THE INSTITUTE OF EDUCATION

Economics

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6TH YEAR

HIGHER LEVEL

2020-21

ELASTICITY

Elasticity – Topics to be covered

1 Price Elasticity of Demand (PED) – Study pages 2,3,4,5,6,12,13,15,16,17,18,19,20,21,22,23,24,26,30,31.

2 Factors affecting PED – Study pages 6,19,23,26,31.

3 Income Elasticity of Demand (YED) – Study pages 7,8,12,14,15,16,17,20,21.

4 Cross Elasticity of Demand (CED) – Removed from the course.

5 Price Elasticity of Supply (PES) – Removed from the course.

6 Factors affecting PES – Study pages 11,30.

7 The uses of Elasticity – Study pages 11,12,14.

8 The elasticity values of a Giffen good – Study page 12.

9 Additions to course as a result of the new syllabus pages – pages 35, 36

There are 4 different types of elasticities-
1 Price Elasticity of Demand.
2 Income Elasticity of Demand.
3 Cross Elasticity of Demand.
4 Price Elasticity of Supply.

1 Price Elasticity of Demand

This measures the percentage change in/responsiveness of the demand for one good caused by the percentage change in the price of that good.

Formula -

$$\frac{\Delta Q}{\Delta P} \times \frac{P1 + P2}{Q1 + Q2}$$

Goods fall into 2 main categories – they are mainly elastic or inelastic.
Inelastic goods such as milk where demand is **not sensitive** to a change in price. If the price rises by say 10% then demand falls by less than 10% and vice versa.
Elastic goods such as fresh salmon where demand is **very sensitive** to a change in price. If the price falls by 10% then demand will rise by more than 10% and vice versa.

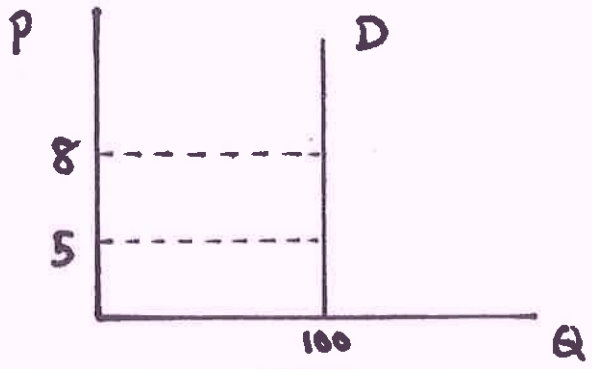
1 Perfectly Inelastic – these goods have a price elasticity of demand value of **zero** and an example of a perfectly inelastic good is medicine. Demand remains unchanged as a result of a price change.

Price	Quantity	Total Revenue
€	units	€
5	100	500
8	100	800

Using the formula from above -

$$\frac{0}{3} \times \frac{13}{200} = 0$$

The demand curve for perfectly inelastic good is vertical as follows -



If you are a producer always **raise the price** of a perfectly inelastic product and the firm will earn extra revenue.

2 Inelastic – These goods have a price elasticity of demand value of less **than one** (if you remove the negative sign), and examples of these goods include milk. Demand is not sensitive to price changes.

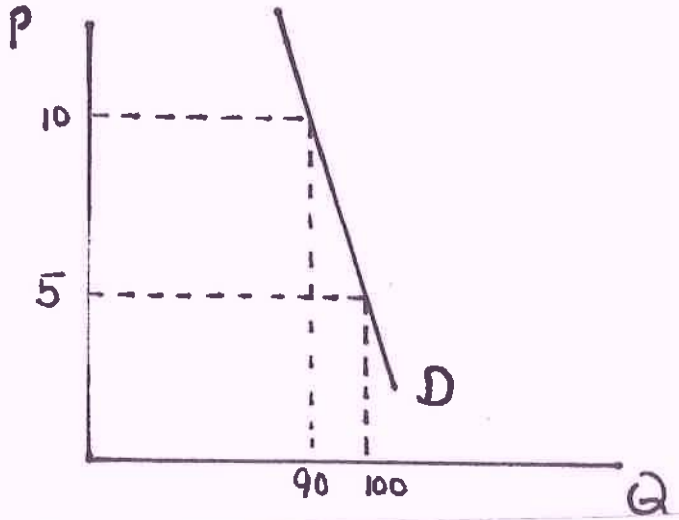
Price €	Quantity	Total Revenue €
5	100	500
10	90	900

Putting this information into the formula above we get –

$$\frac{-10}{5} \times \frac{15}{190} = -0.16$$

The **negative** sign indicates that this product obeys the **law of demand** i.e. as price rises demand falls and vice versa. The **0.16** indicates that the good is **inelastic,**

Insert a diagram at this point with a very steep demand curve –



It is always a good idea to **raise the price** of an inelastic product for 2 reasons – (i) the firm will earn more revenue, in the case above, €468, and (ii) the firm will earn more profit because by producing less goods it will have lower costs and this combined with more revenue leads to more profit.

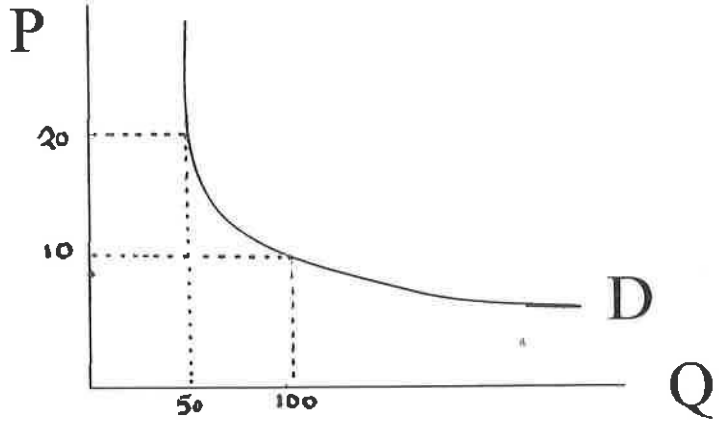
3 Unit Elastic – These goods have a price elasticity of demand value of exactly –1 meaning that a 10% rise in price is exactly matched by a 10% fall in demand and vice versa.

Price €	Quantity	Total Revenue €
10	100	1000
20	50	1000

$$\frac{-50}{10} \times \frac{30}{150} = -1$$

The **negative** sign indicates that the product obeys the normal law of demand and the **1** indicates that the good is unitary elastic.

Now insert a diagram as follows –



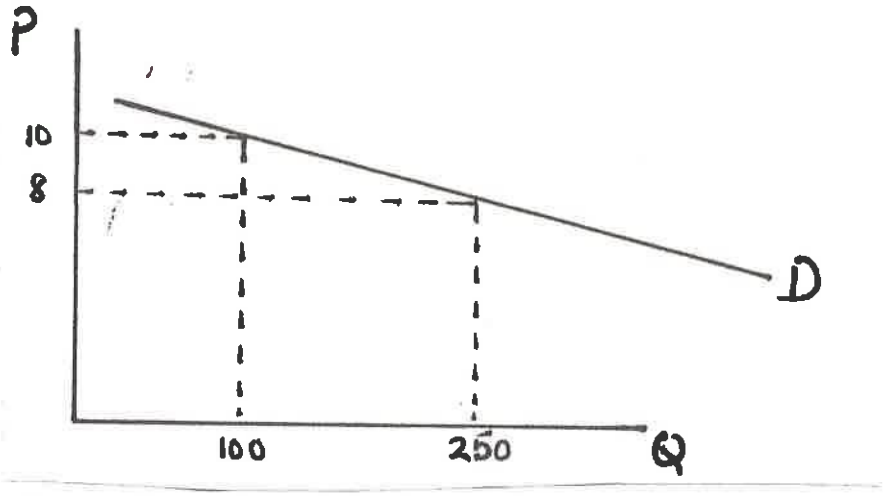
One should always **raise the price** of a unit elastic good because even though **revenue remains the same**, costs fall because one is producing less, and profit rises. (EXAMINE P.25 PRODUCT B)

4 Elastic – These goods have a price elasticity of demand value of **greater than 1** (if you drop the negative sign) and include most luxury goods. Demand is **very sensitive** to price changes.

Price €	Quantity	Total Revenue €
10	100	1,000
8	250	2,000

$$\frac{150}{-2} \times \frac{18}{350} = -3.86$$

The **negative sign** indicates that this good obeys the normal law of demand and the **3.86** indicates that this good is elastic meaning highly sensitive to price changes.
Now insert a diagram with a demand curve having a very **flat** slope.



Always **lower the price** of elastic goods because -
1. The firm will earn more revenue, in the above example an extra €1,000.
2. The effect on profit is inconclusive and all depends on what happens to costs, if the company increases production. Costs will rise but how fast depends upon how easy it is to get the extra resources to increase production.

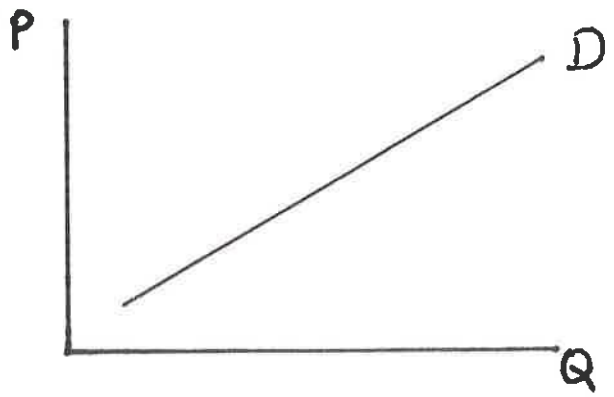
5. Perfectly Elastic – here demand is so sensitive to price changes that if you change the price demand will disappear. A firm can sell all that it wishes at the going market price.

Price elasticity of demand is ∞ (infinity)

6. Exceptions to the Normal Law of Demand.

Giffen goods, snob goods et cetera, disobey the normal law of demand and have a **positive** price elasticity of demand because when price rises demand also rises.

Below you see a diagram with a perverse demand curve.



Factors Affecting Price Elasticity of Demand

1. The number of **close substitutes** that a product has. If a product has no close substitute (milk) and its price is increased, consumers have no alternative to switch to. Demand will not change very much and is **inelastic.**
2. **Habit-forming** goods like alcohol are addictive so if the price rises demand remains much the same and demand will be **inelastic.**
3. The **percentage of income** spent on a product. If consumers spend a small percentage of their income on a product, such as a box of matches, then if the price of matches increases demand will remain much the same and demand is **inelastic.**
4. **Durability of the product.** The more durable the product is the more elastic it is. Cars, washing machines, cookers, if their price rises people extend the life of their existing models and demand drops significantly. In this case demand is elastic.
5. **Necessities versus luxuries** – Necessities tend to be inelastic and luxuries have a tendency to be elastic.
6. **Consumer loyalty and branding** build up the attachment a consumer has for a particular product and makes the product **inelastic**.

7. **Time period.** The longer the time period the more **elastic a** product becomes.

2 Income Elasticity of Demand

Income elasticity of demand measures the percentage change in/responsiveness of the demand for one good caused by the percentage change in the consumers' income.

Formula $\frac{\Delta Q}{\Delta Y} \times \frac{Y1 + Y2}{Q1 + Q2}$

Normally income elasticity of demand is **positive** except in the case of inferior goods.

1 Normal Goods – Luxuries. These products have a high positive income elasticity of demand value, i.e. **greater than plus 1**. This is because when income rises by say 10% demand will rise by more than 10%. Demand is **elastic** meaning it is very sensitive to income changes. Examples include cars, foreign holidays, designer clothes.

Income	Quantity
€	units
25000	2
30000	4

$$\frac{2}{5000} \times \frac{55000}{6} = +3.67$$

The **positive sign** indicates that one is dealing with a normal good (as income rises demand also rises) and the **3.67** indicates that the product is highly elastic (demand is very sensitive to income changes).

2 Normal Goods – Necessities. These products have a low positive income elasticity of demand value i.e. **less than plus 1**. This is because when income rises by say 10% demand will rise

by less than 10%. Demand is **inelastic** meaning demand is not very sensitive to income changes. Examples include milk, electricity.

Income €	Quantity units
25000	10000
30000	11000

$$\frac{1000}{5000} \times \frac{55000}{21000} = +0.52$$

The **positive** sign indicates the one is dealing with a normal good (as income rises demand rises) and the **0.52** indicates that one is dealing with an inelastic good (demand is not very sensitive to income changes).

3 Inferior Goods – such as cheap cuts of meat, public transport and videos. These products have **a negative** income elasticity of demand value because when income rises demand falls.

Income €	Quantity units
25000	3
30000	2

$$\frac{-1}{5000} \times \frac{55000}{5} = -2.2$$

The **negative sign** indicates that we are dealing with an inferior good.

Salt is an example of a product that has a zero income elasticity of demand value.

3 Cross Elasticity of Demand

Cross elasticity of demand measures the percentage change in/responsiveness of the demand for one good caused by the percentage change in the price of other related goods.

Formula -

$$\frac{\Delta Qx}{\Delta Py} \times \frac{(P1 + P2)y}{(Q1 + Q2)x}$$

x is one good and y is a related good

Cross elasticity of demand can be positive or negative.
1 Substitute Goods – price of butter and the demand for margarine. Substitute goods will always have a **positive CED.**

Price of Butter Cent	Demand for Margarine Tonnes
200	1000
250	7000

$$\frac{6000}{50} \times \frac{450}{8000}$$

$$= +6.75$$

The **positive sign** indicates one is dealing with substitute goods (if the price of butter rises then demand for margarine will also rise) and the high value of **6.75** means that the 2 products are very close substitutes (the demand for margarine is highly sensitive to changes in the price of butter).

2 Complementary Goods – such as cars and petrol. Cross elasticity of demand for complementary goods is always **negative.**

Price of Cars €	Quantity of Petrol
10000	2000
15000	1400

$$\frac{-600}{5000} \times \frac{25000}{3400}$$

$$= -0.88$$

The **negative** sign indicates that one is dealing with complementary goods – if the price of one rises then the demand for the other falls.

3 No Connection between products – CED will be zero.

Price of Squash Courts	Demand for Salt
4	1000
5	1000

$$\frac{0}{1} \times \frac{9}{2000} = 0$$

4 Price Elasticity of Supply

Price elasticity of supply measures the percentage change in/responsiveness of the supply of one good caused by the percentage change in the price of that good.

Formula -

$$\frac{\Delta Q}{\Delta P} \times \frac{P1 + P2}{Q1 + Q2}$$

Price Elasticity of Supply is normally **positive** because as price rises so does supply.

1 Perfectly Inelastic – As price rises supply remains the exact same and the price elasticity of supply value is exactly **zero**.

2 Inelastic – As price rises supply increase very slightly and the price elasticity of supply value will be between **0 to + 1**. A 10% rise in price brings forth a less than 10% rise in supply.

3 Unit Elastic – Here the price elasticity of supply value will be exactly **+ 1**. A 10% rise in price results in a 10% rise in supply.

4 Elastic – A 10% rise in price brings forth a greater than 10% rise in supply. Supply is very sensitive to price changes. The price elasticity of supply value will be **greater than plus 1.**

Factors Affecting Price Elasticity of Supply.

1 Production Costs – If the company can keep its **cost per unit stable,** then supply may be **elastic** (will increase by a greater % than the increase in price) when price rises.
2 Time Scale – The longer the time scale the more **elastic** supply is. At a fish market on one particular day (after all the fish have been landed from the boats) supply is **perfectly inelastic.** Supply cannot increase if there is an increase in price
3 Type of Products – Agricultural products tend to be **inelastic.** If the price of wheat goes up in June supply will not increase because it is planted in March and is harvested in August.

Uses of Elasticity

1 The Producer –
The producer will use **price elasticity of demand** because it will indicate the sensitivity of demand if the business alters price. If the product is elastic the producer should consider reducing price and if the product is inelastic the producer should consider raising price in order to earn more revenue.
The producer will also use **income elasticity of demand** because it will indicate the likely change in demand if income in the economy grows e.g. a travel business, luxury cars. If income elasticity of demand is elastic a rise in income will cause a much greater percentage increase in demand.
The producer will use information on **cross elasticity of demand** because this will indicate how demand will respond to price changes in substitutes and complementary goods. At the moment coal producers and gas outlets will be examining the likely effects on their businesses as a result of the recent fall in oil prices.
2 The Government – The government will use information on **price elasticity of demand** because this will indicate the sort of goods the exchequer should increase indirect tax on (inelastic

goods such as alcohol). An increase in tax will only cause a small reduction in demand and the revenue collected by the government increases.
If the government wishes to reduce the quantity bought of socially harmful products, which have an elastic demand, it can increase the tax on these and this will cause a huge reduction in demand achieving their objective. Products here might include fast food, chewing gum, plastic bags and so on.
3 Monopolist – Price elasticity of demand will indicate whether total revenue will increase/decrease when price is changed. Price can be raised until demand becomes elastic. Remember the monopolist has control over price or quantity but not both.

Leaving Certificate 1980

100 hats were sold at a price of £4 each. If the price elasticity of demand is –1, how many hats would be sold if their price is increased to £5 each?
Solution – When PED is –1 an increase/decrease in price results in **no change in total revenue or spending.**

Price €	Quantity	Total Revenue €
4	100	400
5	?	400

$$\text{Quantity} = \frac{400}{5} = 80$$

Leaving Certificate 1982

Income Elasticity of Demand for good X is – 1.3 and for good Y is + 0.6. Which of the following is most appropriate. (i) Could not be a Giffen good; (ii) Is certain to be a Giffen good; (iii) Could possibly be a Giffen good.

Solution – To be a Giffen good a product must be an inferior good (have a negative income elasticity of demand), and it must disobey the normal law of demand (positive price elasticity of demand).
(i) Good Y could not be a Giffen good because it has a positive income elasticity of demand.

(ii) Good X could be a Giffen good because it is an inferior good having a negative income elasticity of demand.
(iii) In order to know for definite we need information on price elasticity of demand.

Leaving Certificate 1993

Is price elasticity of demand normally positive or negative?
Solution –Price elasticity of demand is normally **negative** because as price rises demand falls and as price falls demand rises.
With snob goods, giffen goods and so on price elasticity of demand is **positive** because as price rises demand rises.

Leaving Certificate 1995

a) Define price elasticity of demand.
b) Discuss the factors that affect price elasticity of demand.
c) A bus company which operates 3 routes discovers that price elasticity of demand for each route is as follows –

Route A = - 1.3
Route B = - 1.0
Route C = - 0.4

The company wishes to maximise its revenues. State in respect of each route, what change, if any, it should make in price to enable it to achieve that aim.
Solution –
a) Refer to page 2.
b) Refer to page 6.
c) **Route A** is **elastic** and is very sensitive to price changes. If the company reduced its price by 10% demand would increase by 13% and the company will earn more revenue. Route A – **price should be reduced.**
Route B is unit elastic. If the company raises its price by 10% demand will fall by exactly 10% so there will be no change in revenue. **Leave price as it is.** However if one is discussing profit then the price should be increased because even though revenue will remain the same profit will rise because the company's costs will fall due to producing less goods.

Route C is **inelastic** and demand is not sensitive to price changes. The company should **raise its price**, say by 10%, and demand will fall by only 4%. The company will earn extra revenue.

Leaving Certificate 1996

a) Define income elasticity of demand and give the formula by which it is measured.

b) In the case of each of the following state if the good is normal, inferior or luxury –

Good A has an income elasticity of demand of + 1.5
Good B has an income elasticity of demand of - 3.0
Good C has an income elasticity of demand of + 10
Good D has an income elasticity of demand of 0

c) Briefly explain how knowledge of elasticities is useful to
(i) A producer of goods who is considering increasing production.
(ii) The government when it is considering increasing indirect tax on a particular commodity.
(iii) A monopolist when it is deciding to fix the price of the commodity it is selling.

Solution –

a) For the answer refer to page 7.

b) **Good A** is a **normal luxury good**. The positive sign indicates it is normal i.e. as income rises so does the demand. The 1.5 indicates that it is **elastic** as regards income changes i.e. if income rises by 10% then demand will rise by 15%.

Good B is an inferior good because it has a negative income elasticity of demand. If income rises by 10% then demand will fall by 30%.

Good C is a normal luxury good, for the same reason as with Good A above, except C is far more sensitive to income changes. If income rises by 10% then demand rises by 100%.

Good D is perfectly inelastic as regards income meaning that if income rises demand doesn't change at all, e.g. salt.

c) For the answer refer to page 11.

Leaving Certificate 1998

a) Define each of the following and give the formula by which it is measured – Income Elasticity of Demand and Cross Elasticity of Demand.
b) If a consumer spends £20 per week on petrol when its price is 60 pence a litre and continues to spend £20 when its price rises to 62 pence per litre, what is the consumer's price elasticity of demand for petrol?
Solution –
a) For the answer refer to page pages 7 and 9.
b) Price elasticity of demand is **unit** elastic i.e. it equals –1. If the price is increased and total **revenue remains unchanged** (€20) then price elasticity of demand is unit elastic. A 10% increase in price is exactly matched by a 10% fall in demand.

Leaving Certificate 1999

a) Define what is meant by Cross Elasticity of Demand and give the formula for measuring it.
b) You are given the following information about certain goods –
Cross elasticity of demand between Good A and Good B is + 2.5
Cross elasticity of demand between Good A and Good C is – 0.6
Cross elasticity of demand between Good A and Good D is + 0.3
Cross elasticity of demand between Good A and Good E is – 1.4
Which of these goods are complements to Good A? Which of these goods is the closest substitute for Good A? Explain.
c) Define the following types of price elasticity of demand – (i) Elastic demand; (ii) Inelastic demand; (iii) Unit elastic; (iv) Perfectly inelastic; (v) Perfectly elastic.
Solution –
a) Refer to page 9. (Not part of the new economics course)

b) Good C and Good E are **complements** to Good A because they have a **negative** cross elasticity of demand. If the price of C and D rise then demand for A will fall.
Good B is the **closest substitute** for Good A. Firstly it has a **positive** cross elasticity of demand indicating that if the price of B increases then demand for A will also increase. B also has the highest positive value indicating that if the price of A rises by 10% then the demand for B will rise by 25%. It is highly elastic.
c) Refer to page 2,3,4,5.

Leaving Certificate 2001

a) Define what is meant by price elasticity of demand.
b) A consumer buys 80 units of a good when its price is £1.50. The price increases to £1.75 and the consumer now buys 70 units. Calculate the PED for this product. Is the product elastic, inelastic or unit elastic?
The seller of the above good wishes to maximise his revenue. What changes, if any, should he make to the price?
c) State and explain 4 factors that affect price elasticity of demand.
Solution –
a) For the answer refer to page 2.
b) $\frac{-10}{25} \times \frac{325}{150} = -0.867$

The product is **inelastic** meaning that if the price rises by 10% then demand falls by 8.67%.
To increase revenue the producer should raise the price……..
c) For the answer refer to page 6.

Leaving Certificate 2002

a) Define income elasticity of demand and cross elasticity of demand.
b) Income elasticity of demand is normally positive. Explain. A consumer spends 40% of his income on a certain good. After the consumer's income doubles, only 30% of income is spent on the same good. State whether this good is normal or inferior.

c) Which of the figures below is likely to represent –
(i) Income elasticity of demand for potatoes.
(ii) Income elasticity of demand for designer clothes.
(iii) Price elasticity of demand for airline seats.

- 2.8 - 0.1 + 2.5

d) Income elasticity of demand for a good is +1.8 and sales in year 1 are 20000. If incomes are expected to rise by 5% in year 2 calculate the expected level of sales.
Solution –

a) For the answer refer to pages 7 and 9.
b) This is a **normal good**. Assume income in year 1 is €100 and in year 2 it doubles to €200.
Demand in year 1 is 40% of €100, which is €40. Demand in year 2 is 30% of €200, which is €60. Demand rises from €40 to €60. Therefore this good is certainly not an inferior good, it is a normal good that is a necessity. It will have a YED of less than +1.

c) **(i) Income elasticity of demand for potatoes** is likely to be **- 0.1** indicating that it is an inferior good i.e. if income rises by 10% demand falls by 1%.

(ii) Income elasticity of demand for designer clothes is likely to be **+ 2.5** because they are a normal luxury good. If income rises by 10% then demand will rise by 25%.

(iii) Price elasticity of demand for airline seats is likely to be **– 2.8** because airline seats are highly elastic. If the firm reduces the price by 10% demand will rise by 28%.

d) 5% x 1.8 = 9%. Then 9% of 20000 = 1800. The expected level of sales in year 2 is 20000 + 1800 = 21800.

Leaving Certificate 2003

a) Define price elasticity of demand and cross elasticity of demand, and give the formula by which they are measured.
b) When the price of Good X is €27 the quantity demanded of Good Y is 1,200 units. When the price of Good X falls to €23 (the price of Good Y unchanged) the quantity demanded of Good Y falls to 800 units.
Calculate the cross elasticity of demand for Good Y and is Good Y a substitute or complement to Good X.
c) A firm has the following price elasticity of demand for 2 goods X and Y –

X = - 2.0 Y = - 0.5

What changes if any should the firm make in the price of each of the 2 goods to increase revenue? Explain your answer.
Solution –

a) For the answer refer to pages 2 and 9.

b) $\frac{-400}{-4} \times \frac{50}{2000} = +2.5$

Good Y is a **substitute good** meaning that as the price of Good X decreased, consumers switched from Good Y to the cheaper alternative Good X. (part b is not part of the new Economics course).

c) **Good X is a normal good** because it has a negative price elasticity of demand and this means that it obeys the normal law of demand. It is **elastic** because price elasticity of demand is greater than 1 (when you drop the negative sign). So the firm should **decrease the price** by say 10% and demand will increase by 20%. The increase in demand exceeds the fall in price in percentage terms and total revenue rises.
Good Y is a normal good because it has a **negative price elasticity of demand** meaning that it obeys the normal law of demand. It is **inelastic** because its PED is less than 1 (when you remove the negative sign). So the producer should **increase** the

price by say 10%, demand will fall by only 5%. The increase in price exceeds the fall in demand in percentage terms so revenue will rise.

Leaving Certificate 2004

a) Define the following types of price elasticity of demand - (i) Perfectly elastic; (ii) Perfectly inelastic; (iii) Elastic; (iv) Unitary elastic.

b) State and explain 5 factors that affect price elasticity of demand.

c) A consumer spends €120 per month on a product when its unit price is 80cent, and continues to spend €120 per month on this product when its unit price increase to €1.
(i) Using the normal formula, calculate the consumer's price elasticity of demand.
(ii) Is demand for this product elastic, inelastic or unitary elastic.
(iii) Should the seller make any changes in the selling price of this commodity to increase overall revenue? Explain.

Solution –
a) For the solution refer to page 2,3,4,5.

b) For the answer refer to page 6.

c) (i) PED = - 1

Price	Quantity	Total Revenue
80cent	150 ?	€120
100cent	120 ?	€120

$$\frac{-30}{20} \times \frac{180}{270} = -1$$

(ii) Demand is **unitary elastic**.

(iii) The price of this product should be left **unchanged** because a 10% rise or fall in the price will bring forth a 10% fall or rise in demand and total revenue will be unchanged. The percentage change in the price equals the percentage change in the quantity demanded.

Leaving Certificate 2006

b) A manufacturer of 3 different products calculates the price elasticity of demand for each product as follows:
Product X – 1.5 Product Y – 1 Product Z - 0.3
The company wishes to maximise its revenues. Explain in respect of each of these products, what change, if any, the company should make in the prices currently being charged to enable it to achieve its aim.

c) A consumer buys 10 units of Good A when the price of Good B is €5. When the price of Good B rises to €6 the consumer buys 14 units of Good A (the price of Good A remains unchanged).
(i) Define cross elasticity of demand.
(ii) Using an appropriate formula, calculate this consumer's cross elasticity of demand for Good A.
(iii) Is Good A a substitute for, or a complement to, Good B? Explain your reasoning.

Solution -
b) **Product X** is **elastic**, demand for the product is sensitive to price changes. The company should **decrease price** because the percentage increase in demand exceeds the percentage decrease in price. Therefore total revenue will **increase** if the price is reduced.
Product Y is **unit elastic** the company should leave **price unchanged** because the percentage change in demand equals the percentage change in price. Total revenue will remain **unchanged**.
Product Z is **inelastic**, demand for the product is not sensitive to price changes. The company should **increase the price**

because the percentage increase in price exceeds the percentage decrease in demand. Total revenue will **increase**.

c) (i) This is the percentage change in the demand for one good caused by the percentage change in the price of other related goods.
(ii) The cross elasticity of demand for good A is + 1.83 (show your workings).
(iii) Good A is a **substitute** good because it has a **positive** sign. This means that as the price of Good B increased the consumer switched from Good B to the cheaper alternative Good A.

Leaving Certificate 2009

(b) (i) Define income elasticity of demand and price elasticity of demand.
(ii) Which figures stated below is likely to represent each of the following –
Income elasticity of demand for low price cuts of meat:
Income elasticity of demand for Apple iPhones:
Price elasticity of demand for petrol:

- 1.6 - 0.1 +4.3

Give reasons for your choice.

(c) Assume Income elasticity of demand for games consoles is + 2.5 and total sales in 2008 was 100,000 units. Calculate the expected total sales in 2009 if consumers' incomes are expected to fall by 8% in that year. Show your workings.

Solution -

(b) (i) Define income elasticity of demand **and** price elasticity of demand. **6 marks**

Income Elasticity of Demand measures
The percentage / proportionate change in the demand for a good caused by the percentage / proportionate change in income.

Price Elasticity of Demand measures
The percentage / proportionate change in the demand for a good caused by the percentage / proportionate change in the price of that good.

(ii)

Category	Answer	Reason
Income elasticity of demand for low price cuts of meat	**- 1.6**	• low price cuts of meat is an **inferior good** so it has a **negative** YED. • low price cuts of meat is **not a necessity** so it is **income elastic** (>1)
Income elasticity of demand for Apple iPhones	**+4.3**	• Apple iPhones are a **normal good** so they have a **positive** YED. • Apple iPhones are a **luxury** so they are **income elastic** (>1).
Price elasticity of demand for Petrol	**- 0.1**	• Petrol is a **normal good** so it has a **negative** PED. • Petrol is a **necessity** so it is **price inelastic** (<1).

- If income decreases by 8% then sales will decrease by (8% x 2.5) = 20%.
- Sales will fall by 20% of 100,000 units = 20,000 units.
- Sales in 2009 will equal 100,000 – 20,000 = 80,000 units.

15 marks graded

Leaving Certificate 2010

b) (i) Outline 4 factors which affect price elasticity of demand.

(ii) The price elasticity of demand for the soft drink Quencher (shown in Demand and Supply Question 2010) has been calculated at –3.8. Using your knowledge of PED, explain the economic meaning of this figure.

Solution –

b) (i) 1 **The availability of close substitutes** – Milk has no close substitute. If the price of milk is increased there is no substitute to switch to, so demand remains much the same and is **inelastic.**

2 **Complementary Goods** – If the good in question is the cheaper of two goods that are in joint demand, then the demand for it is likely to be **inelastic** in response to changes in its own price e.g. petrol and cars, petrol being the cheaper of the 2 goods.

3 **The proportion of income that is spent on the good** – In general the smaller the proportion of income spent on a product the more **inelastic** demand will be in response to a change in its own price. A rise of 50% in the price of a box of matches is unlikely to have a very significant effect on the demand for matches.

4 **The durability of the good** – The more durable a good, the more **elastic** is the demand for that product in response to a change in its own price. If a product such as a motor car increases in price it is likely that the public will extend the life of their existing model and postpone the purchase of a replacement so demand will drop significantly and is elastic.

Other points include – **Brand loyalty**, the length of time allowed for adjustment to price changes, is the commodity a luxury or a necessity and so on.

(ii) PED of – 3.8 signifies the following -

1 The minus sign indicates that it is a **normal** good meaning that as price increases demand falls. It obeys the law of demand.

2 The 3.8 indicates that is a price **elastic** good meaning that the percentage change in quantity demanded is greater than the percentage change in the price. It is a luxury good, as price rises the demand will fall by a greater percentage, indicating that the good is not a necessity.

Leaving Certificate 2012

b) A manufacturer of 3 different products calculates the price elasticity of demand for each product as follows-

Product A: -2.8 Product B: -1.0 Product C: -0.5

The manufacturer wishes to maximise its revenues. Explain in respect of each of these products, what change, if any, the manufacturer should make in the prices currently being charged to enable it to achieve its aim.
Illustrate your answers with the aid of a diagram showing a demand curve for each product.

c) You are given the following information about certain products: (CED = Cross Elasticity of Demand)
CED between Product X & Product A= -0.8
CED between Product X & Product B= +3.2
CED between Product X & Product C= -1.6
CED between Product X & Product D= +0.5

(i) Which of the products above are substitutes for Product X? Explain your answer.
(ii) Which product is the closer complement to Product X? Explain your answer.

Solution-
(b) Product A - The price should be **decreased** because it is an elastic good. This means that the % increase in demand will exceed the % fall in price. Total revenue earned by the firm will increase as a result. The shape of the demand curve will have a

very flat slope and draw it now similar to the one on page 5 above.
Product B – The price should be left **unchanged** because it is a unit elastic good. This means that the % change in demand equals the % change in price. The total revenue earned by the firm will remain unchanged as a result. Now draw the diagram similar to the one on page 4 above.
Product C – The price should be **increased** because it is an inelastic good. This means that the % increase in price exceeds the % fall in demand. The total revenue earned by the firm will increase as a result. Now draw the diagram similar to the one on page 3 with a demand curve with a very steep slope.

c) (This is not part of the new Economics course)
(i) Products B and D are substitutes to product X. This is because substitutes have a positive CED, which means that as the price of product X rises the demand for both product B and D rises.
(ii) Product C is the closer complement to product X. This is because C has the highest numerical value of the 2 products A and C, so this is the closest complement. If the price of product X rises then the demand for product C will fall by a greater % than the demand for product A. C has a more elastic demand.

Leaving Certificate 2014

a) (i) Define the categories of Price Elasticity of Demand: elastic, inelastic, and unit elastic.
(ii) State 3 factors that affect PED and explain how each factor affects it. (30m)

b) A consumer/motorist buys 20 litres of petrol when the price is €1.60 per litre. When the price increases to €1.70, as a result of an increase in carbon tax, the consumer buys 19 litres. Calculate the consumer's PED.
Is this demand for petrol price elastic or price inelastic? Outline the implications of your answer for government revenue. (20m)

c) A firm is considering a change to its product's price. It conducts market research which reveals that PED for the product is – 2.5.
Use this information to answer the following question:
(i) If the firm wishes to maximise total sales revenue, should it lower or raise the price of the product? Explain your answer.
The market research also reveals Income Elasticity of Demand for the product is + 4.5. Use this information to answer the following question:
(ii) In the case of an economy which is expected to remain in recession for the next 5 years, what, if any, will be the likely impact on the demand for the product? Explain your answer. (25m)

Solution

a) (i) **Elastic Demand:** The percentage/proportionate change in the price of the good causes a greater percentage/proportionate change in the quantity demanded of the good.
Inelastic Demand: The percentage/proportionate change in the price of the good causes a lesser percentage/proportionate change in the quantity demanded of the good.

Unit Elastic Demand: The percentage/proportionate change in the price of the good is equal to the percentage/proportionate change in the quantity demanded of the good.

(ii) **Three factors affecting PED:**
1 The amount and availability of close substitutes: When a good has no close substitute and its price is increased demand will be inelastic because there is no substitute to change to. When a good has a close substitute and its price is increased the demand for the good will be elastic as people will switch to the cheaper substitute.
2 The proportion of income that is spent on the good: In general the smaller the proportion of income that is spent on a good the more inelastic demand will be in response to a change in its own price. An increase of 50% in the price of a box of matches is unlikely to have a significant effect on the demand for matches as the product constitutes only a small proportion of a person's income. For this reason demand for matches tends to be inelastic.
3 The length of time allowed for adjustment to price changes: The longer any price change persists the more elastic demand will be. If the price of electricity rose by 80% a consumer may cut back on using certain domestic appliances and demand will fall slightly and be inelastic. In the long term, if the price change persists, the consumer may look to install alternative sources of energy such as solar panels and demand for electricity may fall substantially and become elastic.
Other factors: The durability of the good; Brand loyalty; The number of alternative uses the good has.

b) Price Elasticity of Demand for petrol is – 0.846 so demand is inelastic.
An increase in the price of petrol will yield an increase in revenue for the government. The percentage increase in price(due to the tax rise) will be greater than the percentage fall in quantity demanded resulting in increased tax revenue for the government.

c) (i) **Price Elasticity of Demand at – 2.5** indicates that this product is price elastic because its absolute value is greater than 1 (a 1% reduction in price will cause a 2.5% increase in quantity demanded). To increase total revenue the firm should reduce price. This is because the percentage increase in demand is greater than the percentage fall in price.

(ii) **Income Elasticity of Demand for the product is +4.5** indicates that the good is a luxury good because its YED is greater than 1 (a 1% reduction in income will cause a 4.5% reduction in quantity demanded).
So as incomes fall in a recession quantity demanded will fall by a greater % than the percentage fall in income.

Leaving Certificate 2016 Q1

b) Read the following statements and indicate if they are True or False and explain your answer in each case.
(i) The cross price elasticity of demand for substitute goods has a negative value.
(ii) Price elasticity of demand tends to be more elastic in the long-run than in the short-run.
(iii) When demand for a good is price inelastic, a reduction in price will increase total sales revenue.
(iv) Income elasticity of demand for luxury goods is positive.
(24 marks)

Solution:

(i) **False**. The cross price elasticity of demand for substitute goods is **positive** because an increase in the price of one good will lead to an increase in the demand for the other substitute. Toyota and VW cars are substitute goods, an increase in the price of Toyota cars will cause an increase in the demand for VW cars.

(ii) **True.** In general, demand is more elastic in the long run than in the short run because it takes time for consumers to adjust their patterns of consumption to changes in price.

(iii) **False.** If demand is inelastic it means that consumers are not sensitive to price changes. A fall in price causes demand to increase by a lower percentage and revenue falls e.g. a 10% fall in price causes demand to increase by 1% and revenue earned by the firm falls.

(iv) **True.** As income rises consumers spend more on luxury goods which are normal goods. A luxury good is a normal good for which income elasticity of demand is greater than +1. An example of a luxury good is lobster.

LC 2018 Section B

(b) (i) Define the term price elasticity of supply (PES).
(ii) Explain, by means of an example, why the PES might be different in the long run than in the short run.
(iii) Discuss 2 factors, other than time period, that influence the PES of a product. (25)

(c) (i) Outline the potential impact a fall in the value of the pound sterling against the euro would have on the price UK consumers pay for Irish products.
(ii) Explain how knowledge of price elasticity of demand (PED) might be helpful to Irish exporters who wish to maximise their total revenue in the UK market.

Solution –

(b) (i) Price elasticity of supply is the percentage change in the quantity supplied caused/divided by the percentage change in price.

(ii) In the short-run the quantity supplied is not very responsive to the price.
Firms may find it difficult to increase output if there is a change in price because firm's cannot easily change the size of their factories or productive capacity.

Supply is usually more elastic in the long run due to the ability to change capacity in the long run. With more time to adjust, the supply response becomes larger. Over longer periods, firms have more time and can build new factories, hire new staff and invest in capital and equipment.

(iii)
1 **The nature of the product/ease of storing stock** – Some firms can build up a stock of the product to respond more flexibly to changes in prices. In such cases price elasticity of supply is more elastic than in industries where it is difficult to do so. Many products are perishable, fixed in supply or take a long time to produce and cannot respond to price changes and are therefore supply is inelastic e.g. crops.
2 **Is the firm operating at full productive capacity** – If a firm is capable of producing more goods with its present resources, supply will be elastic as the firm can easily increase its production. However, if it was operating at full capacity it could not react quickly to an increase in price so supply would be inelastic.

Other points include – Mobility of the factors of production; Degree of specialised labour or capital used in production; Production cost conditions.

(c)
(i) A fall in the value of sterling means that Irish goods will be more expensive in UK markets. UK consumers will have to pay more for Irish goods. Some sellers in the UK may choose not to pass on the higher prices in order to hold onto market share.

(ii) If the product has an **inelastic** demand then there is scope for the firm to increase price by a large amount as they know that the quantity demanded won't change very much and overall total sales revenue will increase. If PED is inelastic in the UK market they may decide to increase price.
If demand for their product is **elastic** then the firm might be wary of increasing price. This is because the quantity demanded will fall by a greater proportion, thus lowering total sales revenue. If PED is elastic in the UK market they may decide not to increase price.

Leaving Certificate 2019 Q3

(a) (i) Explain the term Price Elasticity of Demand (PED)
(ii) Outline 4 factors that affect the PED for a good or service, providing examples to support your answers. (25)

(b) The price elasticity of demand for airline tickets from Dublin to Dubai for 2 different consumer categories, holiday-makers and business travellers, is given below:

PED Consumer A = - 0.1 PED Consumer B = - 2.4

(i) Using your knowledge of PED explain which figure above is more likely to correspond to holiday-makers and which to business travellers.
(ii) Explain, with the aid of diagrams, the difference between price elastic demand and price inelastic demand.
(iii) Explain how knowledge of PED is useful when analysing the effect of price changes on total revenue for an airline. (30)

(c) (i) Assume that when the price of a tablet device was €500, consumers demanded 25,000 units of a related Good X per year.
When the price of the tablet device fell to €350, the price of Good X remaining unchanged, the quantity demanded of Good X decreased to 10,000 units per year.

Calculate the cross price elasticity of demand (CED) for Good X and explain the relationship between the 2 goods.

(ii) Would you expect a similar CED for a tablet device and a tablet case? Explain your answer.

Solution –
(a) (i) PED refers to the responsiveness of quantity demanded to a change in the price of the good itself/ refers to the proportionate change in the quantity demanded of a good in response to the proportionate change in the price of the good itself. (5m)

(ii)
1 Availability of close substitutes – the more substitutes there are available for the product the more elastic its demand will be. The closer the substitute the greater the elasticity will be. If there is an increase in price there will be a more than proportionate decrease in quantity demanded as consumers will switch to a similar alternative good that has not increased in price e.g. butter to margarine.

2 Brand loyalty - the more loyal consumers are to a certain brand of product the more inelastic their demand will be to changes in the price of that good e.g. some consumers are very loyal to the Apple brand and thus non-responsive to changes in price.

3 Percentage of total income spent on the good – the larger percentage of income the consumer spends on the good/service the more elastic their demand will be to changes in the price of that good e.g. the price of a car takes up a large percentage of a consumer's income than the price of a box of matches thus they will be more responsive to changes in the price of the car than the box of matches.

4 Durability – the greater the durability of the product the more elastic demand will be i.e. the greater the PED. If the price of a durable product increases there will be a more than proportionate decrease in quantity demanded as consumers can postpone the replacement, continue to use their existing product and wait for the price to fall e.g. washing machines have a long lifespan and are elastic with demand being responsive to changes in price.

(4 points scoring a total of 20 marks with 4 examples)

Other points include – Luxury/necessity; Cheaper of 2 complements tends to be inelastic golf balls and golf clubs; Time allowed for adjustment – the longer the time period the more elastic demand is; Expectations of future price changes.

(b) (i)

- 0.1 relates to business peoples' demand for airline tickets as they have price inelastic demand. They have very few alternatives to the flights, therefore when the price of the service increases their quantity demanded falls by a less than proportionate amount. (5m)

-2.4 relates to holiday makers' demand for airline tickets as they have a price elastic demand. Holiday makers' view their spending as luxury expenditure and therefore may not buy the tickets if price is increased. They may look for alternative modes of transport or alternative destinations or do without altogether. When the price of the service increases their quantity demanded decreases by a more than proportionate amount. (5m)

(ii)

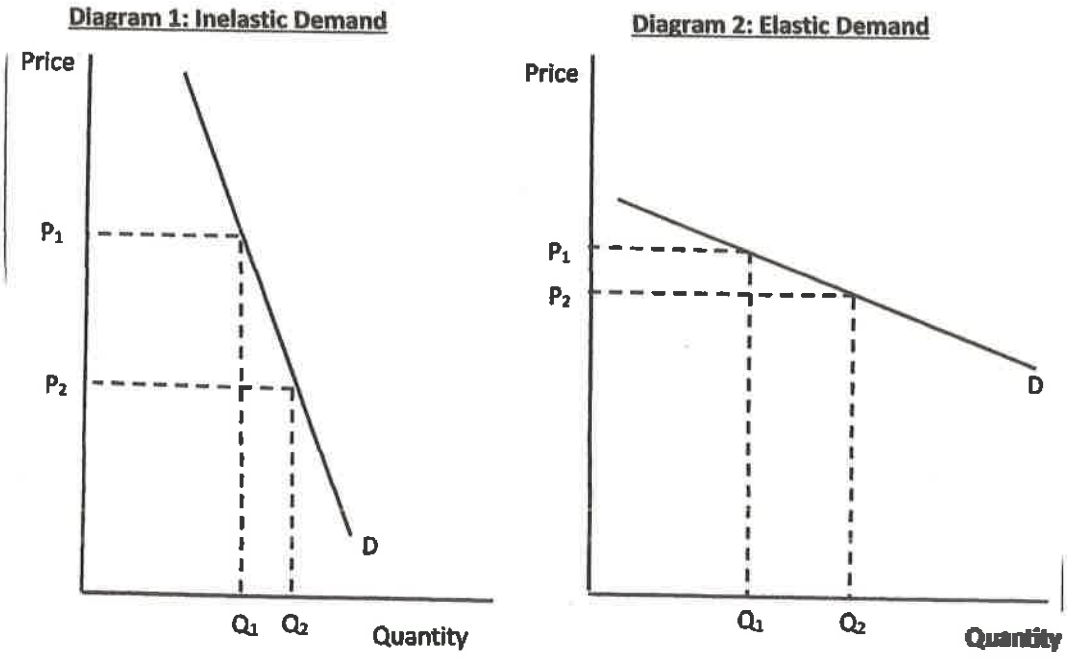


Diagram 1.
Shows a relatively price inelastic demand curve where PED <1.
This means that the percentage change in quantity demanded will be less than the percentage change in the price of the good/service.

Diagram 2.
Shows a relatively price elastic demand curve where PED > 1
This means that the percentage change in quantity demanded will be greater than the percentage change in the price of the good/service.

Diagram 1 – This shows a relatively price inelastic demand curve where PED is less than 1. This means that the percentage change in quantity demanded will be less than the percentage change in the price of the good/service. (2m)

Diagram 2 – Shows a relatively price elastic demand curve where PED is greater than 1. This means that the percentage change in quantity demanded will be greater than the percentage change in the price of the good or service. (2m)

(iii)
Consumers with a price inelastic demand – If the price was increased for business passengers the decrease in quantity demanded would be less than proportionate to the price increase and therefore the firm would gain revenue. (2m)

Consumers with a price elastic demand – If the price were increased for holiday-makers the decrease in quantity demanded would be more than proportionate to the price increase and therefore the firm would lose revenue. (2m)

(c) (i) $\frac{-15{,}000}{-150} \times \frac{500 + 350}{10{,}000 + 25{,}000} = +2.43$ **(12m)**

These goods are substitute goods as they have a positive Cross Elasticity of Demand. As the price of tablet devices decreases from €500 to €350 the quantity demanded of good X decreases more than proportionally from 25,00 units to 10,000 units. This means that the goods are close substitutes i.e. goods which are very similar alternatives to each other.
As the price of one of these goods decreases the demand for the other decreases as consumers swap from one to the other. (4m)

(ii) No. The CED between these goods will give a negative sign as the goods are in joint demand. The goods are complements as if the price of one decreases the quantity demanded of the other good would increase. (4m)

Elasticity (New Course)

Cross Elasticity of Demand and Price Elasticity of Supply have been removed from the new course (pages 9,10 and part of 11 can be ignored) –

The Importance of Elasticity –

1 A study of elasticity is very important for the **Minister for Finance** to decide what goods indirect taxes are placed upon. Indirect taxes should be placed on goods and services that are inelastic (such as cigarettes which are not sensitive to price increases).....

2 A knowledge of elasticity (PED and YED) is important for **producers** when deciding whether to lower or raise price (examine page 11 of the notes but ignore the section on cross elasticity of demand).....

3 For use in **International Trade** – If the € falls in value against other currencies, such as sterling or the dollar, this has the effect of making exports cheaper and imports dearer.
What effect will this have on the Balance of Payments?
If PED for imports is elastic a rise in the price of imports will cause demand for imports to fall significantly resulting in less money being spent on imports and causing the balance of payments to improve.
Marshal-Lerner states that a devaluation of the € will improve our balance of payments if the sum of the price elasticities of demand for exports and imports is greater than 1 (in absolute terms).

Data collection by the CSO –

1 Food/Housing/Alcohol and Tobacco/Clothing and Footwear –
The proportion of total expenditure spent on **food** has declined significantly in the last 40 years from 30% in 1980 to 14% in 2019.
On housing it has increased from 7% to 20%.
On Alcohol and Tobacco it has decreased from 7% to 3%.
On Clothing and Footwear it has decreased from9% to 4%.

2 Childcare – This is a huge expense for most Irish families and can dictate where people take up jobs or where they may move to in order to avail of a close relative taking care of children.

As expected childcare costs in Dublin are more expensive than in rural areas. Also getting a playgroup etc to mind your children is more expensive than getting your children minded by a nanny/au pair etc.

Check the CSO website for up to date data.