Lecture 25 – Consumer Behavior -- Income and Substitution Effects

We have shown that when the price of a good changes, the quantity demanded also changes. For example, when the price of salad rose, the quantity of salad consumed declined. When we look at the diagram, we can see two things going on:

1) It looks like the consumption possibilities in general have shifted in.
2) It looks like the consumption of salad has shifted to the left along the indifference curve.

In this lecture, we are going to explore these two components to the shift in more detail.

A. Income Effect

We have shown how the budget constraint shifts when income changes holding prices fixed – the budget constraint shifts out or in, maintaining the same slope (because the relative price of the goods has not changed).

Key idea – **Income effect** is the change in the quantity demanded resulting from a change in income while holding prices fixed.

We usually think that as income increases, consumption also increases. A good for which consumption does increase with income is called a **normal good**.
But this does not have to be the case. It is possible to have indifference curves that meet our requirements – downward sloping (for goods we like), do not cross, and are increasing away from the origin – that have consumption decrease as income increases. Goods for which this is the case are called **inferior goods**.

![Diagram of indifference curves]

As income increases, the quantity consumed of good 2 decreases (while that of good 1 increases). Good 2 is an inferior good.

Whether or not a good is a normal good or an inferior good depends on the shape of the indifference curves.

Review – Income Effect is change in quantity demanded keeping prices constant and adjusting income (i.e. finding the point on a new indifference curve that has the same slope). The Income effect is usually the same sign as the income change (normal good), but can be the opposite sign (inferior good).

### B. Substitution Effect

The substitution effect asks how quantity demanded changes when the price of the good changes, holding utility constant. That is, what is the change in the relative price moving along the same indifference curve.

To see what we mean, consider an increase in the price of good 2 from \( P_2 \) to \( P_2' \):
Key idea -- The **substitution effect** is the change in quantity demanded following the change in price, holding utility constant (or moving along the same indifference curve).

Because the indifference curve is downward sloping and the slope stays the same or gets flatter as we move from left to right (and cannot be increasing if both goods are desired), the substitution effect is ALWAYS negative – i.e. an increase in the price of a good always leads to change in quantity demanded for that good along the same indifference curve that is negative.

C. **Income and Substitution Effects from a Price Change (Normal Good)**

Now, we are ready to look at the income and substitution effects that result from a price change (such as we were looking at to derive the demand curve).

Let’s continue looking at a price change for good 2. If income doesn’t change, then the slope of the budget constraint will become steeper, rotating at the point on the vertical axis:
We know that with the indifference curves as I’ve drawn them, the overall effect will be a movement from point A to point C and a reduction in quantity demanded of good 2 will fall from $Q_2^A$ to $Q_2^C$.

We could divide the overall change into the income effect and the substitution effect in either order:

1) Substitution first, then income
2) Income first, then substitution

Substitution Effect -- Movement along original indifference curve allowing price to change.
This is the movement from point A to point B, with a decrease in quantity from $Q_2^A$ to $Q_2^B$.

Income Effect – Change in quantity from movement from the old indifference curve to the new indifference curve holding prices constant. This is the movement from point B to point C and the change in quantity is from $Q_2^B$ to $Q_2^C$.

This is the most common case, with both the substitution effect and the income effect being negative. The overall effect is a decrease in the quantity consumed of good 2 when the price of good 2 increases.

We can break down the total change into the substitution and income effects:

Total Change in Quantity Demanded of Good 2 from Price Increase in Good 2 $\quad = \quad Q_2^C - Q_2^A$

Change in Quantity Demanded of Good 2 from Price Increase in Good 2 Due to Substitution Effect $\quad = \quad Q_2^B - Q_2^A$

Change in Quantity Demanded of Good 2 from Price Increase in Good 2 Due to Income Effect $\quad = \quad Q_2^C - Q_2^B$
D. Income and Substitution Effects from a Price Change (Inferior Good)

Substitution Effect -- Movement along original indifference curve allowing price to change. This is the movement from point A to point B, with a decrease in quantity from $Q_2^A$ to $Q_2^B$.

Income Effect – Change in quantity from movement from the old indifference curve to the new indifference curve holding prices constant. This is the movement from point B to point C and the change in quantity is from $Q_2^B$ to $Q_2^C$.

In this case, the substitution effect is negative and the income effect is positive. The income effect is smaller than the substitution effect, so the overall effect is an decrease in the quantity consumed of good 2 when the price of good 2 increases.

We can break down the total change into the substitution and income effects:

\[
\text{Total Change in Quantity Demanded of Good 2 from Price Increase in Good 2} = Q_2^C - Q_2^A
\]

\[
\text{Change in Quantity Demanded of Good 2 from Price Increase in Good 2 Due to Substitution Effect} = Q_2^B - Q_2^A
\]

\[
\text{Change in Quantity Demanded of Good 2 from Price Increase in Good 2 Due to Income Effect} = Q_2^C - Q_2^B
\]
Consider a consumer that consume two goods – Good X and Good Y

1. What is effect on the consumer’s demand for Good X and Good Y when income increases by $100?

2. What is the effect on the consumer’s demand for Good X and Good Y when the consumer receives a coupon good for the consumption of $100 of Good X?

3. What is the effect on the consumer’s demand for Good X when there is a per-unit tax on the purchase of Good X?

4. What is the effect on the consumer’s demand for Good X and Good Y if the consumer’s preferences change in favor of Good X?

5. What is the effect on the consumer’s demand for Good X and Good Y when the price of good X increases? How much of this is due to the income effect and how much is due to the substitution effect?