

## Budget Constraint Handout

**1. The Budget Constraint**

The budget constraint tells us what the consumer can afford given their fixed income and market prices.

Take a two good example where Lisa consumes goods,  $Z$  and  $B$ . Let their prices be  $p_Z$  and  $p_B$ , respectively. Lisa's income is  $I$ .

Since Lisa cannot spend more than her income, we can derive her budget set as:

$$p_Z Z + p_B B \leq I$$

If Lisa uses up all of her income consuming  $Z$  and  $B$ , then her **budget constraint** is,

$$p_Z Z + p_B B = I$$

Note the change from an inequality to an equality. This signifies that Lisa uses all of her income consuming the two goods.

And if we want to graphically describe this in  $Z, B$  space, notice that it is linear and then rearrange in  $y = mx + b$  form to find the equation of the **budget line**<sup>1</sup>:

$$B = \frac{I}{p_B} - \frac{p_Z}{p_B} Z$$

After graphing the budget line in  $Z, B$  space, observe that the following are true:

→ everything to the left of the budget line is affordable

→ everything to the right of the budget line is unaffordable

**Example:**  $p_Z = \$3$ ,  $p_B = \$3$ , and  $I = \$24$ .

Then, the budget line is,

$$B = \frac{24}{3} - \frac{3}{3} Z = 8 - Z$$

Note that the slope of the budget line measures the market rate of substitution between the two goods (i.e. the market's marginal valuation),

$$\frac{\Delta B}{\Delta Z} = \frac{dB}{dZ} = \frac{-p_Z}{p_B} = -\frac{3}{3} = -1$$

This is an extremely important result! The slope of the budget line describes the market's rate of substitution between the two goods, and therefore describes the

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<sup>1</sup> Be careful distinguishing between the *budget constraint* and the *budget line*. The budget line is of the form  $y = mx + b$ , while the budget constraint is not.

*opportunity cost* of consuming a bit more of that good (i.e. to get  $\Delta B$  what you have to give up is  $\Delta Z$ ). This is also called the **marginal rate of transformation**, or **MRT**.

## 2. Changes in the Budget Line

In our simple model, we need to deal with how changes in prices and/or income affect the budget line. For example, how does an increase in income affect the amount of goods that Lisa can afford? Or, how do decreases in prices affect Lisa's budget set? We want to now turn our attention to these questions.

→ **Change in income** – shifts the budget line in or out.

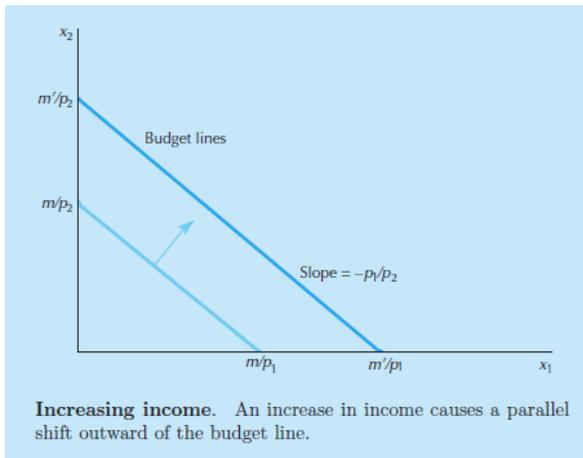


Figure 2.2 (Varian, 2010)

→ **Change in prices** – pivots the budget line.

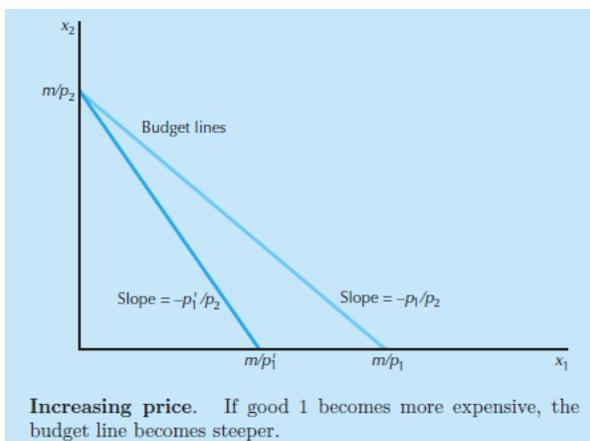


Figure 2.3 (Varian, 2010)

Observe that the cause of the change in either of these variables could be positive (an increase) or negative (a decrease).

In addition, the source of the change in income or prices might be because of some change in government policy (e.g., sales tax/subsidy, quantity tax/subsidy,...).