Applying Consumer Theory

In Chapter 4, we used consumer theory to understand how a consumer chooses a bundle of goods that will maximize happiness given budget constraints. Here, we use it to derive demand curves.

1 Deriving demand curves

Using Chapter 4 analysis, we are able to figure out the quantity consumed (the optimal bundle chosen) at different price levels of a good Z (holding price of good B and income constant) by looking at the point where the highest indifference curve (IC) touches the budget line.

If you plot these price-quantity combinations on a separate graphs, then you generate the demand curve of the consumer for good Z.

Examples:

1.

$U(B,Z) = \sqrt{BZ} = B^{.5}Z^{.5}; I = \$24; P_B = \$3; P_z = \$4/3, \$3, \$12$

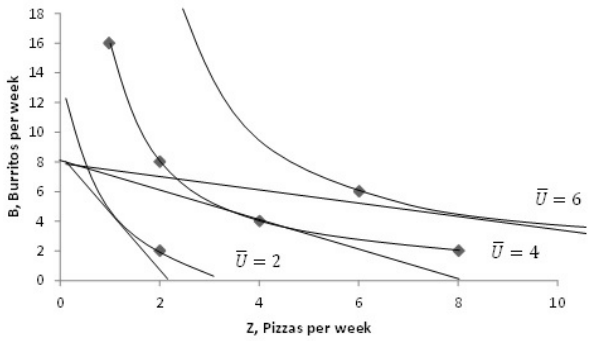


Figure 1: Deriving demand curve

2. $U(B,Z) = 2Z + B; I = \$24; P_B\$3; P_z = \$3, \$5, \$6, \$7$

1.1 Price consumption curve

is the line through equilibrium bundles as only price of good Z changes (falls).

→upward sloping; suggests that as price of good Z falls, you consume more of goods B and Z.

Utility increases as you move down the demand curve (i.e. lower price allows you to consume more)

2 Effect of an increase in income

Example
$U(B,Z) = \sqrt{BZ} = B^{.5}Z^{.5}; P_B = \$3; P_z = \$3; I = \$12, \$24, \$36$

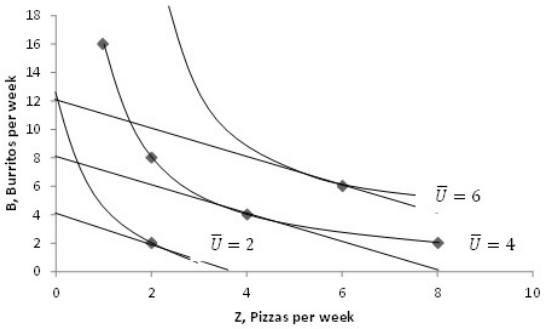


Figure 2: Changes in income

2.1 Income consumption curve

is the line through equilibrium bundles as only income increases (holding prices constant)

→ if upward sloping; suggests that as income goes up, you consume more of goods B and Z; also suggests (+) income elasticity of Demand.

→ if downward sloping; may suggest that one good is a normal good and the other good is an inferior good (defined below).

2.2 Engel Curve

is the graph of income (y-axis) vs. quantity demanded (x-axis)

→ Generally upward sloping (could be backward bending)

→ If income elasticity of demand is >0 (+), then **Normal good** (buy more as income increases)

→ If income elasticity of demand is <0 (-), then **Inferior good** (buy more as income increases)

Income elasticity may vary at different income levels

3 Effects of a price change

While the basics seem quite straight forward, we are masking some very important effects that occur with price changes:

- rate at which the person exchanges one good for the other changes
- the amount you can buy with your income changes

So, within the total effect of a price change, there are two different effects on people's choices:

1. Substitution effect - the effect only due to a change in the price and rate of exchange of 2 goods
2. Income effect - the effect due to a change in the purchasing power of income

These two effects combined determine the total change in quantity demanded when prices change,

i.e. **Total effect of a price change = substitution effect + income effect**

3.1 Substitution effect

is the part of the change in quantity demanded that is caused by substitution of one good for another.

Specifically, it is the change in quantity demanded if we hold utility constant and compensate consumer for the beneficial effect of a price change.

→ Artificially hold utility constant and observe the pure substitution effect of the price change. To do this you need to artificially compensate the consumer so that you are able to keep them just as happy as they were before the price change. Thus you artificially adjust their income so that they remain on their original indifference curve (think: new prices, old utility).

→ movement along an IC (where MRS-new price ratio)

→ Assume: consume more when price falls.

3.2 Income effect

is the part of the change in quantity demanded that is caused by a change in 'real' income (purchasing power).

Specifically, it is the change in quantity demanded due to a change in income.

→ Remove the artificial compensation: so return the individual to their original income where they face the new prices and are on a new indifference curve. The movement from the substitution choice to the final choice is the income effect!

→ shift to new IC

Direction depends on income elasticity

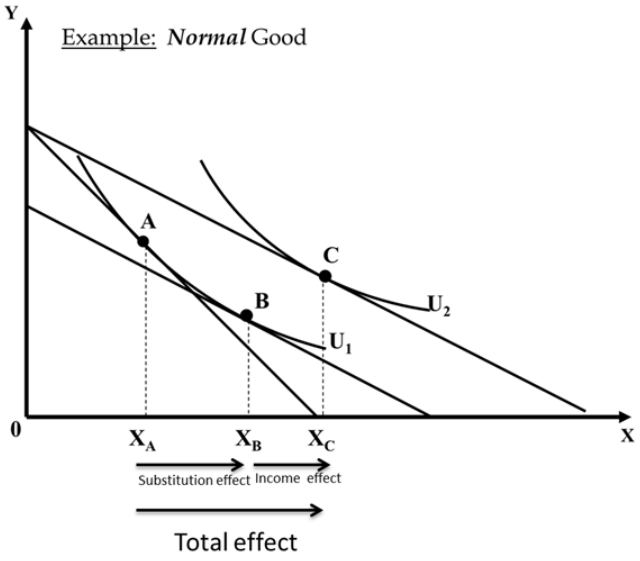
1. If normal good, same direction as substitution effect

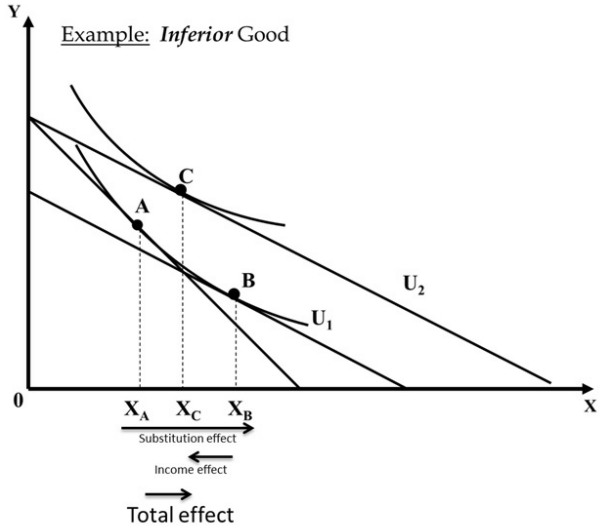
2. If inferior good, opposite direction as substitution effect (direction of total effect depends on which of income or substitution effect is larger).

Note that while the substitution effect is negative, the income effect can be positive or negative depending on whether the food is normal or inferior.

3.3 Total Effect

Note that while the substitution effect is negative, the income effect can be positive or negative depending on whether the food is normal or inferior.

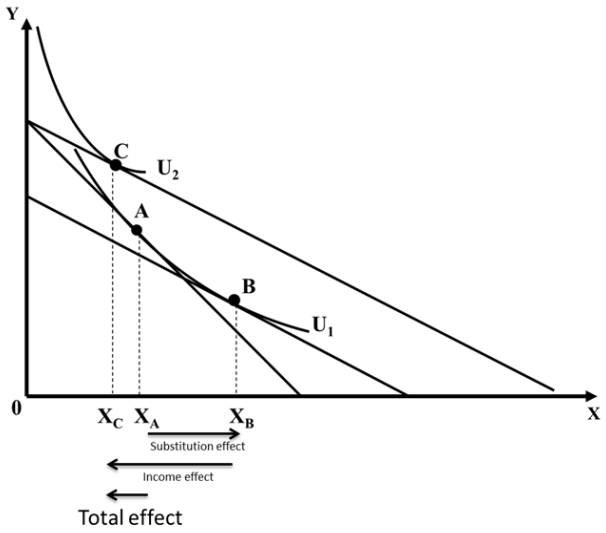




3.4 Giffen good

is a good for which a decrease in price causes quantity demanded to fall

→ Demand curve is upward sloping! (i.e. there are a few exceptions to the Law of Demand).



4 From Individual to Market Demand

Once we have individual demand curves, deriving the market demand is a simple HORIZONTAL summation of individual demand curves.

Example:

Total US demand for wheat has 2 components: domestic demand by US consumers and export demand by foreign consumers.

$$\begin{aligned} Q_{DD} &= 1465 - 88P \\ Q_{DE} &= 1344 - 138P \end{aligned}$$

where quantities are in millions of bushels and price in dollars per bushel.

Domestic own price elasticity of demand around -0.2; export demand has an own price elasticity of -0.4 (substitute away quicker).

To find world demand:

$$Q_{D=}Q_{DD} + Q_{DE} = 1465 - 88P + 1344 - 138P = 2809 - 226P$$

5 Deriving labor supply curves

Consumer theory can also determine the labor supply curve:

1. Derive the demand curve for the time spent NOT working (i.e. leisure hours)- using the usual budget line/IC analysis we've seen

2. Derive the supply curve of hours spent working; for each price (wage level): 24 (hours/day)- leisure hours = work hours.

5.1 Deriving the demand curve for leisure

Budget/Income constraint, I

$I = wH + I^*$

w = wage

H = number of hours worked

I^* = extra unearned income

Also note that work hours, H

$$H = 24 - N$$

where N = leisure hours (hours not working)

For simplicity, assume there is no unearned income, so

$$I = wH = w(24 - N)$$

Slope (which is change in Y/ change in X) is $-w$ since you give up your wage (y-axis) to gain an extra leisure hour (on x-axis).

Note that price is still on the y-axis- this time, the price of leisure hours is measured by wage. The price of leisure is FOREGONE EARNINGS (or foregone wages).

Higher wages mean leisure is more costly so you'll demand less of it. If you're earning \$100/hour, then taking a day off is more costly than if you were making \$5/hour.

The analysis here is the same as the budget line/indifference curve analysis in Chapter 4. Note that if wage goes up, your budget line will pivot/rotate and it will become steeper (since w is the slope which becomes a bigger number).

After you derive the DEMAND for leisure, you can easily obtain the SUPPLY curve for labor. Calculate the number of hours worked at each wage rate (i.e. $H = 24 - N$) then plot. Wage (i.e. price of labor) is on the y-axis and work hours will be on the x-axis. This is a SUPPLY CURVE since you supply the labor.

Depending on whether leisure is regarded as an inferior or a normal good, the supply curve of labor may be upward sloping or backward bending.

An increase in wage also causes income and substitution effects. Use the same analysis as previously discussed.