1 Budget Lines

The budget line is the set of bundles that a consumer can "just afford". The bundles that cost their entire income m.

$$(x_1, x_2)$$

Cost of bundle (x_1, x_2)

$$p_1x_1 + p_2x_2$$

Budget:

$$p_1x_1 + p_2x_2 = m$$

1.1 Endpoints of Budget Line

The amount of x_1 I can afford if I only buy x_1

$$\left(\frac{m}{p_1}, 0\right)$$

The amount of x_2 I can afford if I only buy x_2

$$\left(0, \frac{m}{p_2}\right)$$

For example:

$m = 10, p_1 = 2, p_2 = 1$

$$(5, 0), (0, 10)$$

1.2 Slope of Budget Line

The amount of good 2 you give up to get one more unit of good 1.

$$-\frac{p_1}{p_2}$$

1.2.1 How Budget Line Changes

Did this on the board (see course notes).

1.2.2 Taxes

All a tax does is make a good more expensive.

Quantity Tax A quantity tax chargers consumers $\$t$ more per unit of the good purchased.

For example if there is a quantity tax of $\$t$ on good 1, the cost of the bundle (x_1, x_2):

$$tx_1 + p_1x_1 + p_2x_2$$

$$(t + p_1)\, x_1 + p_2x_2$$

This has the effect of increasing the price of x_1 from p_1 to $p_1 + t$.

Suppose we have $p_1 = 2, p_2 = 1, m = 10$.

Suppose the government adds a 1 dollar quantity tax on good 1, draw the new budget line.

Ad Valorem Tax For ad valorem tax, the government demands a percentage τ of the total value of a good purchased.

Cost of bundle (x_1, x_2):

$$\tau\,(p_1x_1) + p_1x_1 + p_2x_2$$

$$(1 + \tau)\, p_1x_1 + p_2x_2$$

The distincition from a policy perspective:

2 Binary Relations

At the foundation of preference is the ability to compare things.

Suppose I like one scoop of chocolate $(0, 1)$ better than one scoop of vanilla $(1, 0)$.

$$(0, 1) \succsim (1, 0)$$

$$(0, 2) \succsim (1, 0)$$

$$(1, 1) \succsim (2, 0)$$

2.1 What is a Relation?

A relation is the abstract way of talking about comparisons in mathemtics.

A relation is a set of statements about **pairs** of things **from a set**.

2.2 Examples from Everyday Life

Suppose R the "sibling" relation on the set of people.

$$Greg\,R\,Christina$$

And:

$$Christina\,R\,Greg$$

Suppose R is the "strictly taller than" relation on the set of people.

$$Greg\,R\,Christina$$

But not:

$$Christina\,R\,Greg$$

But not:

$$Greg\,R\,Greg$$

Suppose R is the "At least as tall as" relation on the set of people.

$$gRc$$

$$gRg$$

$$sRg$$

2.3 Examples from Math

$\geq, >, =, <, \leq$

$$3 > 2, 1 > 0...$$

$$2 = 2, 1 = 1,$$

2.4 Properties

2.4.1 Reflexive

A relation is **reflexive** if for every element of $x \in X$

$$xRx$$

On the set of all people, these are reflexive:

Same biological parents as.

At least as tall as.

Same hair color.

Lives in the same state.

Same mental disorders.

These are **not** reflexive:

Strictly taller than.

Married to.

Lives in a different state than.

In mathematics:

These are:

$\geq, =, \leq$

These aren't:

$>, <$

2.4.2 Complete

A relation is complete if for every pair of things $x, y \in X$ (including x and itself). Either xRy or yRx (or both).

On the set of people, these are:

At least as tall as.

At least as fast at the $100m$ dash.

On the set of people, these are not:

Strictly taller than. (It is not true xRx for the relation)
Sibling

Married to.

If something fails to be reflexive, it also fails to be complete.

2.4.3 Transitive

2.4.4 Symmetric

2.4.5 Assymetric