Università Bocconi

Microeconomics

Prof. Elisa Borghi &
Prof. Maristella Botticini

Lecture T4

Chapter 6: Demand

Road map

1. Comparative statics analysis
2. **When the own price changes**
   i. price-offer curve
   ii. (direct) demand function (x is function of p)
      a) ordinary goods
      b) Giffen goods
   iii. inverse demand function (p is function of x)
3. **When the price of the other good changes**
   i. (gross) complements
   ii. (gross) substitutes
   iii. unrelated goods
4. **When the income changes**
   i. income-offer curve
   ii. shifts of the demand function
   iii. Engel curve

1. Properties of Demand Functions --- Comparative statics

- Comparative statics analysis of ordinary demand functions is the study of how ordinary demands

$$x_1^*(p_1, p_2, m)$$

$$x_2^*(p_1, p_2, m)$$

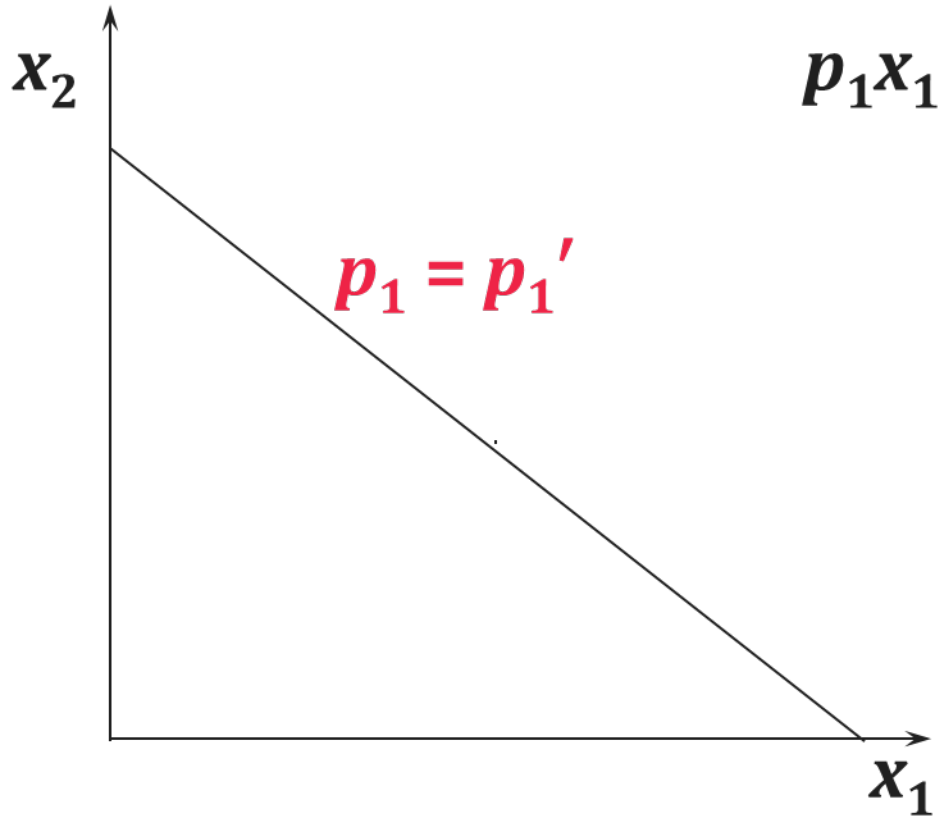
change as prices (p_1, p_2) and income (m) change.

2. Own-Price Changes

- QUESTION: How does $x_1^*(p_1, p_2, m)$ change **as p_1 changes**, holding p_2 and m constant?

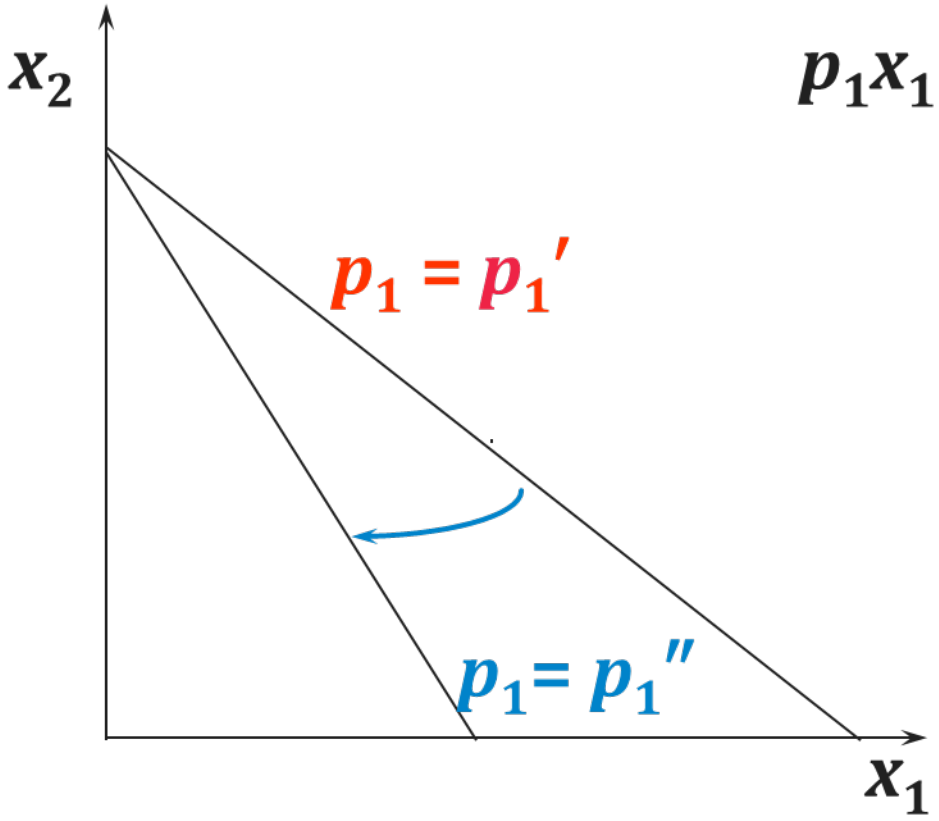
- Suppose only p_1 increases, from p_1' to p_1'' and then to p_1'''.

2. Own-Price Changes (fixed p_2 and m) --- initial budget set



$$p_1x_1 + p_2x_2 = m$$

2. Own-Price Changes (fixed p_2 and m) --- new budget set



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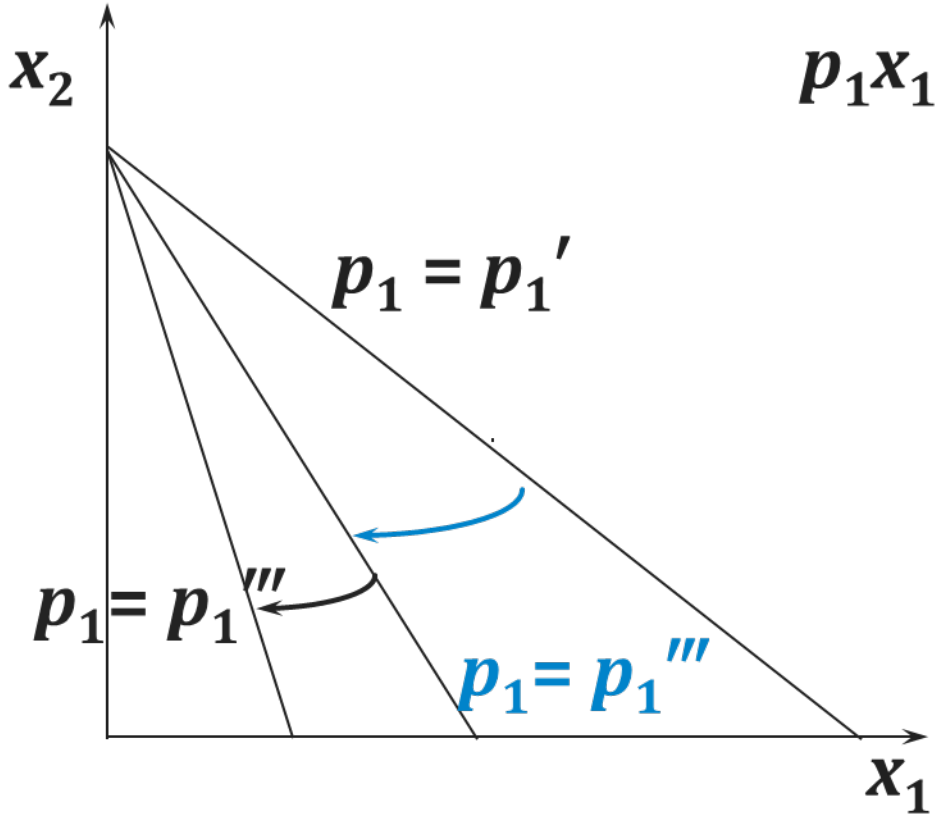
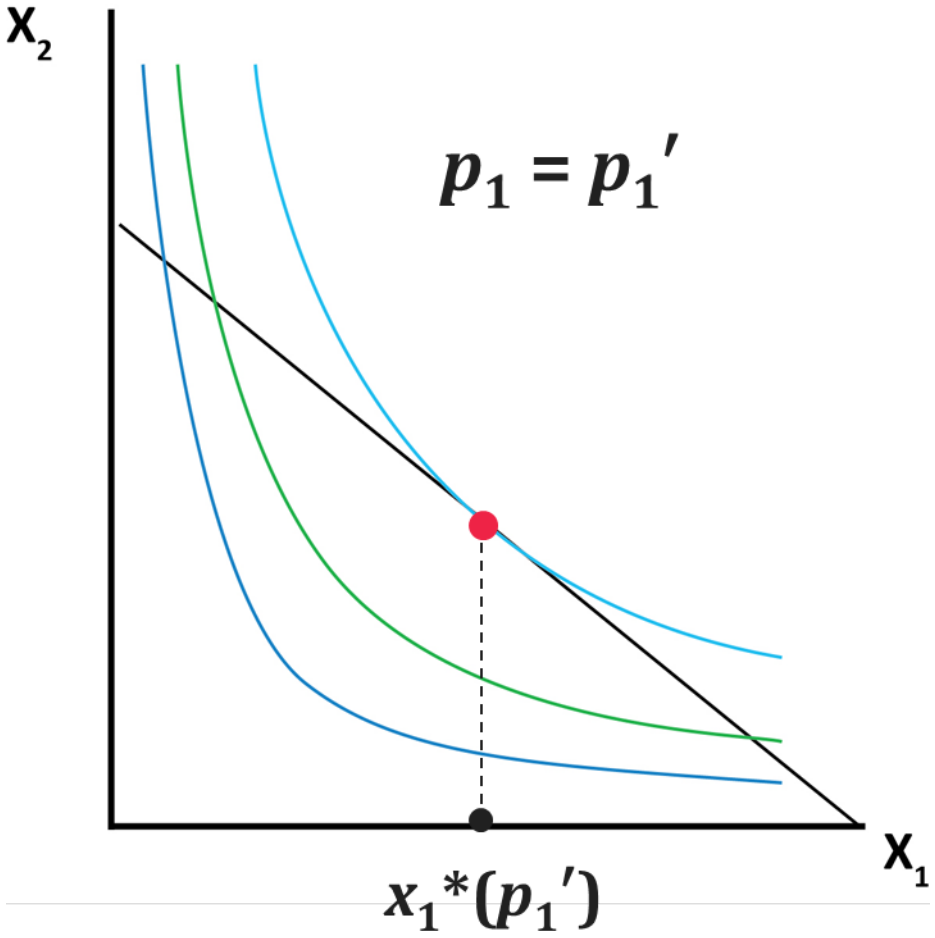
2. Own-Price Changes (fixed p_2 and m) --- new budget set

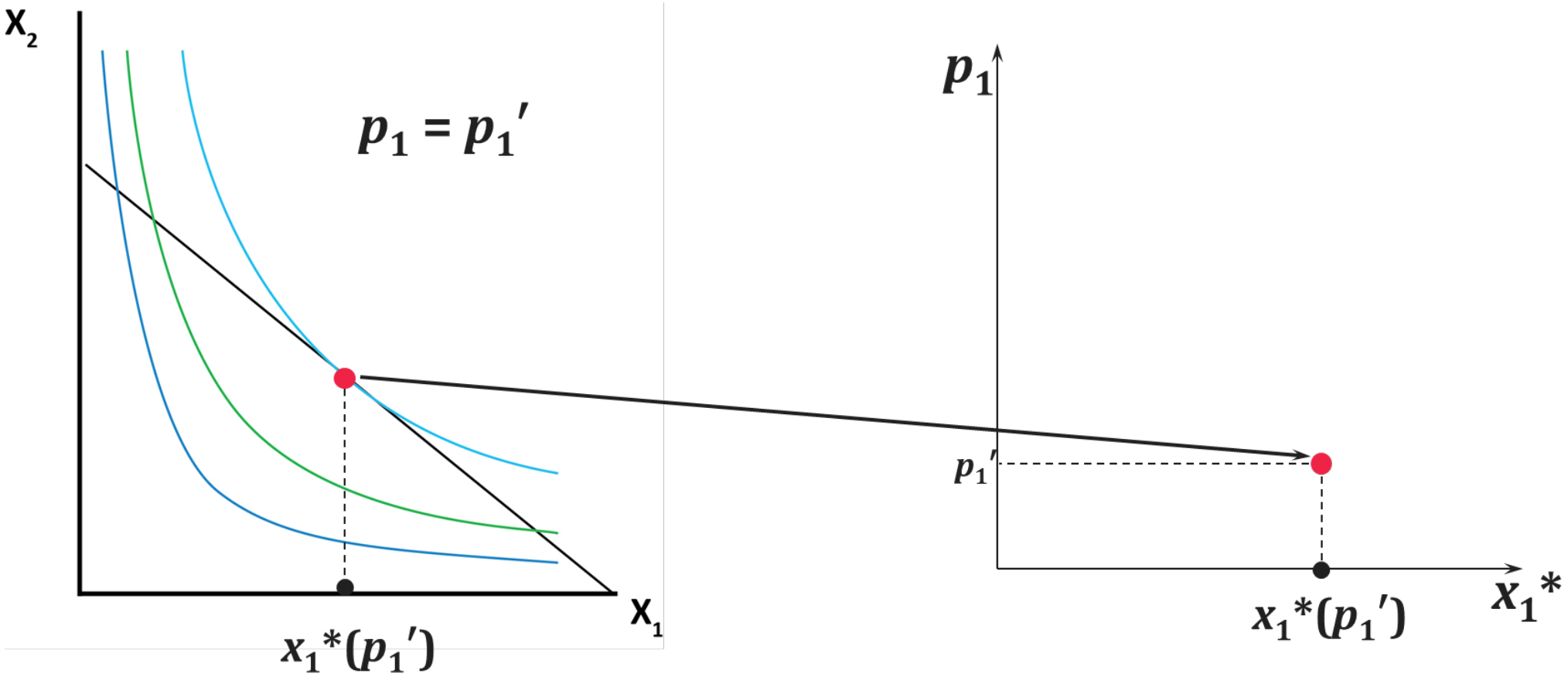


$$p_1x_1 + p_2x_2 = m$$

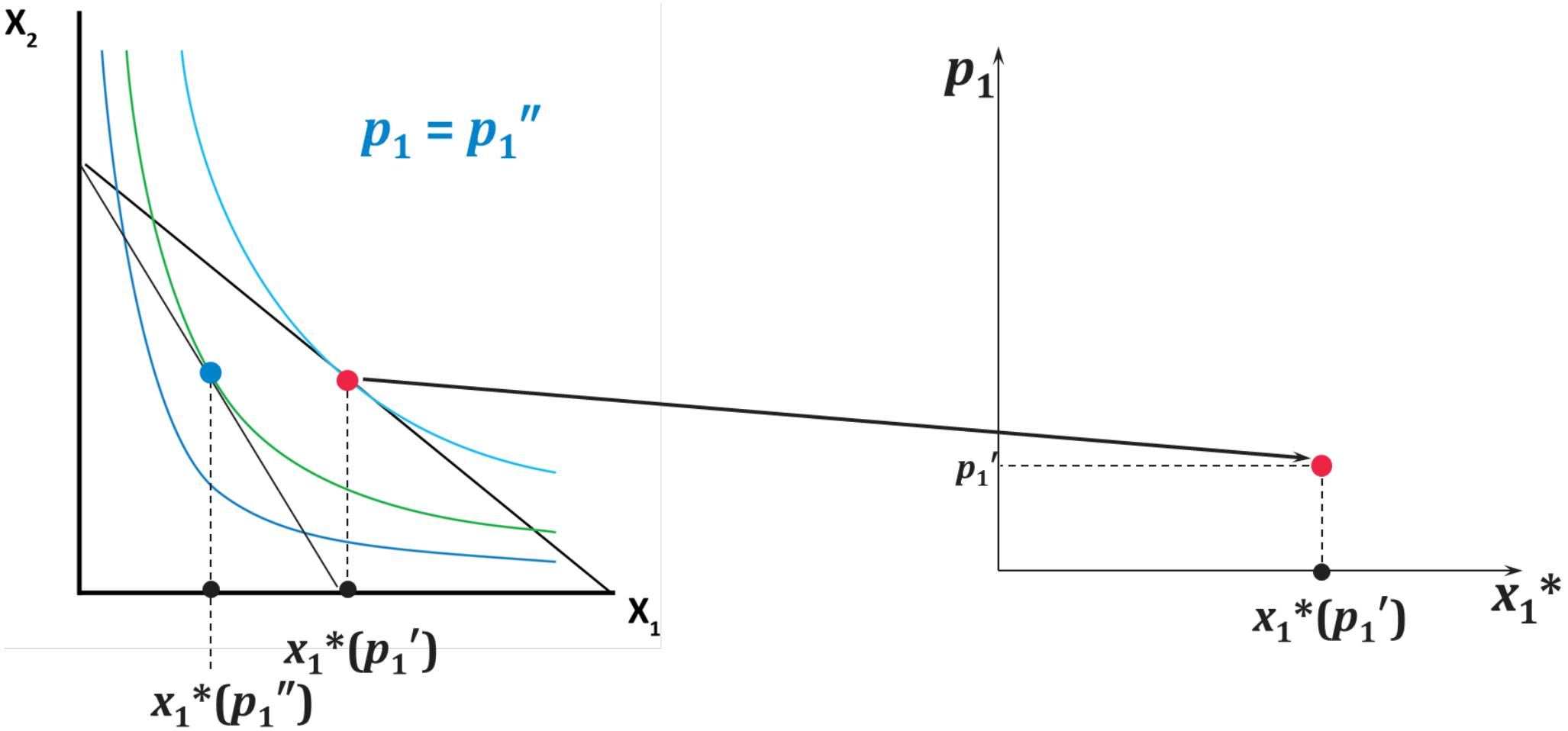
2. Own-Price Changes (fixed p_2 and m) --- optimal choice



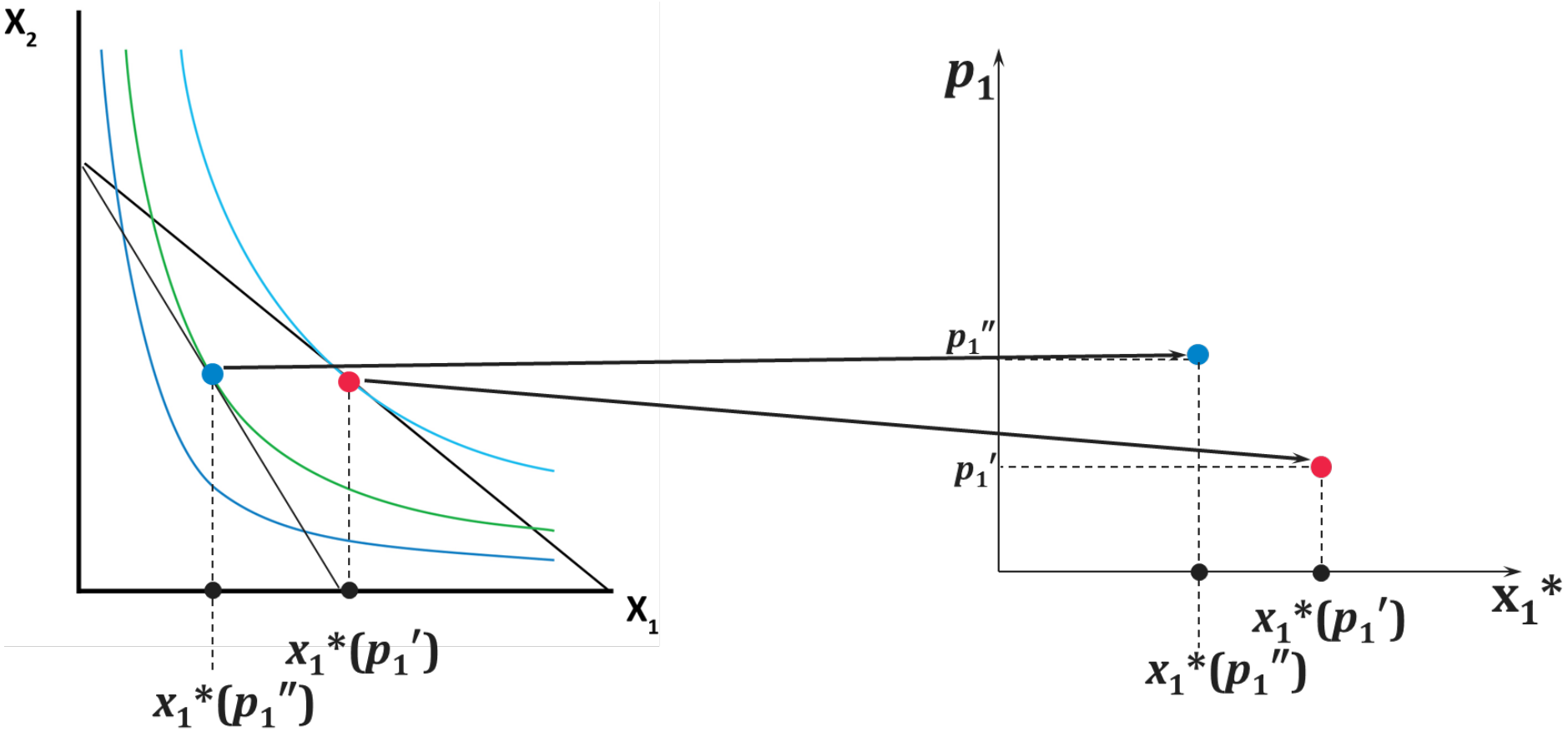
2. Own-Price Changes (Fixed p_2 and m) --- demand curve



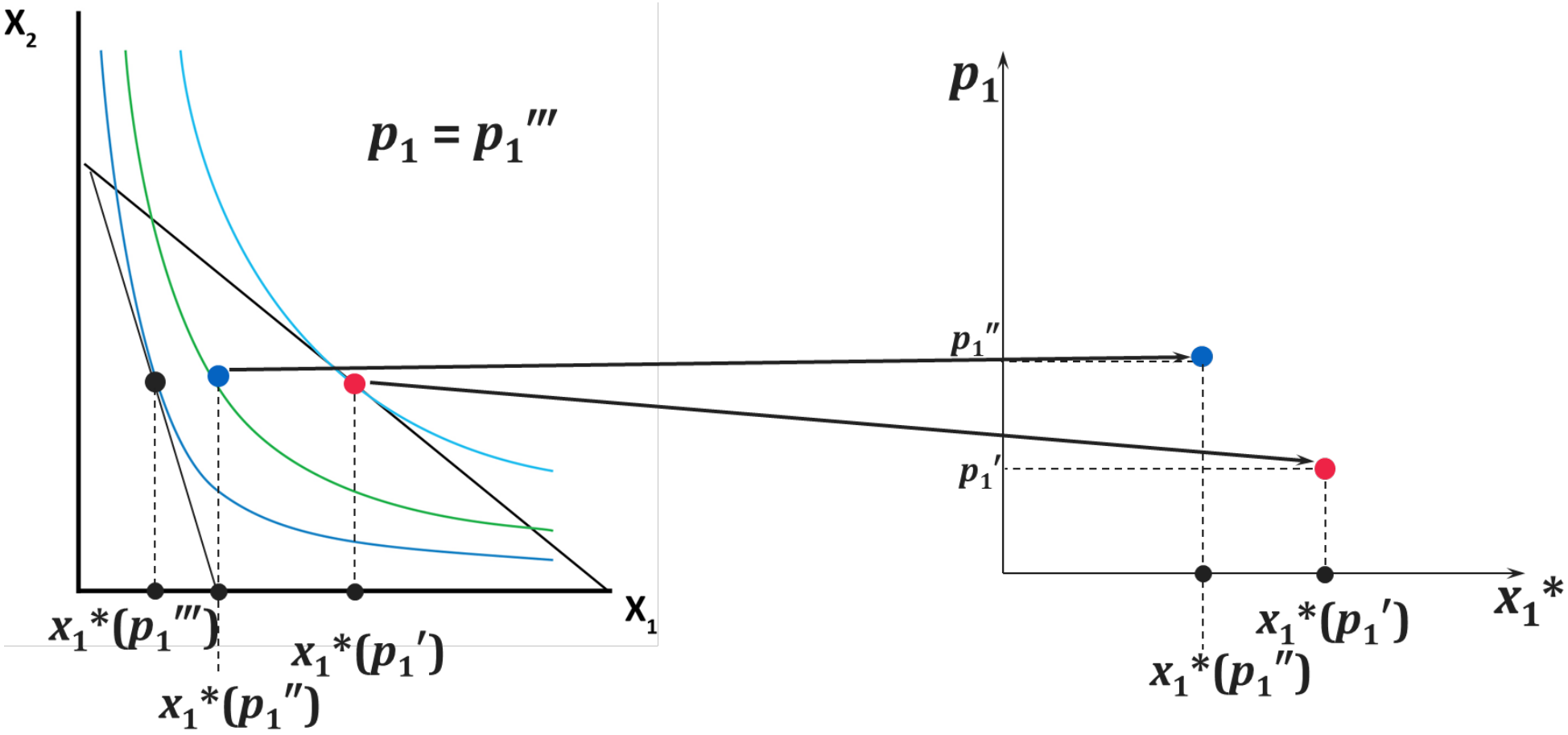
2. Own-Price Changes (fixed p_2 and m) --- new optimal choice



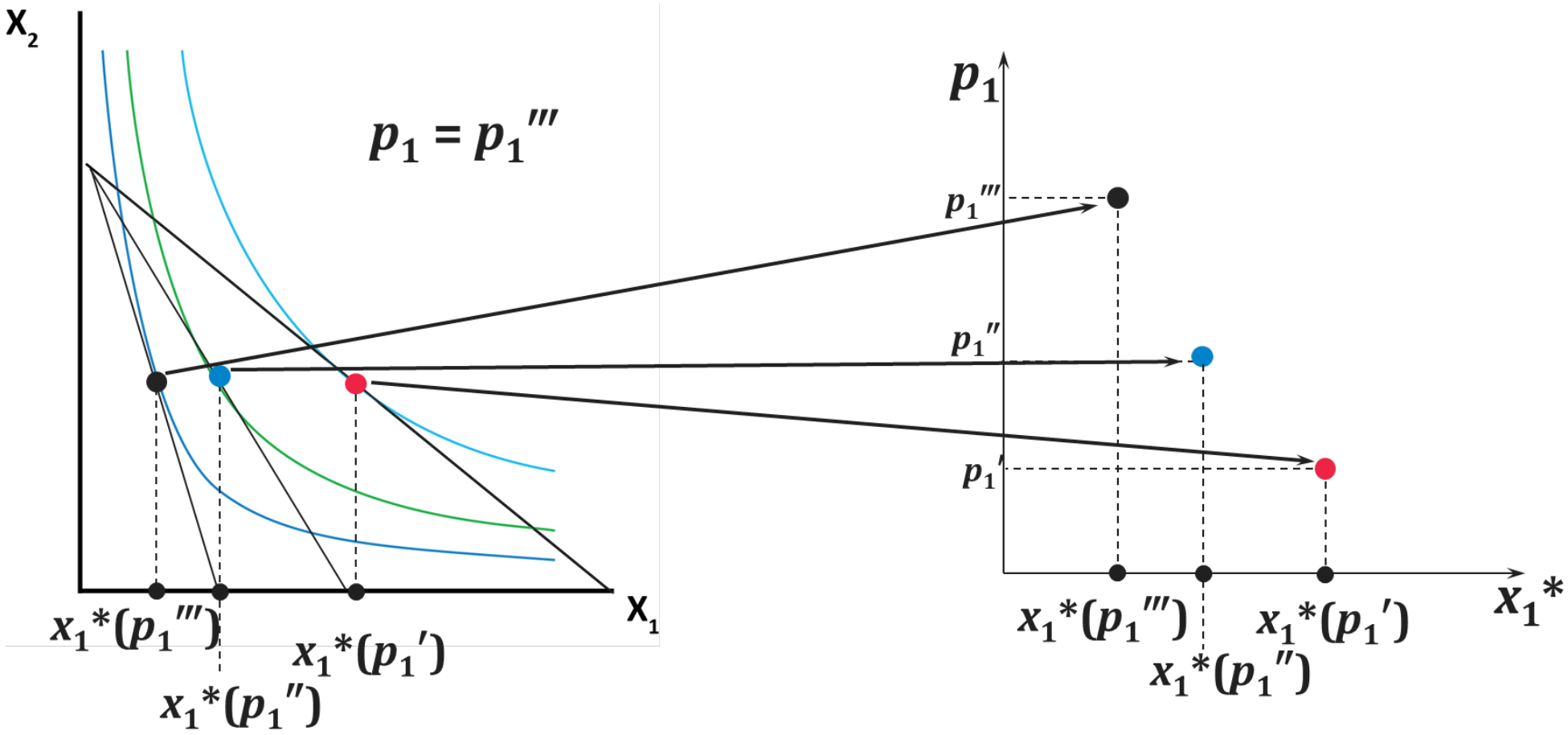
2. Own-Price Changes (fixed p_2 and m) --- demand curve



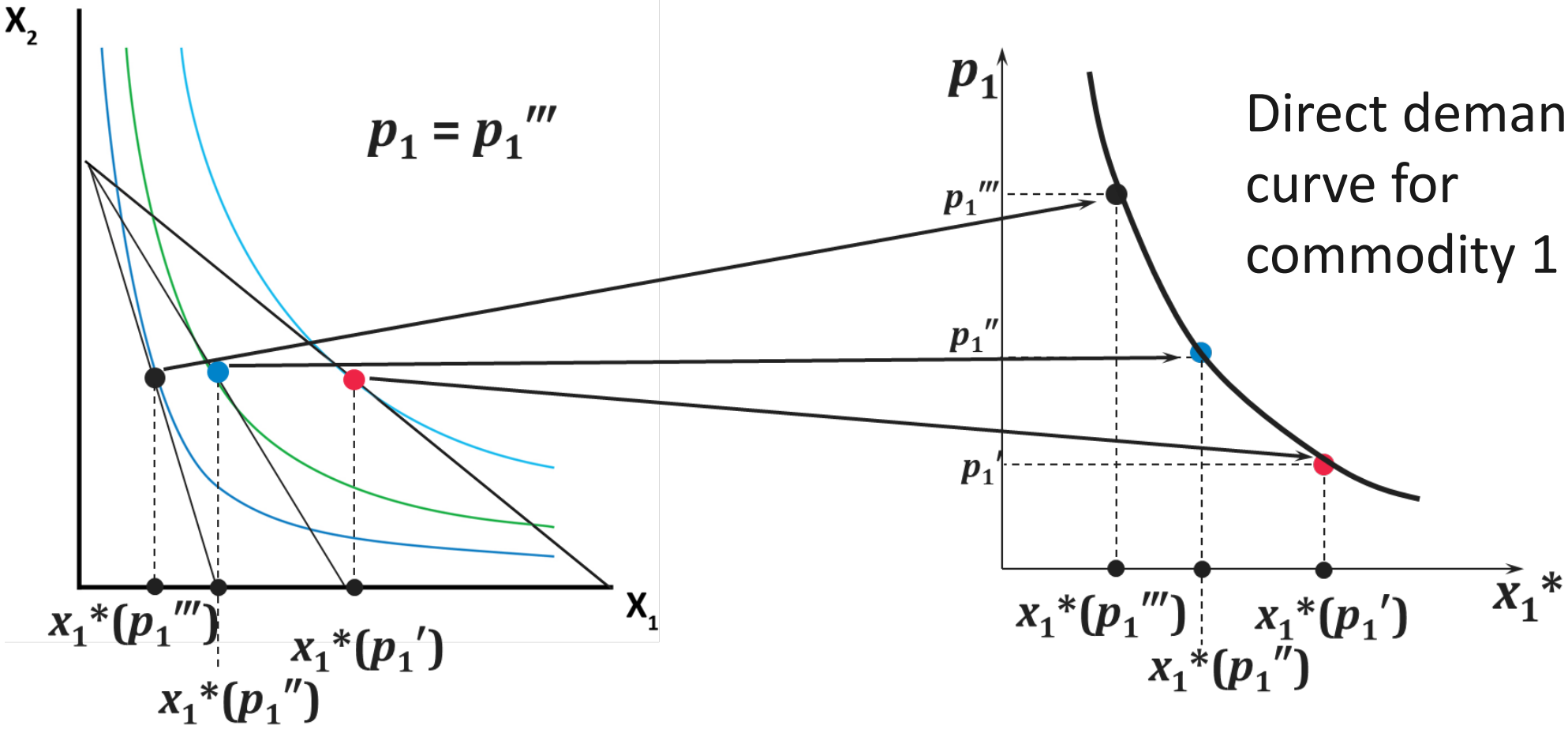
2. Own-Price Changes (fixed p_2 and m) --- --- new optimal choice



2. Own-Price Changes (fixed p_2 and m) --- demand curve

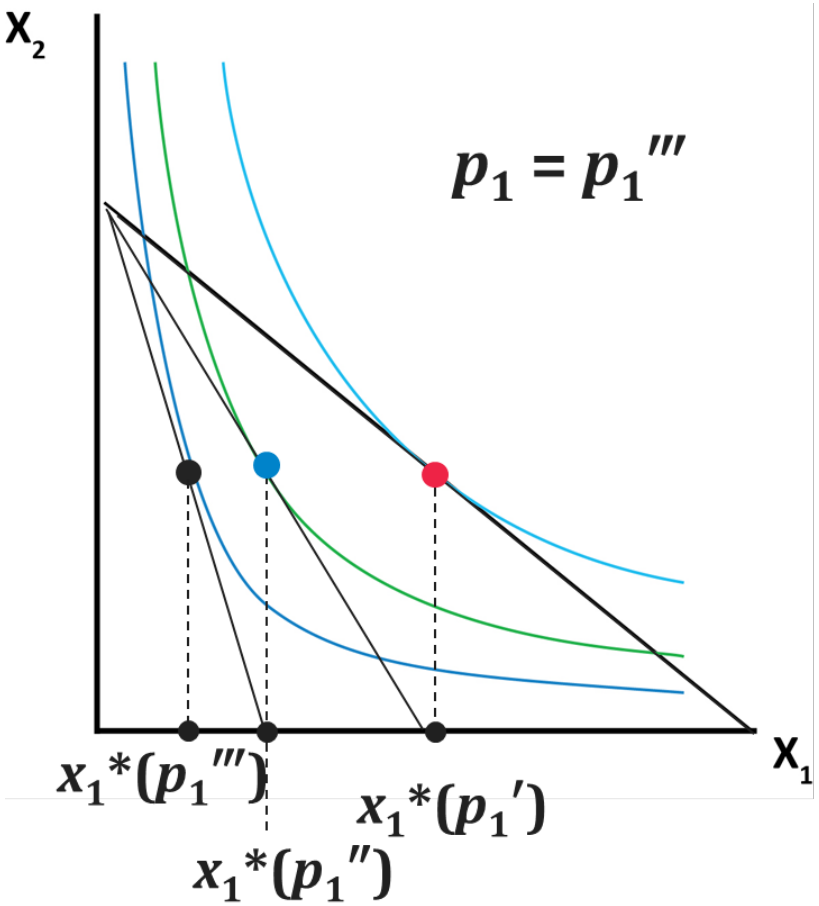


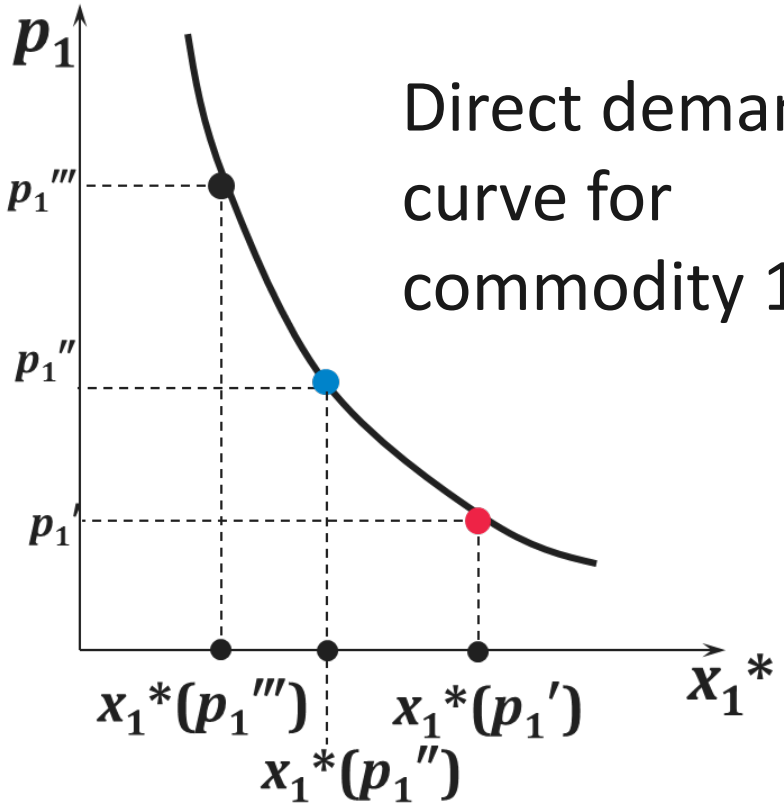
2. Own-Price Changes (fixed p_2 and m) --- demand curve !!!



Direct demand curve for commodity 1

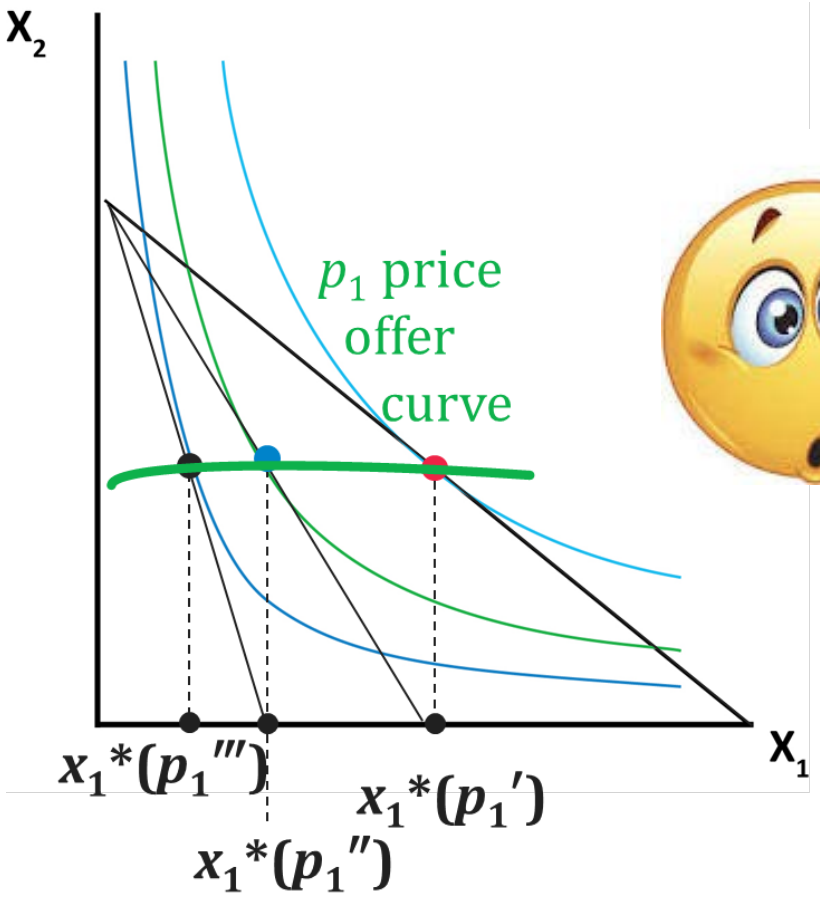
2. Own-Price Changes (fixed p_2 and m)

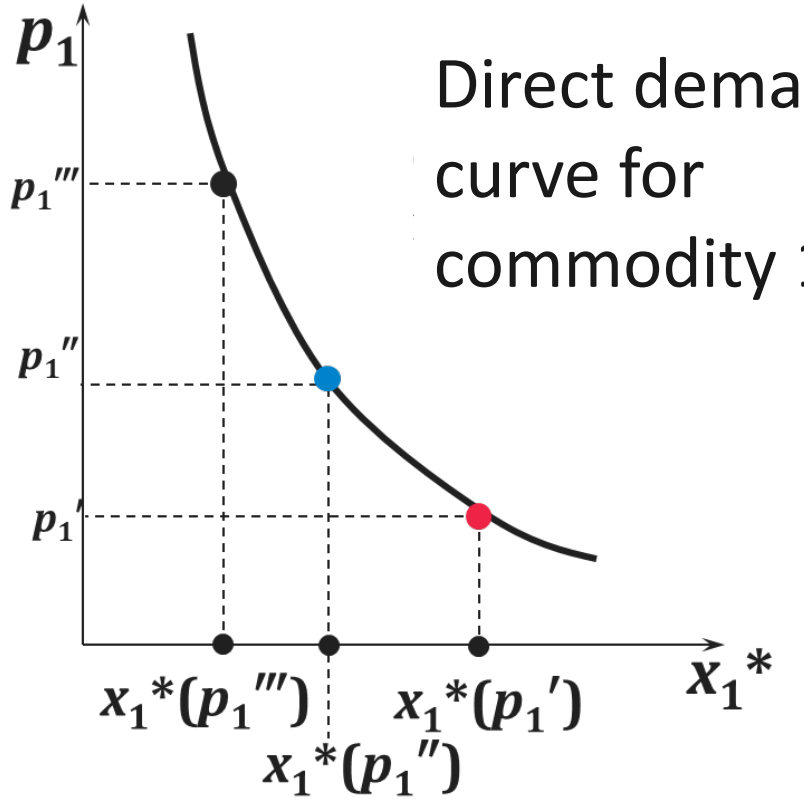




Direct demand curve for commodity 1

2. Own-Price Changes (fixed p_2 and m) --- price offer curve





Direct demand curve for commodity 1

2. Own-Price Changes --- Price offer curve and demand curve

DEFINITION

- The curve containing all the utility-maximizing bundles traced out as p_1 changes, with p_2 and m constant, is the **p_1-price offer curve**.

DEFINITION

- The plot of the x_1-coordinate of the p_1-price offer curve against p_1 is the **direct demand curve** for commodity 1.

2. Own-Price Changes --- Direct and inverse demand functions

- Usually we ask "Given the price for commodity 1, what is the quantity demanded of commodity 1?"

  DIRECT DEMAND FUNCTION (x is function of p)

- But we could also ask the **inverse** question "At what price for commodity 1 would a given quantity of commodity 1 be demanded?"

  INVERSE DEMAND FUNCTION (p is function of x)

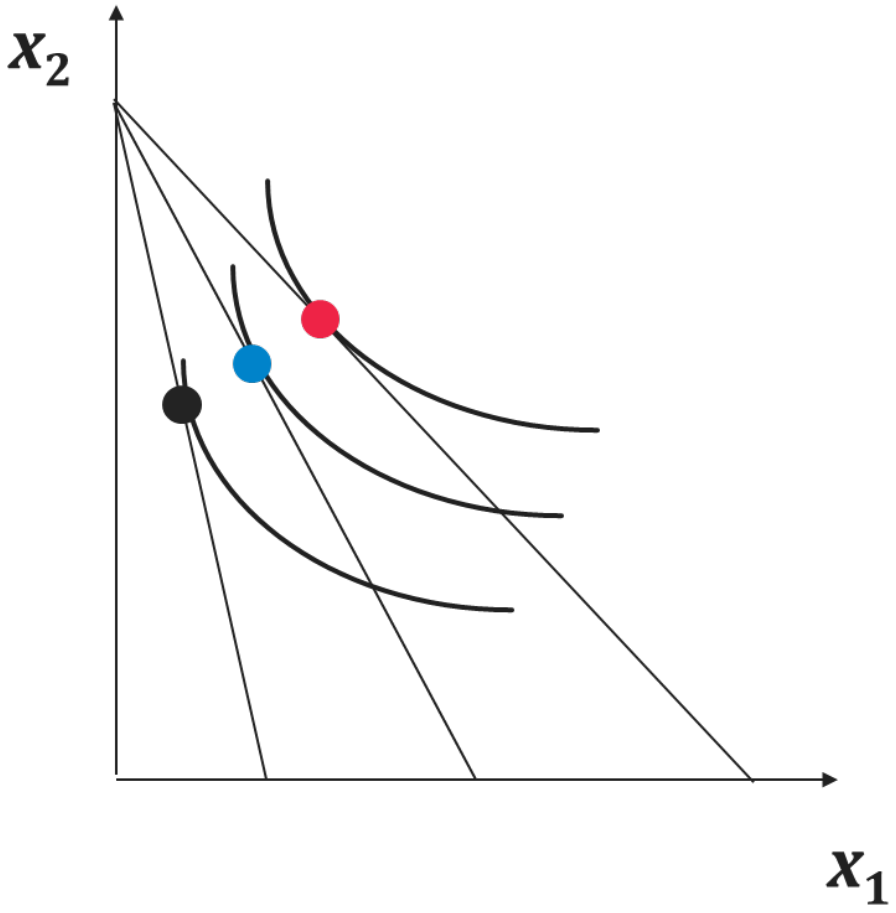
2. Own-Price Changes --- Ordinary goods

DEFINITION

- A good is called **ordinary** if the quantity demanded of it always increases as its own price decreases.
- … and vice versa.

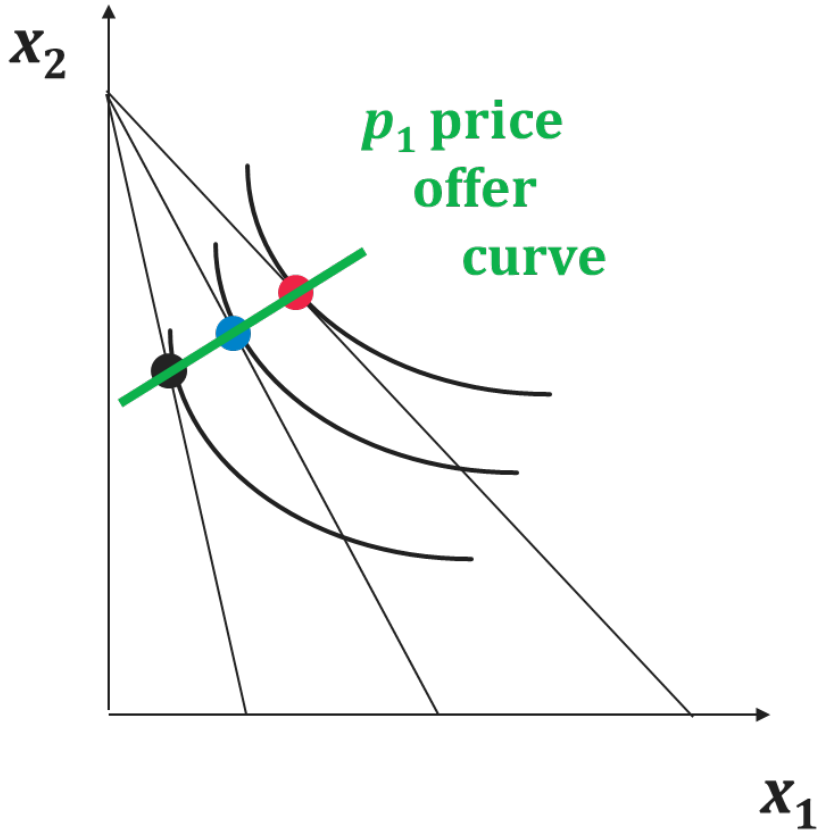
2. Own-Price Changes --- Ordinary goods: optimal bundles

- Fixed p_2 and m.



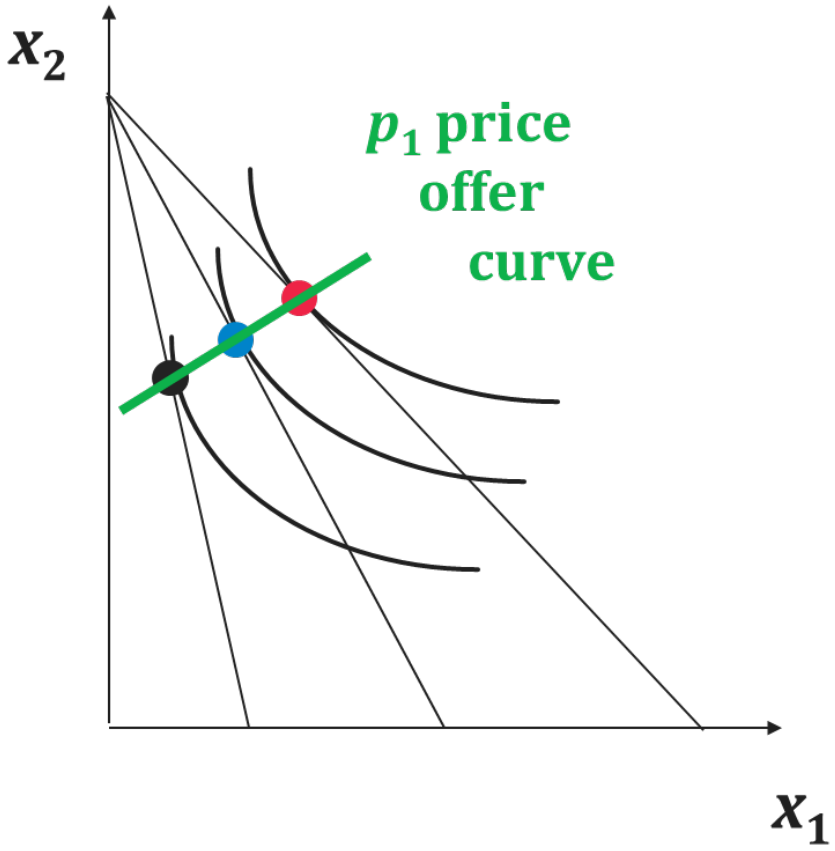
2. Own-Price Changes --- Ordinary goods: the price offer curve

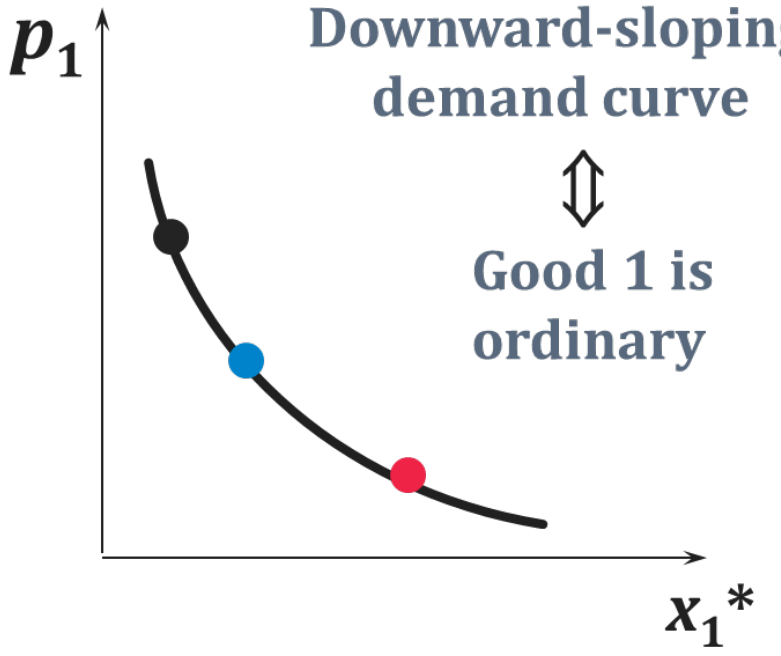
- Fixed p_2 and m.



2. Own-Price Changes --- Ordinary goods --- demand curve

- Fixed p_2 and m.





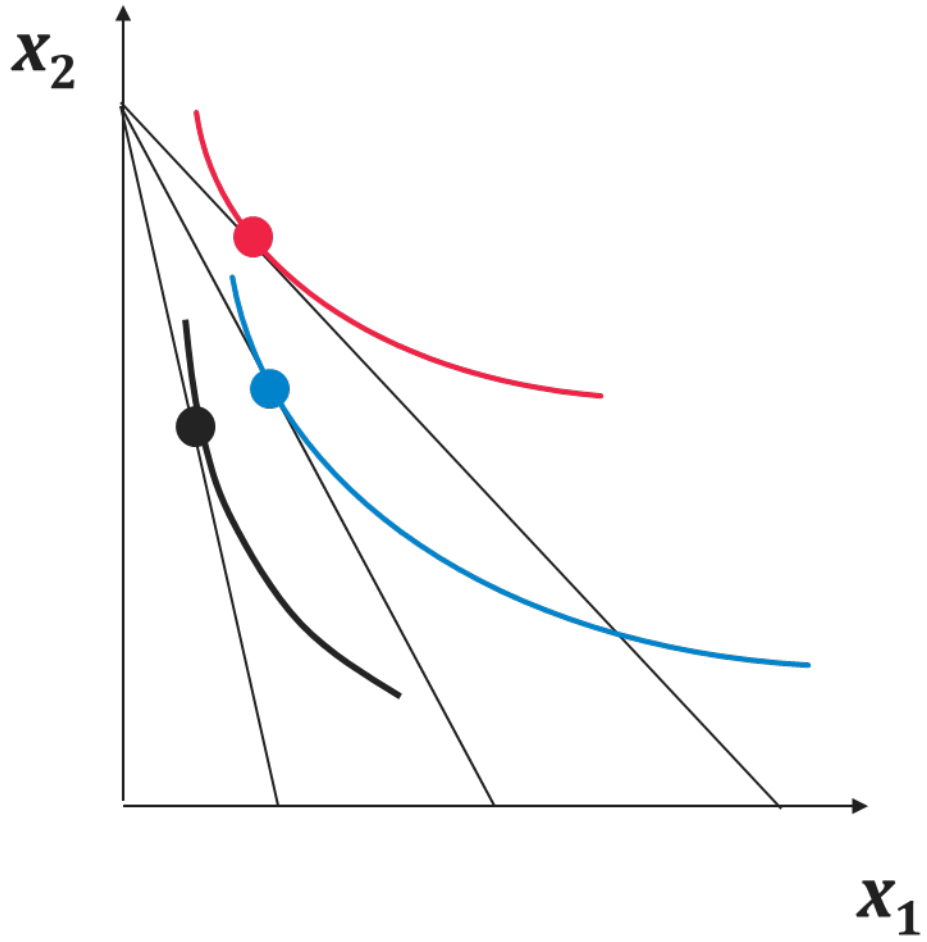
2. Own-Price Changes --- Giffen goods

DEFINITION

- If, for *some* values of its own price, the quantity demanded of a good rises as its own price increases, then the good is called **Giffen good.**

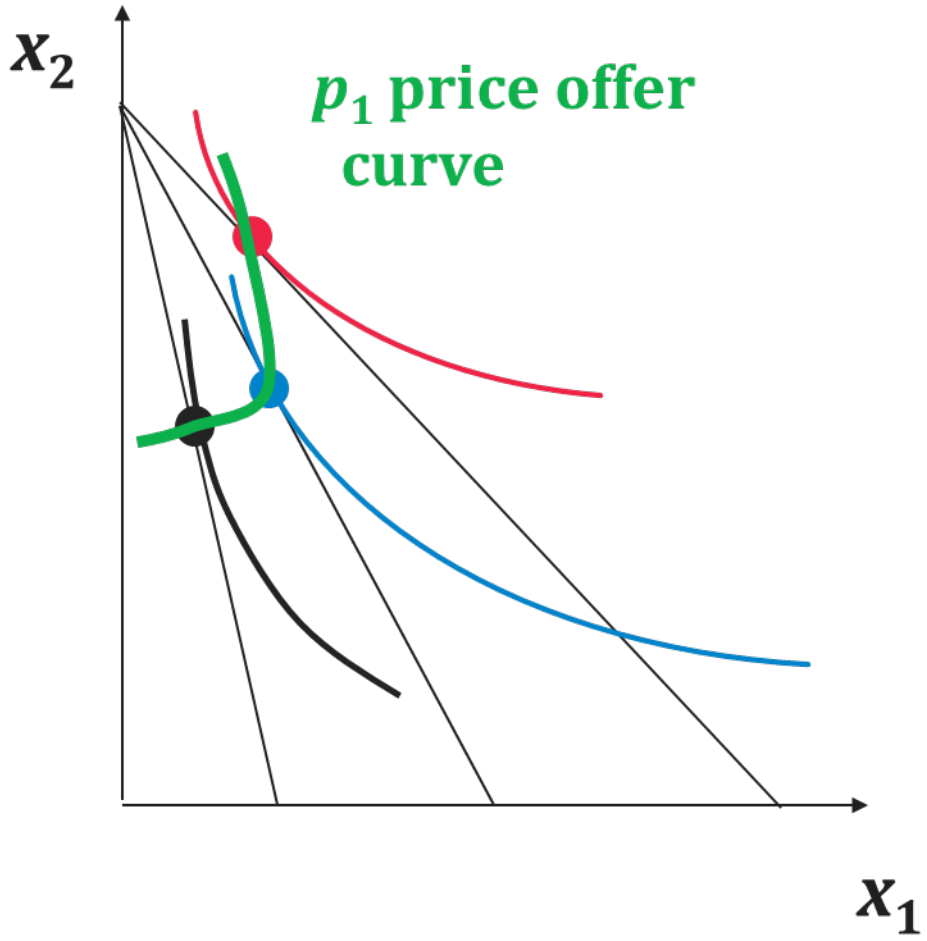
2. Own-Price Changes --- Giffen goods: optimal bundles

- Fixed p_2 and m.



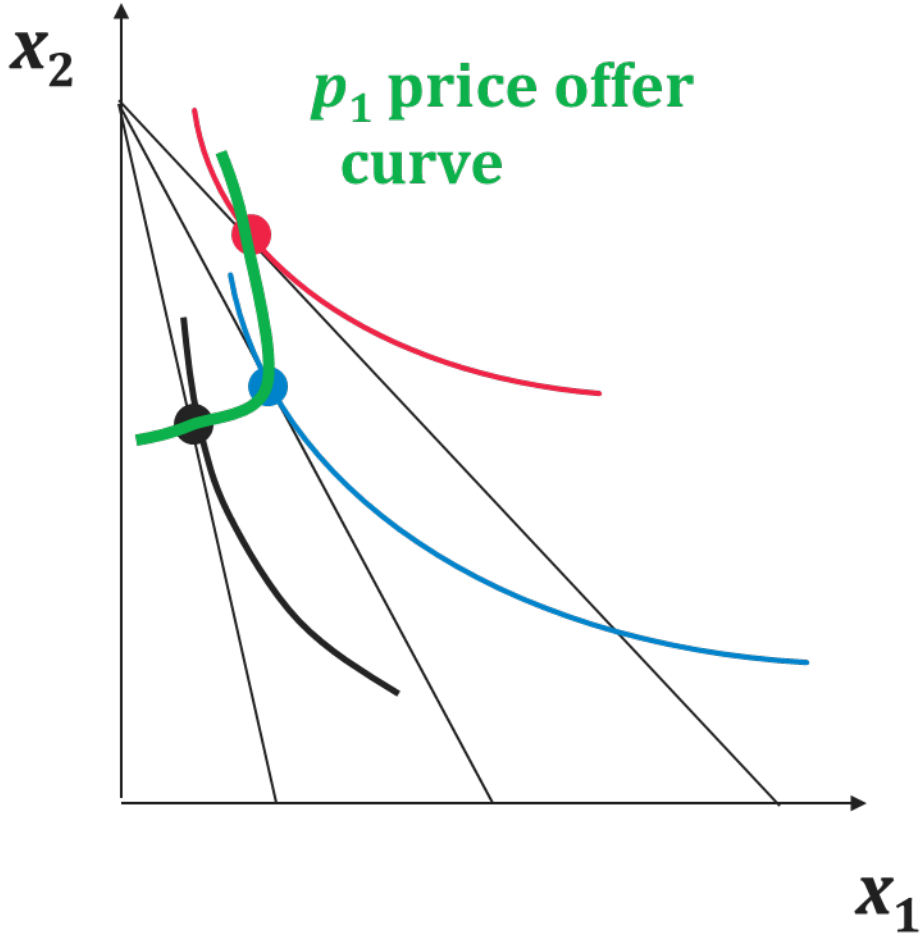
2. Own-Price Changes --- Giffen goods: price offer curve

- Fixed p_2 and m.



2. Own-Price Changes --- Giffen goods: demand curve

- Fixed p_2 and m.



3. Cross Price Changes

QUESTION

- How does the value of $x_1^*(p_1, p_2, m)$ change as p_2 changes, holding both p_1 and m constant?

3. Cross Price Changes --- (gross) substitutes and complements

DEFINITION

If an increase in p_2

- *increases* demand for commodity 1, then commodity 1 is a **gross substitute** for commodity 2.
- *reduces* demand for commodity 1, then commodity 1 is a **gross complement** for commodity 2.

(Symmetric definition if p_1 increases.)

3. Cross Price Changes --- example

- Suppose

$$x_1^* = \frac{m}{p_1 + p_2}$$

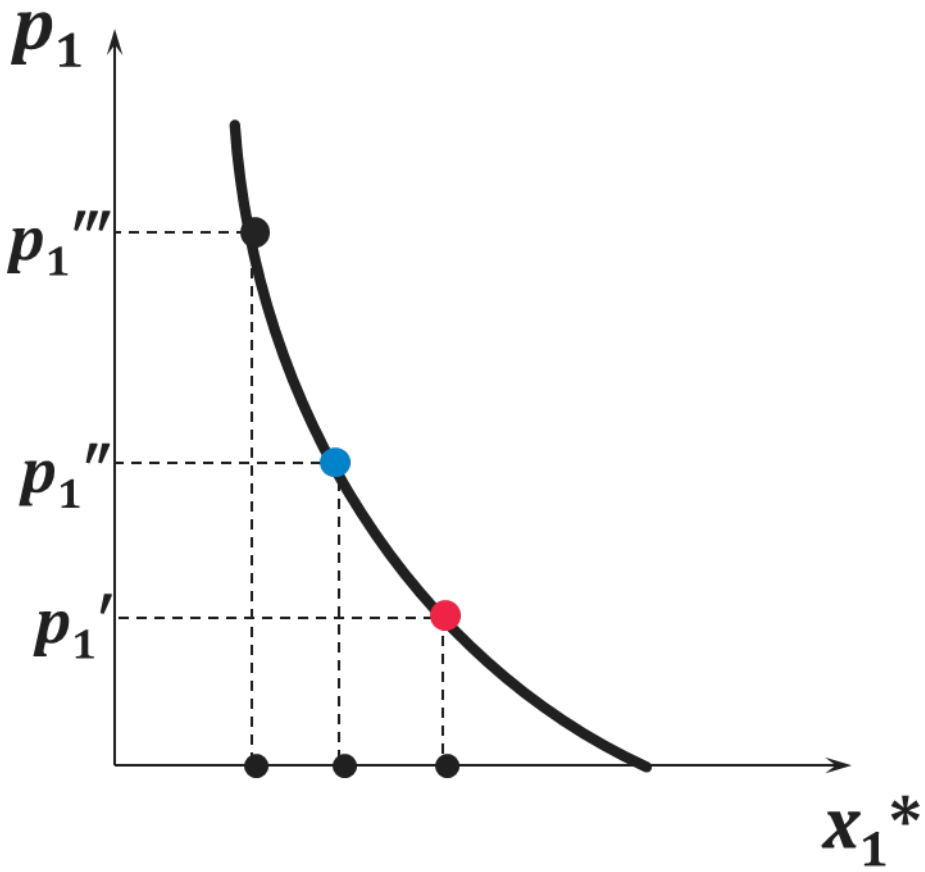
- so . . .

$$\frac{\partial x_1^*}{\partial p_2} = -\frac{m}{(p_1 + p_2)^2} < 0.$$

Therefore commodity 2 is a gross complement for commodity 1.

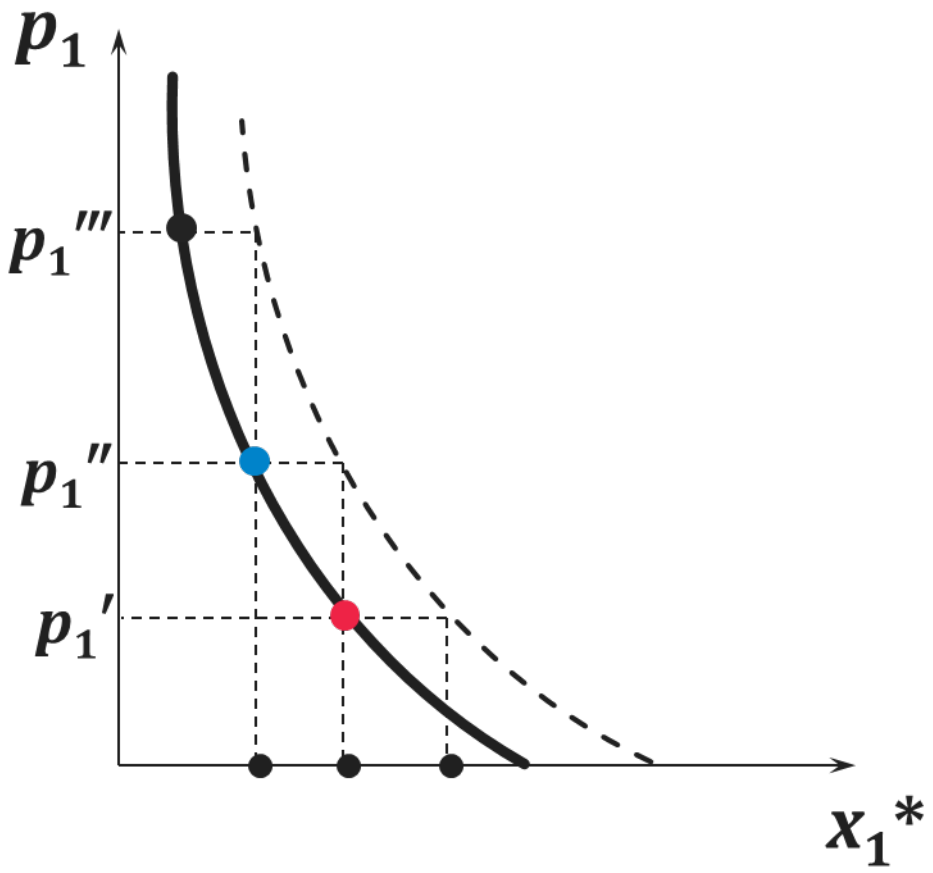
3. Cross Price Changes --- example

- Consider the demand function of commodity 1.
- Suppose the price of commodity 2 decreases.
- Then the individual will demand more of x_2 AND of x_1 given that the two commodities are gross complements.



3. Cross Price Changes --- example

- If the price of good 2 decreases, the demand curve for good 1 shifts outward.
- Hence, good 2 is a gross complement for good 1.



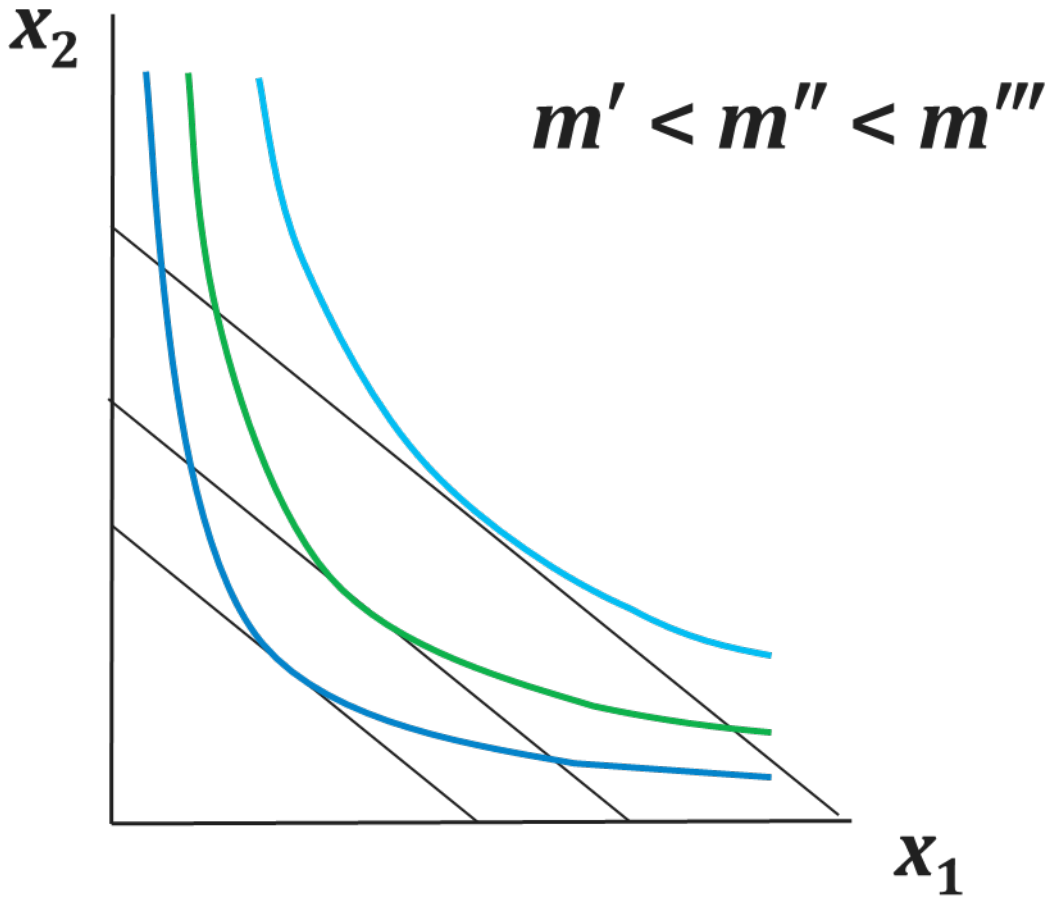
4. Income Changes

QUESTION

- How does the value of $x_1^*(p_1, p_2, m)$ change as m changes, holding both p_1 and p_2 constant?

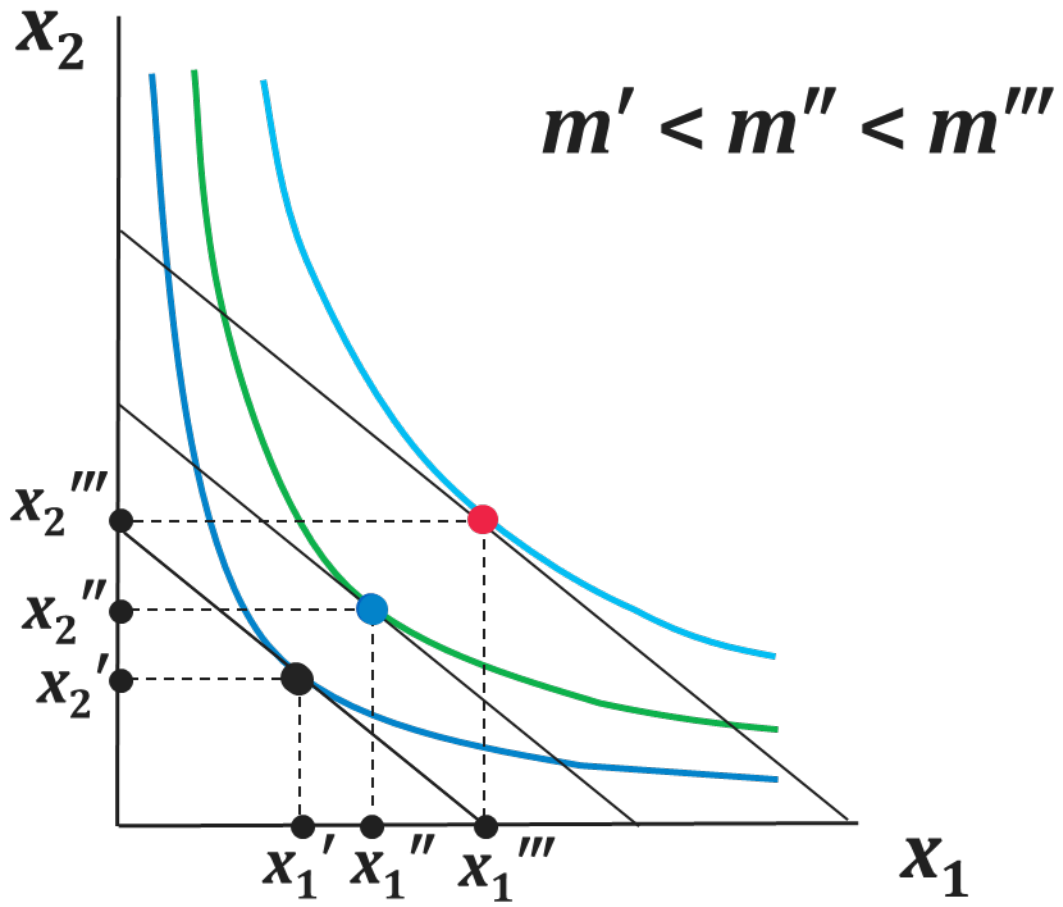
4. Income Changes

Fixed p_1 and p_2.



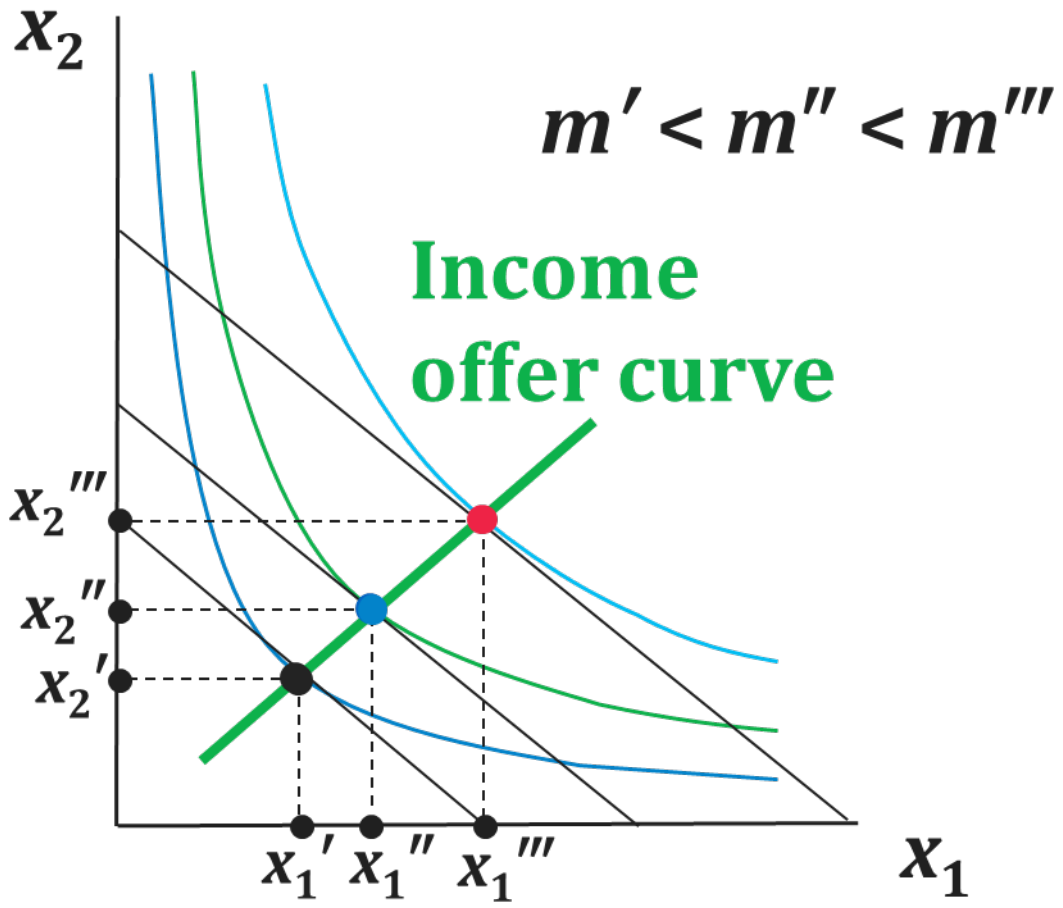
4. Income Changes: optimal bundles

Fixed p_1 and p_2.



4. Income Changes: income offer curve

Fixed p_1 and p_2.

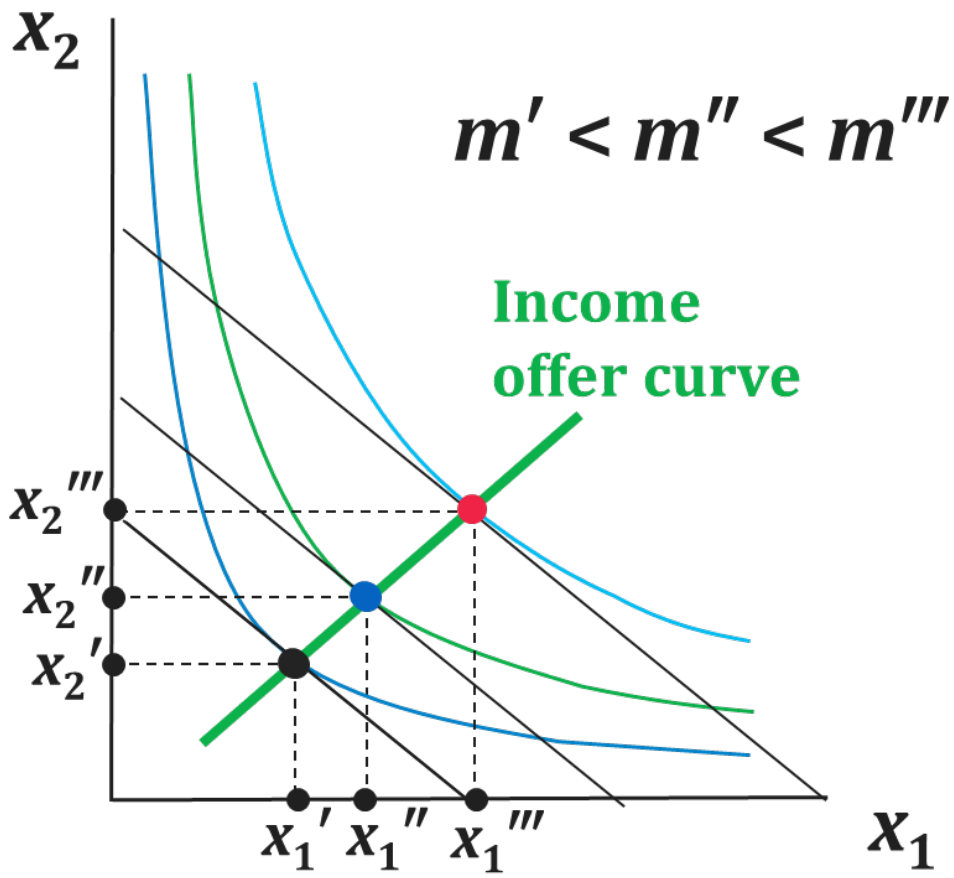


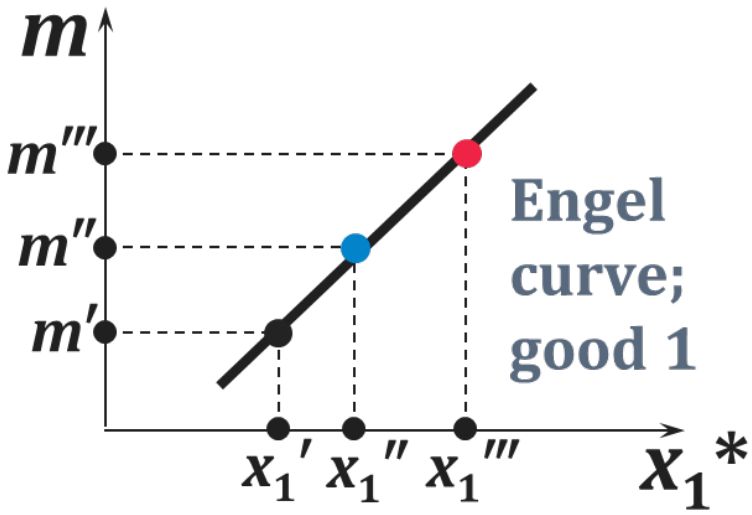
4. Income Changes: Engel curve

DEFINITION

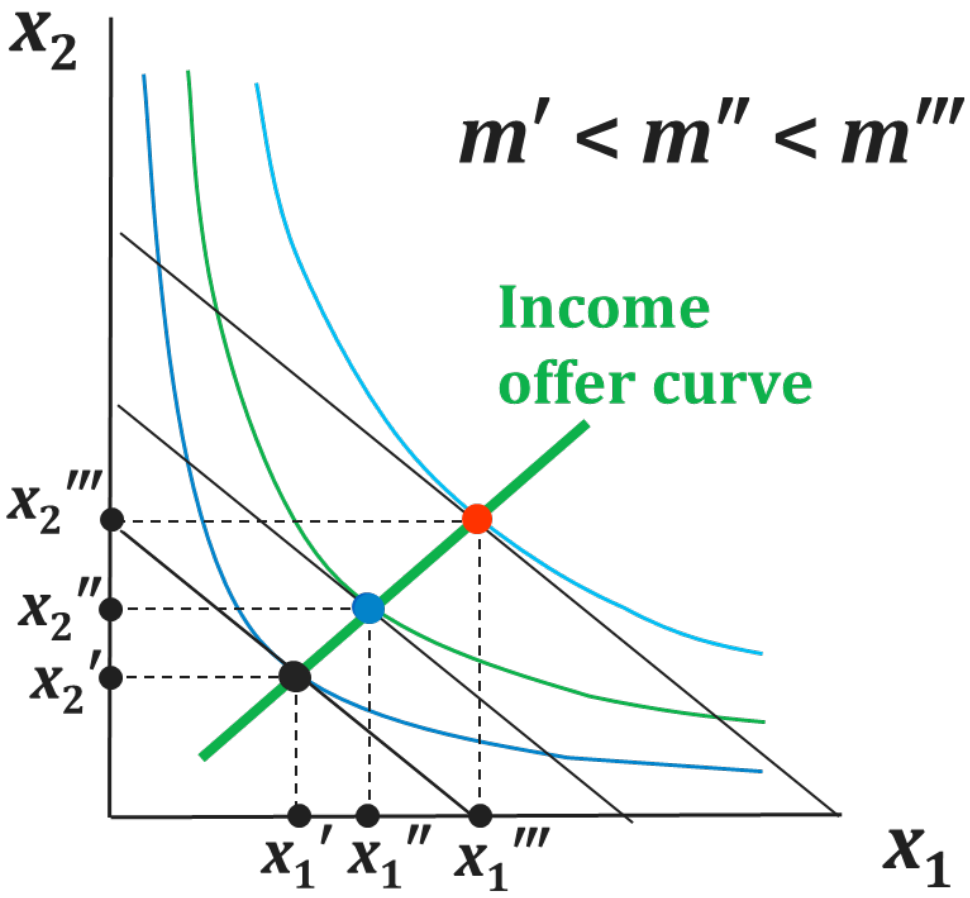
A plot of quantity demanded against income is called an **Engel curve.**

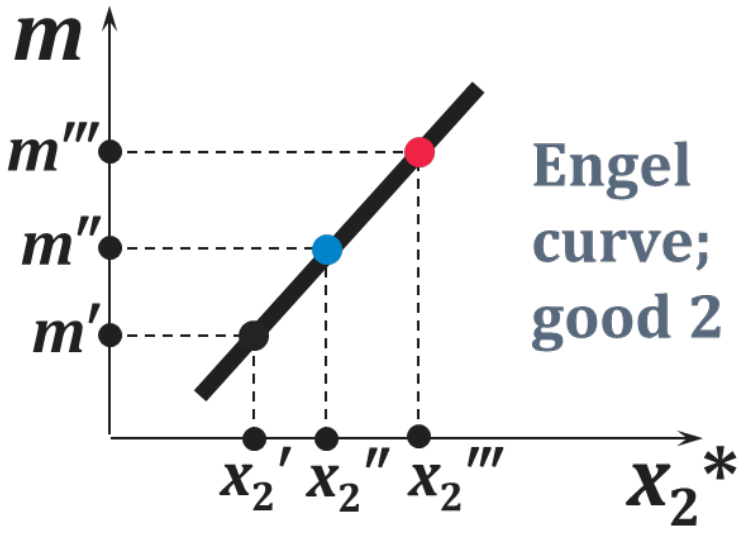
4. Income Changes: Engel curve for good 1





4. Income Changes: Engel curve for good 2





4. Income Changes --- Example: Engel curve for Cobb Douglas preferences

- Let $u(x_1, x_2) = x_1^a x_2^b$ be the Cobb Douglas utility function.
- The ordinary demand equations are

$$x_1^* = \frac{am}{(a+b)p_1} \qquad x_2^* = \frac{bm}{(a+b)p_2}$$

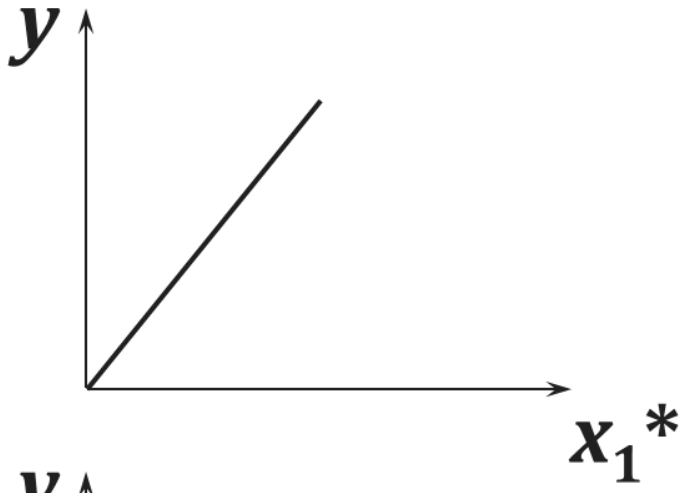
4. Income Changes --- Example: Engel curve for Cobb Douglas preferences

$$x_1^* = \frac{am}{(a+b)p_1}; x_2^* = \frac{bm}{(a+b)p_2}$$

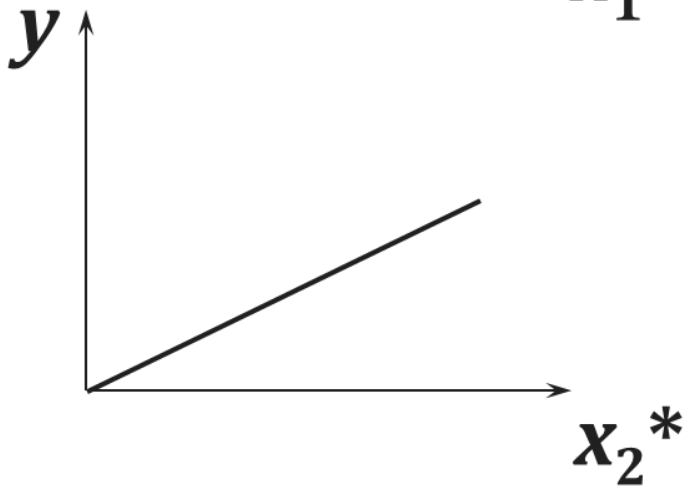
- Rearranging to isolate m, these are
- Engel curve for good 1: $$m = \frac{(a+b)p_1}{a} x_1^*$$
- Engel curve for good 2: $$m = \frac{(a+b)p_2}{b} x_2^*$$

4. Income Changes --- Example: Engel curve for Cobb Douglas preferences

- Engel curve for good 1 $$m = \frac{(a+b)p_1}{a} x_1^*$$



- Engel curve for good 2 $$m = \frac{(a+b)p_2}{b} x_2^*$$



4. Income Changes --- Normal goods

DEFINITION

- A good for which quantity demanded rises with income is called **normal**.

- Therefore a normal good's Engel curve is positively sloped.

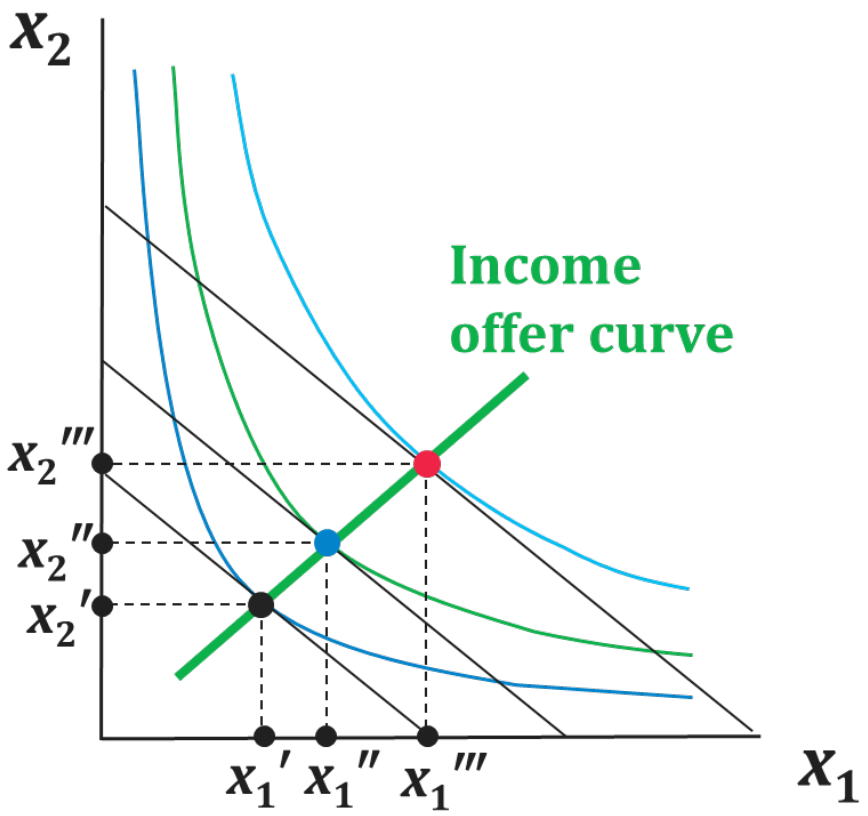
4. Income Changes --- Inferior goods

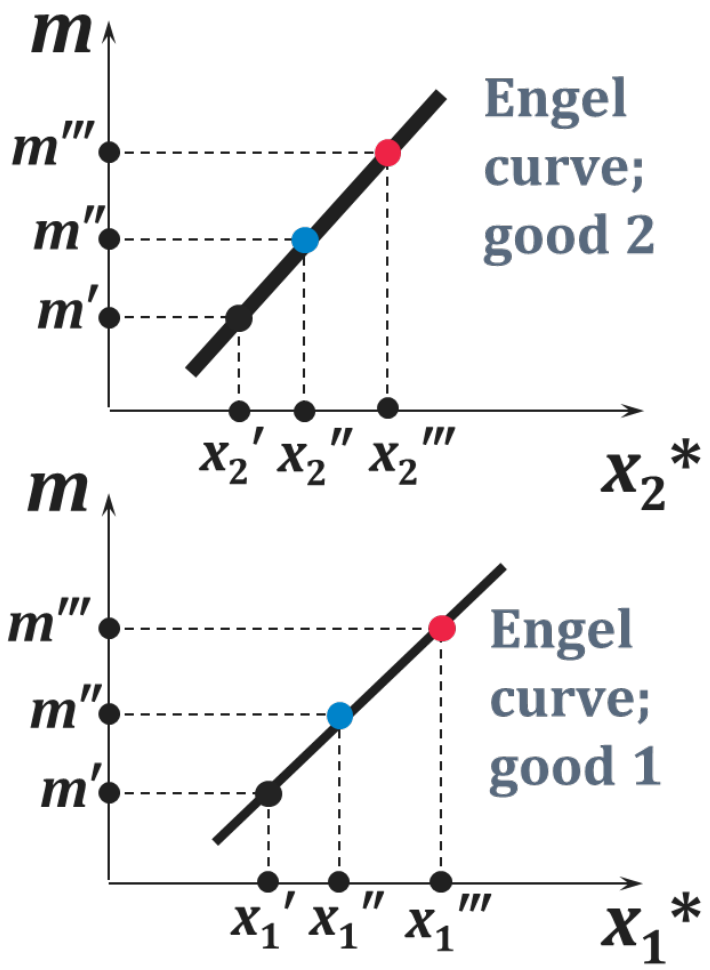
DEFINITION

- A good for which quantity demanded decreases with income is called **inferior**.

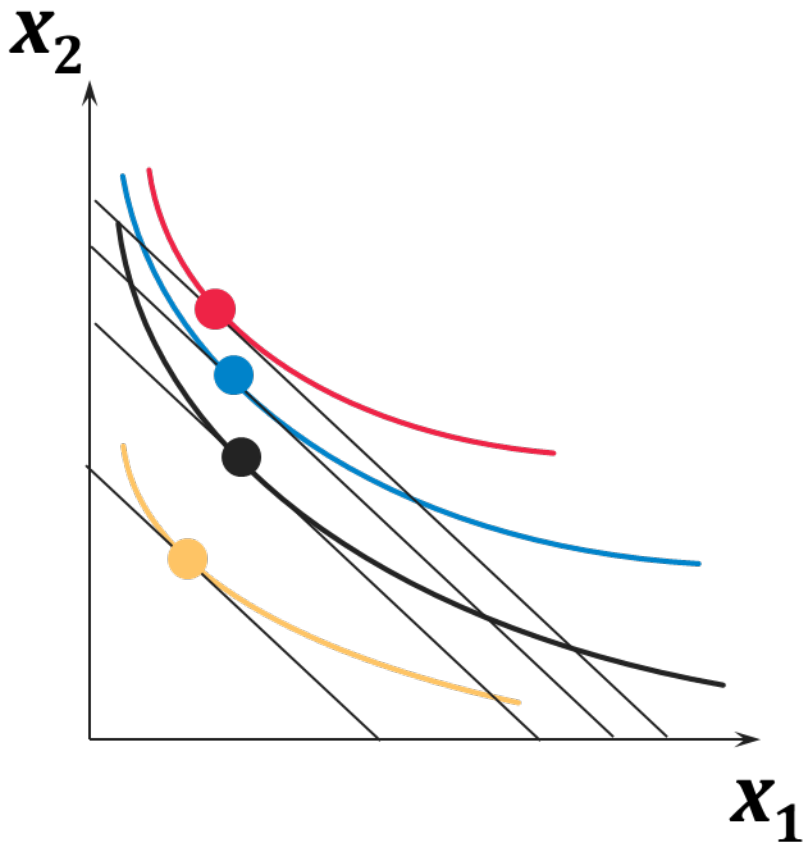
- Therefore an inferior good's Engel curve is negatively sloped.

4. Income Changes --- Normal goods: income offer curve and Engel curves

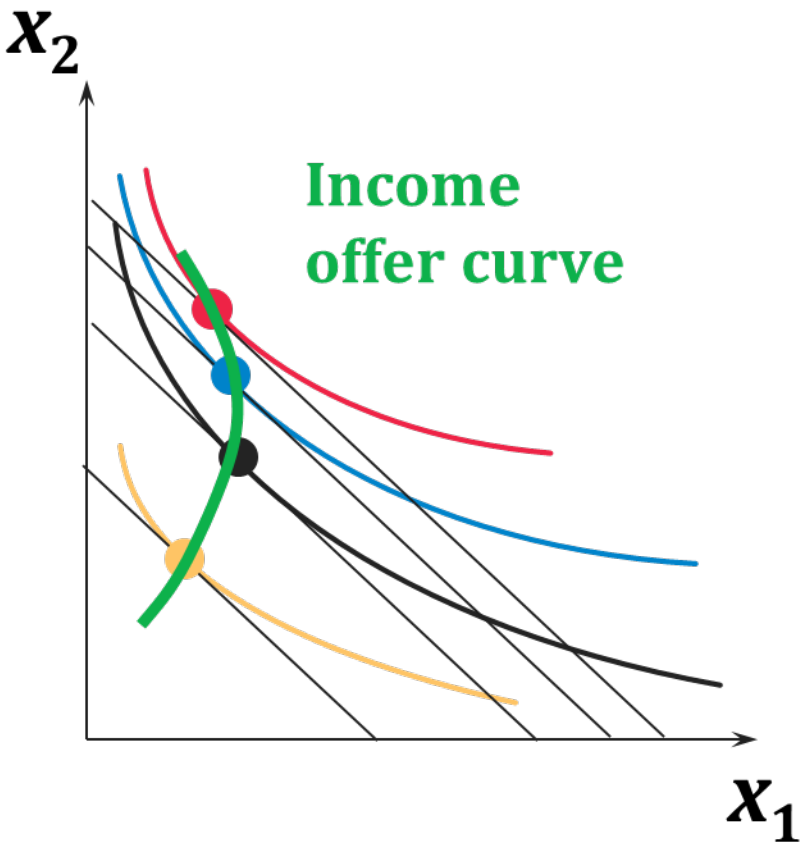




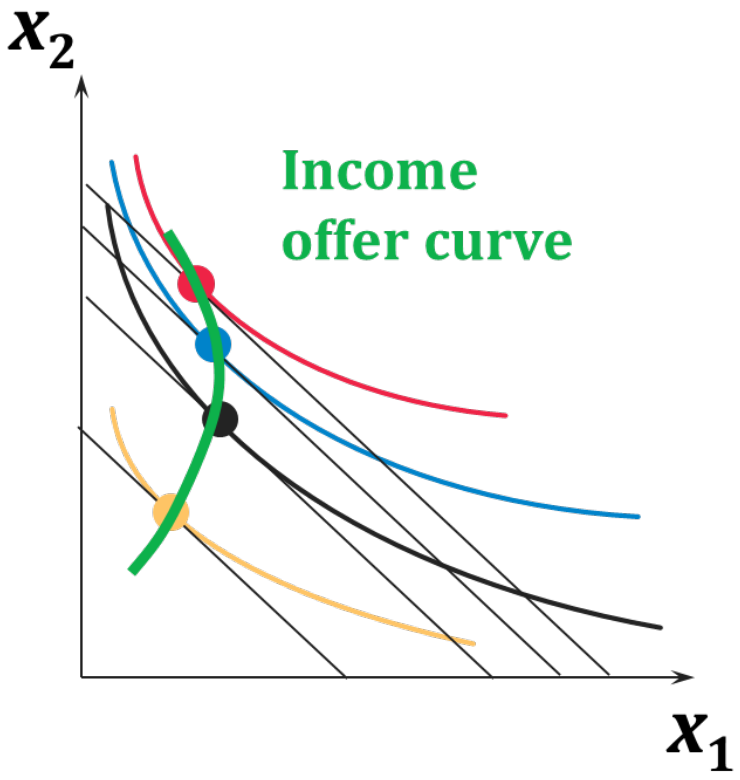
4. Income Changes --- Inferior (x_1) and normal (x_2) goods: optimal bundles

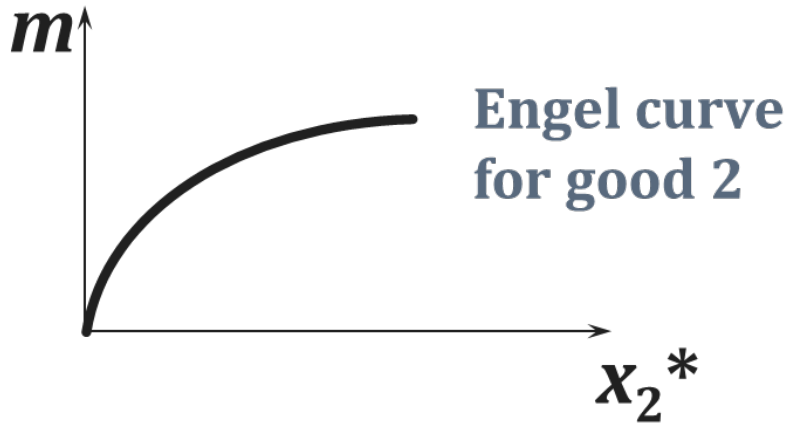


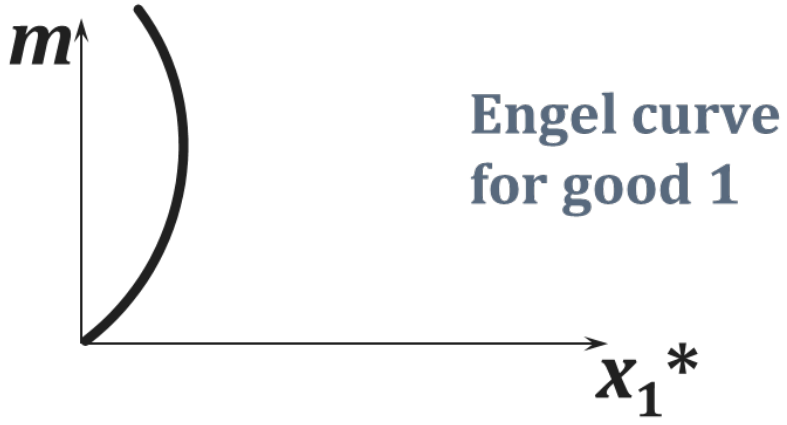
4. Income Changes --- Inferior (x_1) and normal (x_2) goods: optimal bundles --- Income offer curve



4. Income Changes --- Inferior (x_1) and normal (x_2) goods: optimal bundles --- Engel curves







Chapter 6:
Take home message

Which is the key concept we learned in this chapter?

Comparative statics analysis