

Lecture 1

Consumption Set and Budget Constraint

Consumption Choice Sets

- A consumption set is the collection of all consumption choices available to the consumer.
- What constrains consumption choice?
 - Budgetary, time and other resource limitations.

Budget Constraints

- A **consumption bundle** containing x_1 units of commodity 1, x_2 units of commodity 2 and so on up to x_n units of commodity n is denoted by the vector (x_1, x_2, \dots, x_n) .
- Commodity prices are p_1, p_2, \dots, p_n .
- With two goods: $(x_1, x_2), (p_1, p_2)$.

Budget Constraints

- Q: When is a bundle (x_1, x_2) affordable at prices p_1, p_2 ?

Budget Constraints

- Q: When is a bundle (x_1, x_2) affordable at prices p_1, p_2 ?
- A: Let m be consumer's disposable income. Then, the bundle is affordable if

$$p_1x_1 + p_2x_2 \leq m$$

This is the Budget Constraint.

Budget Constraints

- The bundles that are only just affordable form the consumer's **budget line**. This is the set

$$\{ (x_1, \dots, x_n) \mid x_1 \geq 0, \dots, x_n \geq 0 \text{ and } p_1x_1 + \dots + p_nx_n = m \}.$$

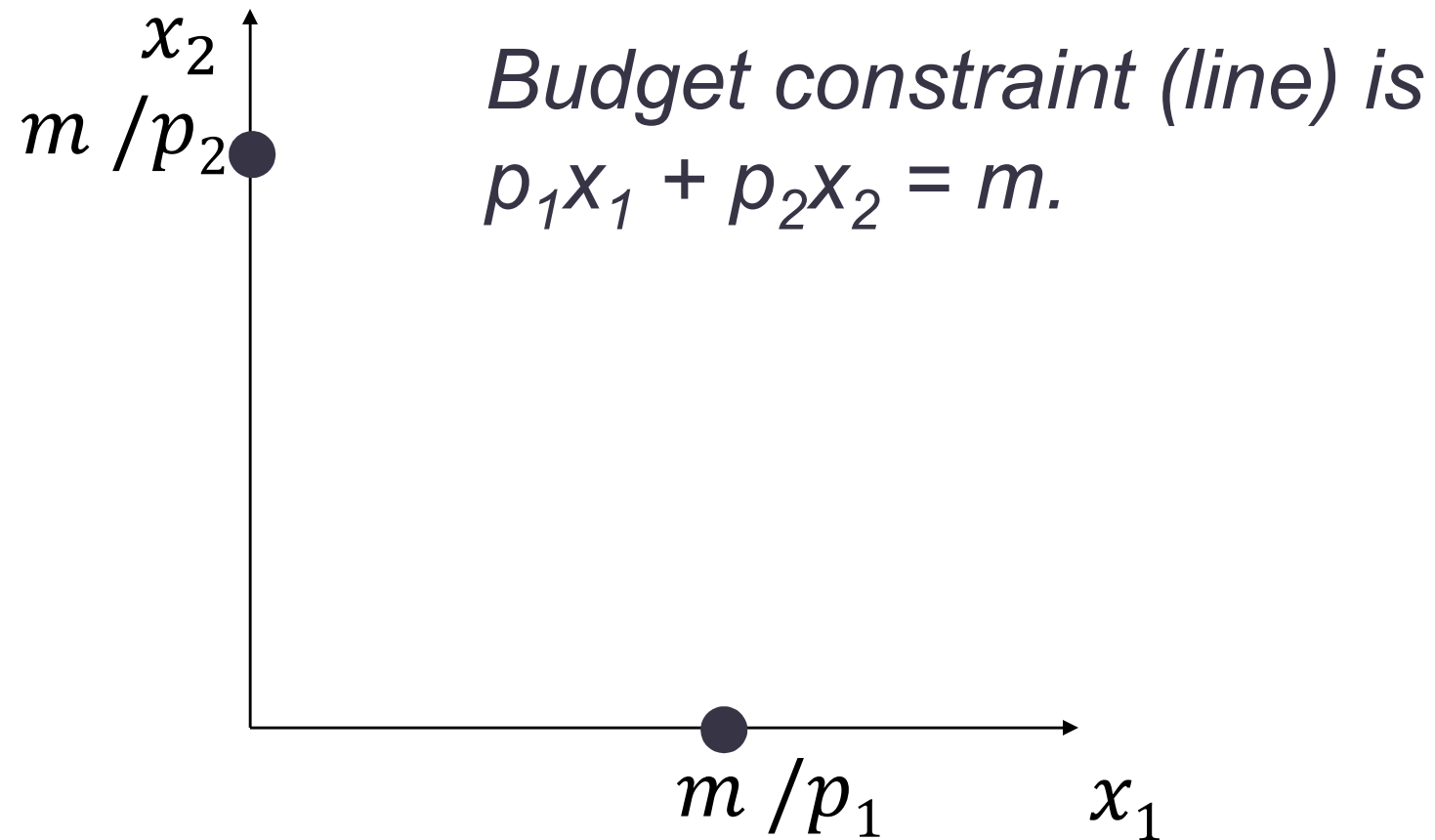
Budget Constraints

- The consumer's **budget set** is the set of all affordable bundles;

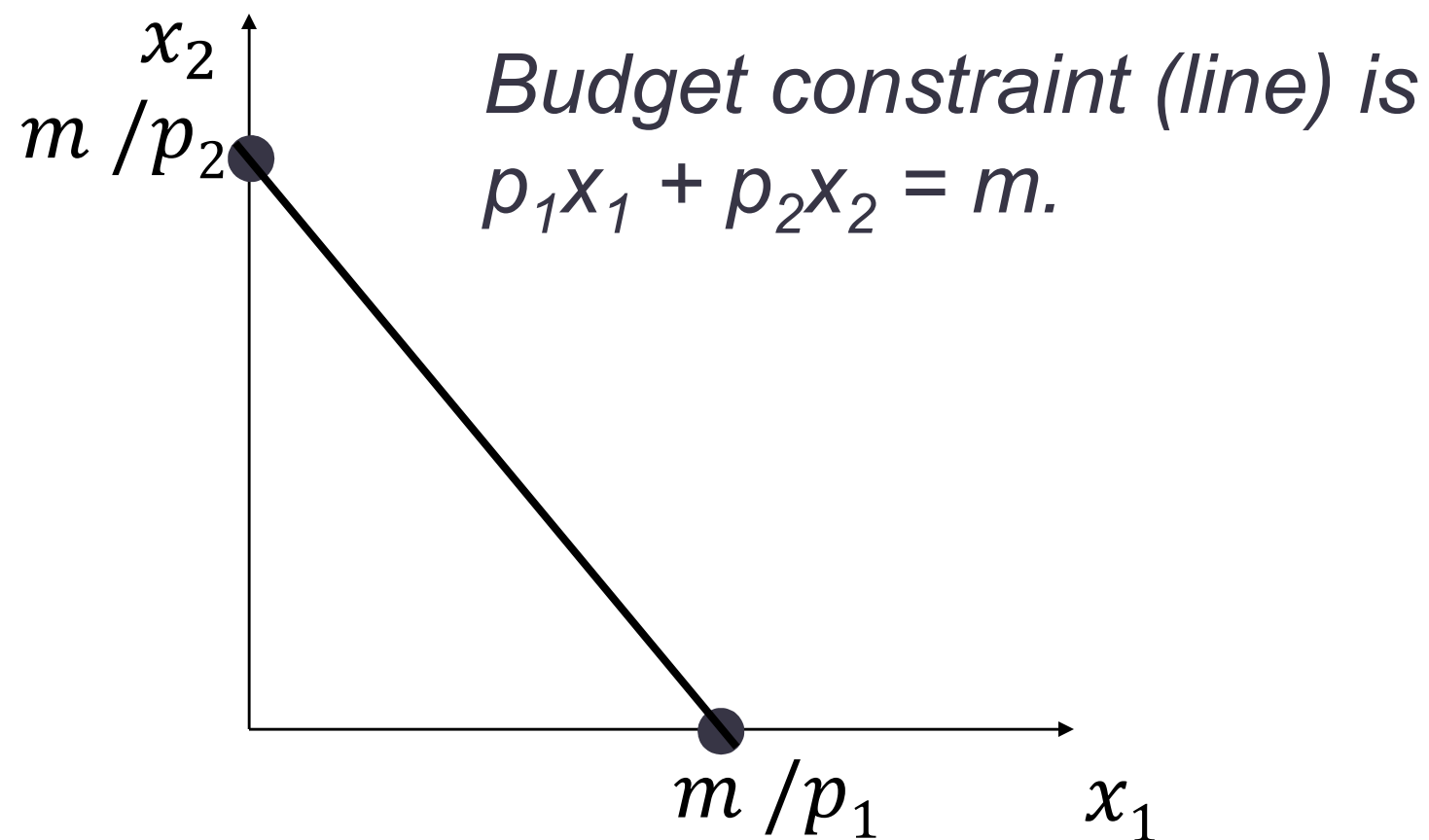
$$B(p_1, \dots, p_n) = \{(x_1, \dots, x_n) | x_1 \geq 0, \dots, x_n \geq 0 \text{ and } p_1x_1 + \dots + p_nx_n \leq m\}$$

- The budget constraint is the upper boundary of the budget set.

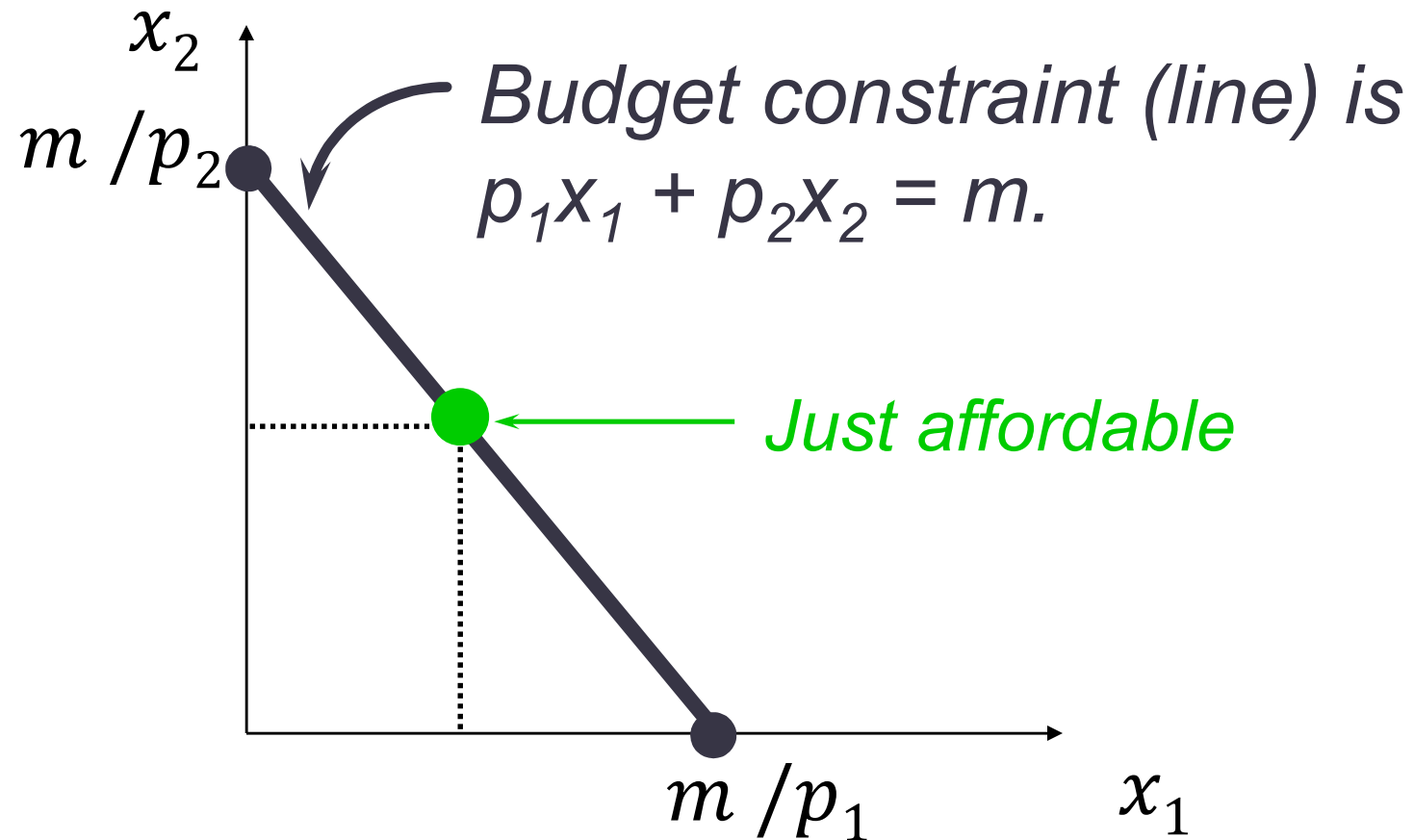
Budget Set and Constraint



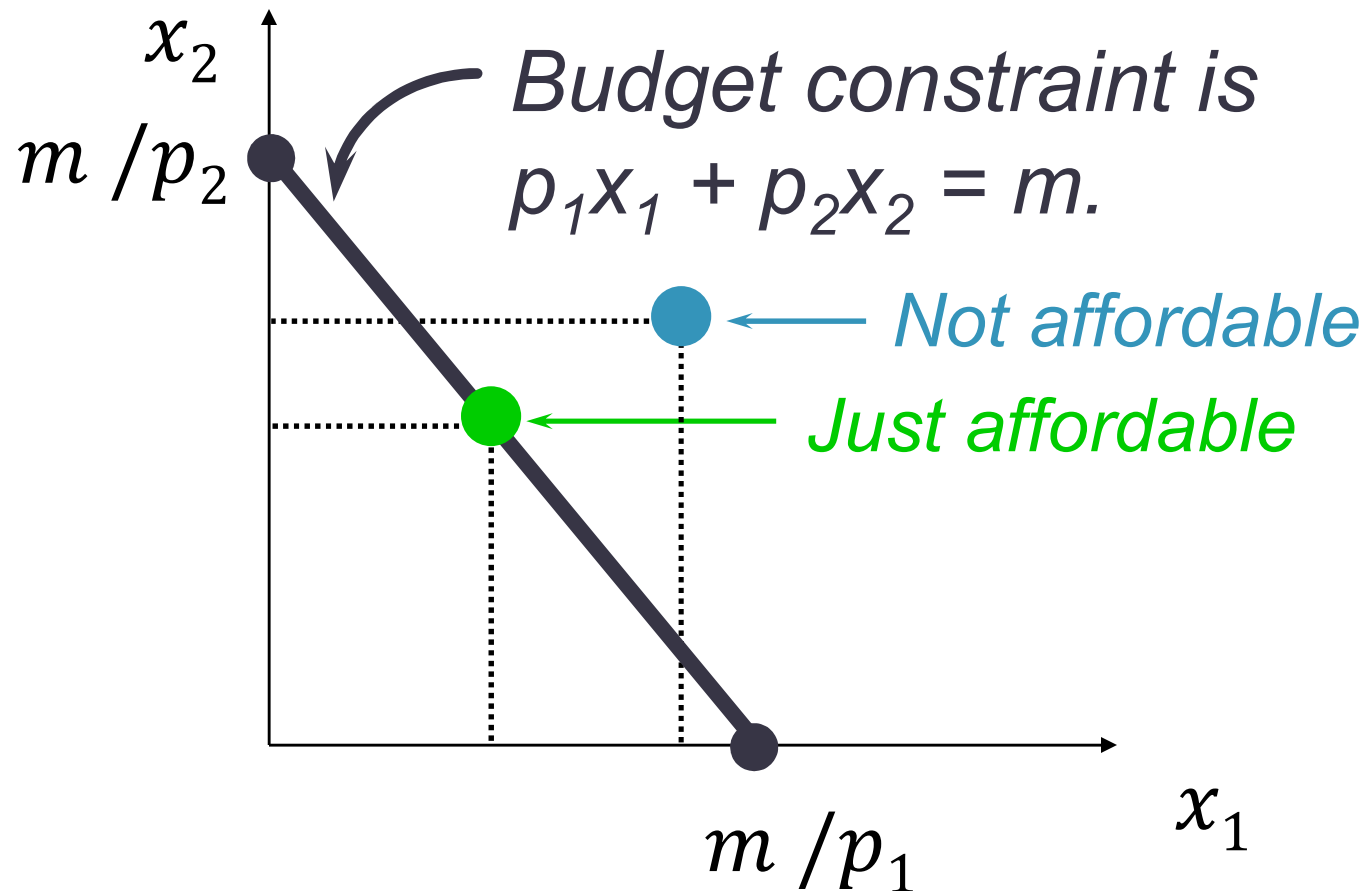
Budget Set and Constraint



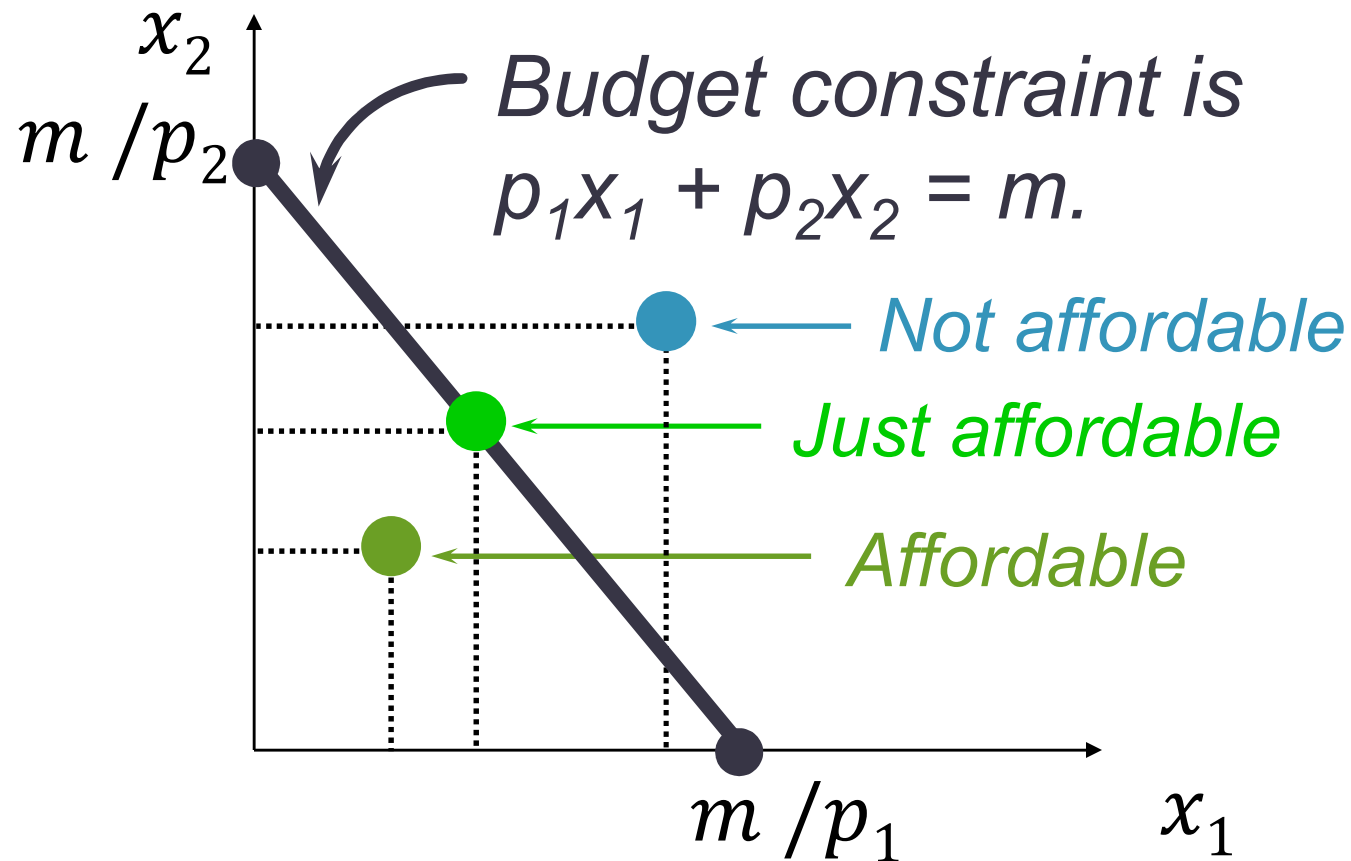
Budget Set and Constraint for Two Commodities



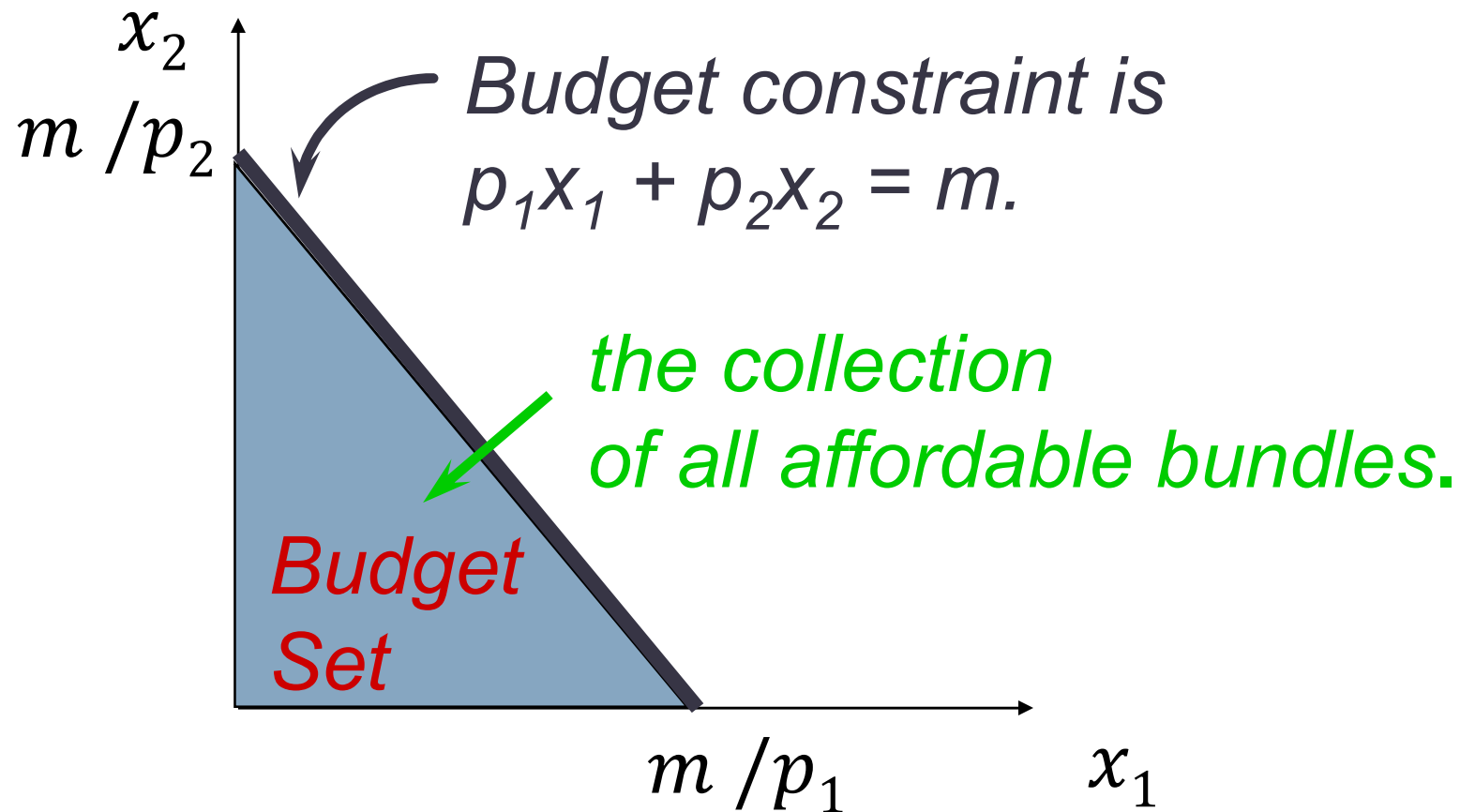
Budget Set and Constraint for Two Commodities



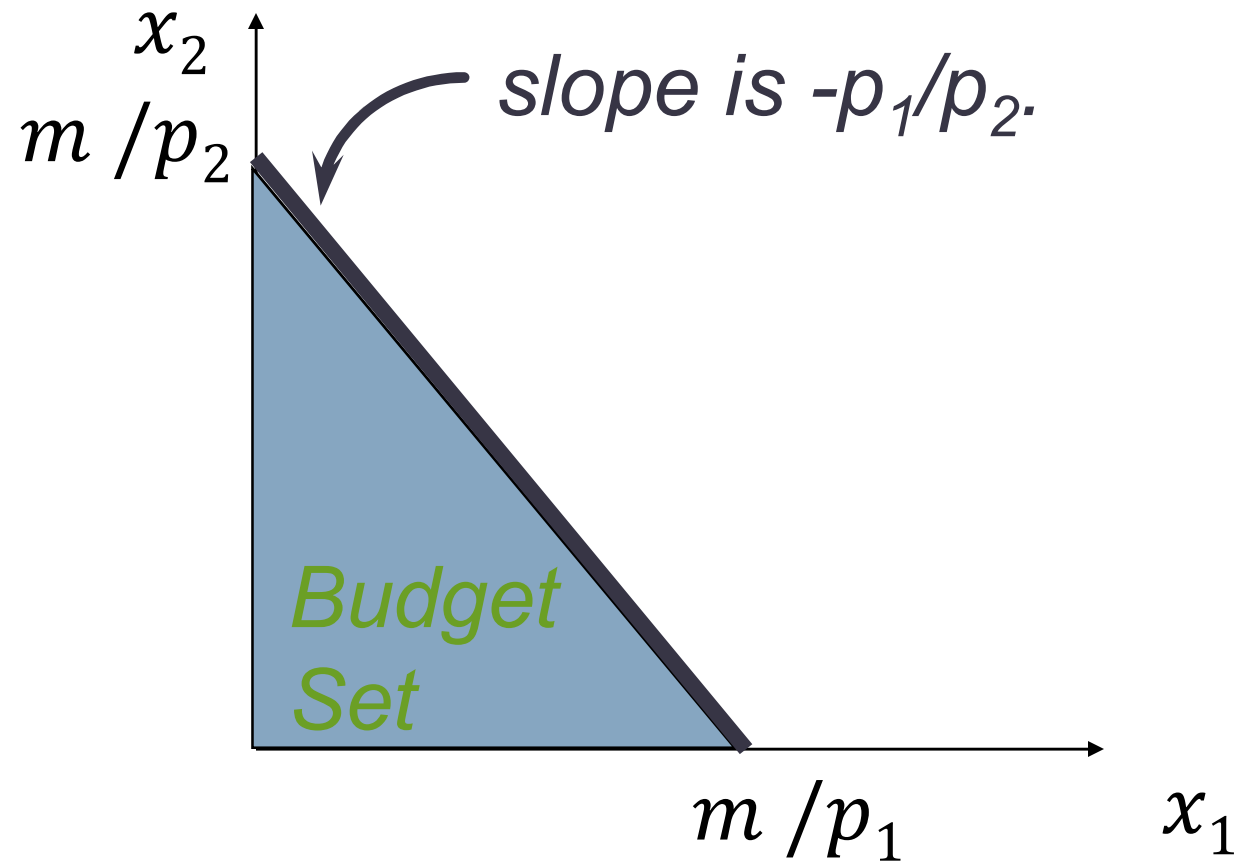
Budget Set and Constraint for Two Commodities



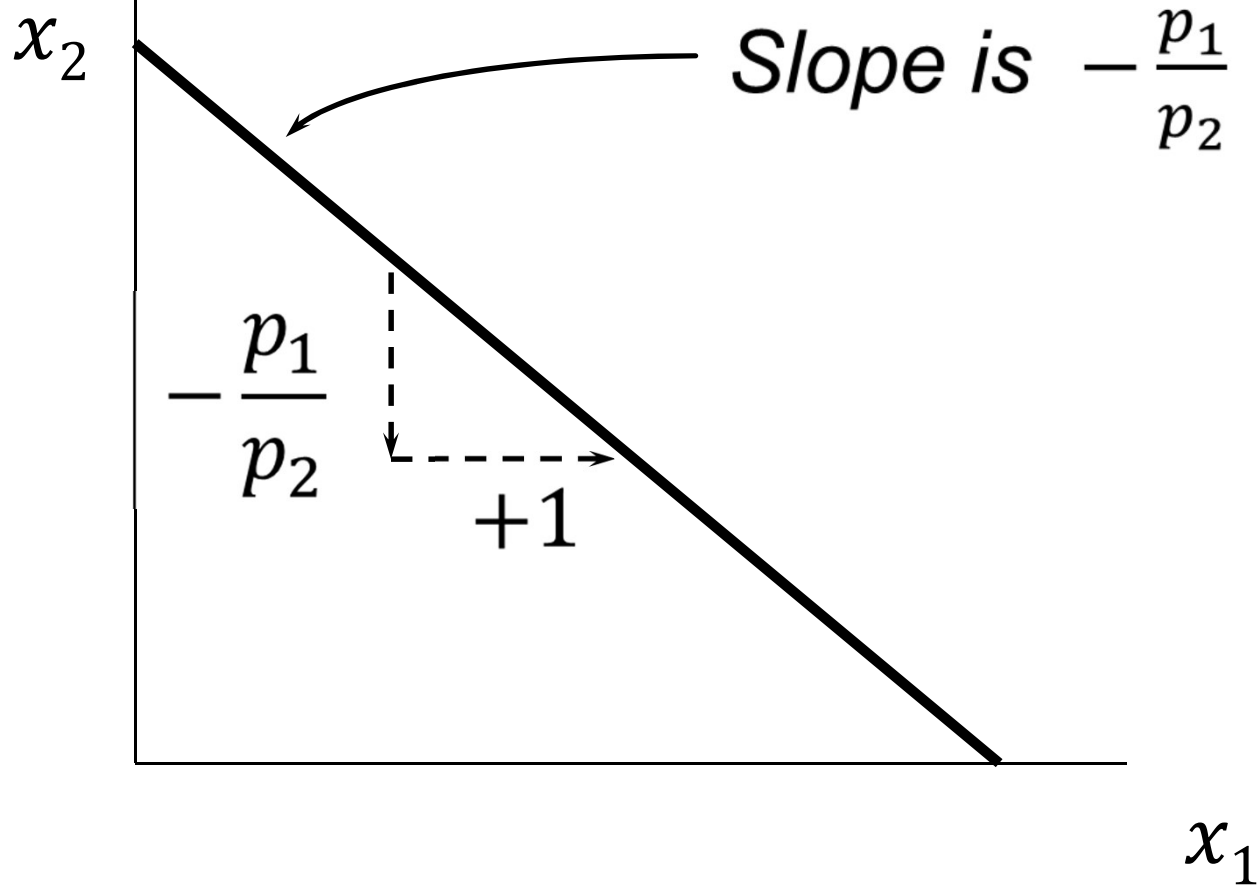
Budget Set and Constraint for Two Commodities



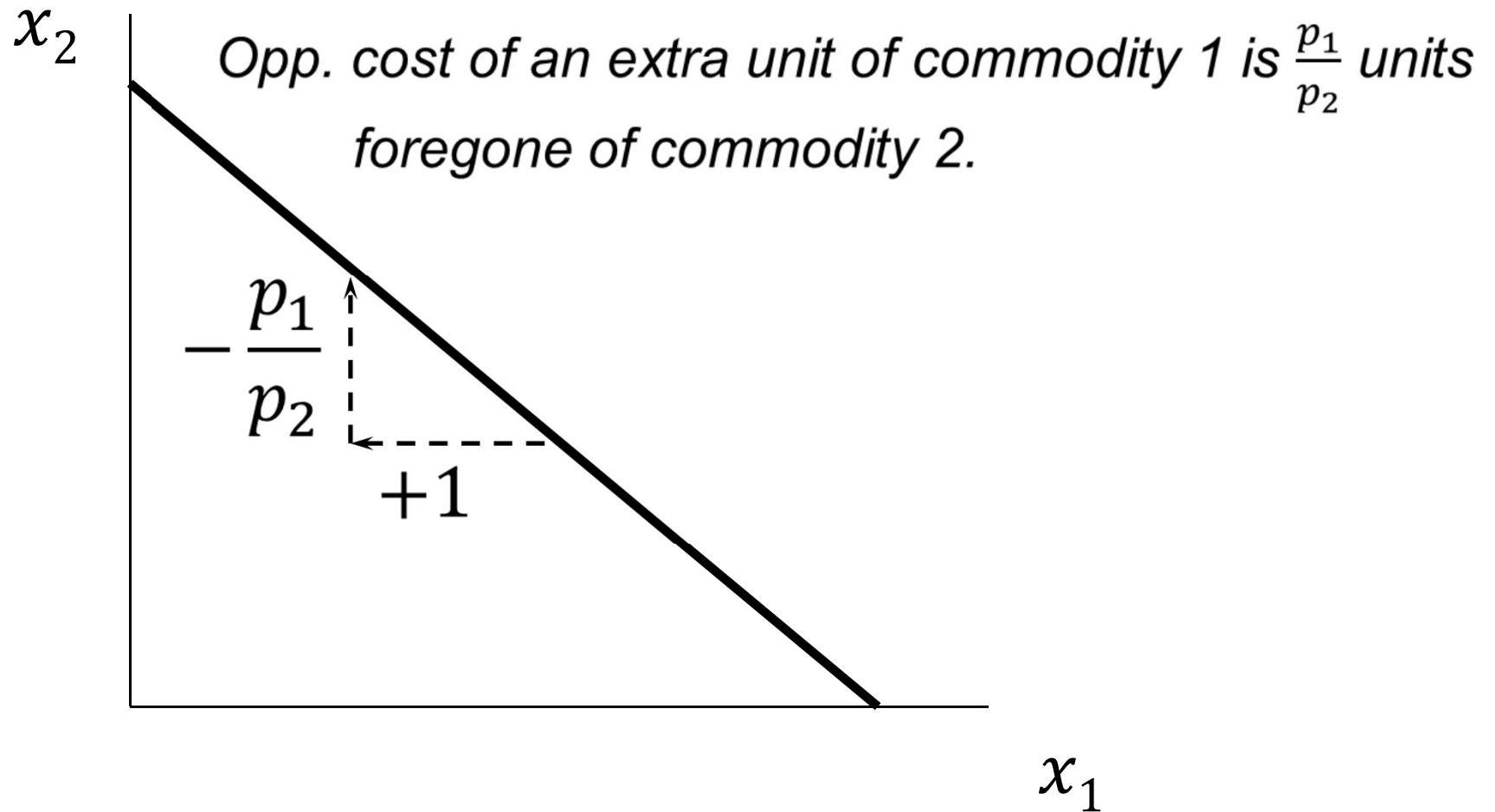
Budget Set and Constraint for Two Commodities



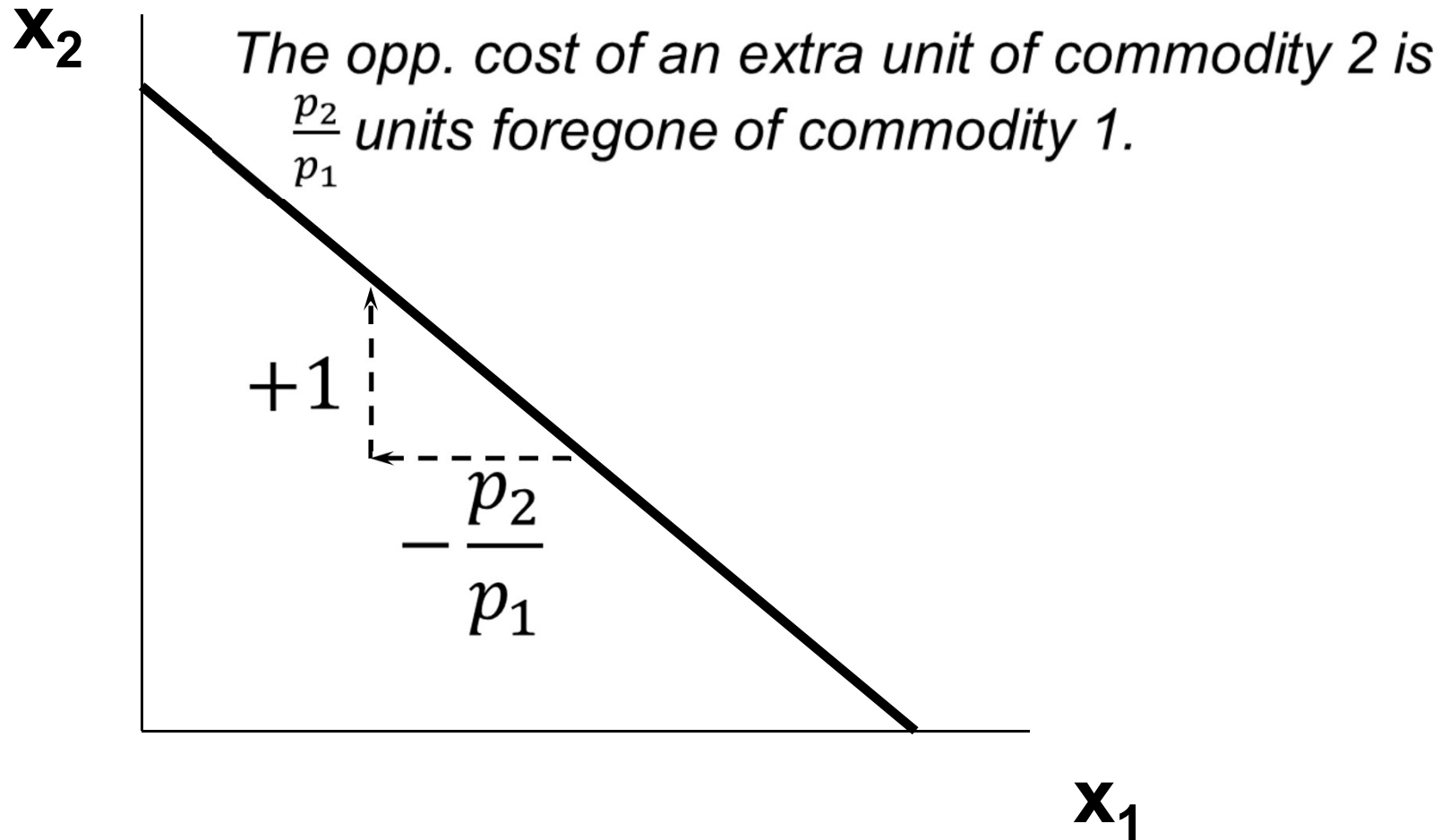
Budget Constraint and Opportunity Cost



Opportunity Cost



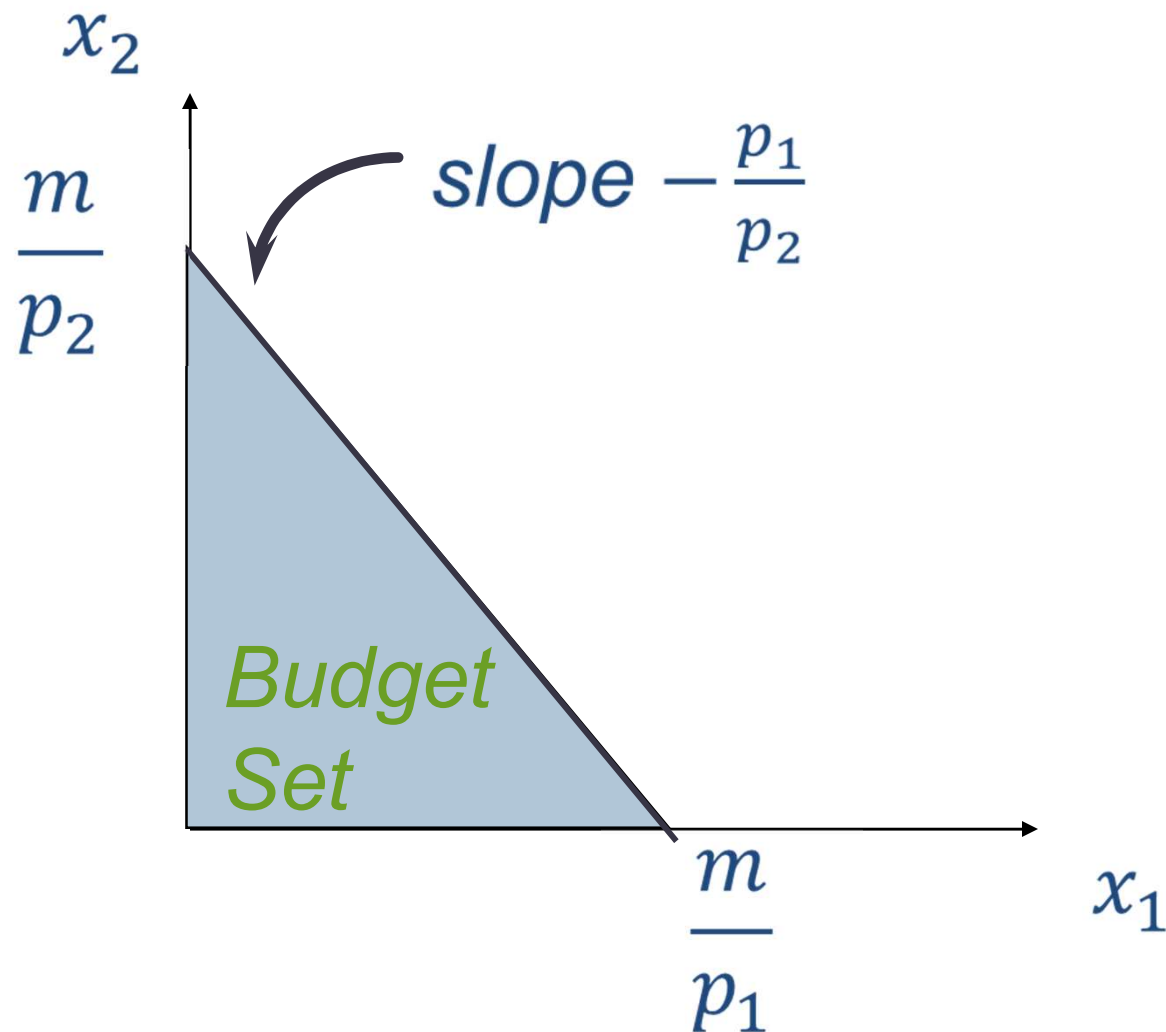
Opportunity Cost



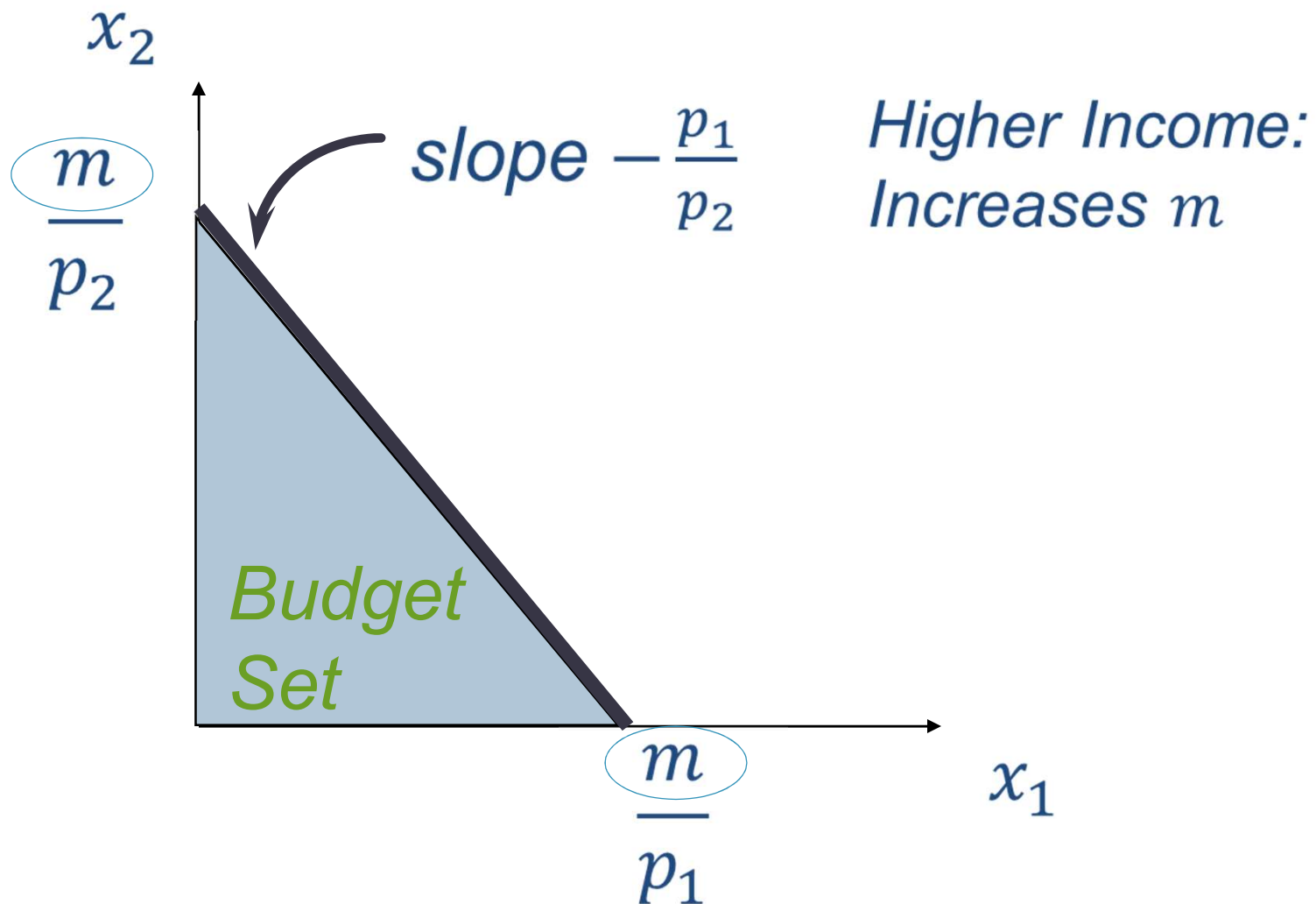
Income and Price Changes

- The budget constraint and budget set depend upon prices and income.
- What happens as prices or income change?
- $p_1x_1 + p_2x_2 = m$

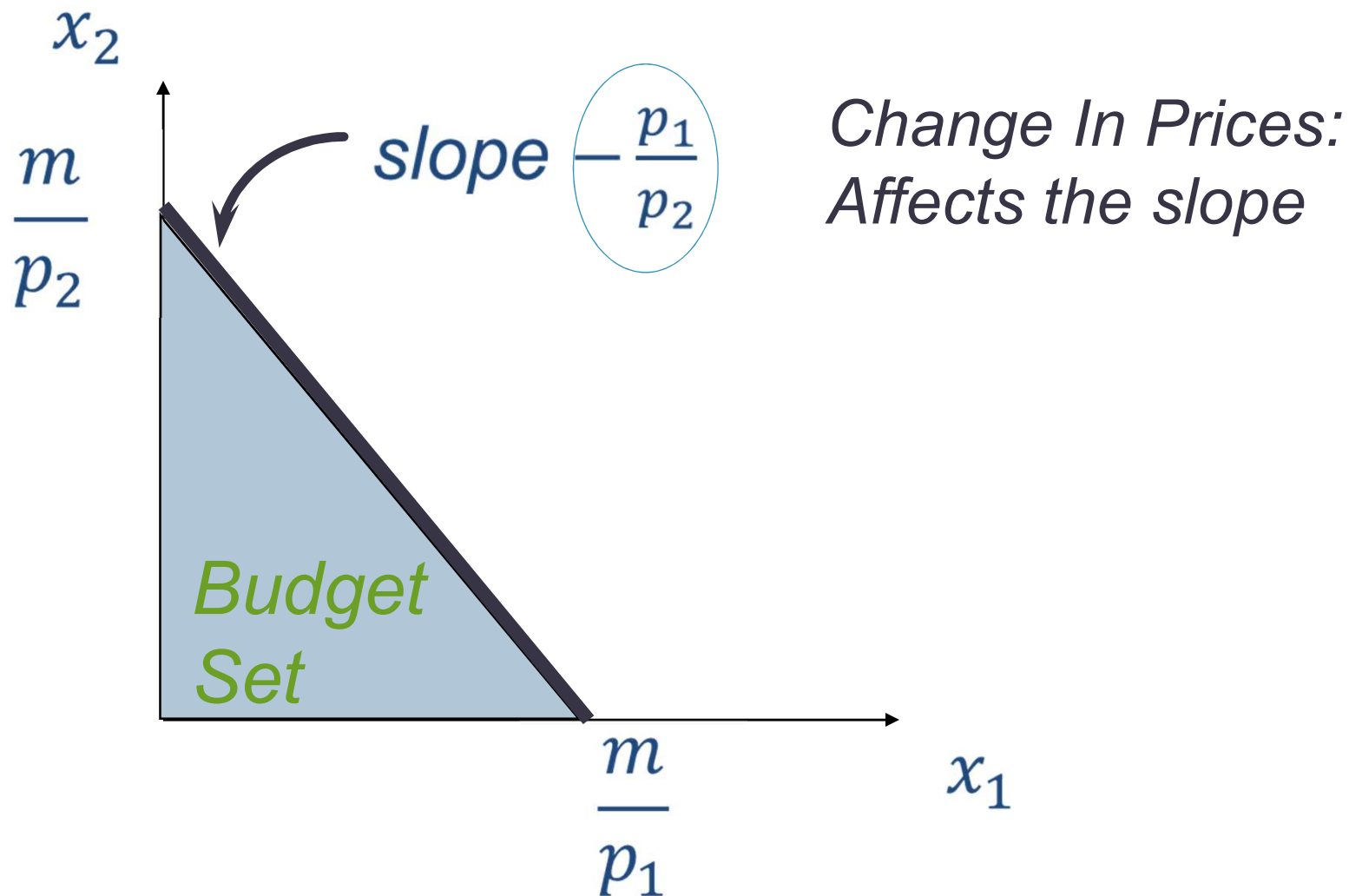
Income and Price Changes



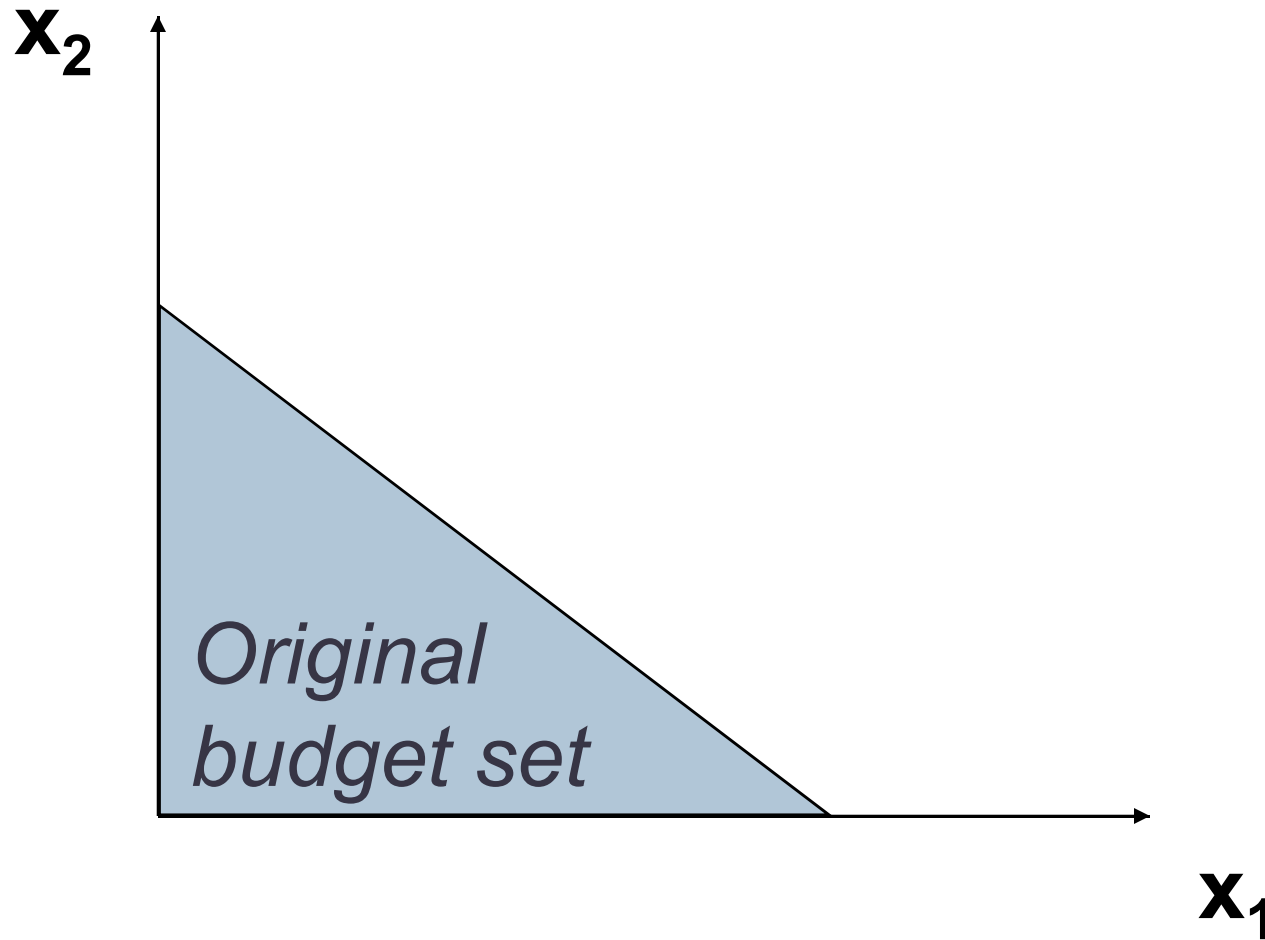
Income and Price Changes



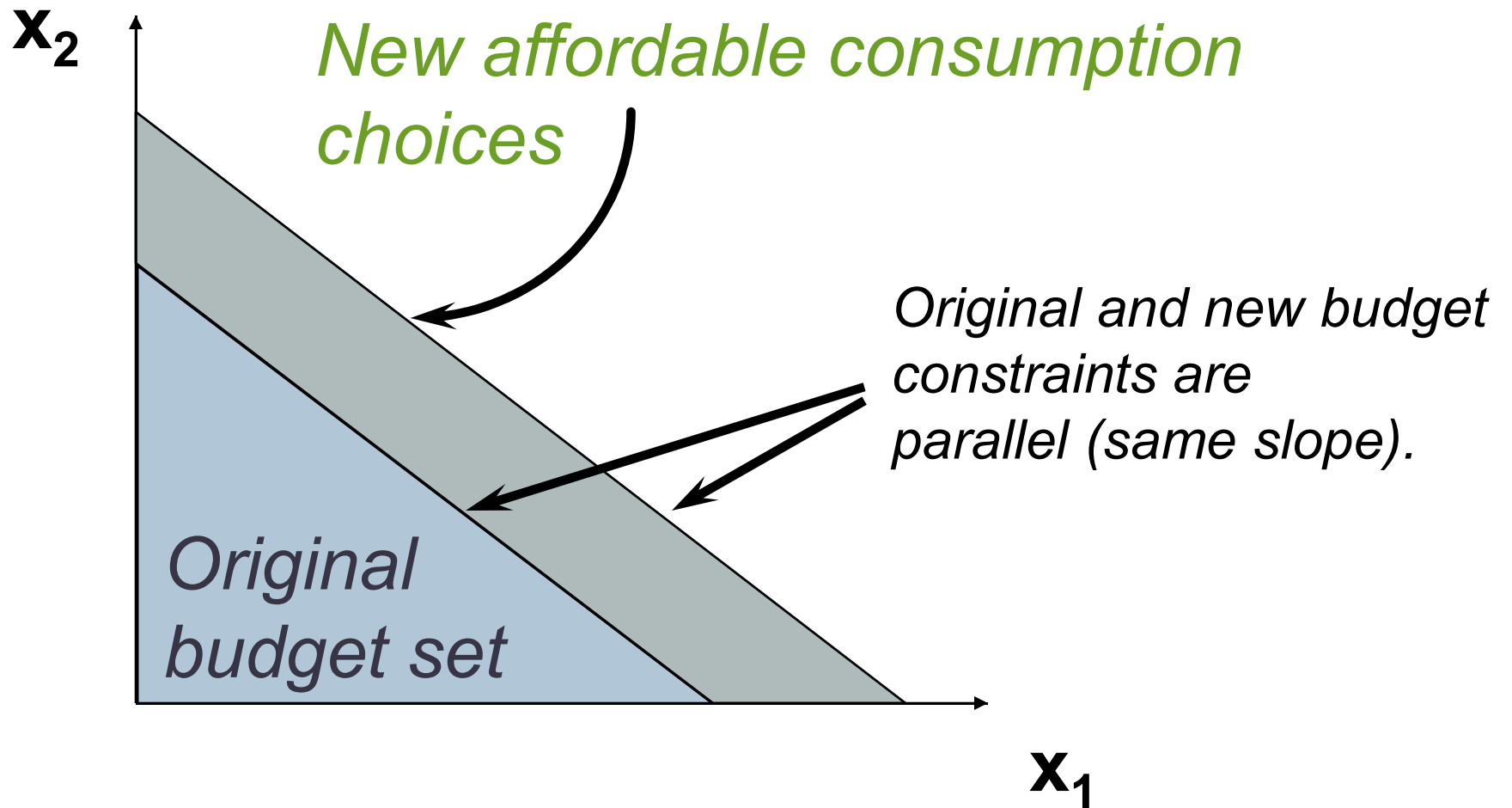
Income and Price Changes



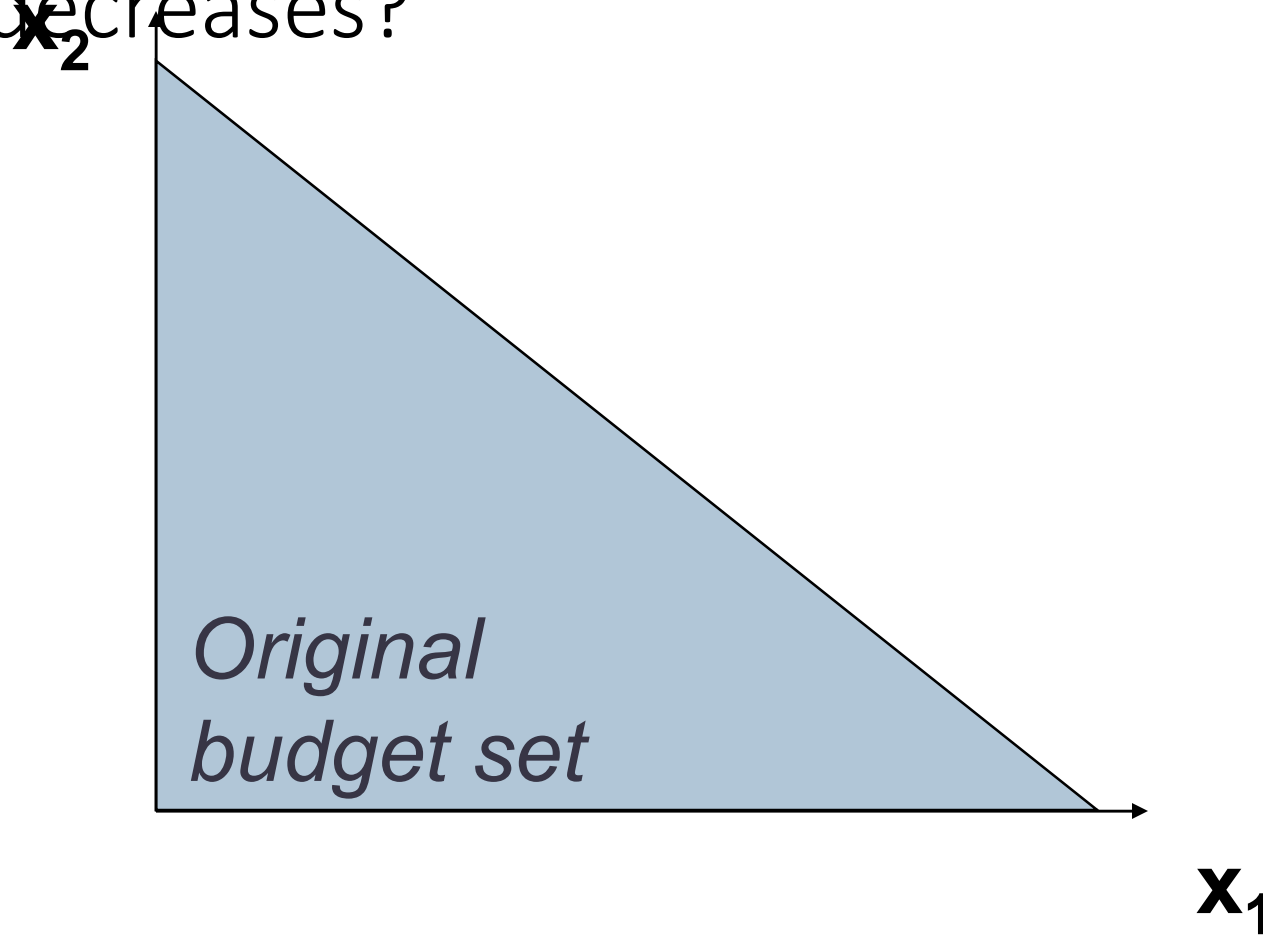
How do the budget set changes as income m increases?



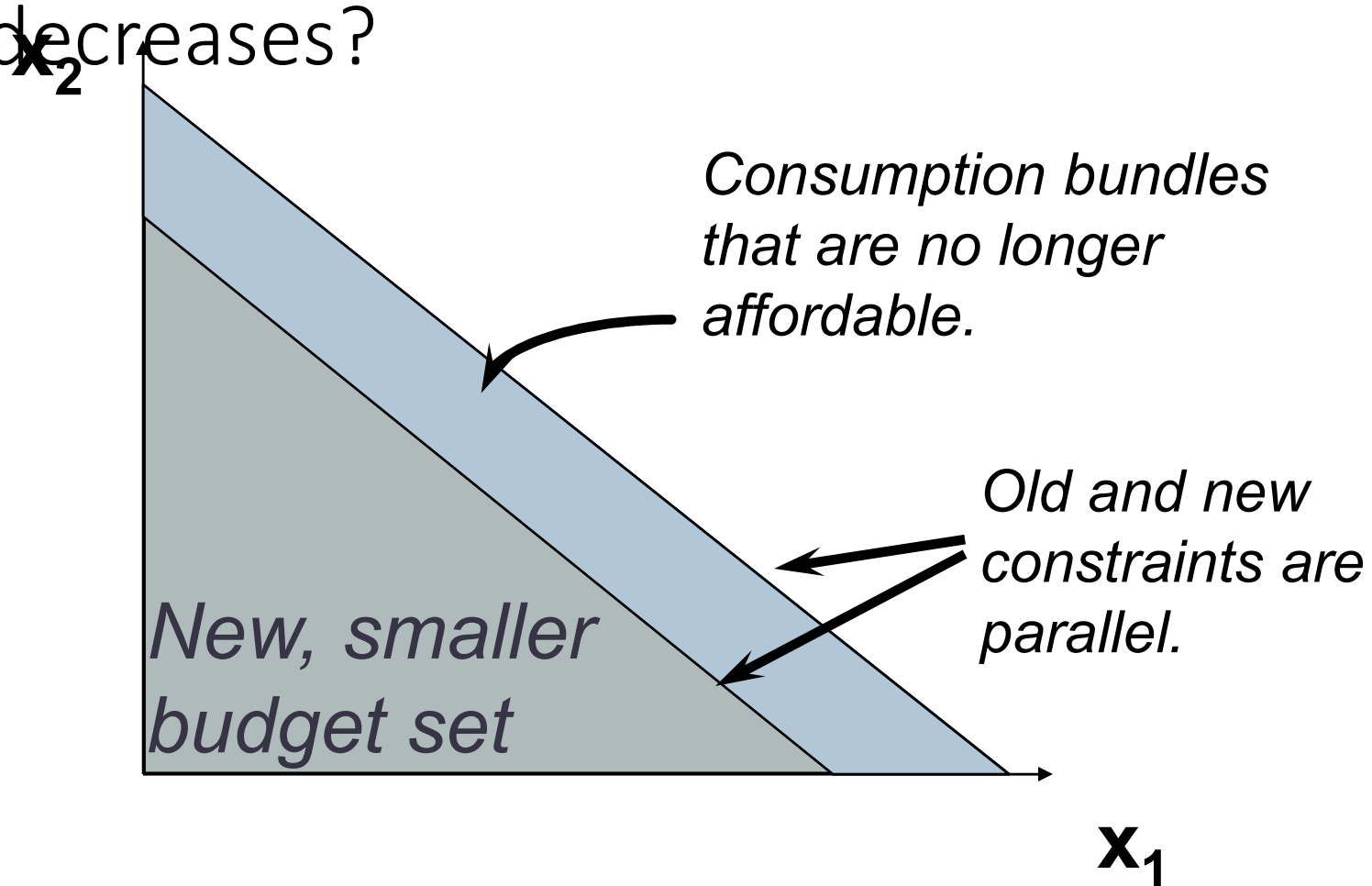
Higher income gives more choice



How do the budget set and budget constraint change as income m decreases?



How do the budget set and budget constraint change as income m decreases?



Budget Constraints - Income Changes

- Increases in income m shift the constraint outward in a parallel manner, thereby enlarging the budget set and improving choice.

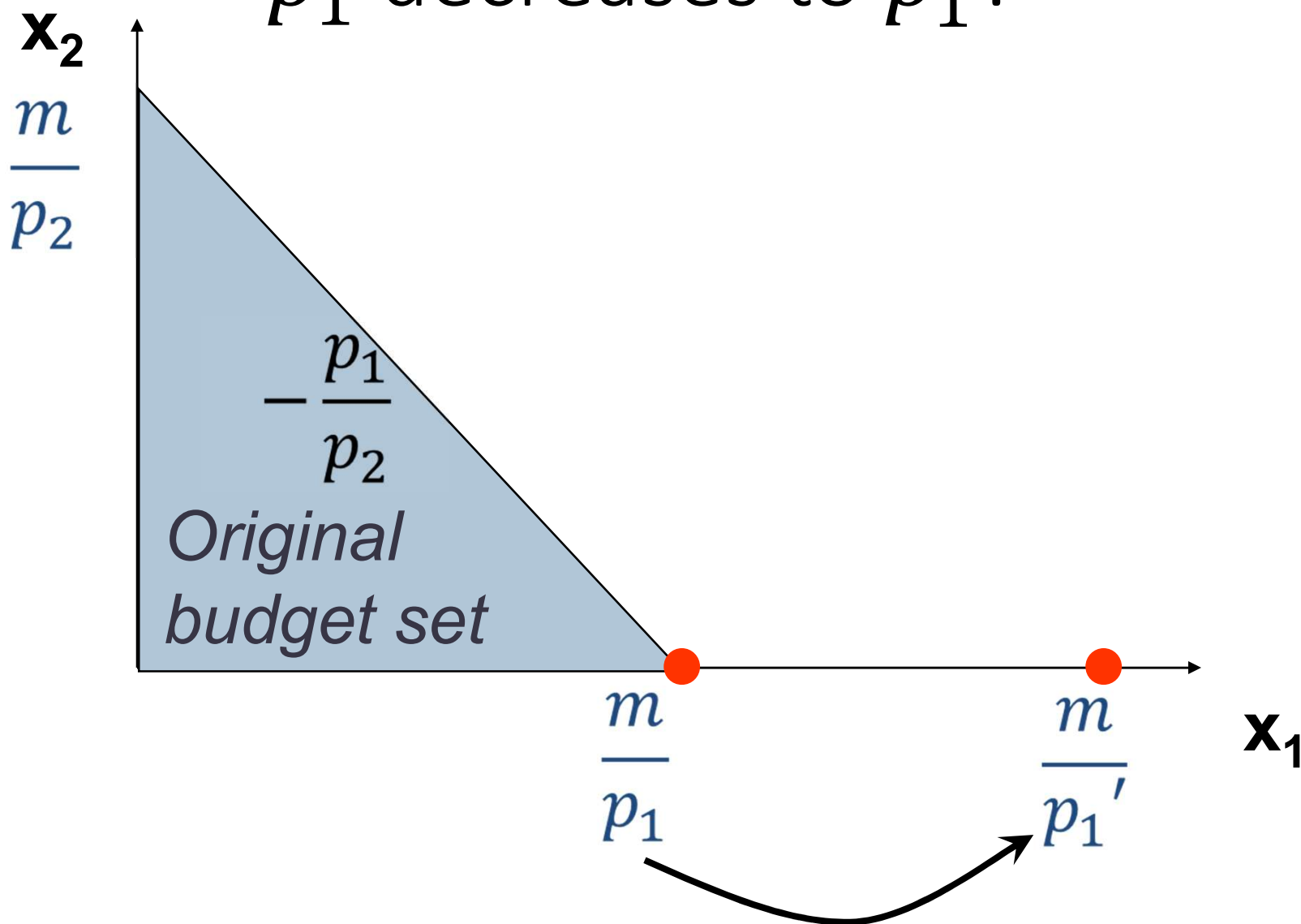
Budget Constraints - Income Changes

- Increases in income m shift the constraint outward in a parallel manner, thereby enlarging the budget set and improving choice.
- Decreases in income m shift the constraint inward in a parallel manner, thereby shrinking the budget set and reducing choice.

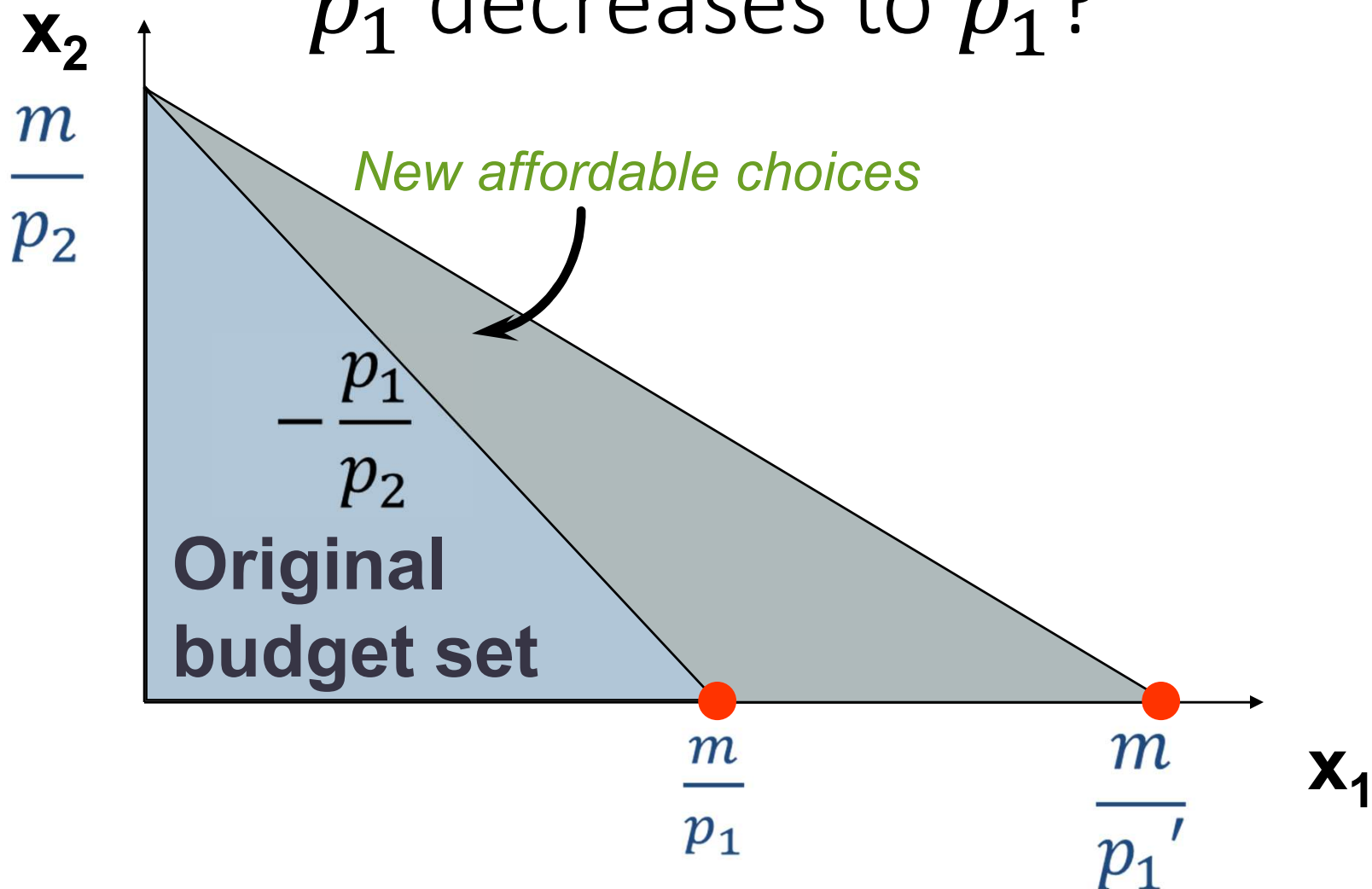
Budget Constraints - Price Changes

- What happens if just one price decreases?
- Suppose p_1 decreases.

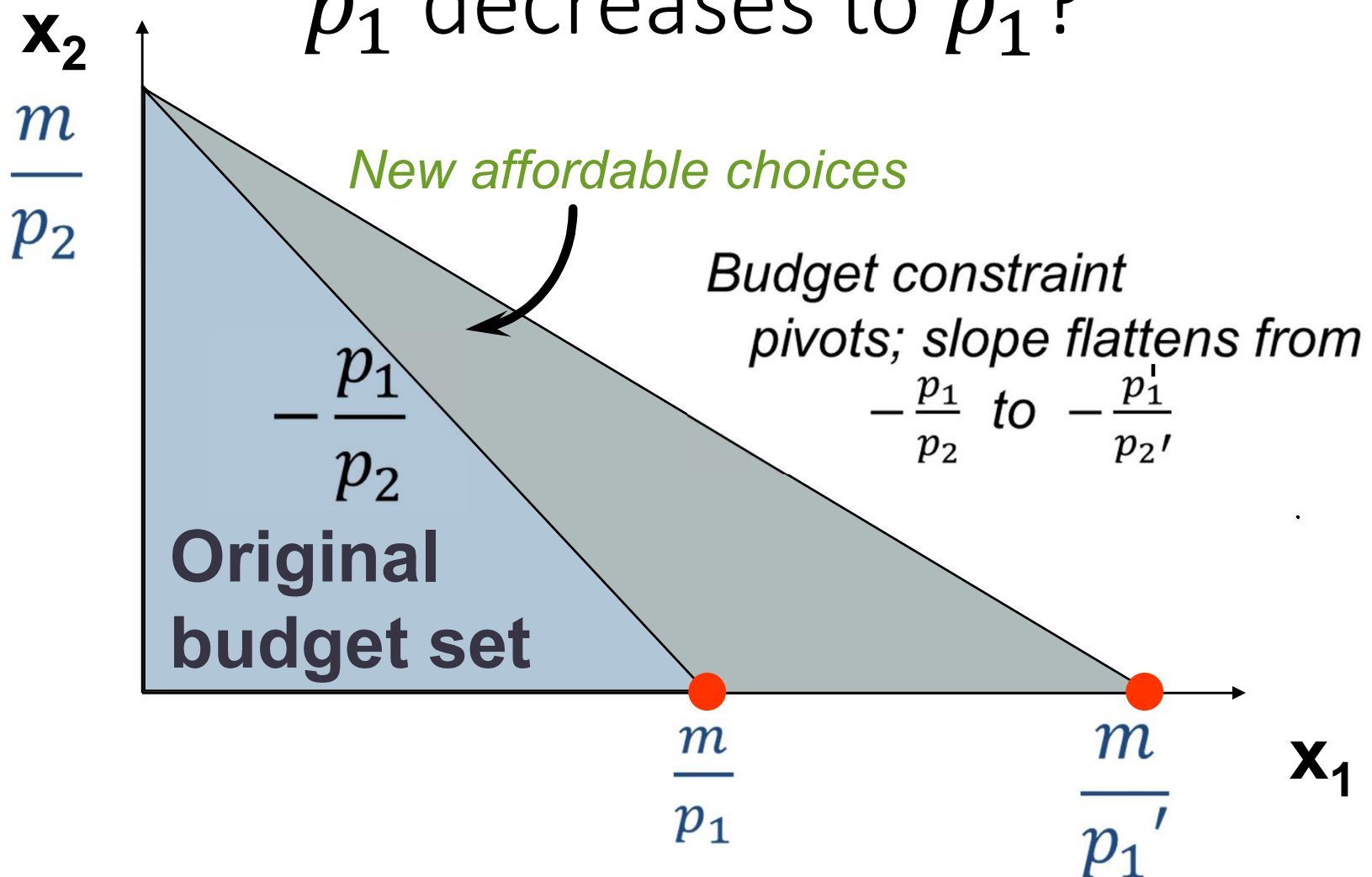
How do the budget set changes as
 p_1 decreases to p_1' ?



How do the budget set changes as p_1 decreases to p_1' ?



How do the budget set changes as p_1 decreases to p_1' ?



Budget Constraints - Price Changes

- Reducing the price of one commodity pivots the constraint outward.
- No old choice is lost and new choices are added, so reducing one price cannot make the consumer worse off.
- Similarly, increasing one price pivots the constraint inwards, reduces choice and may (typically will) make the consumer worse off.

Shapes of Budget Constraints

- Q: What makes a budget constraint a straight line?
- A: A straight line has a constant slope and the constraint is

$$p_1x_1 + \dots + p_nx_n = m$$

so if prices are constants then a constraint is a straight line.

Kinked Budget Line

- But what if prices are not constants?
- *E.g.* bulk buying discounts, or price penalties for buying “too much”.
- Then constraints will be curved.

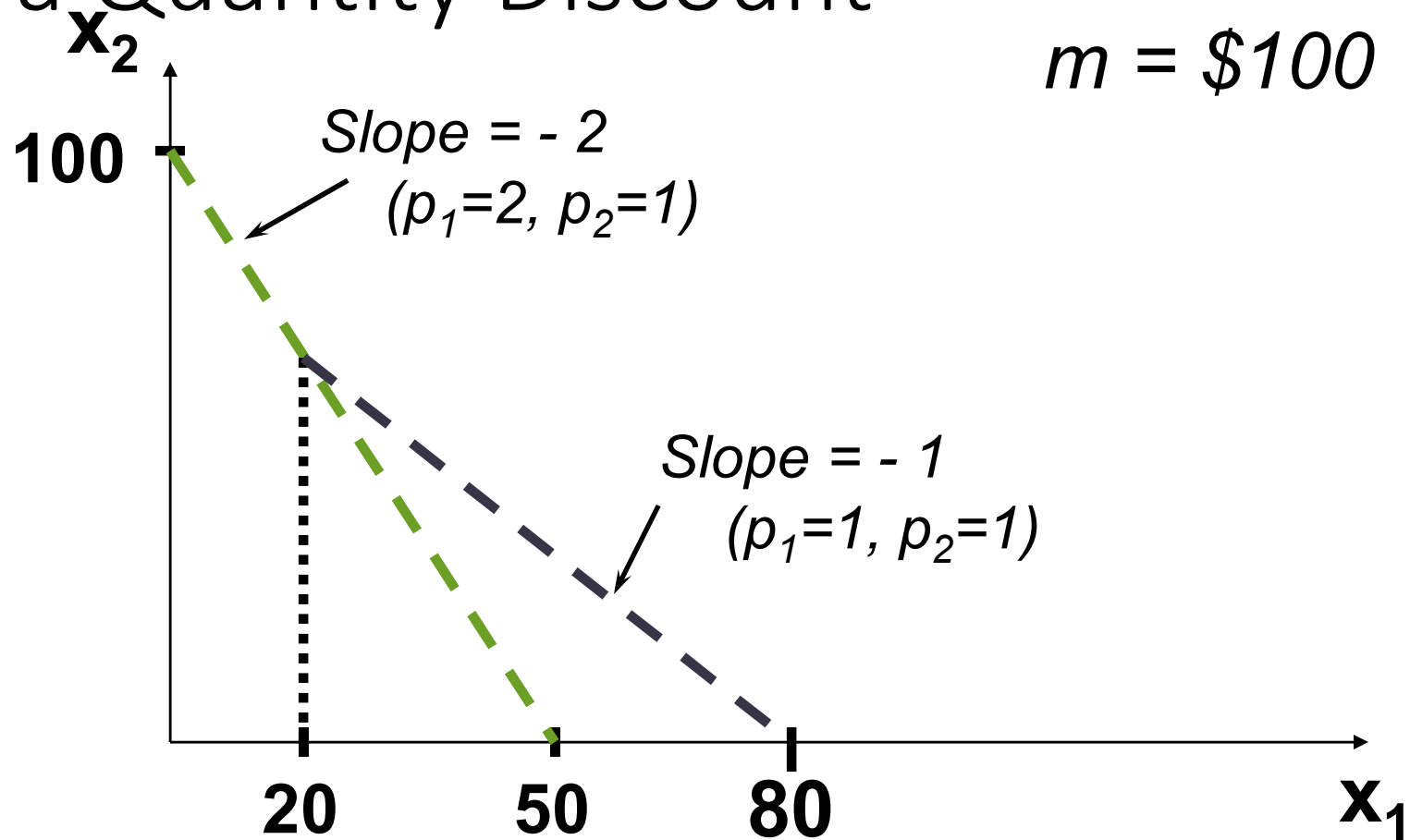
Shapes of Budget Constraints - Quantity Discounts

- Suppose p_2 is constant at \$1 but that $p_1 = \$2$ for $0 \leq x_1 \leq 20$ and $p_1 = \$1$ for $x_1 > 20$.

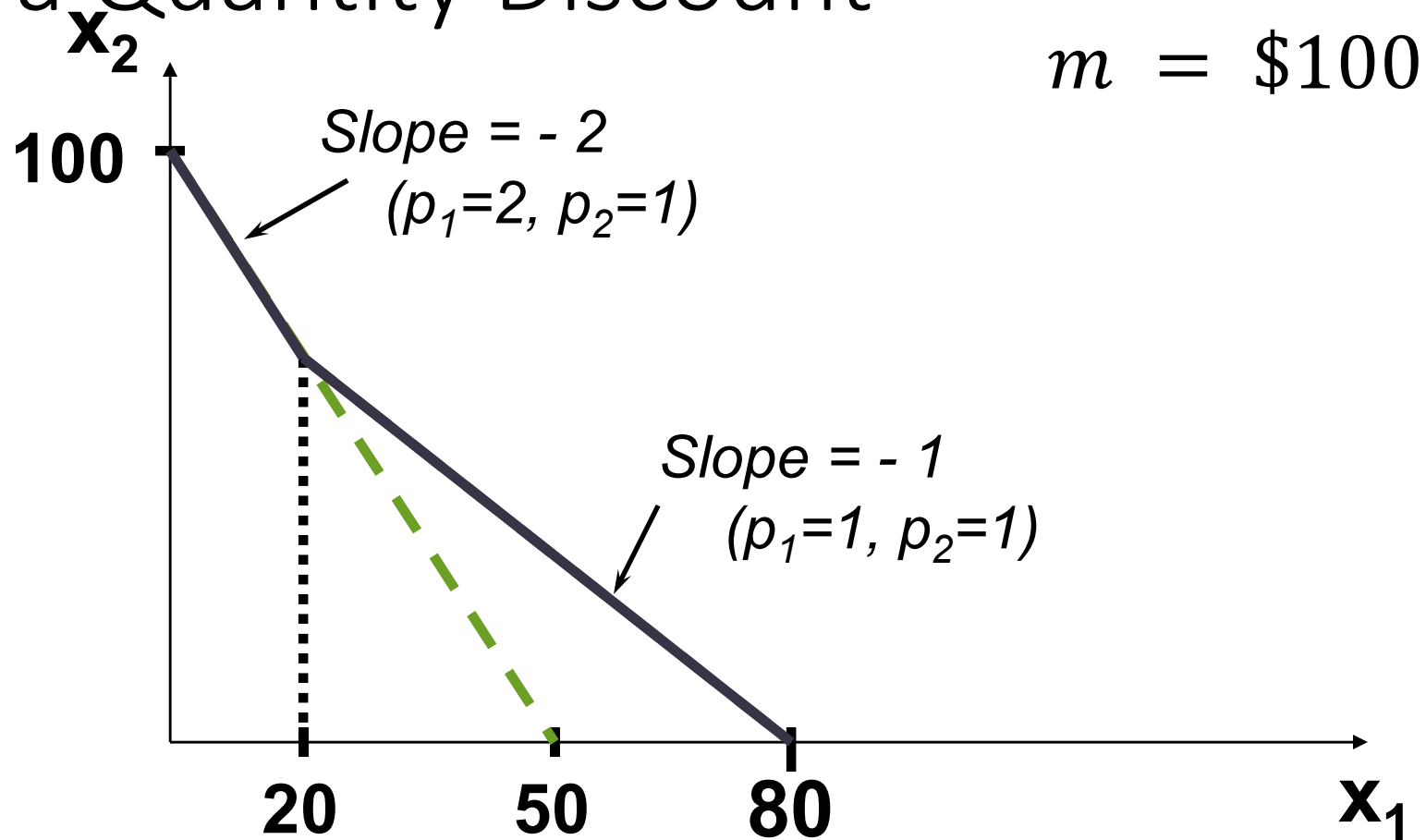
Shapes of Budget Constraints - Quantity Discounts

- Suppose p_2 is constant at \$1 but that $p_1 = \$2$ for $0 \leq x_1 \leq 20$ and $p_1 = \$1$ for $x_1 > 20$. Then the constraint's slope is :
- $-\frac{p_1}{p_2} = -2$, for $0 \leq x_1 \leq 20$
- $-\frac{p_1}{p_2} = -1$, for $x_1 > 20$
and the constraint is

Shapes of Budget Constraints with a Quantity Discount

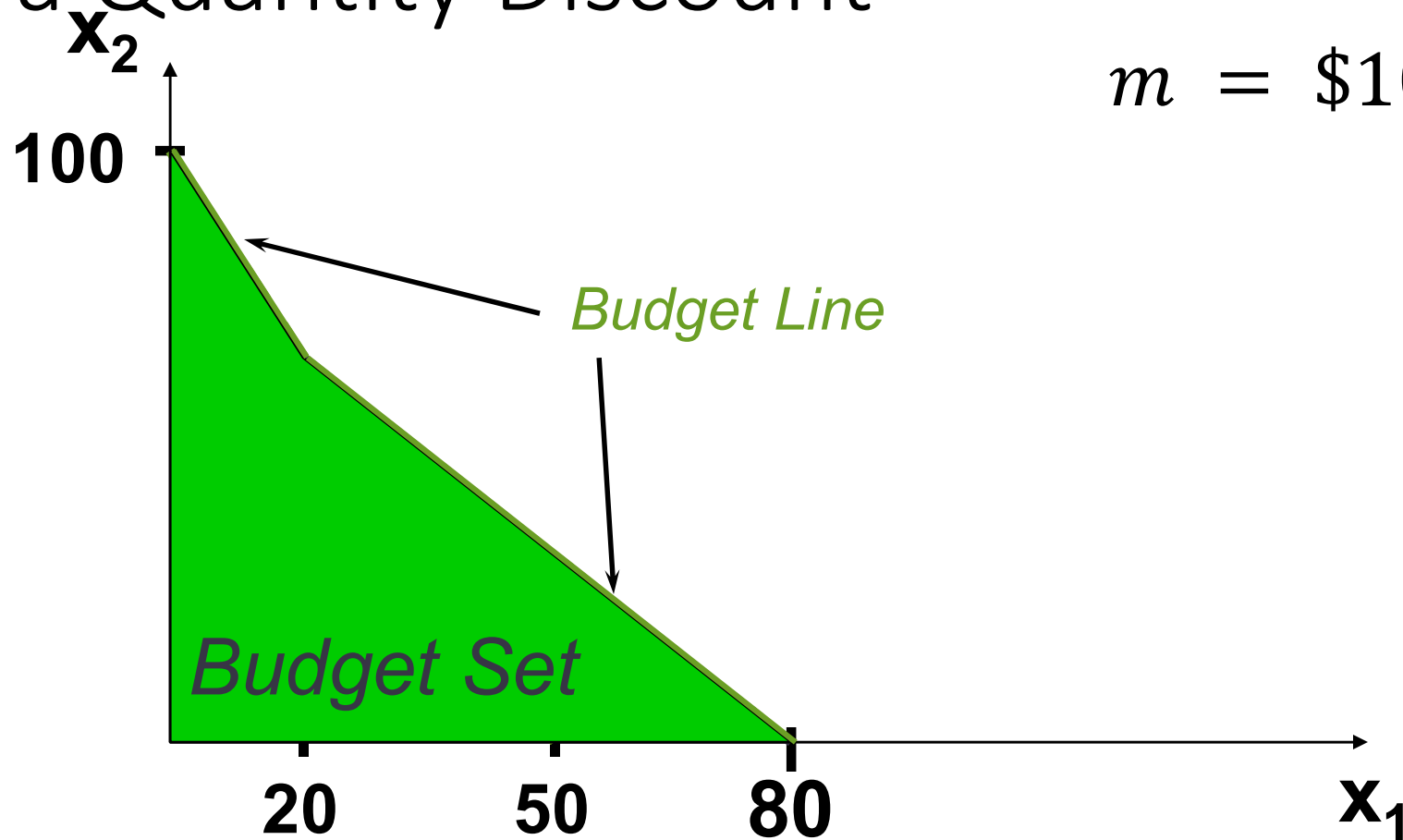


Shapes of Budget Constraints with a Quantity Discount

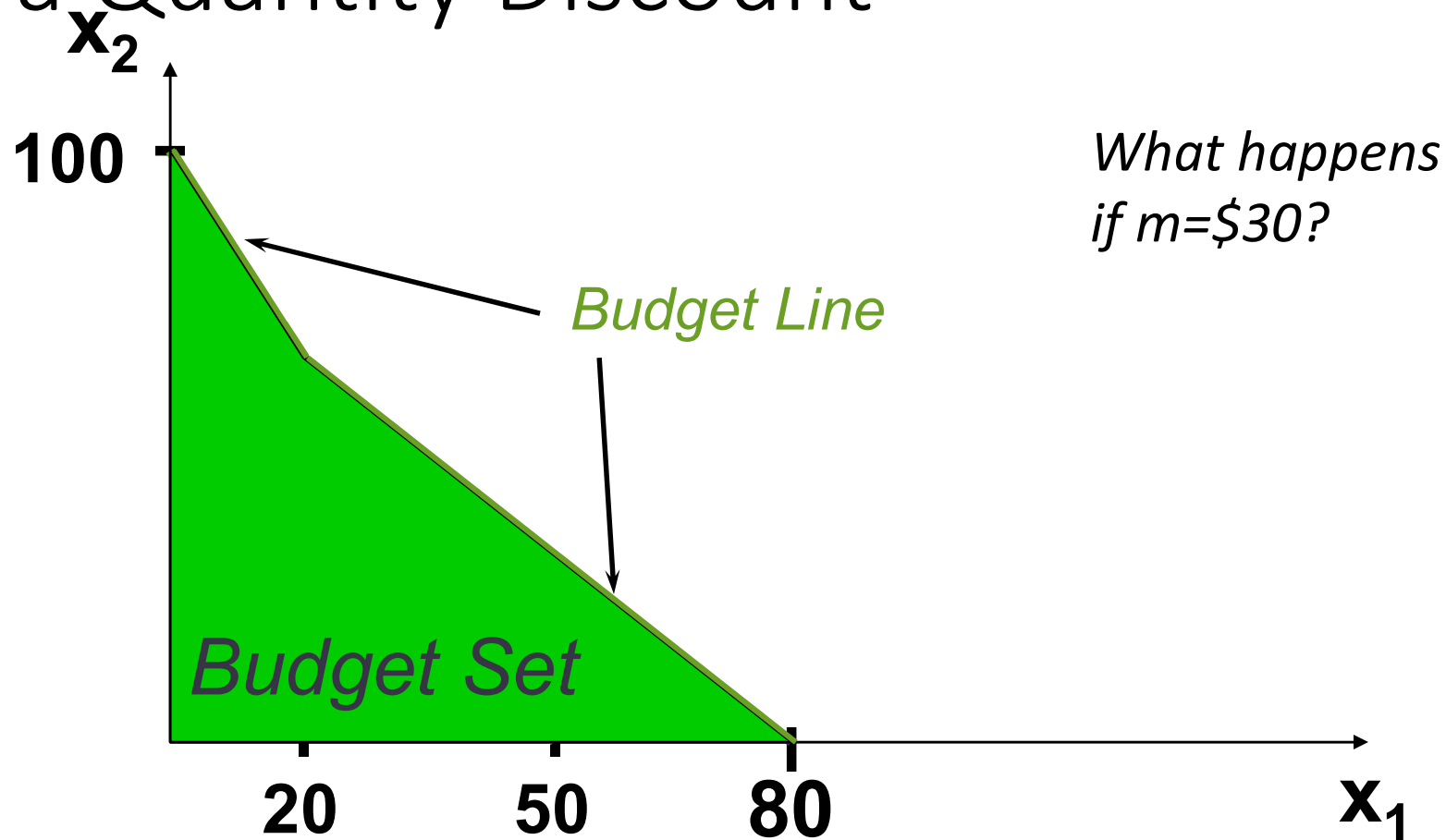


Shapes of Budget Constraints with a Quantity Discount

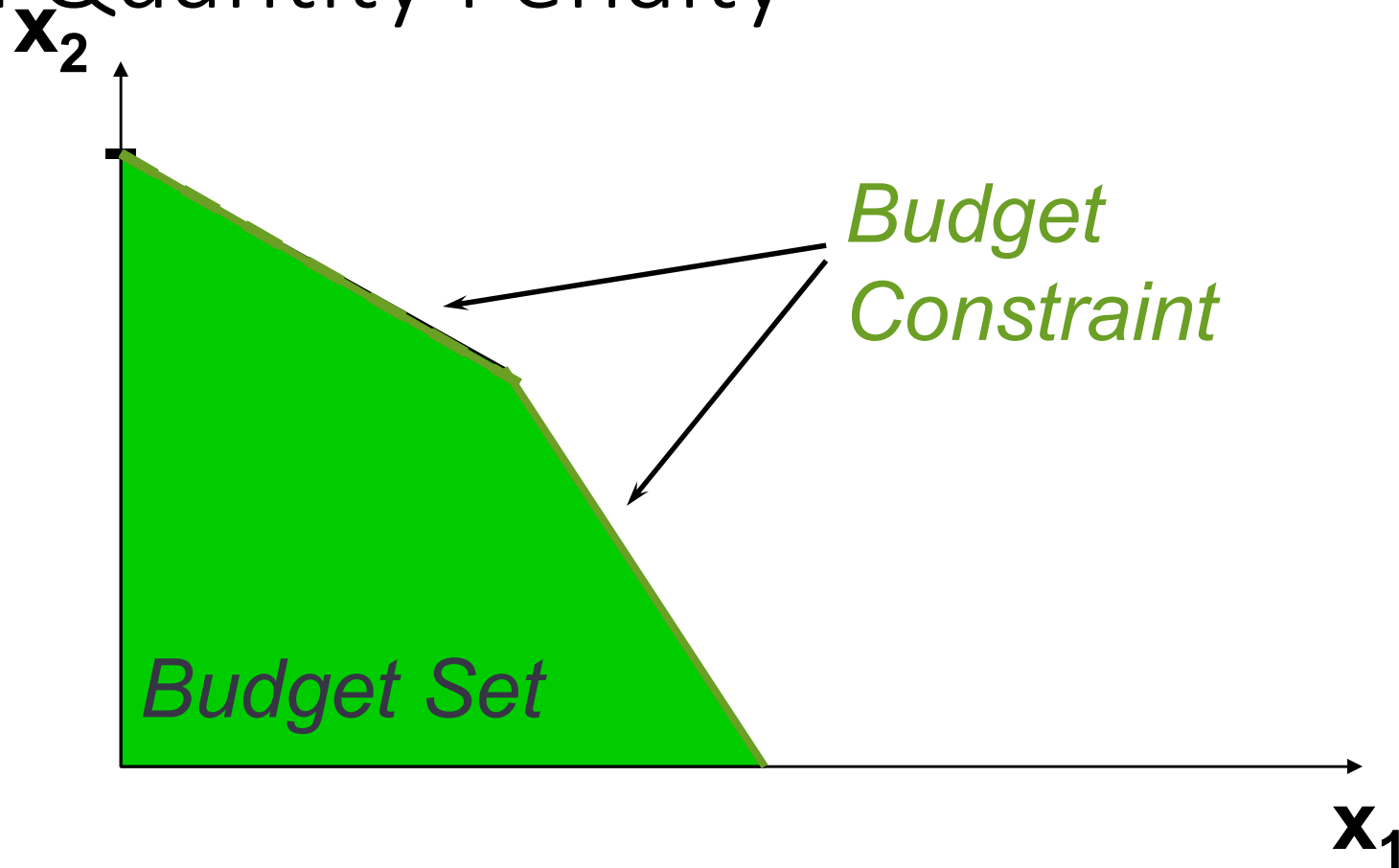
$$m = \$100$$



Shapes of Budget Constraints with a Quantity Discount



Shapes of Budget Constraints with a Quantity Penalty



Taxes and Subsidies

Taxes and Subsidies

- Quantity tax: Fixed amount per unit of the good.
- Ad valorem: Tax on the price of the good.
- Lump sum tax: Government takes a fixed amount of money.

Uniform *Ad Valorem* Sales Taxes

- An *ad valorem* sales tax levied at a rate of 5% increases all prices by 5%, from p to $(1+0.05)p = 1.05p$.
- An *ad valorem* sales tax levied at a rate of t increases all prices by tp from p to $(1+t)p$.

Uniform *Ad Valorem* Sales Taxes

- Tax levied at rate t changes the constraint from

$$p_1x_1 + p_2x_2 = m$$

to

$$(1+t)p_1x_1 + (1+t)p_2x_2 = m$$

Uniform *Ad Valorem* Sales Taxes

- A uniform sales tax levied at rate t changes the constraint from

$$p_1x_1 + p_2x_2 = m$$

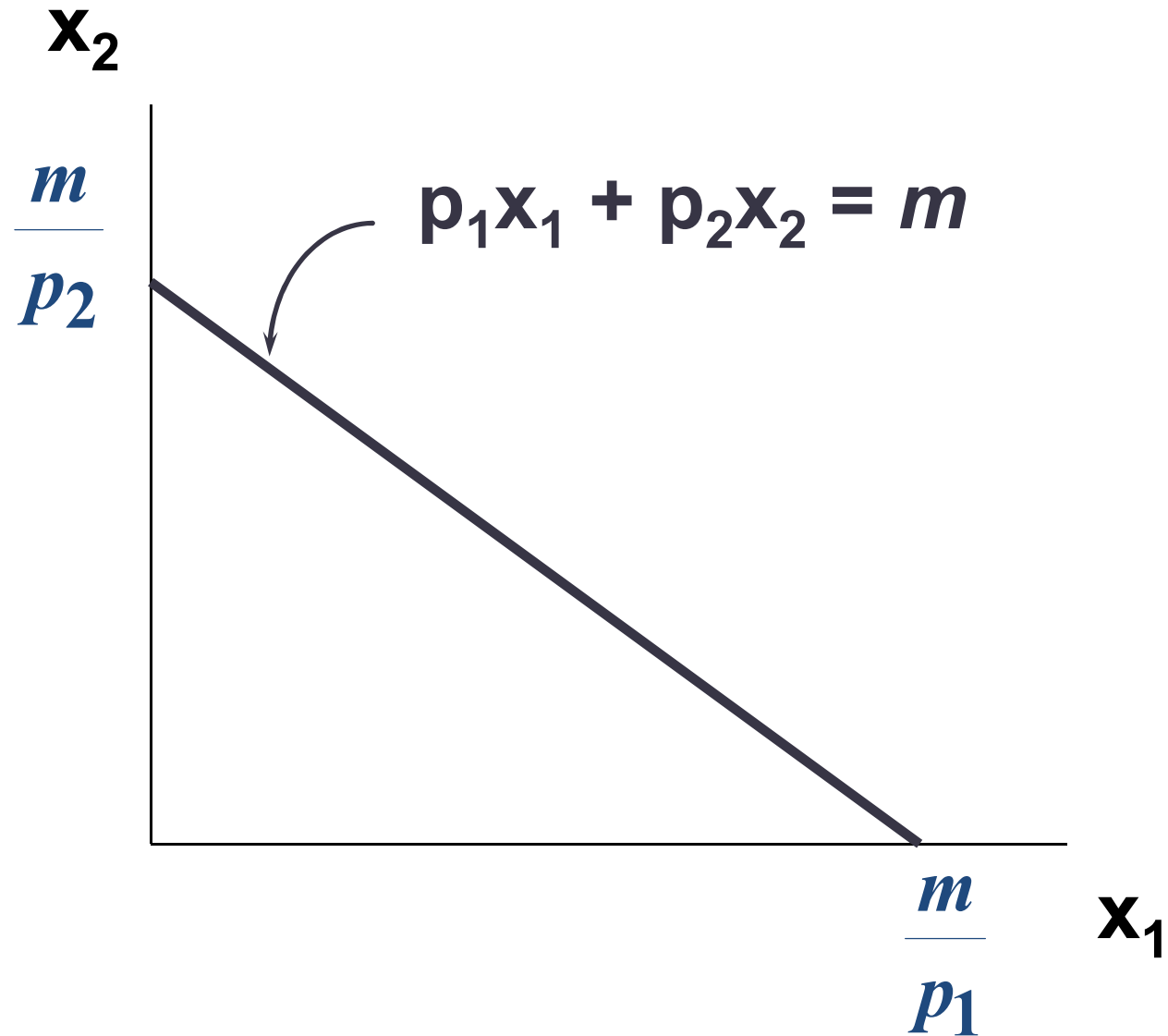
to

$$(1+t)p_1x_1 + (1+t)p_2x_2 = m$$

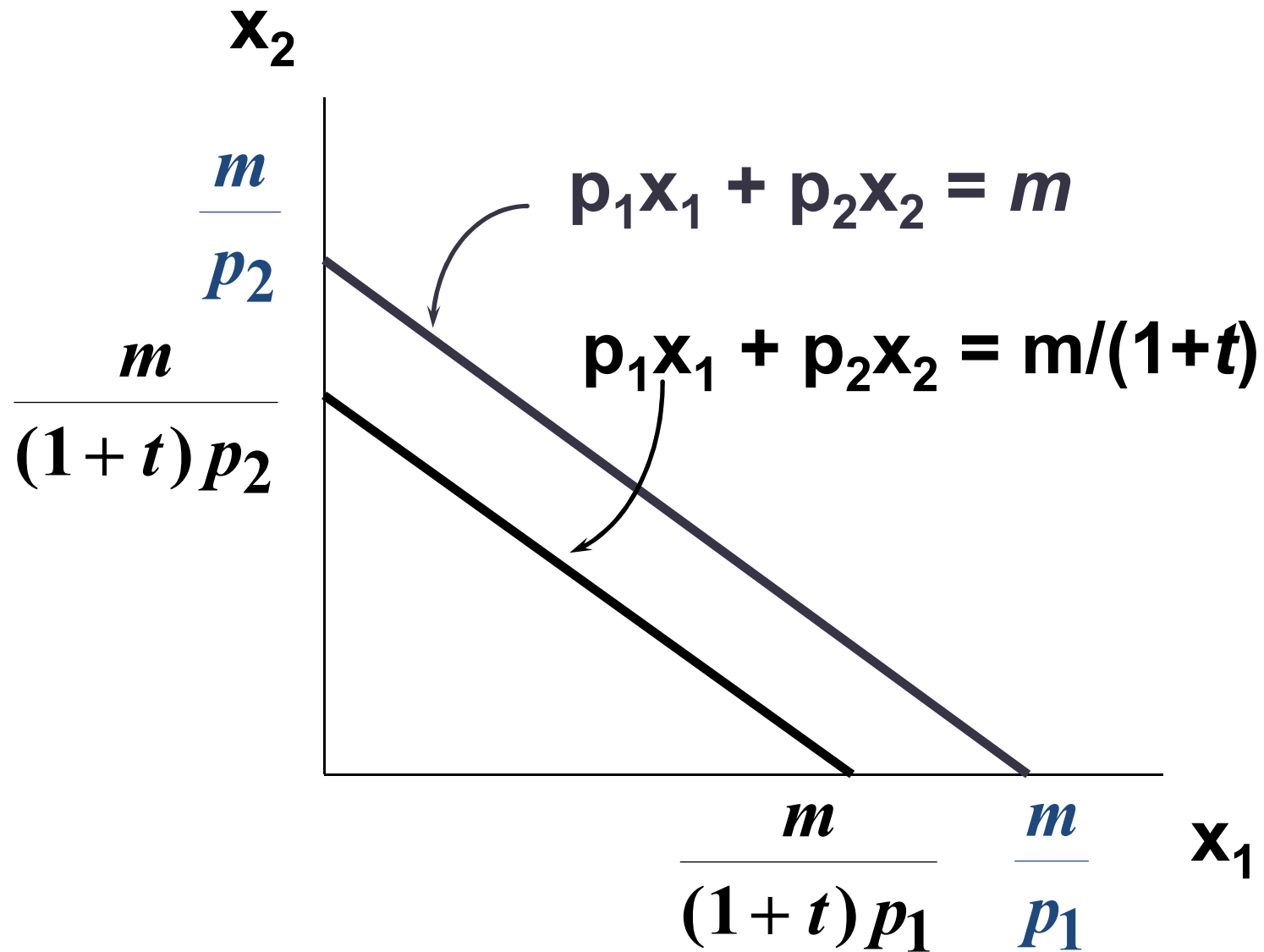
i.e.

$$p_1x_1 + p_2x_2 = m/(1+t).$$

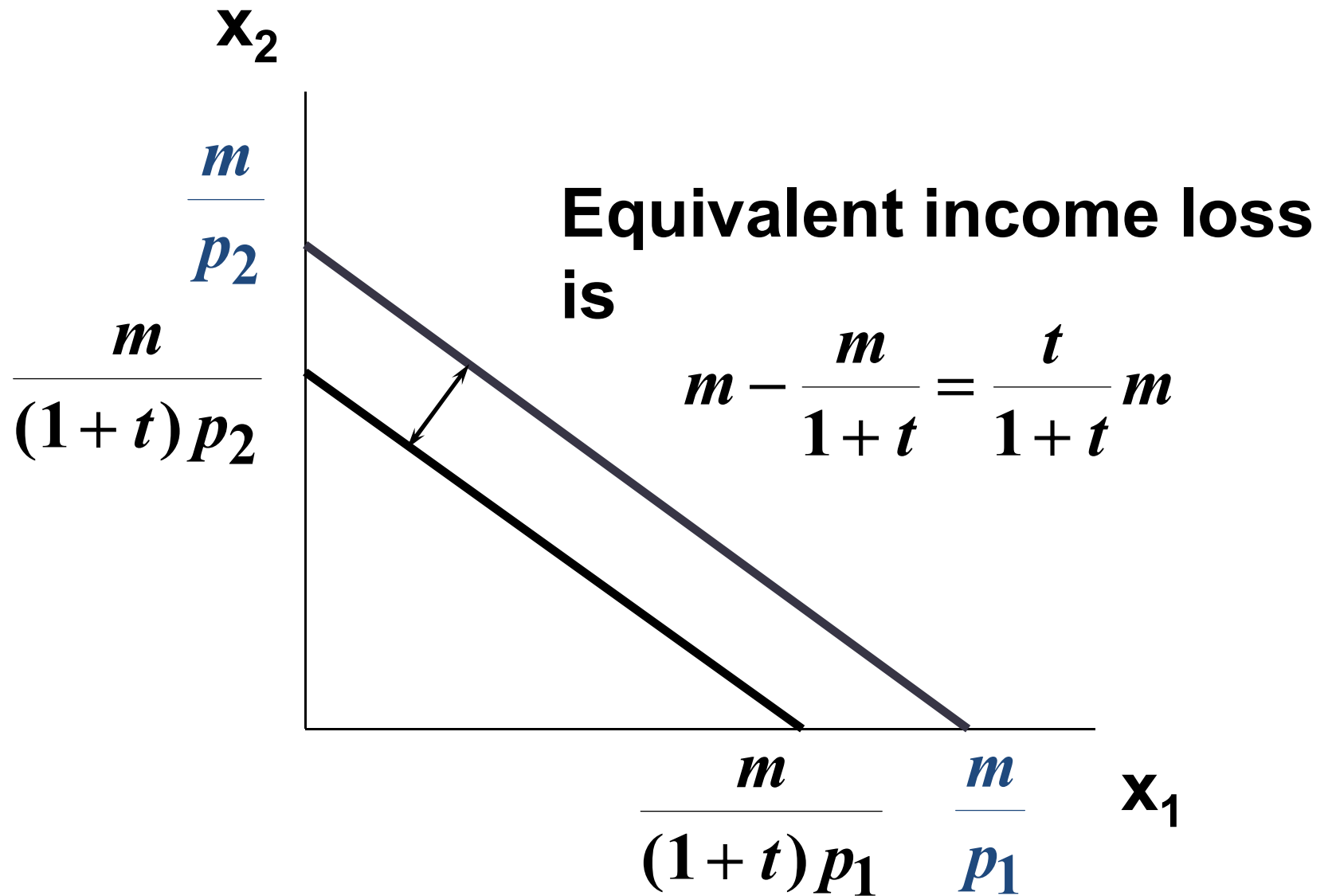
Uniform *Ad Valorem* Sales Taxes



Uniform *Ad Valorem* Sales Taxes



Uniform *Ad Valorem* Sales Taxes



Exercise

- You have an income of \$50 to spend on two commodities. Commodity 1 costs \$12 per unit and commodity 2 costs \$5 per unit.
 1. Write down your budget equation.
 2. Suppose the government taxes \$2 per unit on commodity 1 and 5% per price on good 2. Write down your new budget equation.