

each pair? **(b)** What can you conclude about the strength of this relationship for each pair? **(c)** Suppose the prices of A and C increase; draw a diagram showing the effect that each price increase will have on the demand for B.

7 Suppose goods D and E have a XED of -0.3 and goods E and F have a XED of -0.7 . **(a)** What is the relationship between the two goods in each pair? **(b)** What can you conclude about the strength of this relationship for each pair? **(c)** Suppose the prices of D and F increase; draw a diagram showing the effect that each price increase will have on the demand for E.

8 How can knowledge of cross-price elasticities of demand help firms make pricing decisions in the case of **(a)** substitutes; **(b)** complements?

3.3 Income elasticity of demand (YED)

Income elasticity of demand

Understanding income elasticity of demand

◆ Outline the concept of income elasticity of demand, understanding that it involves responsiveness of demand (and hence a shifting demand curve) to a change in income.

Consumer income is another factor influencing demand for a good and the position of the demand curve.

Income elasticity of demand (YED) is a measure of the responsiveness of demand to changes in income, and involves demand curve shifts. It provides information on the direction of change of demand given a change in income (increase or decrease) and on the size of the change (size of demand curve shifts).

Calculating YED

◆ Calculate YED using the following equation.

$$YED = \frac{\text{percentage change in quantity demanded}}{\text{percentage change in income}}$$

The formula for YED has the same basic form as the other elasticity formulae, and shows the relationship

between the percentage change in quantity demanded of a good, X , and the percentage change in income, which we abbreviate as Y :⁷

$$\text{income elasticity of demand} = YED = \frac{\text{percentage change in quantity demanded of good } X}{\text{percentage change in income}}$$

$$YED = \frac{\% \Delta Q_x}{\% \Delta Y}$$

which can be rewritten as:

$$YED = \frac{\frac{\Delta Q_x}{Q_x} \times 100}{\frac{\Delta Y}{Y} \times 100} = \frac{\Delta Q_x}{\Delta Y} \frac{Q_x}{Y}$$

Suppose your income increases from \$800 per month to \$1000 per month, and your purchases of clothes increase from \$100 to \$140 per month. What is your income elasticity of demand for clothes?

$$YED = \frac{\frac{40}{100}}{\frac{200}{800}} = \frac{0.40}{0.25} = +1.6$$

Your income elasticity demand for clothes is +1.6. We will now see how we interpret various values of income elasticity of demand.

Interpreting income elasticity of demand

Income elasticity of demand provides two kinds of information:

- the sign of YED : positive or negative
- the numerical value of YED : whether it is greater or smaller than one (assuming it is positive).

The sign of income elasticity of demand: normal or inferior goods

◆ Show that normal goods have a positive value of YED and inferior goods have a negative value of YED .

The sign of YED tells us whether a good is normal or inferior:

⁷ Here, too, as with XED , YED involves the responsiveness of 'demand' to changes in income, but is measured as the % change in 'Q demanded'. (See footnote 5, page 59.)

- $YED > 0$ Income elasticity of demand is positive ($YED > 0$) when demand and income change in the same direction (i.e. both increase or both decrease). A positive YED indicates that the good in question is *normal*. Most goods are normal goods (see page 24).
- $YED < 0$ A negative income elasticity of demand ($YED < 0$) indicates that the good is *inferior*: demand for the good and income move in opposite directions (as one increases the other decreases). Examples include bus rides, second-hand clothes and used cars; as income increases, the demand for these goods falls as consumers switch to consumption of normal goods (new cars, new clothes, and so on; see page 24).

The difference between normal and inferior goods can be seen in Figure 3.9, showing a demand curve, D_1 , and shifts of the curve that occur in response to increases in income. As income increases, the demand curve shifts rightward from D_1 to D_3 or D_4 when goods are normal ($YED > 0$), but shifts leftward to D_2 when goods are inferior good ($YED < 0$).

The numerical value of income elasticity of demand: necessities and luxuries

- ◆ Distinguish, with reference to YED , between necessity (income inelastic) goods and luxury (income elastic) goods.

Here we are making a distinction between goods that have a YED that is less than one (but positive) or greater than one:

- $YED < 1$: *Necessities* If a good has a YED that is positive but less than one, it has **income inelastic demand**: a percentage increase in income produces a smaller percentage increase in quantity demanded. Necessities are income inelastic goods.
- $YED > 1$: *Luxuries* If a good has an YED that is greater than one, it has **income elastic demand**: a percentage increase in income produces a larger percentage increase in quantity demanded. Luxuries are income elastic goods.

Necessities, such as food, clothing and housing, tend to have a YED that is positive but less than one; they are normal goods that are income inelastic. In the case of food, as income increases, people buy more food but the proportion of income spent on food increases more slowly than income. In developed countries,

YED for food is about 0.15 to 0.2. This means that a 1% increase in income produces a 0.15% to 0.2% increase in spending on food; or a 10% increase in income results in a 1.5% to 2% increase in spending on food. By contrast, luxuries, such as travel to other countries, private education and eating in restaurants are income elastic: as income increases, the proportion of income spent on such goods increases faster than income (the denominator in the YED formula is smaller than the numerator).

What is a necessity and what is a luxury depends on income levels. For people with extremely low incomes, even food and certainly clothing can be luxuries. As income increases, certain items that used to be luxuries become necessities. For example, items like Coca-Cola® and coffee for many poor people in less developed countries are luxuries, whereas for consumers in developed countries they have become necessities. Income elasticity of demand for particular items therefore varies widely depending on income levels. While YED for food is about 0.15–0.20 in more developed countries, it is about 0.8 in poor countries. For an increase in income of 10%, spending on food increases by only 1.5%–2% in rich countries and by 8% in poor countries.

In Figure 3.9, we see that in the case of necessities, an increase in income will produce a relatively small rightward shift in the demand curve; in the case of luxuries, the rightward shift will be larger.

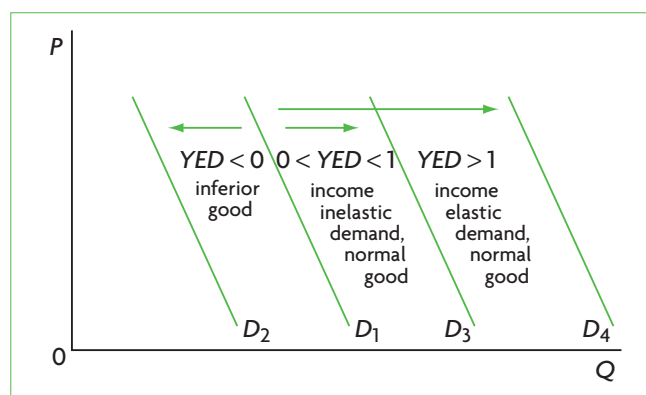


Figure 3.9 Demand curve shifts in response to increases in income for different YED s

Applications of income elasticity of demand

YED implications for producers and for the economy

- ◆ Examine the implications for producers and for the economy of a relatively low YED for primary products, a relatively higher YED for manufactured products and an even higher YED for services.

YED and producers: the rate of expansion of industries

Over time, as countries experience economic growth, society's income increases. Increasing income means a growing demand for goods and services. Suppose that total income in an economy grows at an average rate of about 3% per year. If goods and services have income elastic demand ($YED > 1$), this means that demand for these goods and services grows at a higher rate than 3%. Examples usually include restaurants, movies, health care and foreign travel. Other goods and services have income inelastic demand ($YED < 1$), meaning that the demand for these grows at a rate of less than 3%. Examples include food, clothing and furniture. The first group (with the elastic demand) includes goods and services produced by industries that grow and expand faster than total income in the economy, while the second group includes goods or services produced by industries growing more slowly than total income.

The higher the YED for a good or service, the greater the expansion of its market is likely to be in the future; the lower the YED , the smaller the expansion. Producers interested in producing in an expanding market may therefore want to know YED s of various goods and services.

In contrast to periods of economic growth, if an economy is experiencing a recession (falling output and incomes, see Chapter 8), goods and services with high YED s ($YED > 1$) are the hardest hit, experiencing the largest declines in sales. Products with low YED s ($YED < 1$) can avoid large falls in sales, while inferior goods ($YED < 0$) can even experience increases in sales.

YED and the economy

The implications of differing YED s for the economy follow from what happens to particular industries in the economy as income grows, discussed above.

Every economy has three sectors (or parts): the primary sector including primary products (agriculture, forestry, fishing and extractive industries), the manufacturing sector and the services sector (including entertainment, travel, banking, insurance, health care, education, and so on). With economic growth, the relative size of the three sectors usually changes over time, and these changes can be explained in terms of income elasticity of demand. Agriculture, the main part of the primary sector, produces food, which as noted above (page 63) has a YED that is positive but less than one (it is income inelastic). As society's income grows over time, the demand for agricultural output grows more slowly than the growth in income. Other primary products also have a low income elasticity of demand. For example, cotton and rubber have synthetic substitutes, so as income increases a relatively larger proportion of it is spent on the synthetic materials, while a relatively lower fraction goes towards cotton and rubber. By contrast, manufactured products (cars, televisions, computers, and so on) have a YED that is usually greater than one (income elastic), so that as society's income grows, the demand for these products grows faster than income. Many services have even higher YED s, so the percentage increase in the demand for these is much larger.

Therefore, over time, the share of agricultural output in total output in the economy shrinks, while the share of manufactured output grows. With continued growth, the services sector expands at the expense of both agriculture and manufacturing. In Figure 3.10, this is shown for a hypothetical growing economy in the changes of relative sector sizes from parts (a) to (b) to (c).

Economically less developed countries usually have a large primary sector due to the importance

Real world focus

Income elasticity of demand and industry growth

As consumer incomes increase with economic growth, they lead to a greater amount of spending by consumers. A study was carried out in Thailand to try to find which are the sectors that stand to gain the most from increased consumer incomes and spending. The study suggests that the sectors that benefit the most from rising incomes and consumption are those with the most income elastic demand. It was found that the following sectors are likely to perform the best in Thailand: the auto sector (car sales), communication equipment (mobile phone sales), and financial services. These areas show the greatest sensitivity to changing income levels and have an income elasticity of demand greater than 2.

Source: Adapted from 'Thailand: Economic impacts of the first SP2 allotment of Bt200bn' in Thai Press Reports, 9 November 2009.

Applying your skills

- 1 Explain the meaning of income elastic demand.
- 2 Explain why goods and services with highly income elastic demand stand to gain the most from rising consumer incomes.

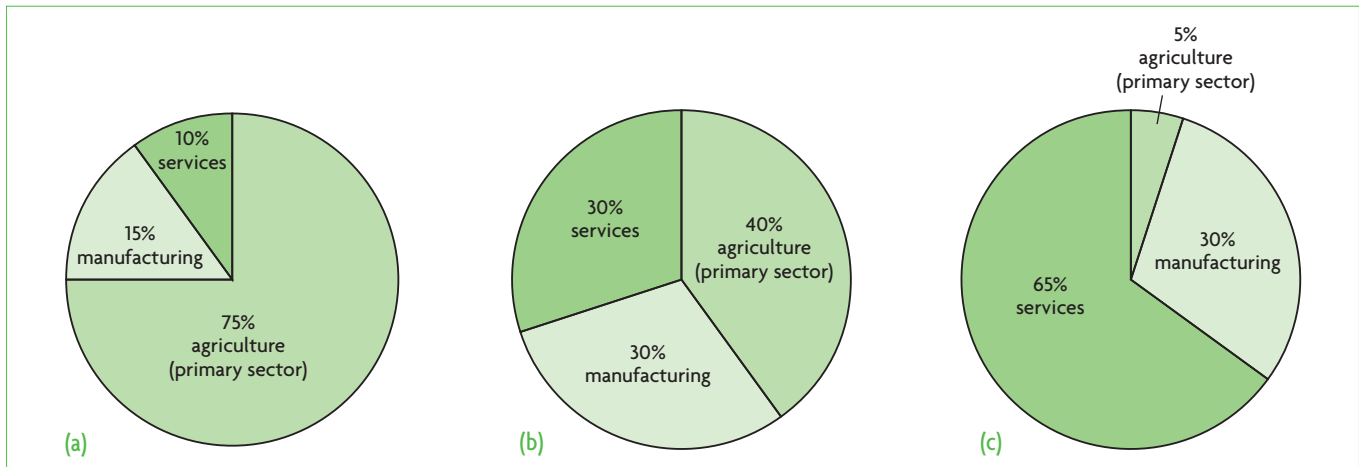


Figure 3.10 Changing relative shares (as percentage of total output) of primary, manufacturing and services sectors for a hypothetical economy as it grows

of agriculture and extractive activities, while manufacturing and services are far less important. The developed countries of today were in a similar position many decades ago. The historical experience of both more and less developed countries shows that with economic growth, the primary sector becomes less and less important, and is partly replaced by manufacturing and services. As the economy grows further, the relative importance of the primary sector continues to shrink, and manufacturing becomes increasingly replaced by services. Thus, while less developed countries are usually dominated by the primary sector, more developed countries are dominated by services. In the developed world today, among the industries experiencing the fastest growth are services, including education, health care, travel and financial services.

Note that if total output is increasing over time, a falling share for a particular sector (such as the primary sector) does not necessarily mean that primary sector output is falling; most likely it means that this sector's output is growing, but more slowly than total output. An increasing share for a sector means that its output is growing more rapidly than total output.

HL **YED and long-term impacts on primary commodity prices (higher level topic)**

(This topic is related to learning outcomes appearing in Chapters 15 and 17.)

A low *YED* for food (agricultural products), compared with a high *YED* for manufactured products and services, has important implications for the level of prices of agricultural products relative to prices of manufactured products and services over long periods of time. We have seen that a low *YED* for food means that as income rises, a relatively smaller

proportion of income is spent on food and a relatively larger proportion on manufactured products and services, indicating that as incomes rise, demand for manufactured products and services rises more rapidly than the demand for food. The result is that the prices of these goods and services rise more rapidly than the prices of agricultural products. This has important implications for economically less developed countries, which we will study in Chapters 15 and 17.

HL

Test your understanding 3.6

- 1 Explain the meaning of income elasticity of demand. Why do we say it involves a *shifting demand curve*?
- 2 Explain the difference between normal and inferior goods and provide examples of each.
- 3 Your income increases from £1000 a month to £1200 a month. As a result, you increase your purchases of pizzas from 8 to 12 per month, and you decrease your purchases of cheese sandwiches from 15 to 10 per month. **(a)** Calculate your income elasticity of demand for pizzas and for cheese sandwiches. **(b)** What kind of goods are pizzas and cheese sandwiches for you? **(c)** Show using diagrams the effects of your increase in income on your demand for pizzas and cheese sandwiches.
- 4 A 15% increase in income leads to a 10% increase in demand for good A and 20% increase in demand for good B. **(a)** Explain which of the two goods is income elastic and which is income inelastic. **(b)** Which of the two goods is likely to be a necessity good and which a luxury good?