

# Econ 301: Microeconomic Analysis

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# Demand

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- ▶ We have seen so far how to calculate the optimal choice for a given set of prices and income
  - ▶ Usually we call this *demand* and write it as

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

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

- ▶ How does the optimal choice change when these parameters change?

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  - ▶ Examples of inferior goods? low-quality food items; public transit
- ▶ Note: A good can be normal at some income levels and inferior at other income levels

# Graphing Changes in Income

- ▶ Note that as we change income, the points  $(x_1^*, x_2^*)$  trace out a curve
  - ▶ This is called the *income expansion path* or *income offer curve*
  - ▶ Graphically, it is  $x_2^*(x_1^*)$
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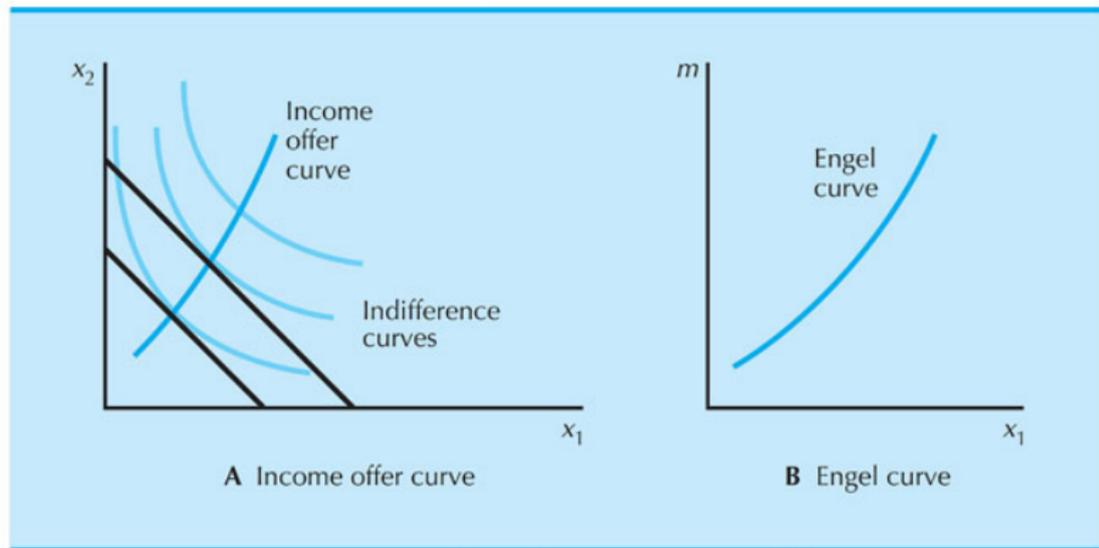
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  - ▶ What is the slope of the income expansion path when good 1 is an inferior good and good 2 is a normal good? Negative
- ▶ Alternatively we can look at how demand for just good 1 changes with income
  - ▶ This is called the *Engel curve*
  - ▶ Note that we typically draw  $x_1$  on the horizontal axis and  $m$  on the vertical axis

# Changes in Income Graphically

Figure 6.3



# Changes in Price

- ▶ What happens to demand for good 1 as the price of good 1 increases?
  - ▶ *Ordinary good*: Increase in price causes a decrease in demand, ie  $\frac{\partial x_1^*}{\partial p_1} < 0$
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- ▶ What are some examples of Giffen goods? Many inferior goods are Giffen goods

# Graphing Changes in Prices

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  - ▶ This is the the *price offer curve*
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- ▶ Alternatively, we can trace out how the demand for just one good changes with its price
  - ▶ This is the famous *demand curve*,  $x_1^*(p_1)$
  - ▶ What is the slope of the demand curve? Demand curve is downward-sloping for ordinary goods but upward sloping for Giffen goods

# Changes in Price Graphically

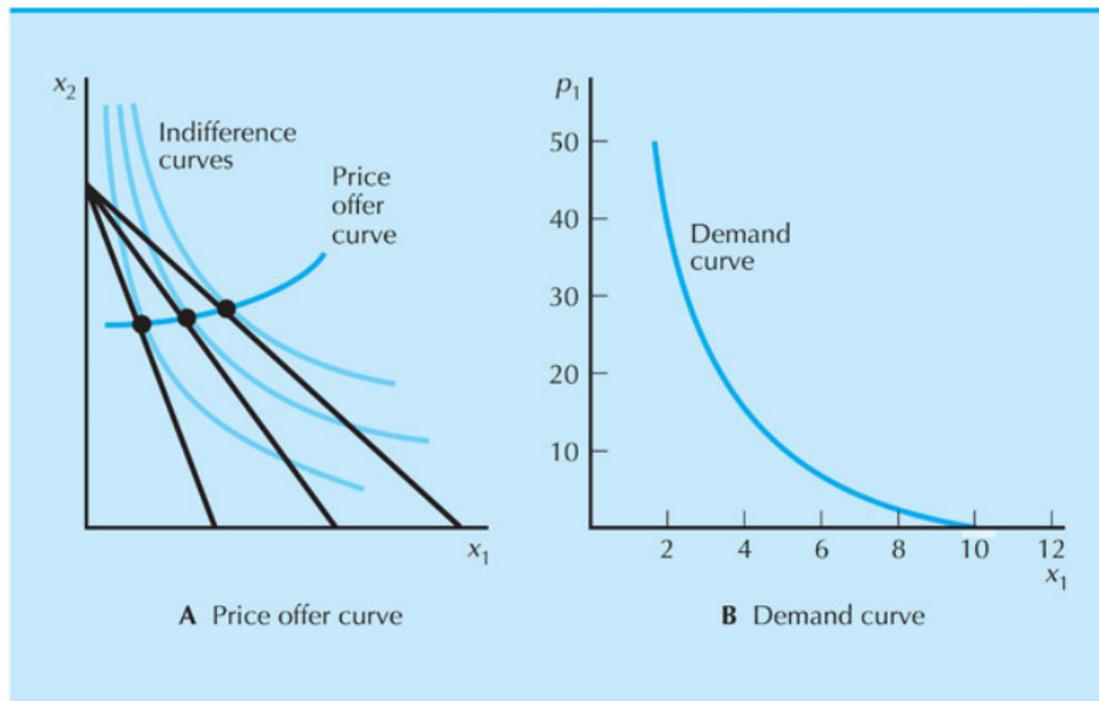


Figure 6.11

# Cross-Price Effects

- ▶ So far, have only looked at how change in  $p_1$  affects demand for good 1

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Good 1 is a *substitute* for good 2 if  $\frac{\partial x_1^*}{\partial p_2} > 0$ .

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Good 1 is a *complement* for good 2 if  $\frac{\partial x_1^*}{\partial p_2} < 0$ .

- ▶ If good 2 gets expensive, consumer buys less of good 1
- ▶ Warning: in general, if good 1 is a substitute (complement) for good 2, good 2 may *not necessarily* be a substitute (complement) for good 1

## Example: Cobb-Douglas

- ▶ Suppose we have Cobb-Douglas utility function

$$u(x_1, x_2) = x_1^\alpha x_2^{1-\alpha}$$

- ▶ We showed earlier that demand is given by

$$x_1^* = \alpha \frac{m}{p_1} \quad x_2^* = (1 - \alpha) \frac{m}{p_2}$$

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- ▶ What is the formula for the Engel curve for good 1?
  - ▶ Need formula for  $m$  as function of  $x_1$ , prices fixed
  - ▶ Can get this from rearranging demand function:

$$m = \frac{p_1}{\alpha} x_1^*$$

- ▶ So Engel curve w.r.t. good 1 is straight line through origin, slope  $\frac{p_1}{\alpha}$
- ▶ So good 1 is a normal good

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$$x_2^* = \frac{(1 - \alpha) p_1}{\alpha p_2} x_1^*$$

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  - ▶  $\frac{\partial x_1^*}{\partial p_1} = -\alpha \frac{m}{p_1^2} < 0$ , so ordinary good

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- ▶ Is good 1 substitute or complement of good 2?
  - ▶  $\frac{\partial x_1^*}{\partial p_2} = 0$ , so neither a substitute nor a complement