What happens when we give them the $1200 back in a lump sum? Are they back to where they were before? No. After getting the tax back they would be able to consume 600 pizzas at $10 each, which they could have done before the tax. But before the tax, they actually consumed 1000 pizzas at that price: they preferred that level of Q at that price, and they aren't restored to their preferred consumption level.

<u>Consumer surplus</u>



The demand curve represents the marginal utility/willingness-to-pay (wtp) of consumers at each Q. For the first unit, the difference between wtp and price paid is high: the difference is extra (surplus) utility consumers are getting for nothing. They receive less surplus utility for each additional unit down until equilibrium, where wtp=price.

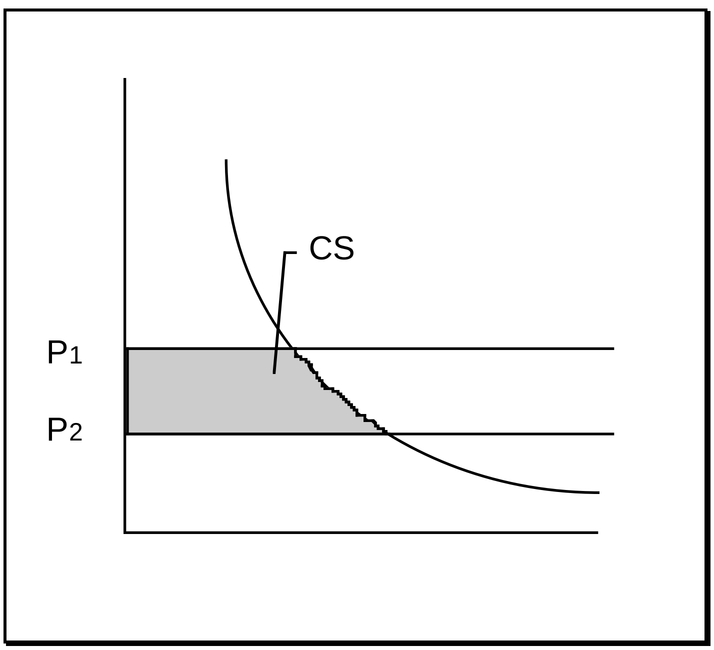
We almost never use total surplus in our measurements. We're interested in the change in consumer surplus (= "change"). If the price rises, CS is negative: if the price falls, CS is positive.



CS is easier to deal with because you don't have to know the whole demand curve, just the part that's relevant to the change, because the other parts of CS are unaffected.

CS will never be exactly right. This graph ignores income effects (we hope they aren't important). We'll get back to this later.

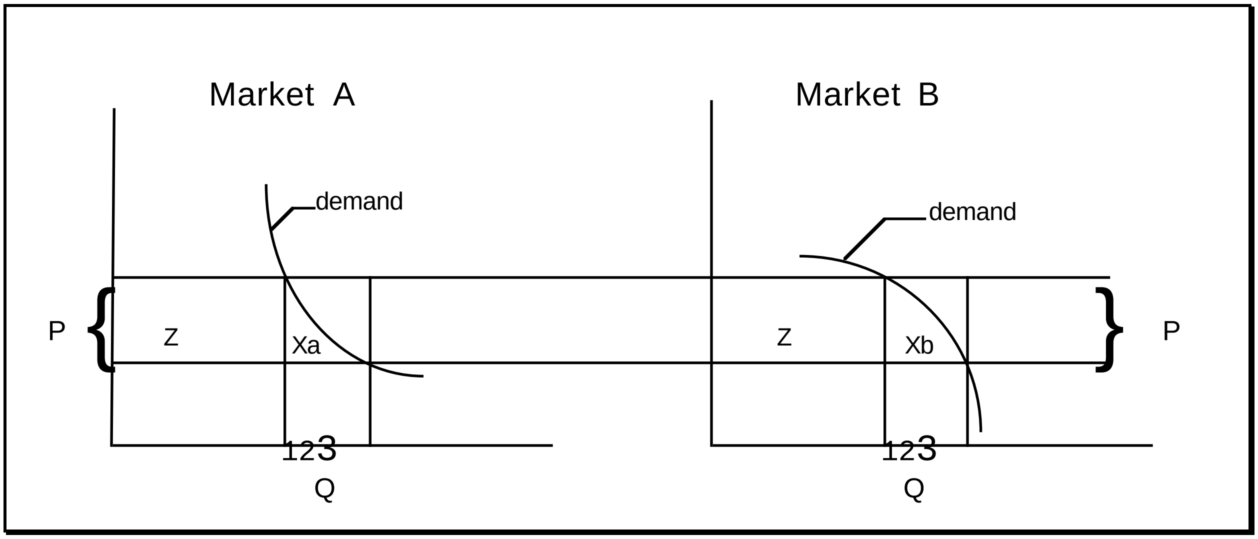
The following is true: as long as the market is sufficiently unimportant (small fraction of disposable income), the income effect will also be relatively unimportant. There are some markets where income effects are important, such as electricity, housing, other necessaries.



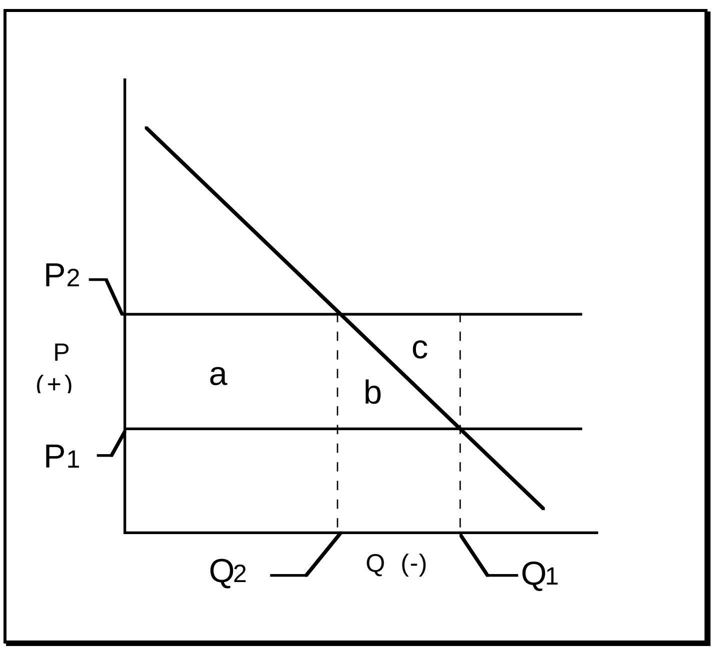
We've drawn these with straight-line demand curves. What if the demand curve is actually a curve—what is CS now? It's still the area to the left of the curve under the price line and above the cost curve.

Q: How would you define and use consumer surplus in the case where the price in the market depends on quantity? (monopolies, volume discounts, price discrimination, drug trade).

Two markets with identical beginning and ending prices may have different-sized CS, depending on the shape of the demand curve:



Here, area Xa is smaller than area Xb, so CSa is smaller than Csb. (Note that CS = Z+Xa or Z+Xb depending on which market you're in.)



In the graph at left, CS is the sum of areas a and b (in this case a negative change because price is rising). Note that area a is the tax revenue generated by this policy.

$CS = -[PQ_2 + 1/2(P(- Q))]$

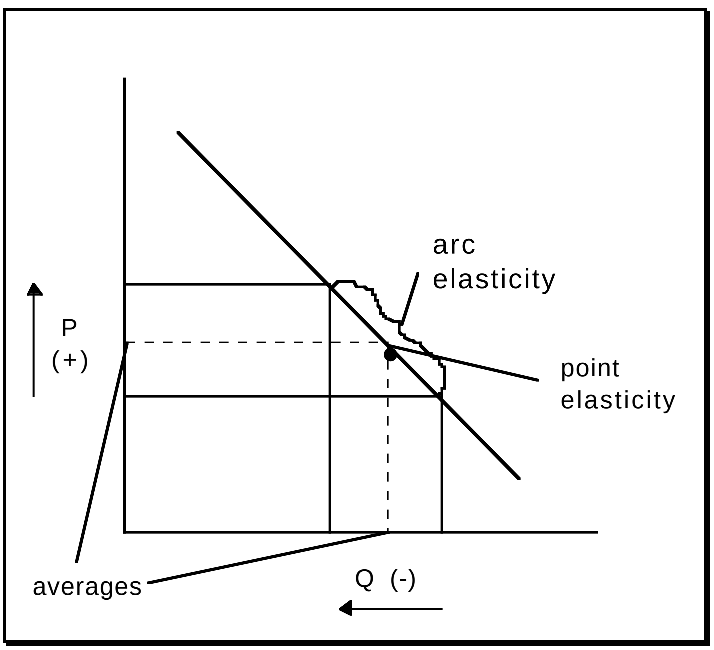
Alternatively, CS is the sum of a, b, and c, minus c. This is a useful approach when you don't know what the new Q is.

$CS = -[PQ1 - 1/2(P(- Q))]$.

We may be in the latter situation if we use price elasticities of demand to figure out Q.

In our pizza example, we know the slope from the data we have: .50/pizza. ($2.00/400). How do we know this?
do a study to determine the demand curve
use demand data from other similar areas (not slopes, since demand curves are generally not straight lines and different communities are on different parts of the curve—instead, assume that the populations are sufficiently similar that price elasticity of demand is similar from place to place).

Price elasticity of demand:
E = -(Q/Q)/(P/P) Note: the negative sign represents the fact that there's movement along a curve: one of the s is always negative.
which Q and P do we use: 1st or 2nd? %change of old or new values?
This is the difference between point and arc elasticity.



In all cases, the percentage change is going to be larger if it's in reference to the old price rather than the new price. If we pick one rather than the other, we bias the results. Therefore we use NEITHER, but rather use the arithmetic average of Q and P. This changes the elasticity formula:

$$E = -\frac{\Delta Q / \bar{Q}}{\Delta P / \bar{P}}$$

where $\bar{Q}$ = Q1+.5(Q)
and $\bar{P}$ = P1+.5(P).

(if you know both P's and Q's, $\bar{Q}$=(Q1+Q2)/2 and $\bar{P}$=(P1+P2)/2. They're equivalent expressions.)