Econ 301: Microeconomic Analysis

Prof. Jeffrey Naecker

Wesleyan University

Demand

Demand

- 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

$$
\begin{aligned}
x_1^* &= x_1^*(p_1, p_2, m) \\
x_2^* &= x_2^*(p_1, p_2, m)
\end{aligned}
$$

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

Changes in Income

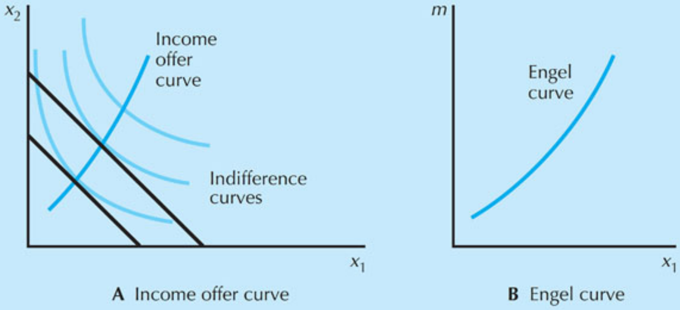
- How does an increase in income (holding prices fixed) change demand?
- For a *normal good*, demand for that good increases with income
  - That is, $\frac{\partial x_1^*}{\partial m} > 0$
- For an *inferior* good, demand for that good decreases with income
  - That is, $\frac{\partial x_1^*}{\partial m} < 0$
  - 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 $x_2^*(x_1^*)$
  - What is the slope of the income expansion path when both goods are normal goods? Positive
  - 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 $\frac{\partial x_1^*}{\partial p_1} < 0$
  - *Giffen good*: Increase in price causes a increase in demand, ie $\frac{\partial x_1^*}{\partial p_1} > 0$
- What are some examples of Giffen goods? Many inferior goods are Giffen goods

Graphing Changes in Prices

- Note that as we change one of the prices the optima bundle traces out a curve
  - This is the the *price offer curve*
  - Note there is one POC for *each* price
- 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

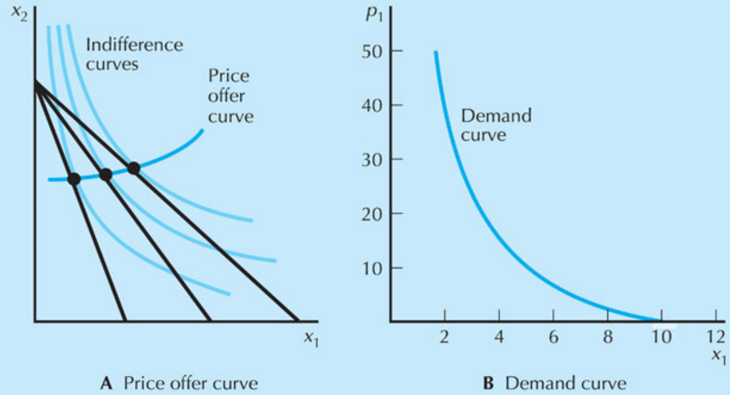


Figure 6.11

Cross-Price Effects

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

Definition

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

- If good 2 gets expensive, consumer substitutes away by buying more of good 1

Definition

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

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

- 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

Cobb-Douglas, cont

- What is formula for income offer curve?
  - Need formula for x_2^* as function of x_1^*, and m must be eliminated
  - Substitute $m = \frac{p_1}{\alpha} x_1^*$ into $x_2^* = (1-\alpha)\frac{m}{p_2}$ to get

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

  - Thus income offer curve is straight line through origin with slope $\frac{(1-\alpha)}{\alpha}\frac{p_1}{p_2}$
- Is good 1 ordinary or Giffen?
  - $\frac{\partial x_1^*}{\partial p_1} = -\alpha \frac{m}{p_1^2} < 0$, so ordinary good
- Is good 1 substitute or complement of good 2?
  - $\frac{\partial x_1^*}{\partial p_2} = 0$, so neither a substitute nor a complement