Microeconomic Theory — ECON 323 503 Chapter 5: Consumer Welfare and Policy Analysis

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Outline

1. Consumer welfare: how do we measure the effect of a price change on a consumer?

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3. Market consumer surplus: we can add up the individual effects to get the effect on the entire market.

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2. Expenditure function and consumer welfare: how much money would we need to give a consumer to compensate him for a price change?

3. Market consumer surplus: we can add up the individual effects to get the effect on the entire market.

4. Effects of government policies on consumer welfare: consumer welfare lets us measure the effects of various policies.

Consumer welfare

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Just look at utility before and after.

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1. We don't know utility functions.

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Two problems:

1. We don't know utility functions.

2. What does it mean if you get utility 1,000 from a bundle and I get 900 from the same bundle? Nothing.

Consumer welfare

Measure consumer welfare in *willingness to pay* ($).

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We can understand what it means if you're willing to give up $1,000 for a bundle that I'm only willing to give up $900 for.

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We can understand what it means if you're willing to give up
$1,000 for a bundle that I'm only willing to give up $900 for.

In this sense, it makes sense that you value it more than I do.

Consumer welfare

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If you buy product for $1,000 and that's exactly what it's worth to you: your welfare is 0.

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If you buy product for $1,000 and that's exactly what it's worth to you: your welfare is 0.

If you buy product for $1,000 but it's worth $2,000 to you: your welfare is $1,000.

Willingness to pay

Inverse demand function:

$$p = p(Q).$$

You can use the demand function $(Q = D(p))$ to get this.

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Inverse demand function tells us the *marginal willingness to pay* for a good.

This is the *marginal value* that you assign to getting one more unit of the good.

Willingness to pay
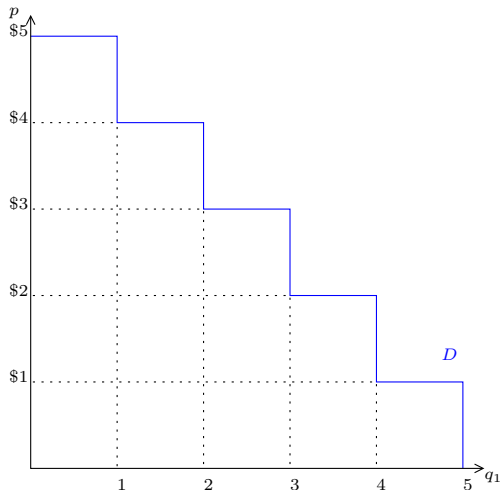
Start with this demand curve: marginal value of first unit is $5, second unit is $4, and so on.

Willingness to pay
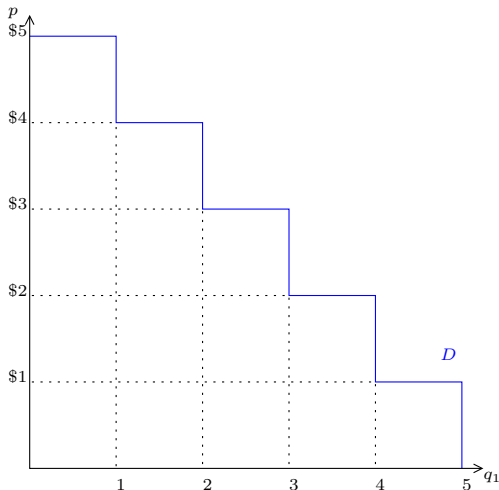
So at price $5, you buy one unit.
At price $4, you buy two units. And so on.

Willingness to pay
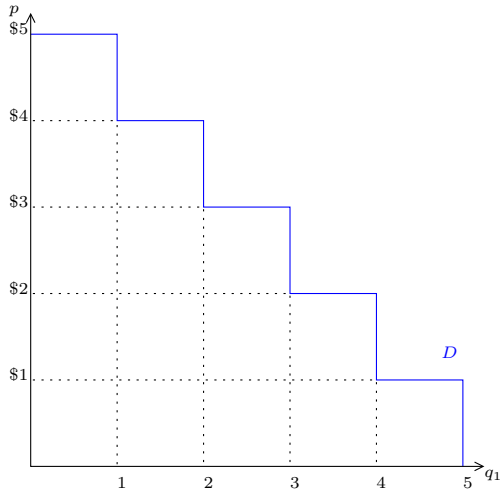
Consumer surplus, CS=maximum amount you're willing to pay
- what you pay for it.

Willingness to pay
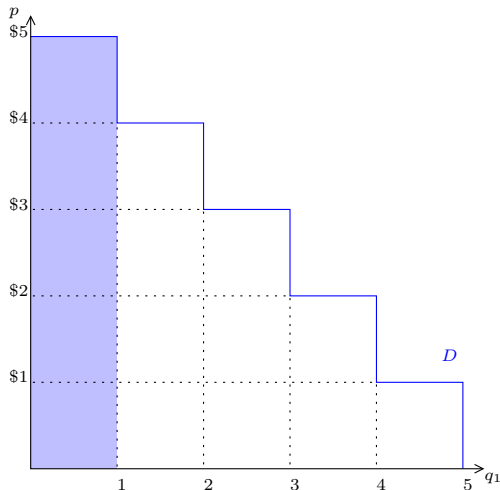
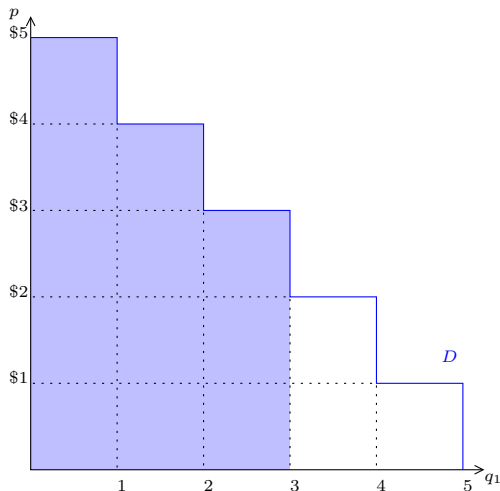The most you're willing to pay for one unit is the shaded area
($(5 × 1)$).

Willingness to pay
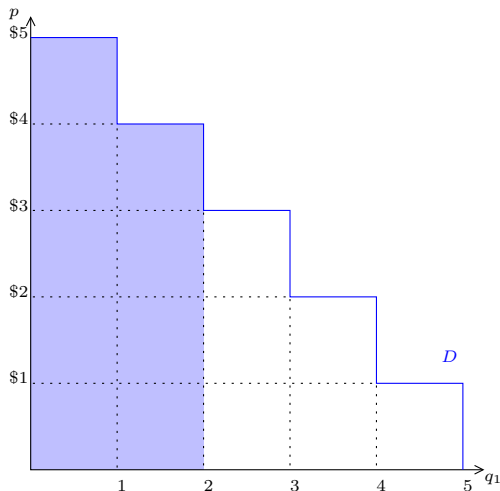
The most you're willing to pay for two units is the shaded area
$(\$(5 \times 1) + (4 \times 1))$.

Willingness to pay

The most you're willing to pay for three units is the shaded area ($(5 \times 1) + (4 \times 1) + (3 \times 1)$).
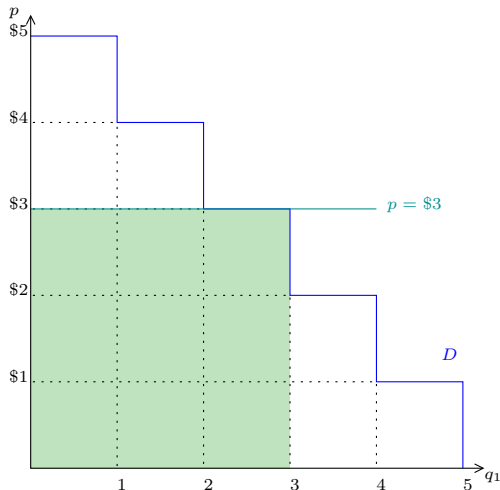
Calculating consumer surplus

Suppose that the price is $3.

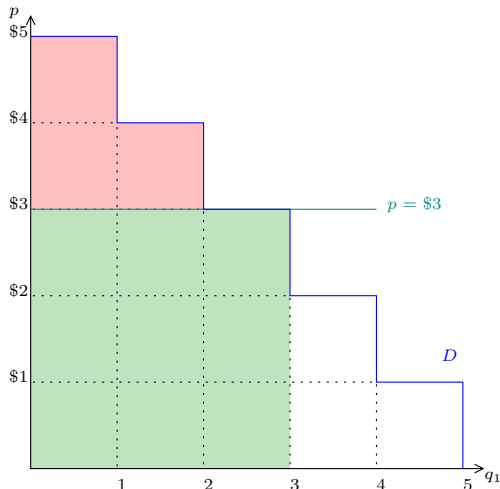# Calculating consumer surplus

Suppose that the price is $3.

You buy three units of the good. This costs you $3 \times \$3 = \$9$.

Calculating consumer surplus

The area of the green shaded area is what you pay for three units if the price is $3.

Calculating consumer surplus

Consumer surplus (red area) = maximum that you're willing to pay (the previous blue area) - what you paid (the green area)

Calculating consumer surplus

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Surplus from the first unit, $CS_1 = \$5 - \$3 = \$2$.

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Calculating consumer surplus

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Surplus from the first unit, $CS_1 = \$5 - \$3 = \$2$.

Surplus from the second unit, $CS_2 = \$4 - \$3 = \$1$.

Surplus from the third unit, $CS_3 = \$3 - \$3 = \$0$.

$$CS = CS_1 + CS_2 + CS_3$$

Consumer surplus

Equivalent definitions

1. Extra value you get after paying for your desired amount of a good at a particular price.

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2. The most you're willing to pay for the right to buy at a particular price.

Consumer surplus

Equivalent definitions

1. Extra value you get after paying for your desired amount of a good at a particular price.

2. The most you're willing to pay for the right to buy at a particular price.

3. The area under the demand curve and above the price up to the quantity demanded at that price.

Consumer surplus of a smooth demand curve
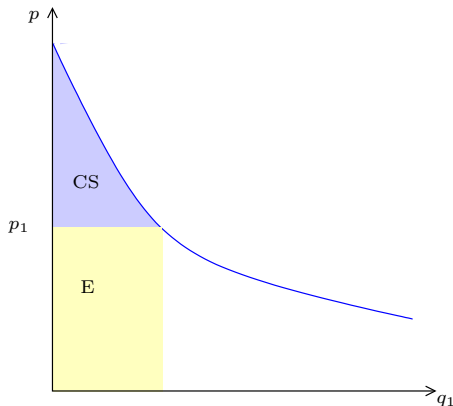
CS is the area under the demand curve, above the price.

Consumer surplus of a smooth demand curve
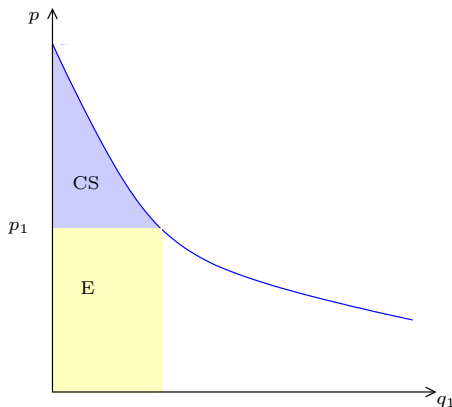
CS is the area under the demand curve, above the price.

The area under the demand curve is still the willingness to pay and you get CS by subtracting expenditure (E).

Effect of a price change on consumer surplus

When the price of a good goes up, the consumer is worse off.

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But how much?

Effect of a price change on consumer surplus

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But how much?

Change in CS is a way to quantify this.

Effect of a price change on consumer surplus
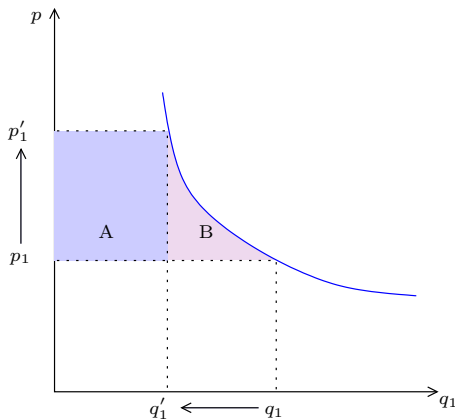
The change in CS is the sum the areas of regions A and B.

Effect of a price change on consumer surplus
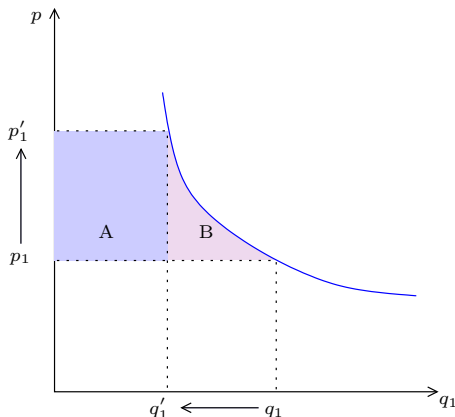
The change in CS is the sum the areas of regions A and B.

A is the loss of welfare from paying more for the units you're still buying.

Effect of a price change on consumer surplus
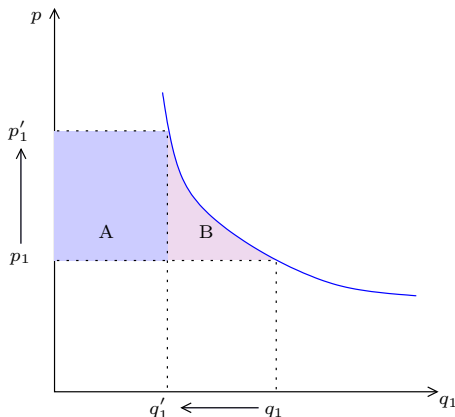
The change in CS is the sum the areas of regions A and B.

A is the loss of welfare from paying more for the units you're still buying.

B is the loss from buying fewer units.

Inverse demand: $p = 60 - q$.
What is the consumer surplus if the price is 30?

Textbook exercise 1.1

Inverse demand: $p = 60 - q$.
What is the consumer surplus if the price is 30?

How much is demanded at the price 30? Solve $30 = 60 - q$ for q
we find that $q = 30$.

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How much is demanded at the price 30? Solve $30 = 60 - q$ for q
we find that $q = 30$.

Let's draw a picture so that we can figure out what CS is.

Textbook exercise 1.1
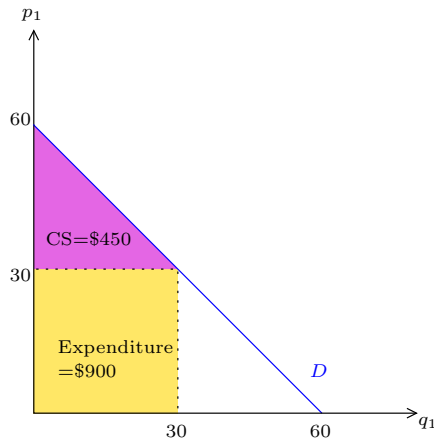
CS is the area of the pink triangle: base = 30, height = 30.

CS=Area=$\frac{\text{base} \times \text{height}}{2} = \frac{30 \times 30}{2} = 450$.

Compensating a consumer for the change in price

Another way to measure your welfare change:

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"How much money would I need to give you to keep you as happy as you were before the price increased?"

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$$\text{welfare change} = \underbrace{E(p_1, p_2, \overline{U})}_{\text{Costs of getting } \overline{U} \text{ at } p_1} - \underbrace{E(p_1', p_2, \overline{U})}_{\text{Cost of getting } \overline{U} \text{ at } p_1'}$$

Wich welfare level $(\overline{U})$ to use?

Two ways to do it:
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"What would I have to pay you to let me to increase the price?"

If I give you this amount, you'd be able to buy a bundle that would keep you at the same utility level $\overline{U}$ as when the price doesn't change.

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"What would I have to pay you to let me to increase the price?"

If I give you this amount, you'd be able to buy a bundle that would keep you at the same utility level $\overline{U}$ as when the price doesn't change.

Since I'm *compensating* you for the price increase, we call it the "compensating variation" (CV).

Equivalent variation

If $\overline{U}$ is your utility *after* the price change, the welfare change is the answer to the following question:

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"What would you pay me to stop the price increase?"

If I take away this amount from you but don't change the price, it'll keep you at the same utility level $\overline{U}$ as if I change the price but don't take any money from you.

Equivalent variation

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If I take away this amount from you but don't change the price, it'll keep you at the same utility level $\overline{U}$ as if I change the price but don't take any money from you.

Since paying me that amount and keeping the prices and not paying me but having a higher price to give you the same utility, they're *equivalent.* So we call it the "equivalent variation" (EV).

An example
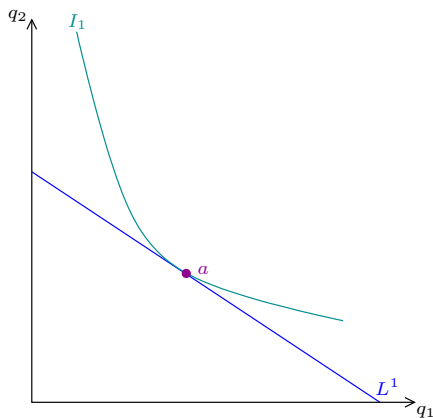
Suppose that $p_2 = 1$. We'll see what happens when p_1 changes.

An example
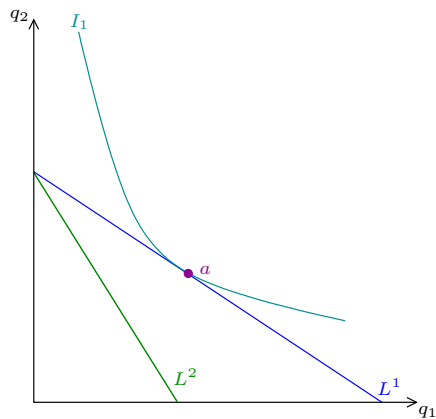
When p_1 increases, we get the new green budget line.

An example
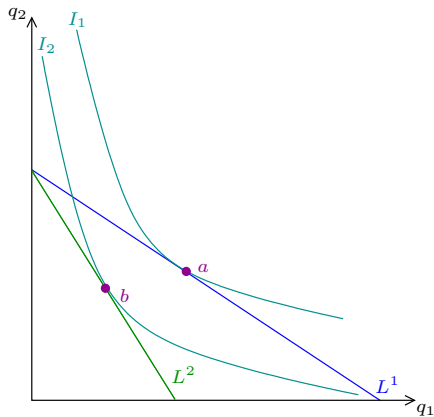
From this budget, you pick bundle *b*. You're worse off.

Compensating variation
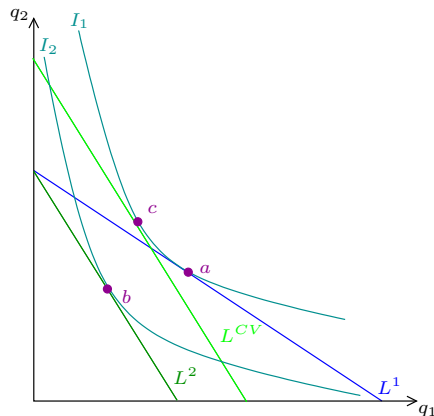
If we give you more income at the new price the light green
budget line brings you back to the indifference curve I^1.

Compensating variation
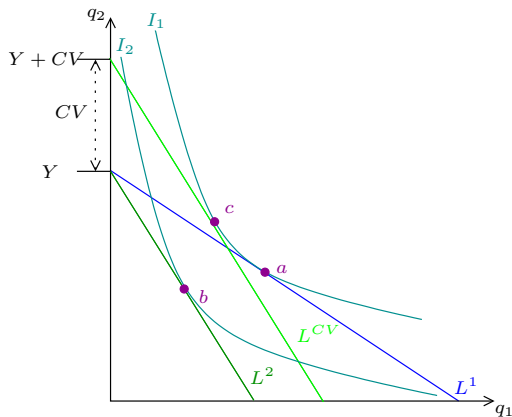
If your original income was Y, the new income is $Y + CV$. Since $p_2 = 1$, this is the vertical distance between the intercepts.

Equivalent variation
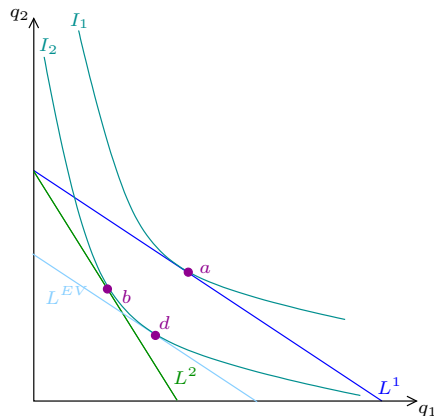
If we take away income from you at the old prices, the light blue budget line brings you to the indifference curve I^2.

Equivalent variation
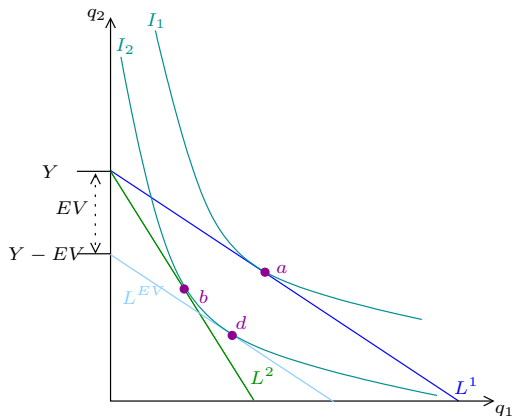
If your original income was Y, the new income is $Y - EV$. Since $p_2 = 1$, this is the vertical distance between the intercepts.

Comparing the three welfare measures

We've seen three ways of measuring welfare:

1. Change in consumer surplus (ΔCS)
2. Compensating variation (CV)
3. Equivalent variation (EV)

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Which one is bigger?

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Which one is bigger?

Depends on income elasticity.
Normal goods: $|CV| > |\Delta CS| > |EV|$.
Inferior goods: $|CV| < |\Delta CS| < |EV|$.

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Which one is bigger?

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We can check this graphically. (We'll skip the math:)

Comparing the three welfare measures
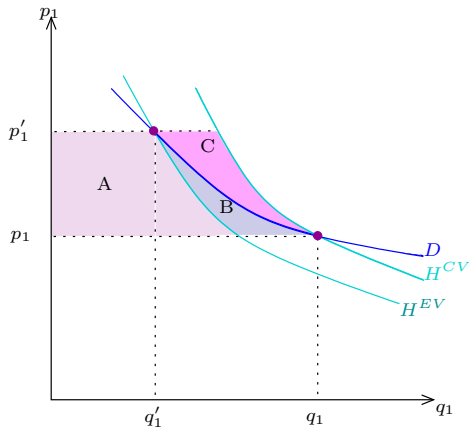
$|CV| = A + B + C$, $|\Delta CS| = A + B$, and $|EV| = A$.

Comparing the three welfare measures
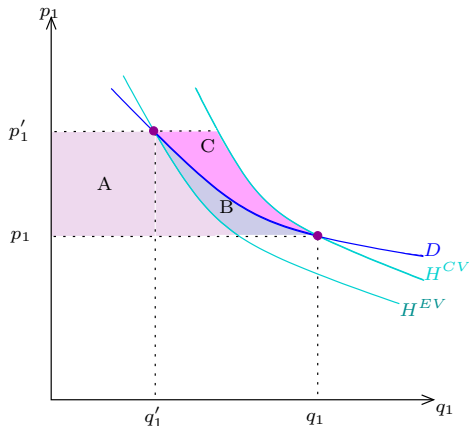
$|CV| = A + B + C$, $|\Delta CS| = A + B$, and $|EV| = A$.

So $|CV| > |\Delta CS| > |EV|$.

Why would this change for an inferior good?

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The areas B and C are really small compared to A for small changes in price.

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So it often does not matter which measure we use in practice.

Comparing the three welfare measures

Why would this change for an inferior good?

The areas B and C are really small compared to A for small changes in price.

So it often does not matter which measure we use in practice.

Economists usually use CS to measure welfare since it's easy to calculate from the observable demand function.

Market consumer surplus

Recall: You get market demand by horizontally adding up individual demand.

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The effect of a price increase on CS is calculated the same way for the market as a whole as it is for individuals.

Market consumer surplus
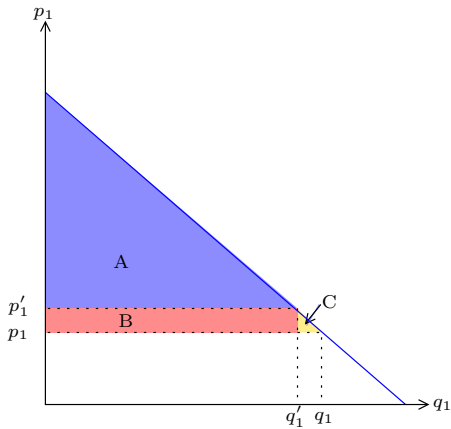
Market consumer surplus
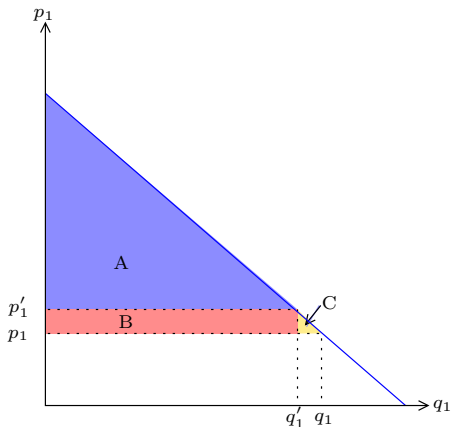
CS before price increase: A+B+C

Market consumer surplus
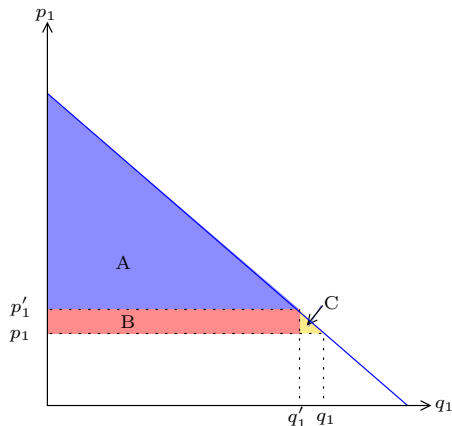
CS before price increase: A+B+C
CS after price increase: A

Market consumer surplus
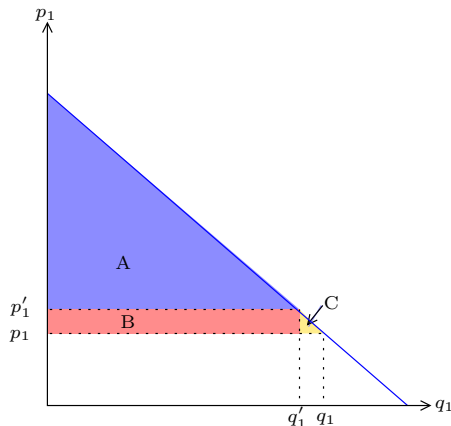
CS before price increase: A+B+C
CS after price increase: A
Loss of CS because of price increase: B+C

CS is loss is bigger

1. The more money is spent on the good (revenue from sales of the good), pQ: This makes A, B, and C all bigger.

CS is loss is bigger

1. The more money is spent on the good (revenue from sales of the good), pQ: This makes A, B, and C all bigger.

2. The less elastic demand is: B is bigger as demand gets more inelastic. This is because consumers buy a similar quantity even as the price rises.

Textbook exercise 3.4

Two linear demand curves go through the initial equilibrium e_1. One demand curve is less elastic than the other at e_1. For which demand curve will a price increase cause the larger consumer surplus loss?

Two linear demand curves go through the initial equilibrium e_1. One demand curve is less elastic than the other at e_1. For which demand curve will a price increase cause the larger consumer surplus loss?

Since they both pass through the same point e_1, the less elastic demand curve is steeper than the more elastic one. That's because $\frac{dQ}{dp}$ is larger in absolute value for the more elastic one.

Textbook exercise 3.4
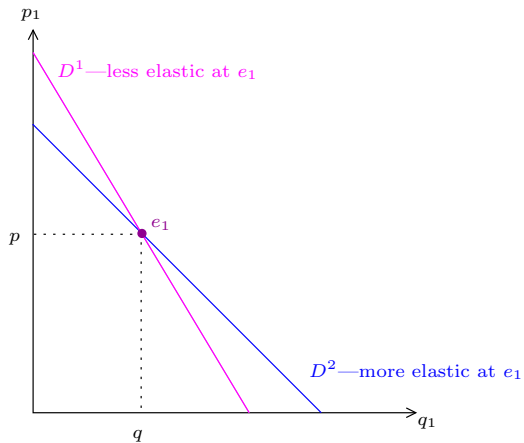
Textbook exercise 3.4
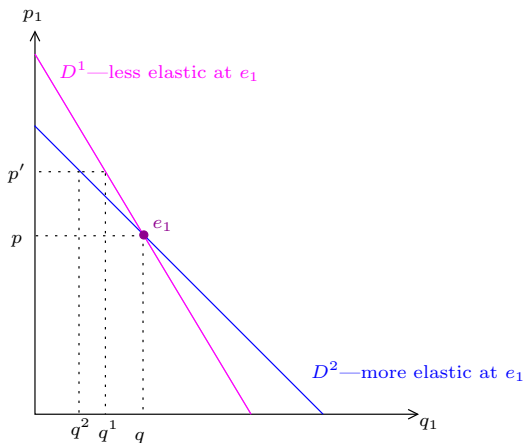
If price increase to p', quantities change to q^1 and q^2.

Textbook exercise 3.4
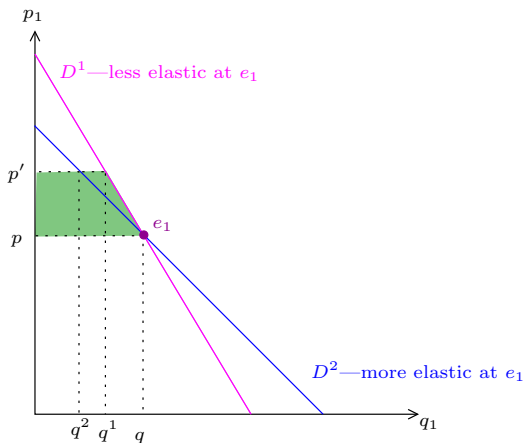
The green shaded area is the loss of CS for D^1

Textbook exercise 3.4
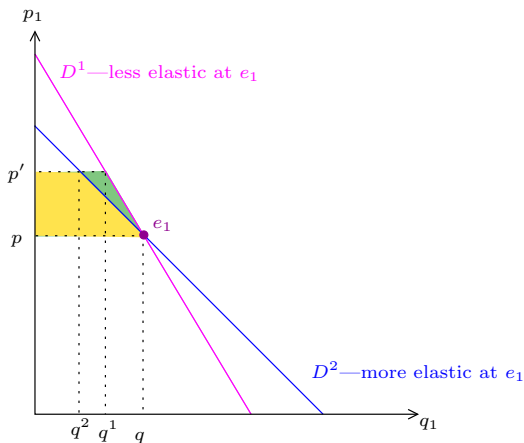
The yellow shaded area is the loss of CS for D^2.

Effects of government policies on consumer welfare

We'll look at two kinds of policies:

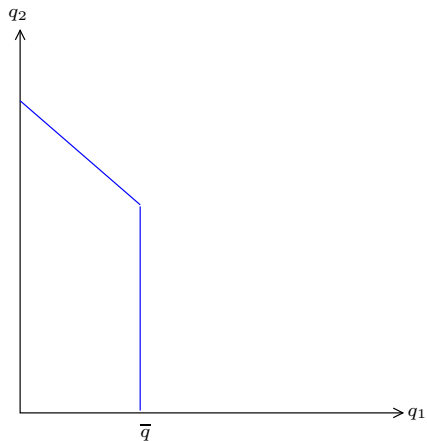1. Quotas: a limit on the amount of a good a person can purchase.

Effects of government policies on consumer welfare

We'll look at two kinds of policies:

1. Quotas: a limit on the amount of a good a person can purchase.
2. Subsidies on the price of a good.

Quotas
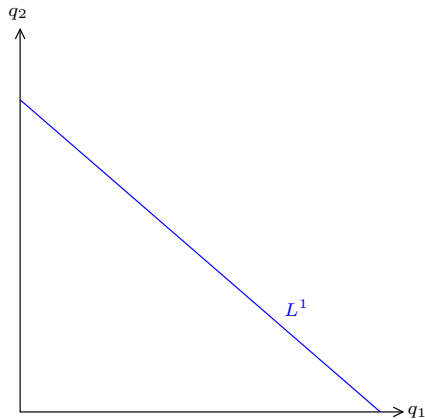
You start with this budget set (both prices are $1).

Quotas
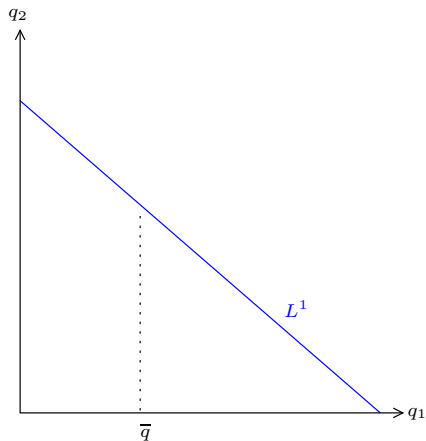
Suppose you have a quota of $\overline{q}$.

Quotas

Now, you can only select from this set.

Quotas
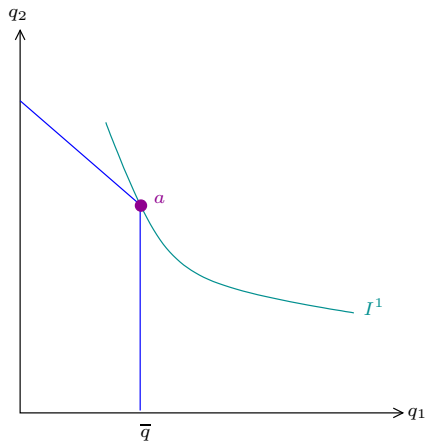
You pick your favorite bundle.

Quotas
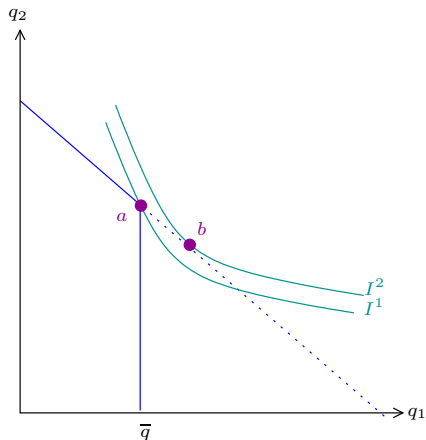
You're worse off than without the quota.

Quotas
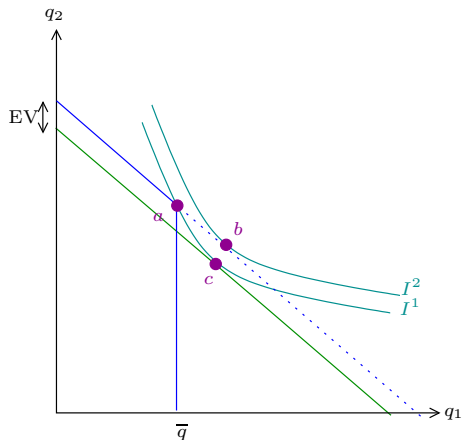
It's as though your income was reduced by EV.

Subsidized goods

Many subsidies are such that the consumer is given a certain amount of a good at no charge.

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The consumer only pays for any of the good that he buys above that amount.

Examples: daycare in Canada, food stamps in the US.
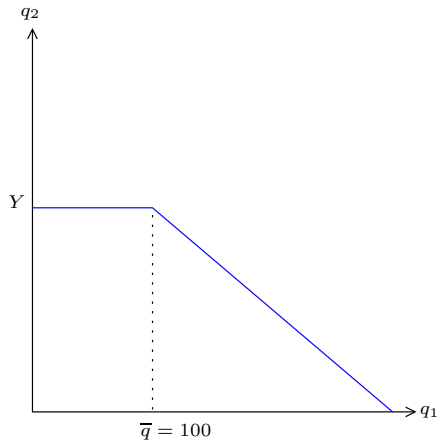
Subsidized goods
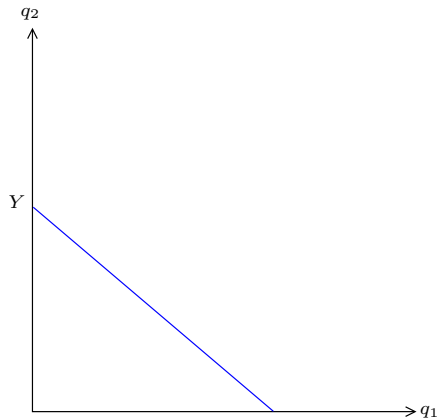
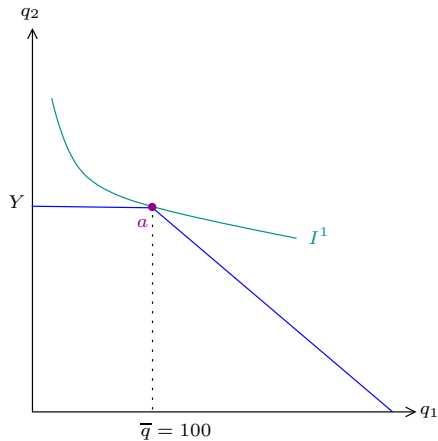Without a subsidy this is your budget line (both prices are $1).

Subsidized goods
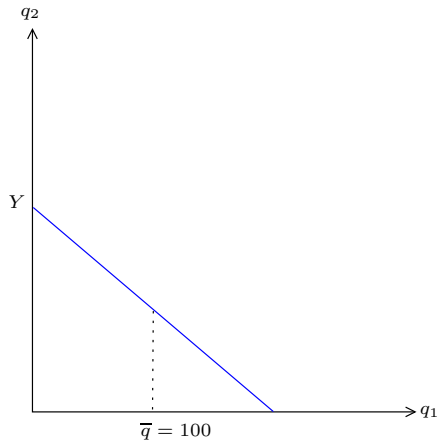
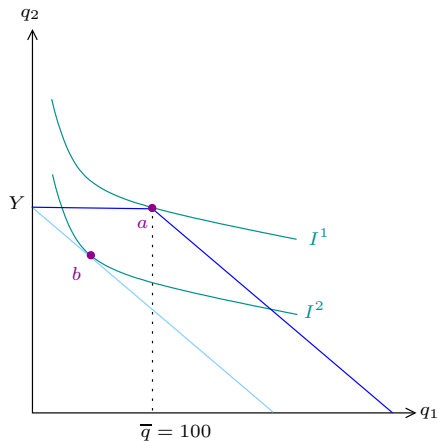Suppose the first $\overline{q}$ units are free.

Subsidized goods

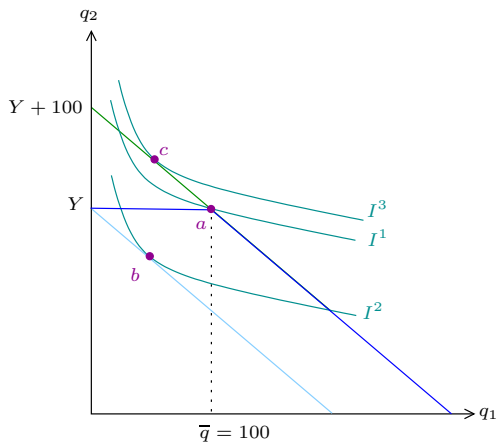

Your now pick from this set.

Subsidized goods

You might choose bundle a.

Subsidized goods

You're better off than without the subsidy when you'd choose b.
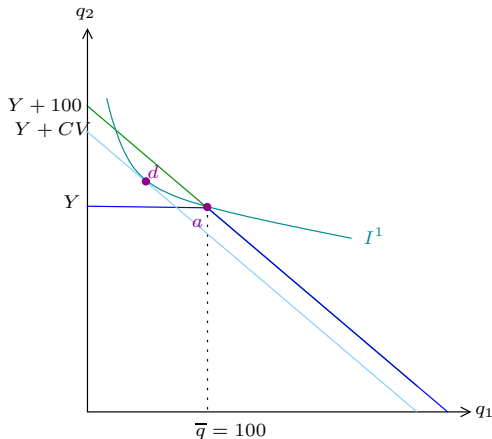
Subsidized goods

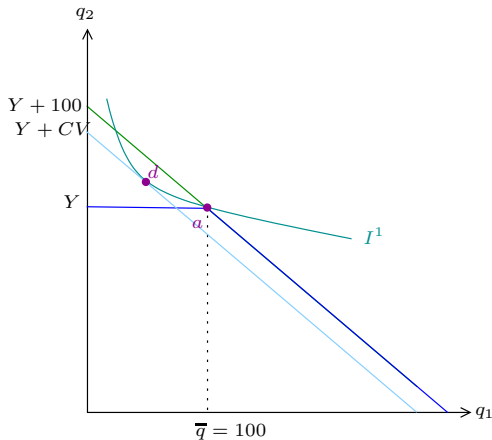You'd be prefer $100 in cash to 100 free units of good 1.

Subsidized goods

You'd be just as happy with \$CV in cash as with the subsidy.

Subsidized goods

If we took away the subsidy, we'd have to give you $$CV$ to compensate you.

A word of caution

The exercise of quantifying the losses from these kinds of policies should not be interpreted as saying that there should never be such policies.

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This is a way of measuring the cost of the policies. When making decisions, these costs must be weighed against benefits from the intended goals of the policies.