The big picture

Real-world issue 1: How do consumers and producers make choices in trying to meet their economic objectives?

Figure 1. Like different strengths of rubber bands, consumers may be more or less responsive to changes in their environment.

Credit: Garrett Aitken Getty Images

In section 2.1.2 (/study/app/pp/sid-186-cid-754025/book/the-law-of-demand-id-29856/), we learned about the law of demand. As prices rise, quantity demanded declines, ceteris paribus. Knowing this is interesting for firms, but for the knowledge to be truly useful, firms would also need to know how much quantity demanded declines in response to a price rise. If quantity demanded declines by a minimal amount, it might be a good idea to raise prices, because total revenue could increase. However, if

Overview (/study/ap 186-cid-754025/

consumers are very responsive to a price rise, total revenue could actually fall. Governments also need to be aware of consumers' responsiveness to price changes when changing taxes or subsidies that raise or lower prices.

The responsiveness of one variable to a change in another variable is called elasticity. The concept of elasticity can be used in a wide array of contexts, but in this subtopic we will explore how responsive consumers are to changes in the price of a product and to changes in consumers' incomes.

An interesting example of this occurred in early 2020, during the outbreak of the coronavirus in China and beyond. During the outbreak, consumers scrambled for face masks to protect themselves from the virus. Some producers saw an opportunity to increase their revenues by raising prices for face masks significantly. Was this a good idea? The case will be explored in greater detail in section 2.5.11 (/study/app/pp/sid-186-cid-754025/book/investigation-id-30281/).

This subtopic is dedicated to understanding the different types of elasticities, and how they can help the different economic agents make more informed decisions to achieve their objectives.

Concept

Change

Change occurs when something transforms from its initial state or condition to a new state or condition.

Markets and economies are dynamic, complex systems where stakeholders are constantly reacting to external forces and feedback loops created from their own and others' actions. Uncertainty among stakeholders and technological innovation are two driving forces of change. Though we often identify equilibrium in our market analyses, most markets are often experiencing dynamic change and are thus in disequilibrium.

In this section, we explore how consumers react to market price and income changes. We assume that consumer demand has a negative relationship to price changes — that is, we assume that price increases cause producers to supply larger quantities to markets (as you have learned in subtopic 2.1 (/study/app/pp/sid-186-cid-754025/book/the-big-picture-id-29721/)). We also assume that increases in income will cause increases in demand for most goods (normal goods), but decreases in demand for other goods (inferior goods).

Here we go further to examine how changing price and income conditions will cause a range of consumer responses to price signals .

To what extent do the generalisations about change made in this subtopic allow us to make accurate predictions about consumers' behaviours?

Student view

Price elasticity of demand (PED): definition, formula and calculations

Definition and formula

Elasticity of demand is a measure of the responsiveness of the quantity demanded of a good or service to changes in one of the factors that determines it. Price elasticity of demand (PED) is a measure of how much the quantity demanded of a good changes when there is a change in its own price.

According to the law of demand, when the price of a good increases, quantity demanded declines, ceteris paribus. The extent to which the quantity demanded changes depends on how 'elastic' its demand is with respect to its price.

$$\text{PED} = \frac{\%\text{ change in the quantity demanded of good X}}{\%\text{ change in the price of good X}}$$

The Greek letter Δ (upper case delta) is used to symbolise 'change in', therefore the formula is commonly written as:

$$\text{PED} = \frac{\%\triangle \text{Q}_\text{d}}{\%\triangle \text{P}}$$

In other words, this means that the price elasticity of demand is the percentage change in the quantity demanded of a good, divided by the percentage change in the price of that same good.

For example, if the price of train tickets decline by 10 percent and, as a result, the quantity demanded of train tickets increases by 15 percent, then the price elasticity of demand for train tickets is 1.5.

Overview (/study/ap 186- cid- 754025/

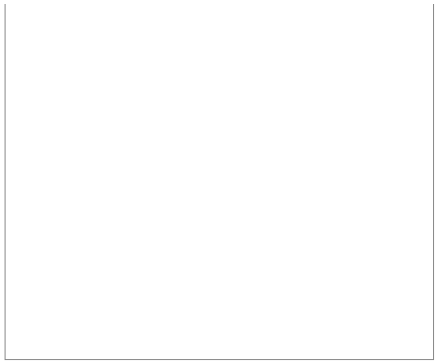


Figure 1. Price elasticity of demand for train tickets.

More information for figure 1

This interactive graph demonstrates price elasticity of demand (PED) for train tickets, showing how price changes affect quantity demanded. The horizontal axis represents quantity (in thousands per day), while the vertical axis shows price in euros (€). A downward-sloping demand curve (D) illustrates the inverse relationship between price and demand. When the ticket price drops by 10 percent (P1 to P2), quantity demanded rises by 15 percent (Q1 to Q2), highlighting elasticity.

The slope of the demand curve and the proportionate changes in price and quantity both assist us in computing the

$$\text{PED} = \frac{\%\Delta \text{ P}}{\%\Delta \text{ Qd}}$$

Since demand moves inversely to price, PED is typically negative, but its absolute value measures consumer sensitivity. Here, the estimated PED is negative 1.5, indicating elasticity—each 1 percent price drop increases demand by 1.5 percent. The interactive graph allows us to explore different price points and view detailed PED calculations, reinforcing key economic concepts.

This visualization bridges economic theory with real-world application, offering transport authorities and companies insights into how fare changes impact ridership and revenue.

Student view

$$\text{PED} = \frac{\%\triangle \text{Q}_\text{d}}{\%\triangle \text{P}} = \frac{15\%}{-10\%} = -1.5$$

This means that for every 1 percent decrease in the price of train tickets, the quantity demanded of train tickets increases 1.5 percent.

Worked example 1

Overview (/study/ap 186- cid- 754025/

What is the price elasticity of demand for ice cream, if when the price per scoop increases by 15 percent, the quantity demanded declines by 5 percent?

$$\text{PED} = \frac{\%\triangle \text{Q}_\text{d}}{\%\triangle \text{P}} = \frac{-5\%}{15\%} = -0.33$$

This means that for every 1 percent increase in price, the quantity demanded of ice cream scoops declines by 0.33 percent.

Because of the negative relationship between the price of a good and quantity demanded, the signs of the percentage price change and the percentage quantity will be different from one another. When the price of a good increases, ceteris paribus, the quantity demanded of the good will decrease. This means that mathematically PED is always negative (PED < 0).

However, by convention, economists always consider PED as a positive number, as the sign does not have any economic meaning.

⚠ Be aware

When calculating the value of PED, the negative sign is irrelevant from an economics point of view, because it will always be a negative number. Instead, it is the absolute value resulting from the calculation that is taken into consideration.

However, when we cover income elasticity of demand (YED) later in this subtopic, the sign of the value does matter. Therefore, when you are working with PED, you may wish to keep the negative sign in your responses. Just be aware that you may see it written as its absolute value in the exam, other textbooks or internet resources.

Calculating price elasticity of demand (PED) from price and quantity data

Student view

PED can be calculated from two points on a demand curve, from a described example or a diagram, as in the worked examples below. First, you should calculate the percentage change with two prices and two quantities, before moving on to the price elasticity of demand (PED) calculation:

$$\%\triangle \text{Q}_\text{d} = \left[\frac{(\text{Q}_2 - \text{Q}_1)}{\text{Q}_1}\right] \times 100$$

where Q_1 is the original quantity and Q_2 is the new quantity.

Overview (/study/ap 186- cid- 754025/

$$\%\triangle P = \left[\frac{(P_2 - P_1)}{P_1}\right] \times 100$$

where P_1 is the original price and P_2 is the new price.

Exam tip

Pay close attention to how you input quantity and price into the equation. In many examples, the price change is often mentioned first and the impact on quantity second. Students frequently make the mistake of putting the price change in the numerator instead of the denominator when price is mentioned first in an example.

Worked example 2

Figure 2. Elote.

Credit: bonchan Getty Images

Student view

A street vendor in Mexico City increases the price of its elote (spicy corn on the cob) from MXN 15 to MXN 17 and finds the quantity demanded of elote decreases from 120 to 110 per day.

Calculate the price elasticity of demand for the vendor's elote.

Step 1: Calculate the percentage change in the price of the elote: $\%\triangle P = \left[\frac{(P_2 - P_1)}{P_1}\right] \times 100$

where P_1 is the original price and P_2 is the new price.

$$\%\triangle P = \left[\frac{(\text{MXN } 17 - \text{MXN } 15)}{\text{MXN } 15}\right] \times 100 = \left(\frac{\text{MXN } 2}{\text{MXN } 15}\right) \times 100 = 13.33\%$$

Overview (/study/ap 186- cid- 754025/

Step 2: Calculate the percentage change in the quantity demanded of the elote per day:

$$\%\triangle Q_d = \left[\frac{(Q_2 - Q_1)}{Q_1}\right] \times 100$$

where Q_1 is the original quantity and Q_2 is the new quantity.

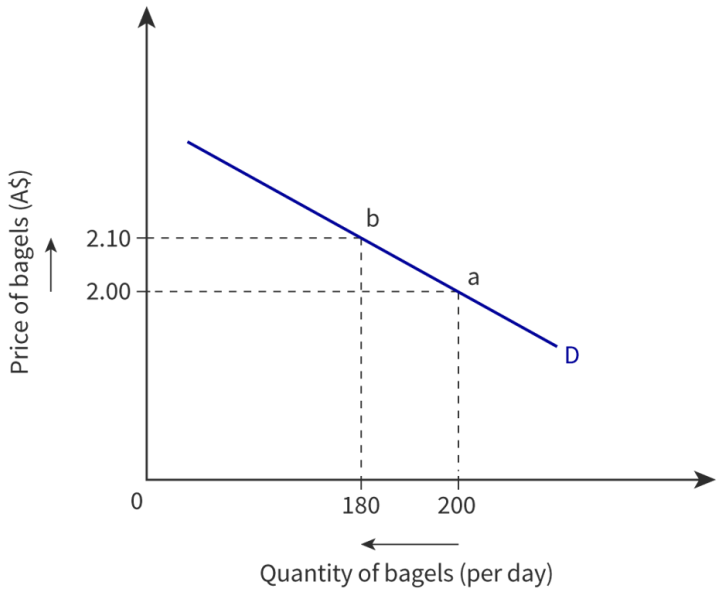
$$\%\triangle Q = \left[\frac{(110 - 120)}{120}\right] \times 100 = \left(\frac{-10}{120}\right) \times 100 = -8.33\%$$

Step 3: Divide to find PED: $\frac{\%\triangle Q_d}{\%\triangle P} = \frac{-8.33\%}{13.33\%} = -0.62$

Result: PED = −0.62 (or 0.62 absolute value)

Worked example 3

It is also possible to determine PED by using points on a demand curve diagram.



Student view

Figure 3. Demand for bagels (round boiled and baked bread with a hole in the middle) in a Melbourne restaurant.

More information for figure 3

The graph is a demand curve illustrating the relationship between the price of bagels and the quantity demanded per day in a Melbourne restaurant. The X-axis is labeled "Quantity of bagels (per day)" with a range starting at 0 and indicating specific points like 180 and 200. The Y-axis is labeled "Price of bagels (A$)" with a range from A$2.00 to A$2.10. The curve is a downward sloping line representing demand, with specific points like "a" and "b" marked on the curve. Point "D" represents a specific part of the demand curve. The graph shows that as the price of bagels decreases, the quantity of bagels demanded increases, which is typical for demand curves.

[Generated by AI]

Overview (/study/ap 186- cid- 754025/(

Using information in **Figure 3,** calculate the price elasticity of demand for bagels using points A and B.

Step 1: Calculate the percentage change in the price of bagels from point a to point b:

$$\%\triangle P = \left[\frac{(P_2 - P_1)}{P_1}\right] \times 100$$

where P_1 is the original price, AUD 2.00, and 'P_2' is the new price, AUD 2.10.

$$\%\triangle P = \left[\frac{(\text{AUD } 2.10 - \text{AUD } 2.00)}{\text{AUD } 2.00}\right] \times 100 = \left(\frac{\text{AUD } 0.10}{\text{AUD } 2.00}\right) \times 100 = 5\%$$

Step 2: Calculate the percentage change in the quantity demanded of bagels from point a to point b: $\%\triangle Q_d = \left[\frac{(Q_2 - Q_1)}{Q_1}\right] \times 100$

where Q_1 is the original quantity, 200, and Q_2 is the new quantity, 180.

$$\%\triangle Q = \left[\frac{(180 - 200)}{200}\right] \times 100 = \left(\frac{-20}{200}\right) \times 100 = -10\%$$

Step 3: Divide to find PED: $\frac{\%\triangle Q_d}{\%\triangle P} = \frac{-10\%}{5\%} = -2$

Result: PED = –2 (or 2 absolute value)

3 section questions

2. Microeconomics / 2.5 Elasticities of demand

Student view

Price elasticity of demand (PED): range of values and diagrams

Section Student... (0/0) Feedback Print (/study/app/pp/sid-186-cid-754025/book/price-elasticity-of-demand-ped-range-id-30272/print/) Assign

Range of values of price elasticity of demand (PED)

The possible values of PED go from zero to infinity. **Table 1** shows the range of values, the classification of demand in each case and how this is explained.

Overview (/study/ap 186-cid-754025/

Table 1. Possible values of PED.

Values of PED	Classification	Explanation
PED > 1	Price elastic demand	A change in price leads to a **proportionately greater** change in the quantity demanded.
0 < PED < 1	Price inelastic demand	A change in price leads to a **proportionately smaller** change in the quantity demanded.
PED = 1	Unitary elastic demand	A change in price leads to a **proportionately equal** change in the quantity demanded.
PED = 0	Perfectly inelastic demand	A change in price leads to **no change** in the quantity demanded.
PED = ∞	Perfectly elastic demand	Any change in price would lead to an **infinite change** in the quantity demanded.

Price elastic demand

When price elasticity of demand is greater than 1 (PED > 1), we say that demand is price elastic. This means that consumers' demand is relatively responsive or sensitive to price changes.

The PED calculation will result in a number greater than 1 when the percentage change in the quantity demanded (the numerator) is greater than the percentage change in price (the denominator).

For example, if the estimated PED for shubat (fermented camel's milk) in Kazakhstan is –1.25, the demand for shubat is price elastic because the absolute value of –1.25 (1.25) is greater than 1. This means that, for example, a 10 per cent increase in the price of shubat will decrease the quantity demanded of shubat by 12.5 per cent. This case is shown in **Figure 1**.

Student view

Overview (/study/ap 186- cid- 754025/(

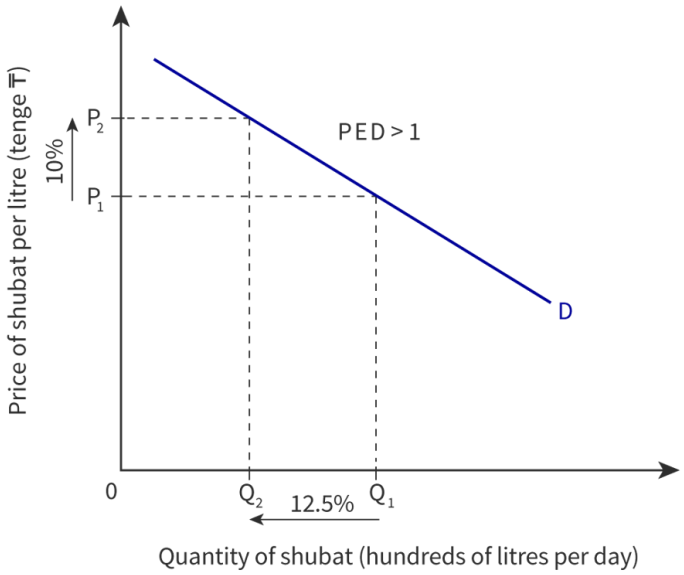


Figure 1. Demand for shubat is price elastic in the diagram above.

More information for figure 1

The image is a graph representing the price elasticity of demand (PED) for shubat, which is fermented camel's milk. It shows a downward sloping demand curve labeled 'D'. The X-axis represents the quantity of shubat in hundreds of litres per day, with specific points marked as Q1 and Q2. The Y-axis indicates the price of shubat per litre in tenge (₸). A price increase from P1 to P2 results in the quantity demanded decreasing from Q1 to Q2. The change in quantity demanded is indicated as a 12.5% decrease, while the price change is marked as a 10% increase. The notation 'PED > 1' is shown, indicating price elasticity greater than 1, meaning demand is price elastic.

[Generated by AI]

Be aware

It is not correct to refer to goods as price elastic or inelastic. Demand for goods has elasticity, not the goods themselves.

Student view

Price inelastic demand

When the price elasticity value is between 0 and 1 (0 < PED < 1), demand is price inelastic , as consumers' demand is relatively unresponsive to price changes.

The PED calculation will result in a number greater than 0 but less than 1 when the percentage change in the quantity demanded (the numerator) is smaller than the percentage change in price (the denominator).

Overview (/study/ap 186- cid- 754025/(

For example, if the estimated PED for apples in Russia is −0.76, the demand for apples is price inelastic, as the absolute value of −0.76 (0.76) is less than 1. This means that a 10 per cent increase in the price of apples will decrease the quantity demanded by 7.6 per cent.

This is shown in **Figure 2**.

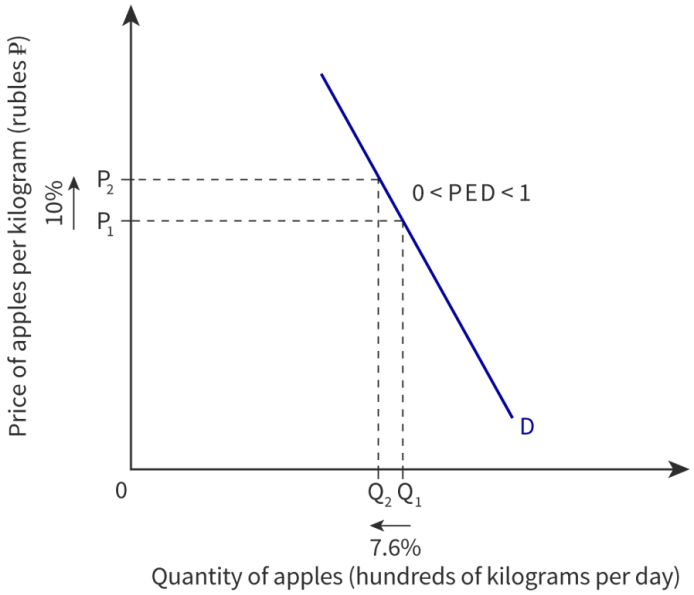


Figure 2. Price inelastic demand of apples.

More information for figure 2

The image is a graph illustrating the concept of price inelastic demand for apples. The X-axis represents the quantity of apples in hundreds of kilograms per day, while the Y-axis represents the price of apples per kilogram in rubles. The graph depicts a linear downward-sloping demand curve labeled 'D', indicating price inelasticity where 0 < PED < 1. The curve shows a 7.6% decrease in quantity from Q1 to Q2, with a 10% increase in price from P1 to P2. Dotted lines indicate these changes on both axes.

[Generated by AI]

Student view

Unitary elastic demand

When the price elasticity of demand is equal to 1 (PED = 1), we say that demand is unitary elastic. In this case, a percentage change in the price of a good results in an equal percentage change in quantity demanded. The values in the numerator and denominator are the same. Therefore, the calculation for price elasticity of demand (PED) will result in a value of 1.

For example, if the price elasticity of demand (PED) for dates in Israel is –1 (absolute value 1), it means that a 10 per cent increase in the price of dates will decrease the quantity demanded by 10 per cent. This is shown in **Figure 3**.

Overview (/study/ap 186- cid- 754025/(

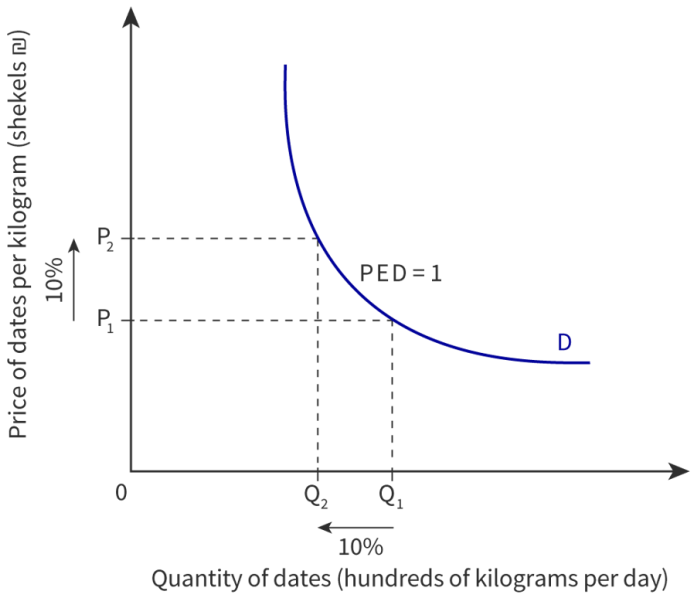


Figure 3. Unitary elastic demand.

More information for figure 3

The graph illustrates the concept of unitary elastic demand, specifically for dates in Israel. The X-axis represents the quantity of dates in hundreds of kilograms per day, starting from zero on the left and increasing to the right. The Y-axis represents the price of dates per kilogram in shekels, also beginning from zero at the bottom and rising upwards. The demand curve labeled 'D' is a downward-sloping curve representing a situation where the percentage change in quantity demanded is equal to the percentage change in price, indicated by a PED of 1.

At one point on the curve, a price increase from P1 to P2 is shown, resulting in a 10% reduction in quantity from Q1 to Q2. This change is annotated with dashed lines connecting the points on the axes to highlight how a 10% increase in price correlates with a 10% decrease in demand, representing the nature of unitary elasticity in this context.

[Generated by AI]

Student view

Important

In order for the PED to be equal to 1 at all points, the demand curve must, in fact, be curved as the diagram above shows. If it were a straight line, then the PED would change along it, because we are dealing with percentage changes, rather than simple changes.

Perfectly inelastic demand

When the value of the price elasticity of demand is zero (PED = 0), we say that demand is perfectly inelastic. Consumers' demand is completely unresponsive to price changes.

Overview (/study/ap 186-cid-754025/

In this case, the calculation of PED results in zero because the change in quantity demanded in the numerator of the formula is always zero, no matter what the percentage change in price in the denominator is. Zero divided by any number is zero.

A demand curve with PED of zero is shown in **Figure 4**. For any price change, there will be no change in the quantity demanded at Q_1.

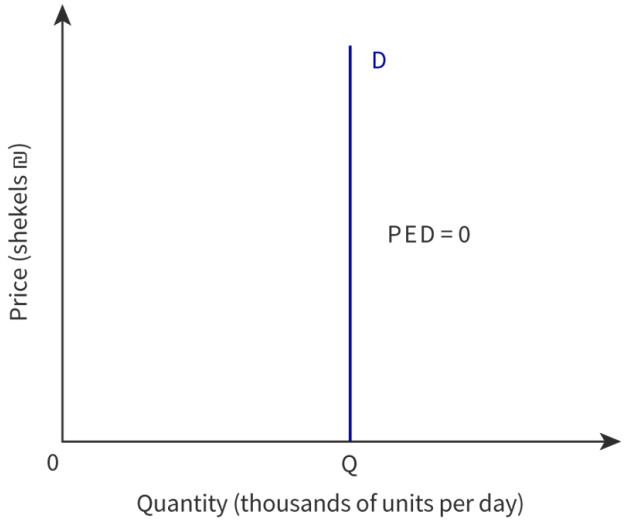


Figure 4. Perfectly inelastic demand.

More information for figure 4

The image depicts a graph illustrating a perfectly inelastic demand curve. The X-axis represents quantity, labeled as "Quantity (thousands of units per day)", while the Y-axis represents price, labeled as "Price (shekels)", denoted by the symbol ₪. The demand curve is a vertical line labeled "D", intersecting the X-axis at a specific point labeled "Q". The label "PED = 0" indicates that the price elasticity of demand is zero, meaning that changes in price will not affect the quantity demanded, which remains constant at Q1.

[Generated by AI]

Student view

Perfectly elastic demand

When the value of price elasticity of demand is infinite (PED = ∞), demand is perfectly elastic. As shown in **Figure 5**, at price P_1 the demand curve extends endlessly, so the quantity demanded is infinite. However, if the price is raised, even by a minimal amount, the quantity demanded will fall to zero, therefore the change in quantity is infinite, which is immeasurably big.

To understand how this works on the PED formula, you have to imagine an infinite percentage change in the numerator (the % change in quantity) divided by any percentage change in the denominator (the % change in price) will result in infinity, which is an immeasurably big number. You will see this perfectly elastic demand curve again in subtopic 2.11 (/study/app/pp/sid-186-cid-754025/book/the-big-picture-id-29858/). (undefined)

Overview (/study/ap 186- cid- 754025/(

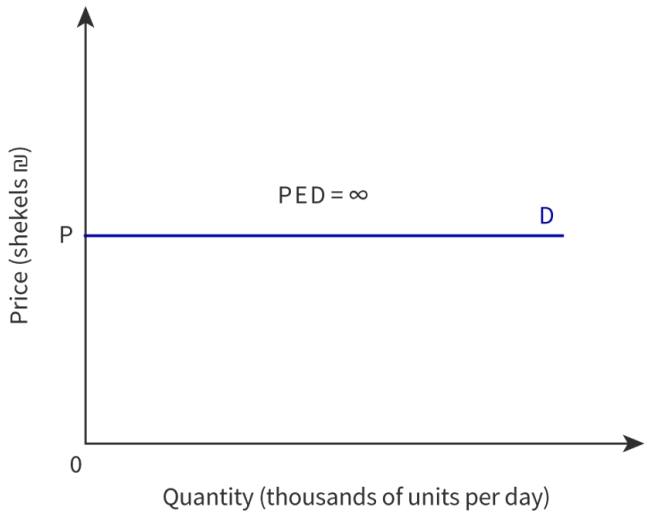


Figure 5. Perfectly elastic demand.

More information for figure 5

The image shows a graph representing a perfectly elastic demand curve. The X-axis is labeled 'Quantity (thousands of units per day)' starting from 0 and increasing to the right. The Y-axis is labeled 'Price (shekels ₪)', starting from 0 and increasing upwards. The demand curve, labeled 'D', is a horizontal line parallel to the X-axis, indicating that any quantity is demanded at the fixed price level 'P'. This reflects the concept of perfectly elastic demand, where the price elasticity of demand (PED) is equal to infinity (PED = ∞).

[Generated by AI]

Worked example 1

If music concert tickets have a price elasticity of demand of −0.45, explain what this means (interpret the number).

Student view

(Hint: classify the elasticity, explain what the number indicates about relative price and quantity changes, and make a claim about the responsiveness of consumers based on the PED value.)

It means that the demand for music concert tickets is price inelastic. This is because the absolute value of −0.45 (0.45) is less than 1 (PED < 1). In this case, a 1 per cent increase in the price of music concert tickets will lead to a decline of 0.45 per cent in the quantity demanded of them. Consumers are relatively unresponsive to price changes.

Overview (/study/ap 186-cid-754025/(

Be aware

The cases of perfectly elastic, perfectly inelastic and unitary elastic demand are exceptional cases. Most real-life examples have elastic or inelastic demand curves.

Also, it is very important to remember that when you explain elasticity, you should use precise language. It is not enough to simply state that quantity increases or decreases by ‘a little’ or ‘a lot’ in response to a price change. You must make it clear whether the percentage change in quantity is proportionally more or less than the percentage change in price.

Activity

Create a blank table like the one shown in **Table 1**. Add an additional column to the right for a diagram. Practise retrieving from memory the values, classification, explanation and diagram for each classification of elasticity in this section. If there are gaps in your knowledge, go back and review that material again.

3 section questions

2. Microeconomics / 2.5 Elasticities of demand

Determinants of price elasticity of demand (PED)

Section Student... (0/0) Feedback Print (/study/app/pp/sid-186-cid-754025/book/determinants-of-price-elasticity-of-demand-ped-id-30273/print/) Assign

There are a number of factors that determine the price elasticity of demand for a product. Being aware of these factors can help firms or governments predict how consumers may react to price changes.

Student view

Be aware

It is important to distinguish between determinants of demand and determinants of price elasticity of demand (PED).

Determinants of demand are factors that make the demand curve shift, while the determinants of price elasticity of demand (PED) influence how sensitive the quantity demanded of a good is to changes in its price.

Overview (/study/ap 186-cid-754025/

The number and closeness of substitutes

The number and closeness of substitute goods available is an important determinant of price elasticity of demand (PED).

For example, if there are many different types of vegetables then the increase in the price of tomatoes will lead some consumers to change their consumption to other vegetables that have now become relatively cheaper. Thus, the demand for goods with many substitutes will be more responsive to price changes and therefore demand will be more elastic.

Figure 1. How many vegetables really have close substitutes?

Tatiana Dyuvbanova Getty Images

To take another example, if there are several different brands or flavours of yogurt available (thats is, a number of very similar products) then when the price of one brand or flavour increases, consumers can easily change to another brand or flavour, immediately decreasing the demand for that brand whose price has increased. Thus, the demand for goods that have *very similar* substitutes will tend to be more responsive to price changes and therefore demand will be more elastic.

Student view

On the other hand, products with few substitutes, such as crude oil, will have a relatively inelastic demand, as consumers do not have many options to replace this product with another.

Important

The *more substitutes* there are for a product, the *more elastic* the demand for it will be.

The *closer* (more similar) the existing substitutes for a product are, the *more elastic* the demand for it will be.

Overview (/study/ap 186-cid-754025/(

The degree of necessity and how widely a product is defined

When a good is a necessity good, consumers will be less responsive to changes in its price because they have to consume it regardless of price. This is the case for basic necessities like food and water, addictive goods such as drugs and cigarettes, and also for medical services or products, like insulin, for sick people who can't live without them.

Case study

Sky-high drug prices in the United States

Figure 2. Insulin is a necessity good for people with diabetes.
Credit: Ben_Gingell Getty Images

In the last 10 years, the prices for many life-saving drugs in the United States have increased far faster than the rate of inflation. Many drugs that have seen the steepest price increases are those where there is little competition from other medicines.

Some drugs that have been highlighted for rapidly rising prices include:

- Daraprim: a drug to treat a parasitic infection called toxoplasmosis
- Epi-pen: a drug that treats severe, life-threatening allergic reactions
- Sovaldi: a drug that treats hepatitis C
- Insulin: a drug that treats diabetes

Source: Adapted from A Decade Marked by Outrage Over Drug Prices (https://www.npr.org/sections/health-shots/2019/12/31/792617538/a-decade-marked-by-outrage-over-drug-prices), NPR.

Why are prices so high for these drugs? Consider these factors:

- Cost of production for firms (section 2.2.4 (/study/app/pp/sid-186-cid-754025/book/nonprice-determinants-of-supply-costs-id-29871/))

Student view

- Competition (or lack thereof) in the market (section 2.2.4 (/study/app/pp/sid-186-cid-754025/book/nonprice-determinants-of-supply-costs-id-29871/))
- Business objectives (section 2.4.4 (/study/app/pp/sid-186-cid-754025/book/business-objectives-id-30267/))
- Government intervention (section 2.2.6 (/study/app/pp/sid-186-cid-754025/book/nonprice-determinants-of-supply-government-id-29873/))
- Elasticity of demand (section 2.5.4 (/study/app/pp/sid-186-cid-754025/book/12123123123-id-30274/))

✓ **Important**

The *greater the level of necessity* for the consumer, the *more inelastic* the demand of the good will be.

On the other hand, when the good is very widely defined, such that it includes every product in its category, for example 'food', then it will not have many substitutes. Its demand will be more inelastic than a more narrowly defined good, such as a particular type of food. For example, a more narrowly defined food such as beef has other alternatives, like chicken, lamb, fish, vegetables, etc.

✓ **Important**

The *more widely* a good is defined, the *more inelastic* is its demand.

The time period considered

The time period under consideration also affects the responsiveness of consumers to price changes in goods and services.

In the immediate term, consumers do not have any time to react to find alternatives for those goods whose prices have increased. However, when they have more time to look for substitutes, their demand will become more elastic.

Going back to the medicine example, if one pharmaceutical firm increases the price of a prescribed medicine, like the EpiPen, that you need to treat a severe allergy, at first you will probably continue to buy the prescribed brand of medicine indicated by your doctor. As the weeks go by, however, you or your doctor may have time to find an alternative option and change the prescription.

Overview (/study/ap 186-cid-754025/

Important

The demand for a good will be *more inelastic* in a *short period of time* than in a longer period of time.

The proportion of income spent on the good

When the price of a good is very low and/or people spend a very small proportion of their income on a good or service, a change in its price will not have a very big impact on the quantity demanded. The change in price will be insignificant for consumers' disposable income and demand will be more inelastic.

On the other hand, when people spend a large proportion of their income on a good or service, then a change in its price will have a much larger impact on the quantity demanded. The change will be significant for consumers' disposable income and demand will be more elastic.

Figure 3. A change in the price of pencils will not cause a large change in quantity demanded because of the small proportion of income spent.

Credit: Fototocam Getty Images

Student view

Important

The *higher the proportion of income* spent on a good, the *more elastic* the demand.

An example is the price of pencils. If each pencil costs only $0.13, even a price rise of 100 per cent would only cause pencils to rise in price to $0.26. This would likely cause a decline in quantity demanded, but by a much smaller percentage because the price is likely to be a very low proportion of income.

Overview (/study/ap 186-cid-754025/(

Activity

Now that you know a number of determinants of price elasticity of demand, make yourself a mind map to practice retrieving and organising the information, including appropriate examples.

Theory of Knowledge

The price elasticity of demand refers to the responsiveness of quantity demanded to a change in price. The more desired (essential) a product is, or the fewer substitutes available, the less impact price rises will have on the quantity demanded. In these circumstances the percentage increase in price would be followed by a less than proportional decrease in demand.

We know that one of the factors influencing price elasticity of demand is the nature and closeness of these substitutes. However there are no statistical techniques that measure the strength of a substitute. So we have no way of measuring the accuracy of the substitutability of uber for a taxi, or airbnb for a hotel room.

For example, economists may consider cigarettes to be relatively inelastic. However, cigarettes have many substitutes such as cigars, cigarillos, electronic cigarettes and roll-ups. What determines whether one considers electronic cigarettes or roll-up cigarettes as viable substitutes, and what determines whether one sees them as non-substitutable?

Knowledge question: To what extent is economic knowledge scientifically objective?

3 section questions

2. Microeconomics / 2.5 Elasticities of demand

Price elasticity of demand (PED) and total revenue for firms

Student view

Section Student... (0/0) Feedback Print (/study/app/pp/sid-186-cid-754025/book/12123123123-id-30274/print/) Assign

Price elasticity of demand has many uses and applications that could be listed and discussed in this book. However, we will focus in this and the following sections on three distinct issues:

- The relationship between PED and firms' total revenue (covered in this section and section 2.5.5 (/study/app/pp/sid-186-cid-754025/book/changing-price-elasticy-of-demand-id-30275/) (HL only))
- The implications of PED for government tax and subsidy policies (section 2.5.6 (/study/app/pp/sid-186-cid-754025/book/implications-of-price-elasticity-of-demand-id-30276/))

Overview (/study/ap 186- cid- 754025/

- The special case of commodities (section 2.5.7 (/study/app/pp/sid-186-cid-754025/book/price-elasticity-of-demand-of-id-30277/) (HL only))

There will be more discussion of the impact of price elasticity of demand on government policies in subtopic 2.7 (/study/app/pp/sid-186-cid-754025/book/the-big-picture-id-29874/).

We know that price, P, and the quantity demanded, Q_d, have a negative relationship according to the law of demand. When the price of a product increases, the quantity demanded will fall, and therefore the quantity sold by firms will fall as well. The impact on the total revenue of the firm will depend on how much the quantity demanded changes in response to a price change; in other words, it will depend on the elasticity of demand.

✓ Important

When there is a change in the price of a good or service, the impact on the firm's total revenue will depend on the price elasticity of demand of the good.

⚠ Be aware

A firm's total revenue is not the same as profit. Profit is total revenue minus total costs. If the firm's aim is to maximise profits, this might not correlate with maximising total revenue. As revenue increases, total costs might rise even faster, which would cause a decline in the firm's profits.

There are three possible situations to analyse:

- When PED > 1 (elastic demand)
- When PED < 1 (inelastic demand)
- When PED = 1 (unitary elastic demand)

Student view

Overview (/study/ap 186-cid-754025/(

Elastic demand

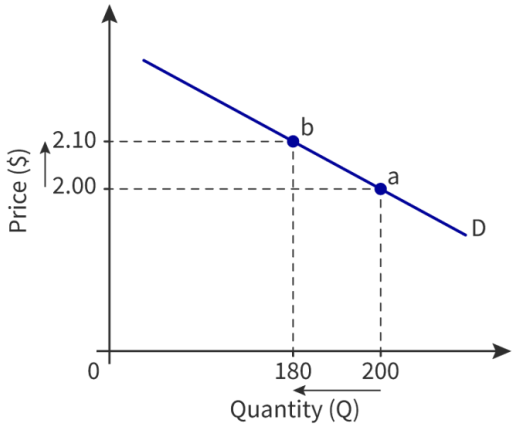


Figure 1. Demand for bagels is price elastic in the diagram above — what will happen to the firm's total revenue?

More information for figure 1

The graph shows a straight downward-sloping line representing the demand curve for bagels. The x-axis is labeled 'Quantity (Q)' and ranges from 0 to beyond 200, with markers at 180 and 200 representing quantities of bagels. The y-axis is labeled 'Price ($)' and ranges from slightly below 2.00 to slightly above 2.10. A dashed line marks a price of 2.00, intersecting the demand curve at point 'a' which corresponds to a quantity of 200 bagels. Another dashed line marks a price of 2.10, intersecting at point 'b' with a quantity of 180. The movement from point 'a' to 'b' on the demand curve illustrates how a price increase from 2.00 to 2.10 causes the quantity demanded to decrease from 200 to 180, indicating price elasticity of demand.

[Generated by AI]

Figure 1 , which we saw in worked example 3 of section 2.5.1 (/study/app/pp/sid-186-cid-754025/book/price-elasticity-of-demand-ped-id-30271/), shows that when the price of bagels in a Melbourne restaurant increases from AUD 2.00 to AUD 2.10, the quantity demanded of bagels decreases from 200 to 180 per day. The change in price is +5 per cent and the decrease in quantity demanded is –10 per cent.

Student view

$\text{PED} = \frac{-10\%}{5\%} = -2$(or 2 in absolute terms). As PED > 1 demand for bagels is elastic.

What is the impact on the restaurant's revenue? Total revenue TR_1 is the restaurant's revenue before the price increase, and TR_2 is the restaurant's revenue after the price increase:

$$\text{TR}_1 = \text{P}_1 \times \text{Q}_1 = \text{AUD } 2.00 \times 200 = \text{AUD } 400$$

$$\text{TR}_2 = \text{P}_2 \times \text{Q}_2 = \text{AUD } 2.10 \times 180 = \text{AUD } 378$$

The change in revenue is:

Overview (/study/ap 186- cid- 754025/(

$$TR_2 - TR_1 = \text{AUD } 378 - \text{AUD } 400 = -\text{AUD } 22$$

Therefore, the restaurant's revenue has declined by AUD 22 per week even though it has increased the price of its product. This is because the demand for bagels is price elastic, so the quantity demanded declines by a more than proportional amount compared to the increase in price. Since the percentage decline in Q is greater than the percentage increase in P, there is a decline in TR.

Be aware

If a firm wishes to increase its total revenue, but has a product for which demand is elastic, it should not raise the price. Depending on how elastic the demand is, it may be beneficial to decrease the price of the good instead.

Inelastic demand

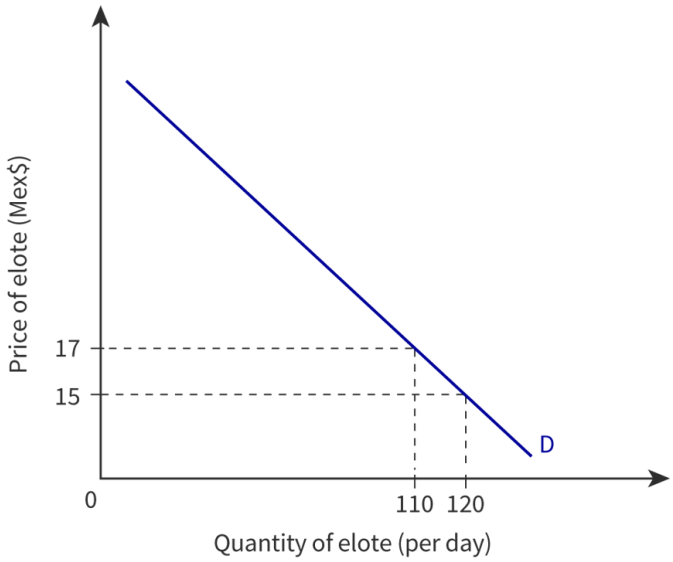


Figure 2. Demand for elote is price inelastic in the diagram above — what will happen to the firm's total revenue?

Student view

More information for figure 2

This image is a graph illustrating the demand for elote, a type of spicy corn on the cob. The graph has two axes. The Y-axis represents the "Price of elote (Mex$)" and includes labels at 15 and 17. The X-axis represents the "Quantity of elote (per day)" and includes labels at 110 and 120. The demand curve is a downward-sloping line labeled "D." It moves from a higher point on the price axis to a lower point intersecting the quantity axis, indicating that as the price increases, the quantity demanded decreases. Specifically, as the price of elote rises from 15 to 17 Mex$, the quantity demanded falls from 120 to 110 per day. This suggests the demand for elote is price inelastic in this range.

[Generated by AI]

Overview (/study/ap 186- cid- 754025/

Figure 2 , which we saw in worked example 2 in section 2.5.1 (/study/app/pp/sid-186-cid-754025/book/price-elasticity-of-demand-ped-id-30271/), shows the impact of a street vendor in Mexico City increasing the price of its elote (spicy corn on the cob) from MXN 15 to MXN 17, a 13.33 per cent increase . As a result, the quantity demanded of elote decreases from 120 to 110 per day, an 8.33 per cent decrease (–8.33). Therefore:

$$\text{PED} = \frac{-8.33\%}{13.33\%} = -0.62 \text{ (or 0.62 absolute value)}$$

What is the impact on the street vendor's revenue in this case? Total revenue TR_1 is the street vendor's revenue before the price increase, and TR_2 is the street vendor's revenue after the price increase:

$$\text{TR}_1 = \text{P}_1 \times \text{Q}_1 = \text{MXN } 15 \times 120 = \text{MXN } 1800$$

$$\text{TR}_2 = \text{P}_2 \times \text{Q}_2 = \text{MXN } 17 \times 110 = \text{MXN } 1870$$

The change in revenue is:

$$\text{TR}_2 - \text{TR}_1 = \text{MXN } 1870 - \text{MXN } 1800 = \text{MXN } 70$$

Therefore, the street vendor's revenue has increased by MXN 70 per day when it raises the price of the elote. This is because the demand for the good is price inelastic, and as the quantity demanded falls by a smaller percentage than the price increases, there is an increase in TR.

Be aware

If a firm wishes to increase its total revenue and demand for its product is inelastic , it should raise the price of the good.

Student view

Unitary elastic demand

In the case of a unitary price elasticity, the percentage change in the quantity demanded is equal to the percentage change in the price, as PED = 1. Therefore, when the price of the product is increased, the quantity demanded will fall by the same proportion (percentage) and the total revenue of the firm will not change, no matter what the change in price is.

Be aware

If demand is unitary elastic (also referred to as unit elastic), a firm is unable to increase its revenue by changing its price.

Overview (/study/ap 186-cid-754025/

Making connections

Topic 3 Finance and Accounts in the IBDP Business Management course refers to elasticity of demand and firms' total revenues. In the section about how firms can increase gross profits, increasing prices is mentioned as a way to raise revenues. However, the course points out that this can only work if demand is inelastic.

4 section questions

Changing price elasticity of demand (PED) along a straight line, downward-sloping demand curve (HL)

Section Student... (0/0) Feedback Print (/study/app/pp/sid-186-cid-754025/book/changing-price-elasticy-of-demand-id-30275/print/) Assign

Although there is a relationship between PED and the slope of the demand curve, PED is **not** the slope of the curve. For any straight line, downward-sloping demand curve, the value of price elasticity of demand (PED) varies along the curve.

In the cases of unitary elastic, perfectly elastic and perfectly inelastic curves (where PED = 1, PED = ∞ and PED = 0, respectively) the value of PED does not vary along the curve.

Student view

Important

PED should not be confused with the slope of the demand curve. While the slope of a linear demand curve is constant, PED varies along its price range.

Relationship between PED and the slope of the demand curve

The slope is defined as $\frac{\triangle Q_d}{\triangle P}$ (the change in quantity demanded divided by the change in price), which means the horizontal change between two points on the curve divided by the vertical change between the same two points.

Overview (/study/ap 186- cid- 754025/

$$\text{However, PED} = \frac{\%\triangle Q_d}{\%\triangle P} = \left(\frac{\frac{\triangle Q_d}{Q_{1d}}}{\frac{\triangle P}{P_1}}\right)$$

$$= \left(\frac{\triangle Q_d}{\triangle P}\right) \times \left(\frac{P_1}{Q_{1d}}\right)$$

$$= \text{slope} \times \left(\frac{P_1}{Q_{1d}}\right)$$

The price elasticity of demand is equal to the slope of the curve multiplied by the original price divided by the original quantity.

Change in price elasticity of demand (PED) along a linear demand curve

For any linear downward-sloping demand curve, demand is price elastic for high prices and low quantities, and price inelastic for low prices and high quantities. This is shown in **Figure 1.**

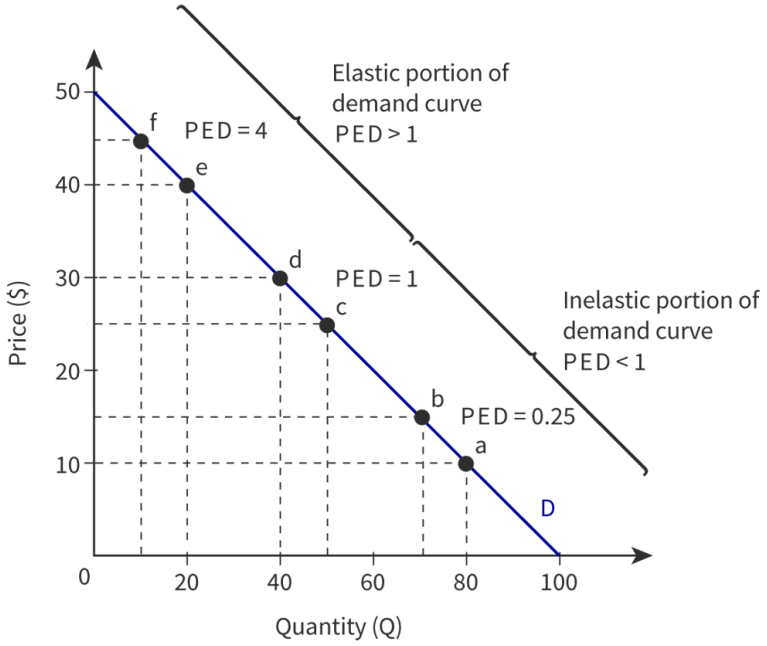


Figure 1. PED varies along the demand curve.

More information for figure 1

The graph depicts a downward-sloping demand curve plotted on a standard price-quantity plane. The X-axis represents quantity (Q), ranging from 0 to 100 units, and the Y-axis represents price ($), ranging from 0 to 50 dollars. The demand curve is marked with labels indicating different price elasticity of demand (PED) values.

Student view

Overview (/study/ap 186- cid- 754025/

At the higher end of the curve, from points 'f' to 'e', the PED is 4, indicating an elastic portion (PED > 1). As the curve moves downwards through points 'd' and 'c', the PED becomes 1, marking the unit elastic point. Further along, between points 'b' and 'a', the PED is 0.25, signifying the inelastic portion (PED < 1).

The elastic portion of the curve is labeled as "Elastic portion of demand curve" and the inelastic portion as "Inelastic portion of demand curve." The graph visually and textually illustrates how price elasticity varies along the demand curve, showing it is more elastic at higher prices and less elastic at lower prices.

[Generated by AI]

If we calculate the PED from points e to f, when price increases from USD 40 to USD 45, the quantity demanded declines from 20 to 10 units. Thus, the PED value is elastic:

$$\text{PED} = \frac{\%\triangle \text{Q}_\text{d}}{\%\triangle \text{P}} = \frac{50\%}{12.5\%} = 4$$

If we calculate the PED from points c to d, when price increases from USD 25 to USD 30, the quantity demanded declines from 50 to 40 units. Thus, the PED value is unitary:

$$\text{PED} = \frac{\%\triangle \text{Q}_\text{d}}{\%\triangle \text{P}} = \frac{20\%}{20\%} = 1$$

If we calculate the PED from points a to b, when price increases from USD 10 to USD15, the quantity demanded declines from 80 to 70 units. Thus, the PED value is inelastic:

$$\text{PED} = \frac{\%\triangle \text{Q}_\text{d}}{\%\triangle \text{P}} = \frac{12.5\%}{50\%} = 0.25$$

We can see that the value of PED declines as we move downwards along the demand curve. This has a mathematical explanation but it is also logical from an economics point of view.

Student view

At lower prices, or in the case of very low priced goods, consumers are less concerned and impacted by changes in the price, therefore their demand doesn't change much. However, when the price is high, the impact on consumers is bigger and people's reaction to changes in the price of expensive products is more sensitive. This and other factors were discussed in section 2.5.3 (/study/app/pp/sid-186-cid-754025/book/determinants-of-price-elasticity-of-demand-ped-id-30273/).

⚠ Be aware

Be careful not to confuse 'slope' and 'elasticity'. Mathematicians calculate slope by dividing rise over run. Economics calculate elasticity by dividing the percentage change in Q_d over the change in price. Close, but not the same! This is why in the example above, even though the

Overview (/study/ap 186-cid-754025/

slope of the demand curve is constant, the elasticity changes as we move down the demand curve.

PED along the demand curve and total revenue

Figure 2 shows the relationship between PED along a demand curve (**Figure 2a**) and total revenue (**Figure 2b**).

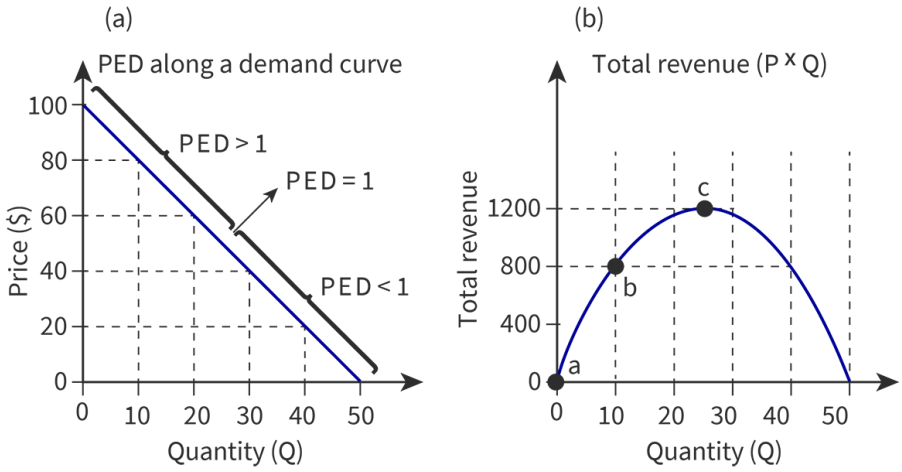


Figure 2. Price elasticity (a) and total revenue (b).

More information for figure 2

The image consists of two graphs side by side.

The first graph on the left (Figure 2a) illustrates the demand curve over a range of prices. The X-axis represents the quantity demanded, while the Y-axis represents the price in USD. Starting from the top left, the graph shows a downward sloping demand curve indicating that as the price decreases, the quantity demanded increases. No specific data points are labeled, but the trend is consistent with elastic demand.

The second graph on the right (Figure 2b) demonstrates total revenue over the same range of prices. The X-axis represents price in USD, and the Y-axis represents total revenue. The curve starts at the origin, rises to a peak, and then falls, creating a one-hump shape. The point "a" is at the start where the price is USD 100, revenue is USD 0, and quantity is zero. As the price decreases to USD 80, a point "b" on the curve indicates a rise in total revenue to USD 800. This peak represents the point of unitary elasticity where revenue is maximized, after which further price decreases lead to lower total revenue, indicating elastic demand at these prices.

[Generated by AI]

Student view

At a price of USD 100 for a product, consumers demand zero quantity. This results in a total revenue for the producer of USD 0 at point "a" in **Figure 2b**. As price is lowered to USD 80, the quantity demanded

increases to 10 in **Figure 2a**. This results in a total revenue of USD 800, at point "b" in **Figure 2b**. Along this portion of the demand curve, demand is elastic and the firm can increase revenue by decreasing the price.

This continues until a certain point on the demand curve where PED = 1 (somewhere between the price of USD 40 and USD 60 in **Figure 2a**). Here, the total revenue curve is at its maximum point at point "c" in **Figure 2b**.

From this point onwards, if the firm continues to decrease price, demand becomes more and more inelastic. Total revenues after this point will decline as price declines.

If their goal is to increase revenues, firms need to be aware of the elasticity of demand for their products in order to decide whether to increase or decrease their prices. Even if demand for their product is inelastic, raising prices too high can bring demand into the more elastic region and cause decreases in revenues.

Important

The terms elastic or inelastic should be used to refer to a portion of a demand curve or a price range along the demand curve.

2 section questions

Implications of price elasticity of demand (PED) for government policies

Governments also need to be aware of price elasticity of demand when they create policies that affect the prices of goods and services.

PED and the incidence of taxes and subsidies

In section 2.2.6 (/study/app/pp/sid-186-cid-754025/book/nonprice-determinants-of-supply-government-id-29873/), you learned about indirect taxes. An indirect tax is a tax imposed on a good or service; it adds to the selling price and is paid when the good is purchased. It is typically paid to the government

Overview (/study/ap 186- cid- 754025/(

by a producer or supplier, though some of the burden of the tax may be paid by the consumer.

The burden of the tax (tax burden) is called the tax incidence. It refers to the percentage of an indirect tax paid for by consumers and producers, respectively. Elasticity of demand (and elasticity of supply, which you will learn about in subtopic 2.6 (/study/app/pp/sid-186-cid-754025/book/the-big-picture-id-29878/)) has an impact on the tax burden faced by consumers. Usually, consumers will only pay part of the tax, reflected in the higher price ($P_c > P^*$) in **Figure 1.** The rest of the tax is absorbed by producers through receiving a lower net price ($P_p < P^*$) after the tax is applied.

Figure 1 demonstrates the different impact of relatively inelastic (a) and relatively elastic (b) demand curves.

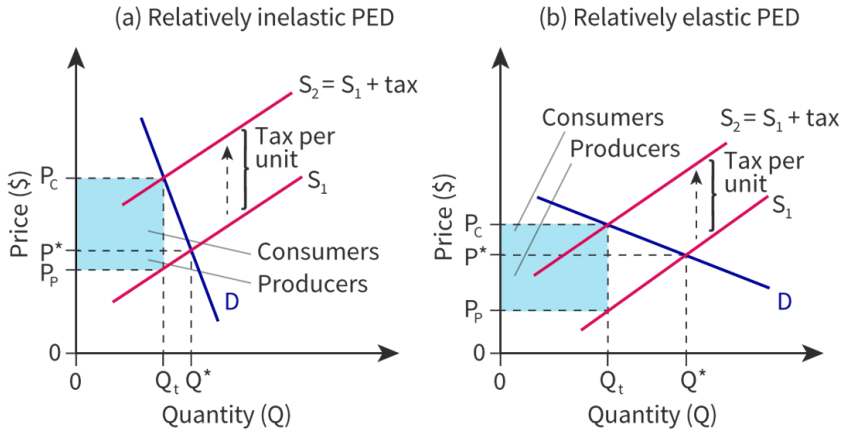


Figure 1. How incidence (burden) of tax changes depending on the elasticity of demand for a product.

More information for figure 1

The image shows two graphs side by side, illustrating the effect of tax incidence on products with different price elasticities of demand.\n\nGraph (a) represents a relatively inelastic price elasticity of demand (PED):\n- The axes are labeled 'Price ($)' along the vertical and 'Quantity (Q)' along the horizontal.\n- The demand curve (D) is steep, indicating inelastic demand.\n- Two supply curves are shown: S1 (original supply curve) and S2 (supply curve post-tax), where S2 is parallel and above S1. The vertical distance between S1 and S2 represents the 'Tax per unit'.\n- The equilibrium price without tax is P, *and the new equilibrium price with tax is Pc.\n- The tax burden is divided between consumers and producers, indicated by shaded areas.\n\nGraph (b) represents a relatively elastic PED:\n- Similarly, the vertical axis is 'Price ($)', and the horizontal axis is 'Quantity (Q)'.\n- The demand curve (D) in this graph is flatter, indicating elastic demand.\n- The supply curves are similarly labeled S1 and S2, with S2 shifted upwards by the tax amount.\n- The equilibrium price without tax is P*, and with tax is Pc.\n- The division of tax burden is again shown as shaded areas, differing from graph (a) with a larger producer's burden compared to the consumer's.\n\nBoth graphs illustrate how the price and quantity change due to tax implementation and how the burden is distributed according to demand elasticity.

[Generated by AI]

Student view

Overview (/study/ap 186-cid-754025/

As you learned in subtopic 2.2 (/study/app/pp/sid-186-cid-754025/book/the-big-picture-id-29867/), an indirect tax will shift the supply curve to the left (or upwards). The vertical distance between the two supply curves, S_1 and S_2, is the amount of the tax.

In **Figure 1 (a)**, before the tax, the equilibrium was at P*Q*. An indirect tax decreases supply from S_1 to S_2. At the new equilibrium point, P_cQ_t, consumers are paying a higher price of P_c and quantity demanded and supplied has declined to Q_t. However, producers need to give the value of the tax to the government, so producers only receive P_p (P_c – tax).

The total amount of the tax is the shaded area $(P_c - P_p) \times Q_t$. However, consumers have paid a larger portion of that tax $(P_c - P^*) \times Q_t$. Producers have paid a smaller portion of the tax $(P^* - P_p) \times Q_t$. When demand is inelastic, consumers tend to pay more of the tax. Producers can be confident that they can raise the price of the good for consumers without losing too many sales when demand is inelastic.

In **Figure 1 (b)**, the demand is more elastic, and this results in a different allocation of the tax burden. Before the tax, the equilibrium was at P*Q*. An indirect tax decreases supply from S_1 to S_2. At the new equilibrium point, P_cQ_t, consumers are paying a higher price of P_c and quantity demanded and supplied has declined to Q_t. However, producers need to give the value of the tax to the government, so producers only receive $P_p(P_c - \text{tax})$.

The total amount of the tax is the shaded area $(P_c - P_p) \times Q_t$. However, consumers have now paid a smaller portion of that tax $(P_c - P^*) \times Q_t$. Producers have paid a larger portion of the tax $(P^* - P_p) \times Q_t$. When demand is elastic, consumers tend to pay less of the tax. Producers do not wish to raise the price of the good to cover the tax, because they know that it will result in a very large decrease in quantity demanded. Thus, producers are more willing to absorb more of the tax payment when demand is elastic.

Be aware

When the demand is relatively inelastic, the tax incidence falls more on consumers than producers.

When the demand is relatively elastic, the tax incidence falls more on producers than consumers.

Student view

Activity

Now that you have seen how elasticity of demand impacts the incidence of a tax, write up an explanation with diagrams to show how elasticity of demand would impact the incidence of a subsidy.

Overview (/study/ap 186-cid-754025/

You need to use the same logic, but work with a supply curve that is increasing, or shifting to the right (down). Work through the explanation in the text on taxes above, considering the reverse situation.

Who will benefit more from a subsidy when demand is inelastic? What about when demand is elastic?

Governments have a number of goals when they impose taxes. One goal is increasing tax revenues to use on government spending in the economy. However, sometimes governments impose taxes on harmful goods, like cigarettes or alcohol, in order to decrease their production and use in society. You will learn more about this in subtopic 2.8 (/study/app/pp/sid-186-cid-754025/book/the-big-picture-id-29875/). The goals of increasing tax revenue and reducing production and consumption of harmful products can conflict with one another.

PED and government revenue

Producers and consumers are not the only ones affected by the relative price elasticities of demand and supply. Government revenue from tax also varies based on PED.

Remember from **Figure 1** that government revenue is the amount of tax per unit multiplied by the quantity sold:

Revenue for the government = $(P_c - P_p) \times Q_t$

If demand is elastic, or very responsive to price changes (PED > 1), then the quantity demanded will fall by a significant amount when the price increases. However, if demand is inelastic, or less responsive to price changes (PED < 1), then the quantity demanded will fall by a smaller amount when the price increases.

This means that a government that imposes an indirect tax on a good is likely to earn relatively more revenue from those taxes on goods with inelastic demand than on goods with elastic demand. Thus, taxes on goods like petrol (gas) will tend to earn governments a lot of money.

Student view

Overview (/study/ap 186-cid-754025/

Figure 2. Petrol (gas) taxes earn governments a lot of revenue because demand is relatively inelastic.

Source: "Petrol Station (https://www.flickr.com/photos/mikecogh/30242929122/in/photostream/)", by Michael Coghlan is under CC BY-SA 2.0 (https://creativecommons.org/licenses/by-sa/2.0/)

Activity

Now that you have seen how elasticity of demand impacts a government's tax revenues, write up an explanation with diagrams to show how elasticity of demand would impact the government's spending on a subsidy. With this activity, you will be using the skill of transfer, and the hard thinking you have to do to create this will help you secure your understanding.

You need to use the same logic, but consider a supply curve that is increasing, or shifting to the right (down). Work through the explanation in the text on government revenue from taxes above, considering the reverse situation of government spending on a subsidy

Will the government spend more on subsidies when demand is elastic or inelastic? Why?

Student view

PED and influencing production/consumption

Governments can use taxes and subsidies to influence the quantity of products produced and consumed in society. Generally, governments will tax products of which they want to reduce production and consumption, and they will subsidise products of which they will want to increase production and consumption.

If the product is one where demand is inelastic, taxes and subsidies will not have much of an impact on production and consumption. This is because consumers are not very responsive to price changes. So, for example, if a government wants to reduce consumption of petrol, a tax on petrol will not be very effective to reduce the quantity demanded and supplied. However, as mentioned previously, it should

result in a very high amount of government revenue. Likewise, a subsidy for a product for which demand is inelastic will cost the government a lot of money, but will not result in a large increase in the quantity of the product demanded and supplied.

If a government wants to have a significant impact on the quantity demanded and supplied, it can impose a very large tax or subsidy. This would move the price so much that there will be a much larger impact. So, if the government's goal is to really reduce the quantity demanded and supplied of petrol, then it needs to make the tax very large, to move the price into the elastic portion of the demand curve (upper half of the demand curve). This will cause a much larger reduction in the quantity demanded and supplied.

If, however, the product is one for which demand is elastic, taxes and subsidies will have more of an impact on production and consumption. This is because consumers are very responsive to price changes. So taxes and subsidies will have a greater impact on production and consumption of goods for which demand is elastic than those for which demand is inelastic.

This is important because governments will often use increased taxes to claim that their goal is to reduce consumption of harmful products, like petrol, cigarettes or alcohol, when the main reason is really to increase government revenues. If governments really want to reduce production and consumption of harmful goods, they need to raise taxes very significantly.

Case study

Taxes on soft drinks and sugar-sweetened beverages in Chile

Figure 3. Soft drinks in Chile.
Credit: Getty Images Klaus Vedfelt

A study released in 2017 estimated the price elasticity of demand for soft drinks, other sugar-sweetened beverages and energy-dense foods in Chile. According to the study, Chile is the world's second largest per capita consumer of high caloric beverages. These beverages are

Overview (/study/ap 186- cid- 754025/(

connected with obesity and other chronic diseases. Estimating the price elasticity of demand for these goods is useful for governments in determining the effectiveness of policies, like taxes on these foods, to reduce the quantity demanded and supplied in the market.

The results of the study indicated that the price elasticity of demand for soft drinks in urban areas of Chile is — 1.37 . This means that an increase in price of 1 per cent would result in a decrease in the quantity of soft drinks demanded and supplied of 1.37 per cent . Demand was therefore found to be elastic. This indicates that a tax that raises the price of soft drinks would have a large negative impact on the consumption of soft drinks, and therefore may be an effective policy to reduce their consumption.

Source: Adapted from Price elasticity of the demand for soft drinks, other sugar-sweetened beverages and energy dense food in Chile (https://bmcpublichealth.biomedcentral.com/articles/10.1186/s12889-017-4098-x), BMC Public Health.

Questions to consider:

- Considering the information in the text above, what could the government of Chile do if it wanted to have an even larger impact on the consumption of soft drinks in the country? Consider two policies: one to do with the size of the tax and one to do with the provision of substitutes.
- Considering the information on the factors affecting price elasticity of demand, which group of people would have a larger elasticity of demand for soft drinks: low-income consumers or high-income consumers? Why would knowing this matter to governments?

Read more about the study:

Price elasticity of the demand for soft drinks, other sugar-sweetened beverages and energy dense food in Chile (https://bmcpublichealth.biomedcentral.com/articles/10.1186/s12889-017-4098-x)

2 section questions

2. Microeconomics / 2.5 Elasticities of demand

Student view

Price elasticity of demand (PED) of primary commodities (HL)

Section Student... (0/0) Feedback Print (/study/app/pp/sid-186-cid-754025/book/price-elasticity-of-demand-of-id-30277/print/) Assign

Commodities, also called primary commodities or primary goods, are goods that come from the land, are extracted from it, or are extracted from under the sea. They include agricultural, fishing, oil, coal, mineral and forestry products.

Overview (/study/ap 186- cid- 754025/

Credit: James O'Neil Getty Images

Credit: Christoph Ruisz Getty Images

Figure 1. Wheat and fish are both considered primary commodities.

The demand for most primary commodities is inelastic, with a low price elasticity of demand (PED), so consumers are not very responsive to price changes. Primary commodities are often necessities to those who consume them and have few or no substitutes. In addition, many primary commodities take up a small proportion of income and are used (and used up) immediately.

Student view

Manufacturing industries consume many primary commodities. These producers process primary commodities to make other products. These raw materials usually have very few or no substitutes. For example, companies like Royal Dutch Shell or ExxonMobil Corporation use crude oil to produce derivative products, such as petroleum.

On the other hand, the demand for manufactured goods is usually more elastic. Consumers tend to be more responsive to a price change. Although in some cases these products may also be necessities, there are often more substitutes available to consumers. In addition, they are often one-time purchases that take up a larger proportion of income and are used over a longer time period.

Overview (/study/ap 186-cid-754025/

Important

Primary commodities tend to have relatively lower PED than manufactured goods, because commodities are necessities for those who consume them and have very few or no substitutes.

Be aware

There are some exceptions to the relationships outlined here. For example, the demand for some medications, which are manufactured goods, is inelastic because they are necessities and do not have substitutes.

Volatile prices for commodity producers

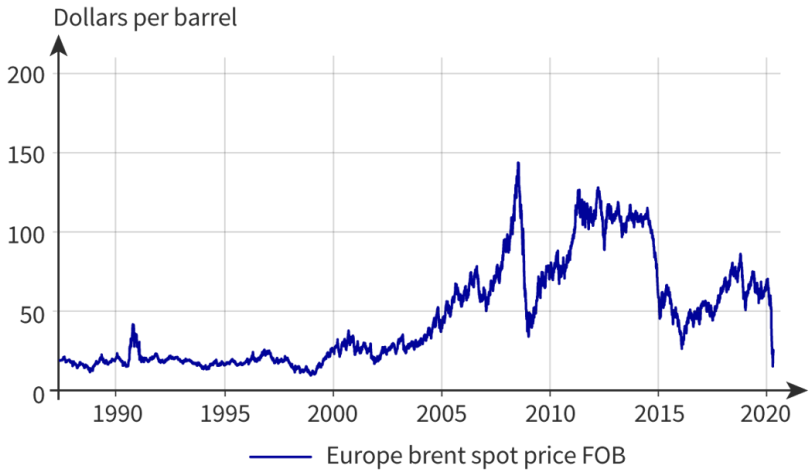


Figure 2. Volatile price of Brent crude oil over time.

More information for figure 2

Student view

The image is a line graph depicting the volatility of Brent crude oil prices over time, ranging from 1985 to 2020. The X-axis represents years, labeled in increments from 1985 to 2020. The Y-axis is labeled as 'Dollars per barrel' and is scaled from 0 to 200.

Visible data points and trends include a relatively stable price around $20 per barrel from 1985 to the early 2000s, followed by a sharp increase that peaks at around $140 in 2008. After a steep decline in 2009 to about $40, the prices fluctuate between $80 and $120 until 2014, when they again decrease significantly to below $50 by 2015. The trend continues with fluctuations, showing a decline towards 2020.

Overall, the graph illustrates significant fluctuations in oil prices with notable peaks around 2008 and declines in years like 2009 and 2015.

[Generated by AI]

Overview (/study/ap 186- cid- 754025/(

As can be seen in **Figure 2**, the prices of primary commodities like Brent crude oil tend to fluctuate a lot, while prices of manufactured goods tend to be much more stable. This relates to how changes in supply affect markets where demand is less elastic and where it is more elastic.

The demand for primary commodities is relatively inelastic because of their nature as necessity goods, often with few or no replacements. Additionally, the supply of agricultural commodities can be quite unstable, as agricultural production depends on many factors beyond the producer's control. Farmers are subject to weather conditions such as drought, floods and frosts, and other natural influences such as pests, which cause large and frequent supply changes.

Figure 3 illustrates the impact of supply changes of two goods, one for which demand is more inelastic (**Figure 3a**) and one for which demand is more elastic (**Figure 3b**).

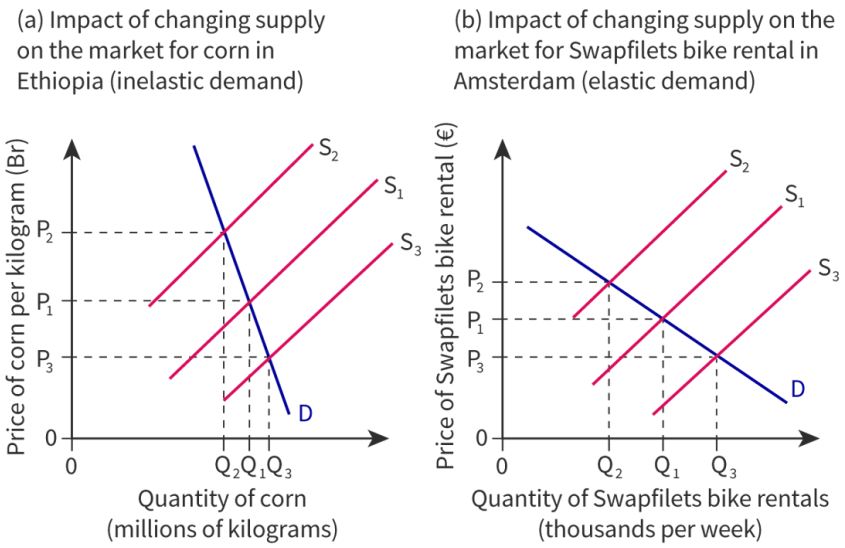


Figure 3. Impact of supply changes when demand is relatively inelastic (a) and elastic (b).

More information for figure 3

Student view

The image shows two graphs comparing the impact of supply changes on two markets: corn in Ethiopia with inelastic demand (left graph, Figure 3a) and Swapfiets bike rental in Amsterdam with elastic demand (right graph, Figure 3b).

Left Graph (Figure 3a): - **X-axis:** Quantity of corn (millions of kilograms) - **Y-axis:** Price of corn per kilogram (Br) - **Curves:** Supply and demand curves are depicted. The demand curve is labeled 'D' and supply curves are labeled 'S1', 'S2', and 'S3'. - **Points:** Initial quantity and price are at Q1 and P1. - **Supply Shift:** Supply shifts left from S1 to S2 leading to price increase from P1 to P2. Alternatively, if supply increases from S1 to S3, the price decreases from P1 to P3.

Right Graph (Figure 3b): - **X-axis:** Quantity of Swapfiets bike rentals (thousands per week) - **Y-axis:** Price of Swapfiets bike rental (€) - **Curves:** Depicts similar supply and demand scenarios with curves labeled 'D', 'S1', 'S2', 'S3'. - **Points:** Initial equilibrium is at Q1 and P1. - **Supply Shift:** When supply decreases from S1 to S2, prices rise from P1 to P2. Conversely, a supply increase from S1 to S3

Overview (/study/ap 186-cid-754025/

leads to a price drop from P1 to P3.

The graphs visually demonstrate the differences in price changes due to supply shifts under conditions of elastic and inelastic demand.

[Generated by AI]

For example, as explained in the following case study, in early 2020 there was a severe locust infestation in eastern Africa, which destroyed a lot of Ethiopia's corn (maize) crop. The supply of corn declines from S_1 to S_2, as shown in **Figure 3a**. Because the price elasticity of demand for corn in Ethiopia is inelastic, there will be a large increase in the price of corn from P_1 to P_2. Conversely, a good harvest that increases supply from S_1 to S_3 would produce a large decline in the price of corn from P_1 to P_3.

For manufactured goods, on the other hand, demand is more elastic because there tend to be more substitutes for these goods. If we compare both diagrams, the same shifts of the supply curve in the case of manufactured goods (**Figure 3b**) produce a smaller change in the price due to the more elastic demand.

Case study

Locust plague in eastern Africa 2020

After unusually heavy rains from a strong cyclone off the coast of Somalia in December 2019, the entire region faced an invasion of desert locusts that thrived under the climate and soil conditions created by the weather. A group of locusts is called a swarm.

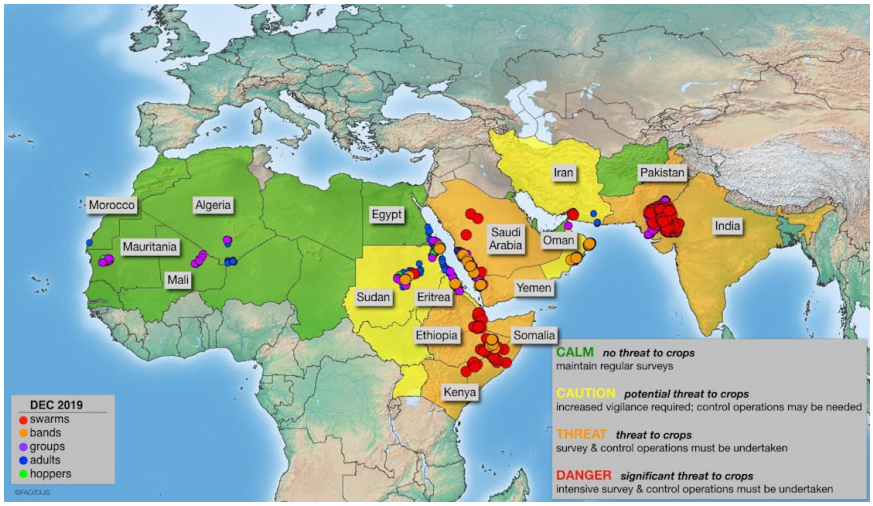


Figure 4. Areas affected by the Desert Locust crisis in the Horn of Africa, Arabian Peninsula and South Asia.

Source: Food and Agriculture Organization of the United Nations, http://www.fao.org/ag/locusts/en/info/info/index.html (http://www.fao.org/ag/locusts/en/info/info/index.html). Reproduced with permission

Student view

Overview (/study/ap 186-cid-754025/

More information for figure 4

There were very large swarms, some as big as 40 kilometres wide and 60 kilometres long. According to the Food and Agriculture Organisation (FAO), even a small swarm of locusts (one square kilometre) can eat as many crop plants in a day as would feed 35 000 people.

Figure 5. Locust swarm.
Credit: Frans Lemmens Getty Images

One of the hardest hit countries was Ethiopia. Corn and other grains are an important part of Ethiopia's economy. More than 70 per cent of people work in the agricultural sector and the grains grown in the country are an important part of people's diets, as well as a major export.

Thus, the unprecedented locust infestation in early 2020 has devastated individual livelihoods and government revenues. Food prices had already risen due to flood damage that had destroyed crops and transportation networks. The additional damage caused by the locusts made the situation worse. Decreases in food supplies and rising prices contributed to widespread food insecurity.

Source: Adapted from FAO appeals for urgent support to fight worsening Desert Locust upsurge in the Horn of Africa (http://www.fao.org/news/story/en/item/1259082/icode/), FAO, Food fears grow as swarms of locusts reach Uganda and Tanzania (https://www.theguardian.com/world/2020/feb/10/food-fears-grow-as-swarms-of-locusts-reach-uganda-and-tanzania), The Guardian and National Geographic: Locusts (https://www.nationalgeographic.com/animals/invertebrates/group/locusts/), National Geographic.

Student view

Questions to consider:

1. Draw a diagram to show the impact of the locust infestation on the market for corn in Ethiopia. How will you draw the demand curve: as relatively elastic or inelastic? Be sure to use axis labels that reflect the context.
2. Comment on why large price increases for food crops will likely occur in Ethiopia. Be sure to refer to both supply and price elasticity of demand in your response.
3. Economic theory suggests that farmers may see large increases in revenue when price increases occur in markets with inelastic demand. Will that be true in this case for local farmers in the area of the locust infestation ? Why or why not?

Read more:

Overview (/study/ap 186-cid-754025/

FAO appeals for urgent support to fight worsening Desert Locust upsurge in the Horn of Africa (http://www.fao.org/news/story/en/item/1259082/icode/)

Food fears grow as swarms of locusts reach Uganda and Tanzania (https://www.theguardian.com/world/2020/feb/10/food-fears-grow-as-swarms-of-locusts-reach-uganda-and-tanzania)

National Geographic: Locusts (https://www.nationalgeographic.com/animals/invertebrates/group/locusts/)

Revenue consequences for primary producers

When the prices of primary commodities fluctuate in the short term, producers' revenues also fluctuate.

Remember that total revenue is equal to price multiplied by quantity: $TR = P \times Q$.

Price fluctuations combined with a low PED, as we have seen previously in this section, result in an increase in total revenue for producers when supply falls, because the percentage increase in price is greater than the percentage decrease in quantity demanded.

It also results in a fall in total revenue for producers when supply increases, because the percentage fall in price is greater than the percentage increase in quantity demanded.

Considering that many low income countries rely on the production of primary products, the volatility of prices and producers' revenues is a serious problem. Farmers cannot rely on consistent incomes from year to year, even if their harvests are good. Governments cannot rely on consistent tax revenues from primary product production. This makes it difficult for both producers and governments to plan investment expenditures over time and hinders productivity. From a development perspective, the price and revenue volatility for farmers across the globe contributes to persistent poverty and malnutrition among the world's poorest people. This will be discussed in greater detail in subtopic 4.9 (/study/app/pp/sid-186-cid-754025/book/the-big-picture-id-30278/).

Student view

Be aware

The generalisations made above may not be true for every individual producer. For example, a decrease in supply of an agricultural crop and higher prices may result in higher revenues for farmers in the aggregate. However, if you are a farmer who has lost her entire crop due to a locust infestation, you will not see these increases in revenue. So the higher prices and higher revenues that come with decreased supply in a market assumes that producers have something to sell.

Additionally, it is worth noting that sometimes a good harvest can actually result in lower revenues, if that good harvest is experienced by a large number of producers. Increased supplies of a crop in an entire market, for example due to favourable weather conditions, can

Overview (/study/ap 186-cid-754025/(

lead to a fall in prices in markets and lower revenues for producers, because of the low PED of primary commodities. However, if one producer has a successful crop, but others do not, prices may not fall in the market and the successful producer could see increased revenues.

3 section questions

2. Microeconomics / 2.5 Elasticities of demand

Income elasticity of demand (YED): definition, formula, calculations, range of values and diagrams

Section Student... (0/0) Feedback Print (/study/app/pp/sid-186-cid-754025/book/income-elasticity-of-demand-yed-range-of-values-id-30279/print/) Assign

Income is another factor that determines people's demand for goods and services, as we learned in section 2.1.5 (/study/app/pp/sid-186-cid-754025/book/nonprice-determinants-of-demand-changes-in-income-id-29860/).

A change in people's incomes causes an increase or decrease (a shift) in demand for a good. The extent to which the demand curve is shifted, and in which direction it will shift, is explained by the income elasticity of demand (YED).

Definition of income elasticity of demand (YED)

Income elasticity of demand (YED) is a measure of how much the quantity demanded of a good will change in response to a change in consumers' incomes.

Student view

If incomes rise by 5 per cent in a country, we will likely see an increase in the demand for many goods. However, some goods will experience a stronger increase in demand and quantity demanded, say 10 per cent. Others will see a smaller increase in demand and quantity demanded, say 1 per cent. Calculating income elasticity of demand (YED) helps us see these differences in consumer responsiveness to changes in income, and to make generalisations about how changing incomes may impact consumer choice.

Overview (/study/ap 186- cid- 754025/(

Formula and calculations for income elasticity of demand (YED)

The formula for income elasticity of demand (YED) is similar to the one for price elasticity of demand. Because we are now looking at how quantity demanded changes in response to income changes, rather than price changes, we put incomes in the denominator instead of price.

$$\text{YED} = \frac{\%\text{ change in the quantity demanded of good X}}{\%\text{ change in the income (Y) of consumer}}$$

The formula written in symbols is:

$$\text{YED} = \frac{\%\triangle \text{Q}_\text{d}}{\%\triangle \text{Y}}$$

This means that the income elasticity of demand (YED) is the percentage change in the quantity demanded of a good, divided by the percentage change in income.

For example, if consumers' incomes increase by 10 per cent and as a result the quantity demanded of electric cars increases by 15 per cent, the income elasticity of demand (YED) is 1.5.

$$\text{YED} = \frac{\%\triangle \text{Q}_\text{d}\text{ of electric cars}}{\%\triangle \text{Y}} = \frac{15\%}{10\%} = 1.5$$

This means that for every 1 per cent change in people's incomes, the quantity demanded of electric cars will increase by 1.5 per cent.

For income elasticity of demand, we must pay attention to the sign (positive or negative) of the result. The sign helps us classify the type of good.

Student view

⚠ Be aware

Both the sign of YED and the size of its value are relevant, as together they will reveal what type of good we are examining. This is different from price elasticity of demand (PED), where we noted the sign is always negative.

Also, the abbreviation for income in the calculations is Y.

Worked Example 1

If incomes in China increase by 6 per cent, and as a result demand for beef increases by 10 per cent, what is the income elasticity of demand for beef?

Overview (/study/ap 186-cid-754025/

$$\text{YED} = \frac{\%\triangle \text{Q}_\text{d}}{\%\triangle \text{Y}}$$

$$\triangle \text{Q}_\text{d} = 10\%$$

$$\triangle \text{Y} = 6\%$$

$$\text{YED} = \frac{10\%}{6\%} = 1.67$$

Answer: YED = 1.67

Range of values of income elasticity of demand (YED)

Normal goods and inferior goods

The sign of the value of income elasticity of demand tells us something about the good in question.

A *positive sign* means that as incomes increase, quantity demanded of a good increases; and as incomes decrease, quantity demanded decreases. You may remember from section 2.1.5 (/study/app/pp/sid-186-cid-754025/book/nonprice-determinants-of-demand-changes-in-income-id-29860/) that when there is a positive relationship between incomes and demand for a product, we call the goods normal goods.

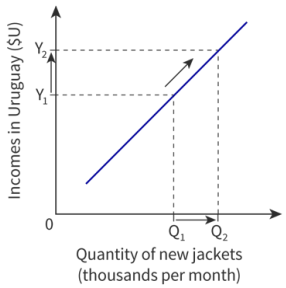
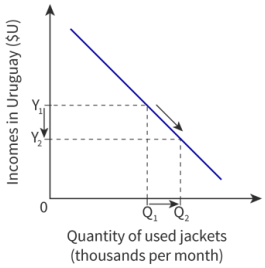
Another model, called an Engel curve, is used to show the relationship between income and quantity demanded. In this model, income is placed on the vertical axis and quantity demanded on the horizontal axis. For a normal good, the Engel curve would have a positive slope, because as incomes increase, quantity demanded of normal goods increases. The positive correlation between incomes and new jackets in Uruguay is shown in **Figure 1** in the table below.

Student view

A *negative sign* for a YED value means that as incomes increase, quantity demanded of a good decreases; and conversely, as incomes decrease, quantity demanded increases. You may remember from section 2.1.5 (/study/app/pp/sid-186-cid-754025/book/nonprice-determinants-of-demand-changes-in-income-id-29860/) that when there is an inverse relationship between incomes and demand for a product, we call the goods inferior goods. An Engel curve can illustrate this situation too. **Figure 2** in the table below shows the inverse relationship between income and quantity demanded of used jackets in Uruguay when incomes increase. Used jackets may be considered an inferior good.

Table 1. Positive and negative YED.

Overview (/study/ap 186- cid- 754025/

Value of YED and type of good	Explanation/ Interpretation	Diagram
YED > 0 Normal good	The quantity demanded of the good increases as consumer income increases (or the quantity demanded decreases as consumer income decreases).	 **Figure 1.** Positive correlation between income and quantity demanded of new jackets in Uruguay. More information for figure 1
YED < 0 Inferior good	The quantity demanded of the good increases as consumer income decreases (or the quantity demanded decreases as consumer income increases).	 **Figure 2.** Impact of increased incomes on demand and quantity demanded of used jackets in Uruguay. More information for figure 2

Student view

Income inelastic and income elastic demand

In addition to the sign of the income elasticity of demand (YED) value, it is also helpful to consider how large or small the value is.

Values between –1 and 1 (–1 < YED < 1) indicate income inelastic demand. A value in this range occurs when the percentage change in quantity demanded is less than the percentage change in income. In other words, consumers are not very responsive to income changes when demanding the good.

A value of zero, or very close to zero, will indicate a good for which demand is *very* inelastic. These are typically necessity goods, which consumers need. The quantity demanded is not very responsive to price changes or to other non-price determinants of demand, such as income changes. Examples may

Overview (/study/ap 186-cid-754025/

include water, bread or toilet paper. Higher incomes generally do not cause people to consume measurably more of these goods, particularly if their incomes are already at a level where they have what they need.

Figure 3. For many, bread is a necessity good with very low income elasticity of demand.

Credit: Filip Noetzel / EyeEm Getty Images

Values of income elasticity of demand that are above 1 or lower than –1 (YED < –1, YED > 1) indicate income elastic demand. Values in these ranges occur when the percentage change in quantity demanded is greater than the percentage change in income. In other words, consumers are very responsive to income changes when demanding the good. Goods with positive income elastic demand tend to be superior goods: those with a high price that tend to make up a larger share of a consumer's income as income rises. Once consumers have satisfied their needs, a larger share of each additional unit of income gets spent on such superior goods.

Student view

Overview (/study/ap 186- cid- 754025/

Figure 4. Caviar is considered a superior good with income elastic demand.

Credit: Cristina Pedrazzini Getty Images

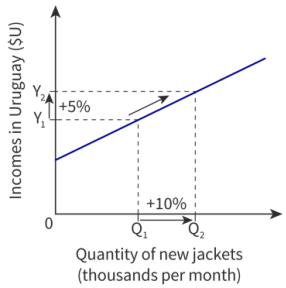
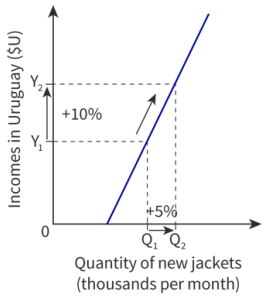
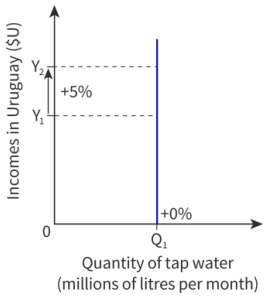
Be aware

Students sometimes assume that because a good is a basic necessity, it is also an inferior good. However, *basic necessities have low positive YED*, while *inferior goods have negative YED*.

Table 2. Elastic and inelastic values of YED.

Student view

Overview (/study/ap 186- cid- 754025/c

Value of YED and classification of demand	Explanation/ Interpretation	Diagram
YED < —1 YED > 1 Income elastic demand	A change in income leads to a **proportionately greater** change in the quantity demanded.	 **Figure 5.** A 5 per cent increase in incomes causes a 10 per cent increase in Q_d. More information for figure 5
—1 < YED < 1 Income inelastic demand	A change in income leads to a **proportionately smaller** change in the quantity demanded.	 **Figure 6.** A 10 per cent increase in incomes causes a 5 per cent increase in Q_d. More information for figure 6
YED = 0 Perfectly income inelastic demand	A change in income leads to **no** change in the quantity demanded. (Goods with a positive YED value close to zero are considered necessity goods.)	 **Figure 7.** A 5 per cent increase in incomes causes a 0 per cent increase in Q_d. More information for figure 7

Student view

Overview (/study/ap 186- cid- 754025/c

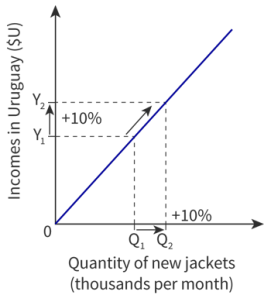
Value of YED and classification of demand	Explanation/ Interpretation	Diagram
YED = 1 No classification	A change in income leads to a **proportionately equal** change in the quantity demanded.	

Figure 8. A 10 per cent increase in incomes causes a 10 per cent increase in Q_d.

More information for figure 8

International Mindedness

Different countries with different cultures, income levels and urbanisation rates will experience different YED values as incomes change.

Meat is a good example of this. Low income countries will likely experience a much higher increase in the quantity demanded of meat as incomes rise and urbanisation increases than high income countries. This is because meat costs more than other food groups, so consumers in low-income countries are likely to be consuming less than they would like to. As their incomes rise, they are likely to spend a proportionally larger percentage of their higher incomes on meat than consumers in high income countries, who are already eating large quantities of meat. In fact, as environmental awareness increases, consumers in high-income countries may even start to eat less meat.

Figure 9 below, from Our World in Data, illustrates the strong positive correlation between incomes and meat consumption.

Student view

Overview (/study/ap 186-cid-754025/

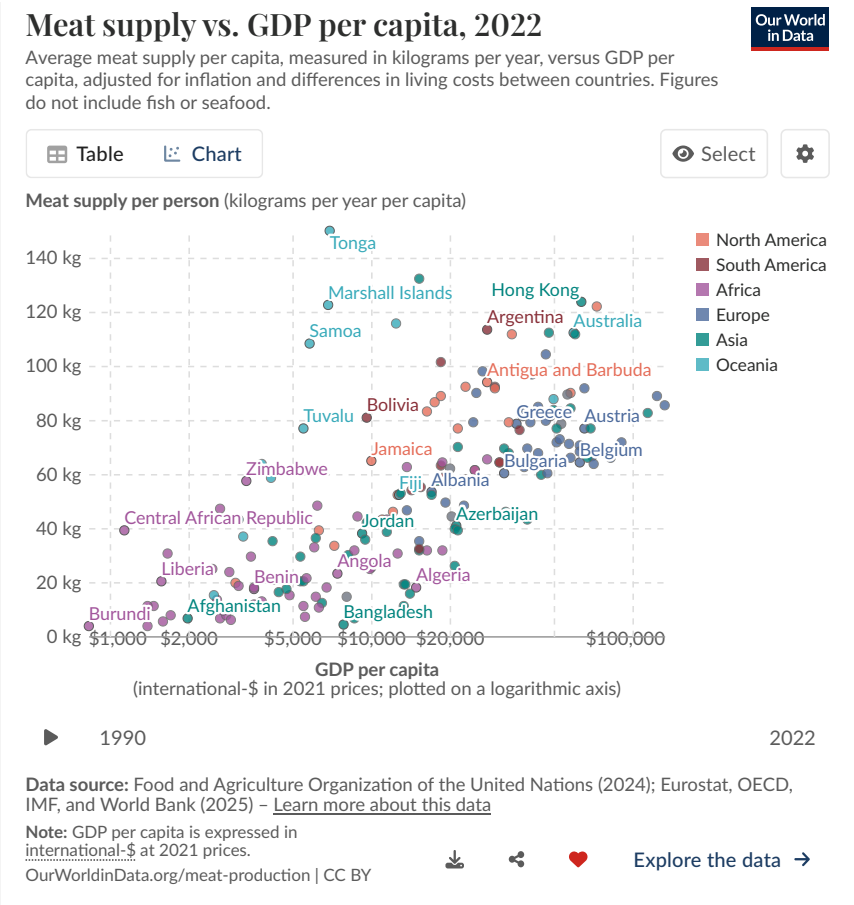


Figure 9. Meat consumption vs. GDP per capita, 2017.

More information for figure 9

It is important to be aware of the cultural or income context when making predictions about how consumers will change their consumption patterns in reaction to changes in income.

This article (https://www.who.int/nutrition/topics/3_foodconsumption/en/index4.html)from the World Health Organisation explains how meat consumption is expected to change as incomes and urbanisation increase.

- If demand for meat is elastic at lower incomes, and then becomes more elastic as incomes rise, what would the Engel curve look like for meat? What would it look like if meat was considered an inferior good at very high income levels?

Student view

Worked example 2

Maria has received a 25 per cent raise in her monthly salary. Now that she has more income, she has decided to increase her expenditure on clothes from USD 600 to USD 750 a month. She will also decrease her expenditure on public transportation from USD 500 to USD 250, as she will take more taxis. Her expenditure on library membership will remain the same.

a) Calculate her income elasticity of demand for clothes and explain what the value means.

Overview (/study/ap 186- cid- 754025/

b) Calculate her income elasticity of demand for public transportation and explain what the value means.

c) Calculate her income elasticity of demand for the library membership and explain what the value means.

Question (a)

$$\text{YED} = \frac{\%\triangle \text{Q}_\text{d} \text{ of clothes}}{\%\triangle \text{Y}}$$

$$\triangle \text{Q}_\text{d} \text{ of clothes} = \frac{(\text{USD } 750 - \text{USD } 600)}{\text{USD } 600} = 0.25$$

$$\%\triangle \text{Q}_\text{d} \text{ of clothes} = 0.25 \times 100 = 25\%$$

$$\triangle \text{Y} = 25\%$$

$$\text{YED} = \frac{25\%}{25\%} = 1$$

Answer: YED = 1

Interpretation: Clothes are normal goods, as the value of YED is a positive number. However, Maria will not increase the proportion of her income that she actually spends on clothes, because for every 1 per cent increase in income, the quantity consumed of clothes will increase proportionally, by 1 per cent .

Question (b)

Student view

$$\text{YED} = \frac{\%\triangle \text{Q}_\text{d} \text{ of public transportation}}{\%\triangle \text{Y}}$$

$$\triangle \text{Q}_\text{d} \text{ of public transport} = \frac{(\text{USD } 250 - \text{USD } 500)}{\text{USD } 500} = -0.5$$

$$\%\triangle \text{Q}_\text{d} \text{ of public transport} = -0.5 \times 100 = -50\%$$

$$\triangle \text{Y} = 25\%$$

$$\text{YED} = \frac{-50\%}{25\%} = -2$$

Answer: YED = -2

Overview (/study/ap 186- cid- 754025/(

Interpretation: Public transport is an inferior good, as the value of YED is a negative number. Maria will start consuming more normal goods and services (taxis) as her income increases. For every 1 per cent increase in income, the quantity consumed of public transportation will fall more than proportionally, by 2 per cent .

Question (c)

$$\text{YED} = \frac{\%\triangle \text{Q}_\text{d} \text{ of library expenditure}}{\%\triangle \text{Y}}$$

$$\%\triangle \text{Q}_\text{d} \text{ of liberty expenditure} = 0\%$$

$$\triangle \text{Y} = 25\%$$

$$\text{YED} = \frac{0\%}{25\%} = 0$$

Answer: YED = 0

Interpretation: The value of YED is zero, as Maria will not change her consumption of library membership now that she has more income. If she already has a satisfactory library membership, it makes no sense for her to pay more. Her consumption of library services is enough, no matter her income level. Therefore, the percentage change of her demand for the library is zero, no matter the percentage change in income.

3 section questions

2. Microeconomics / 2.5 Elasticities of demand

Student view

Importance of income elasticity of demand (YED) for firms and sectoral change in the economy (HL)

Section Student... (0/0) Feedback Print (/study/app/pp/sid-186-cid-754025/book/importance-of-income-elasticity-of-demand-yed-id-30280/print/) Assign

The value of the income elasticity of different goods and services has different implications for different producers and for different industries, depending on the stage of growth that an economy is going through.

Overview (/study/ap 186-cid-754025/

Importance of YED for firms

In times of economic growth, we typically see average incomes rising in the population. In times of economic recession, we see average incomes declining in the population. As a firm, if you know the income elasticity of demand for your products, you can make predictions about what may happen to sales and revenues in these different economic scenarios.

In an economic recession, incomes and employment are decreasing. We would expect an increase in the demand and quantity demanded of inferior goods. Firms that sell inferior goods should experience an increase in sales and revenues. However, these firms may also experience a decrease in sales and revenues when economic growth resumes.

On the other hand, firms who sell normal goods or superior goods should see demand and quantity demanded of their goods increase during periods of economic growth. Their sales and revenues should improve in these periods. However, they will likely see sales and revenues decline during recessions. As most goods are normal goods, this is the situation for most firms.

As we have seen in section 2.5.8 (/study/app/pp/sid-186-cid-754025/book/income-elasticity-of-demand-yed-range-of-values-id-30279/), the higher the YED the more sensitive the demand for the good or service is to changes in people's incomes. If goods have an income elastic demand (YED > 1), this means that the quantity demanded of these goods will increase proportionally more than the increase in income. Goods and services that have high YED tend to be superior goods, (luxury goods and services), such as high-end cars, exclusive restaurants and foreign travel.

If goods have income inelastic demand (YED < 1), this means that the quantity demanded of these goods will increase proportionally less than the increase in income. Goods and services that have low YED tend to be necessities, such as food and clothing.

Important

In periods of economic recession, goods and services with the highest YED (YED > 1) will be the ones whose demand and quantity demanded will suffer the largest fall.

However, products with low YED (YED < 1) may avoid a large reduction in sales, and inferior goods (YED < 0) are likely to experience an increase.

Student view

YED and sectoral change in the economy

Income elasticity of demand changes for goods as incomes increase. This can cause the entire output of an economy to shift to different sectors over time, as consumers spend larger proportions of their income on different goods.

Overview (/study/ap 186- cid- 754025/(

Industries in an economy are typically divided into three sectors:

1. The primary sector. This includes all primary commodities and products; for example, agriculture, forestry, fishing and mining industries.
2. The secondary sector. This includes industries producing goods manufactured from primary commodities or intermediate goods; for example, clothes, machines, cars, houses, books and paper.
3. The tertiary sector. This includes all economic goods that are not tangible and yet improve people's quality of life or standards of living; for example, entertainment, travel, insurance, banking, healthcare and education.

As an economy grows over time, the relative size of these sectors, as a percentage of total output in the economy, changes. This is known as sectoral change and is related to YED values of goods in the three sectors. **Figure 1** shows an example of a hypothetical economy.

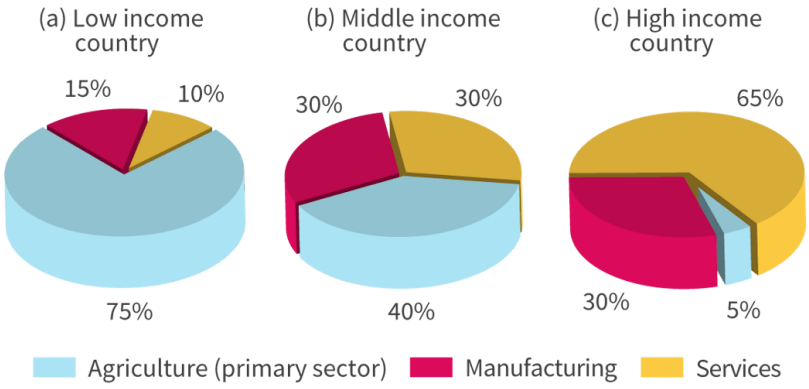


Figure 1. Changes in composition of a country's output per sector at different stages of growth.

More information for figure 1

We know that demand for necessity goods is income inelastic. Consumers on low incomes will spend a large share of their income on necessity goods to satisfy their basic needs. Low income countries therefore typically focus output on primary products. **Figure 1a** shows that primary products (usually agricultural) comprise the largest share of output.

Student view

Making connections

The implications of this focus on primary products for low income countries will be discussed in more detail in subtopic 4.9 (/study/app/pp/sid-186-cid-754025/book/the-big-picture-id-30278/).

As the economy grows and achieves higher levels of national income , the demand for manufactured goods will increase more rapidly (with higher YED) than demand for agricultural products (with lower YED), as consumers are likely to have met their basic needs. Additional income will be spent

Overview (/study/ap 186-cid-754025/

disproportionately in the secondary sector, increasing the secondary sector's proportion of economic output, shown in **Figure 1b**.

When an economy achieves a high level of national income, consumers will spend disproportionately more in the tertiary sector (even higher YED) than in the primary and secondary sectors. **Figure 1c** shows that the tertiary sector becomes the largest sector of the economy at this stage.

Low income countries usually have a large primary sector, while the secondary and tertiary sectors are smaller. When a country's economy grows, the primary sector shrinks relative to the secondary and tertiary sectors. As the economy grows even further, this process continues and the tertiary sector becomes the largest sector in the economy.

Be aware

Note that if total output increases over time, the fact that the proportion of spending on the primary sector is falling does not necessarily mean that the primary sector's output is falling. It could mean that this sector's output is increasing, but at a lower rate than the secondary and tertiary sectors. A high income country can still have a significant primary sector.

Also, be aware that not every country follows this pattern of sectoral growth. For example, some low income countries have a large tertiary sector because they specialise in tourism. The generalisations made above about sectoral change are often true, but not for every country.

Activity

Access the list of countries in high, upper middle, lower middle and low income categories from the World Bank (https://datahelpdesk.worldbank.org/knowledgebase/articles/906519-world-bank-country-and-lending-groups). Identify three countries in each category and write them into a table like the one below. You need to scroll down the page to find the countries grouped by income level.

Student view

Find the GNI per capita at $PPP using this World Bank page (https://data.worldbank.org/indicator/NY.GNP.PCAP.CD). Record the GNI per capita at $PPP for each country.

Then access the CIA World Factbook (https://www.cia.gov/the-world-factbook/)website and record the proportion of primary, secondary, and tertiary sectors for each country.

Argentina is given as an example.

Overview (/study/ap 186- cid- 754025/

Country	GNI per capita at $PPP	High, middle or low income?	Percentage agriculture (primary)	Percentage manufacturing (secondary)	Percentag services (tertiary)
Argentina	12 390	Upper middle	10.8 (2017)	28.1 (2017)	61.1 (2017)

Did you find evidence of the sectoral allocation mentioned in the text above?

Did you find evidence of anomalies?

Compare your data with another student in a group.

Student view

3 section questions

2. Microeconomics / 2.5 Elasticities of demand

Checklist

What you should know

By the end of this subtopic **2.5 Elasticities of demand**, you should be able to:

- Define the following terms: elasticity of demand, price elasticity of demand (PED), price elastic demand, price inelastic demand, unitary elastic demand, perfectly elastic demand, perfectly inelastic demand, necessity good, total revenue, profit, tax incidence, commodities (primary commodities, primary goods), manufactured goods, income elasticity of demand, Engel curve, income elastic demand, income inelastic demand, perfectly income inelastic demand, superior goods, economic growth, recession, primary sector, secondary sector, tertiary sector, sectoral change.

Price elasticity of demand (PED)

- Calculate PED using the following equation:

  PED = % change in quantity demanded / % change in price

- Calculate PED from two points on a demand curve.
- Explain, using diagrams and PED values, the concepts of:
  - Elastic demand
  - Inelastic demand
  - Unitary elastic demand
  - Perfectly elastic demand
  - Perfectly inelastic demand
- Explain why PED varies along a linear demand curve and is not represented by the slope of the demand curve.
- Explain the determinants of PED, including:
  - Number and closeness of substitutes
  - Degree of necessity
  - Proportion of income spent on the good
  - Time
- Explain the relationship between price elasticity of demand and total revenue.
- Examine the importance of PED for firms and government decision-making.
- Explain why the PED for primary commodities is relatively low and the PED for manufactured products is relatively high (HL).

Income elasticity of demand

- Calculate YED using the following equation:

  YED = % change in quantity demanded/% change in income

- Explain, using Engel curves and YED values, the concepts of:
  - Elastic demand
  - Inelastic demand
  - Perfectly inelastic demand

Overview (/study/ap 186-cid-754025/(

- Normal goods
- Inferior goods

- Examine the importance of YED for producers (HL).
- Examine the importance of YED for sectoral change in the economy (HL).

Investigation

Section Student... (0/0) Feedback Print (/study/app/pp/sid-186-cid-754025/book/investigation-id-30281/print/) Assign

Real-world issue 1: How do consumers and producers make choices in trying to meet their economic objectives?

In early 2020, the virus COVID-19 reached pandemic status. As it spread, numerous countries reported large increases in the price of hygienic face masks.

Figure 1. What happens to the prices of face masks during virus outbreaks?

the_burtons Getty Images

As you have learned in these first subsections of the economics course, we expect increases in demand to cause increases in prices. As you learned in this subtopic 2.5 (/study/app/pp/sid-186-cid-754025/book/the-big-picture-id-29882/), when demand is inelastic, prices may be more volatile. In section 2.5.4 (/study/app/pp/sid-186-cid-754025/book/12123123123-id-30274/), you learned that producers can increase revenues by raising prices when demand is inelastic, and we assumed that they would want to do this.

Student view

Overview (/study/ap 186- cid- 754025/

However, there is a hot debate around the economics and ethics of raising prices on goods that people need in an emergency. Face masks during a virus outbreak are not the only example. Shovels during a severe snowstorm, sandbags during a flood, water during a drought – all are examples of goods that people may need desperately during a crisis. In these circumstances, producers *can* increase prices significantly to make enormous revenues. The question many ask is: *should* producers increase prices in these circumstances?

The article below describes some high prices seen for face masks in Italy.

Italy probes "insane" prices for coronavirus masks, sanitizers (https://www.reuters.com/article/us-china-health-italy-probe/italy-probes-insane-prices-for-coronavirus-masks-sanitizers-idUSKBN20J1M7?il=0), Reuters

Some economists argue that we should let producers raise prices to high levels in these situations. They point out that prices ration goods in times of scarcity, and very high prices will also encourage producers to supply more of the goods to the market. They argue that this is exactly what the market needs in times of scarcity. The opinion piece below takes this view.

Sold-Out Coronavirus N95 Face Masks Offer a Lesson in Price Gouging (https://www.bloombergquint.com/gadfly/sold-out-coronavirus-n95-face-masks-offer-lesson-in-price-gouging), Bloomberg

Others argue that charging high prices for necessity goods in a time of crisis is unethical. They point out that the price mechanism does not equitably allocate goods, and that price gouging will mean that the poorest and most vulnerable are left without the goods they need. Such actions from producers are not distributively just. Some, like Daniel Kahneman, who we met in subtopic 2.4 (/study/app/pp/sid-186-cid-754025/book/the-big-picture-id-30262/), have pointed out that the long-term reputational damage to firms for damaging social values of fairness is significant. The article below outlines this view.

Student view

Why Economists Love Price Gouging, And Why It's So Rare (https://www.npr.org/sections/money/2012/10/29/163861383/why-economists-love-price-gouging-and-why-its-so-rare)

Suggestions for activities:

- Hold a debate on whether it is a good idea to allow producers to raise prices on necessity goods during emergencies. You could use these articles and others they find to support their arguments.
- Suggest a policy for your local, regional or national government about price gouging. Some governments have laws against it. You could write a policy paper either in favour of no government intervention on prices, or in favour of a law banning price gouging.

Overview
(/study/ap
186-
cid-
754025/

Rate subtopic 2.5 Elasticities of demand

Help us improve the content and user experience.

☆ ☆ ☆ ☆ ☆

Student
view