

 **HL IB Economics**

2.5 Elasticities of Demand

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Your notes

2.5.1 Price Elasticity of Demand (PED)

The Definition & Calculation of PED

- The **law of demand** states that when there is an increase in price, there will be a fall in the quantity demanded
 - Economists are interested **by how much** the **quantity demanded will fall**
- **Price elasticity of demand** reveals how **responsive** the change in **quantity demanded** is to a change in **price**
 - The responsiveness is different for different types of products

Calculation of PED

- **PED can be calculated** using the following formula

$$\text{PED} = \frac{\% \text{ change in quantity demanded}}{\% \text{ change in price}} = \frac{\% \Delta \text{ in QD}}{\% \Delta \text{ in P}}$$

- **To calculate a % change**, use the following formula

$$\% \text{ Change} = \frac{\text{new value} - \text{old value}}{\text{old value}} \times 100$$

WORKED EXAMPLE

A firm **raises** the price of its products from \$10 to \$15. Its **sales fall** from 100 to 40 units per day. Calculate the **PED** of its products

[2 marks]

Answer:

Step 1: Calculate the % change in QD

$$\% \Delta \text{ QD} = \frac{40 - 100}{100} \times 100$$

$$\% \Delta \text{ QD} = -60\%$$

Step 2: Calculate the % change in P



$$\% \Delta P = \frac{15 - 10}{10} \times 100$$

$$\% \Delta P = 50\%$$

Step 3: Insert the above values in the PED formula

$$PED = \frac{\% \Delta \text{ in QD}}{\% \Delta \text{ in P}}$$

$$PED = \frac{-60}{50}$$

$$PED = -1.2$$

Step 4: Final answer = 1.2

The PED value will **always be negative** so economists **ignore the sign** and present the answer as 1.2

(Two marks for the correct answer or 1 mark for any correct working in the process)

EXAMINER TIP



In Paper 2 you are occasionally given the PED value and the %Δ in QD - you are then asked to calculate the %Δ in price. Follow the standard math procedure as follows:

1. Substitute the values provided into the equation
2. Substitute X for %Δ in price
3. Solve for X

Interpreting PED Values

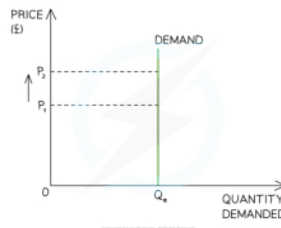
The size of PED Varies from 0 to Infinity (∞) and is Classified as Follows

Value	Name	Explanation	Diagram
0	Perfectly Inelastic	<ul style="list-style-type: none"> ▪ The QD is completely unresponsive to a change in P (very theoretical value e.g. heart) 	



Your notes

transplant is extremely inelastic but possibly not perfectly)



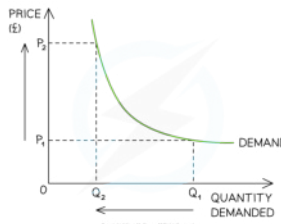
0 → 1
Relatively Inelastic

- The %Δ in QD is **less than** proportional to the %Δ in P (e.g. addictive products)



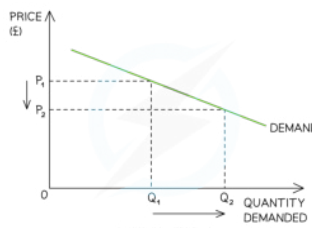
1
Unitary Elasticity

- The %Δ in QD is **exactly equal** to the %Δ in P



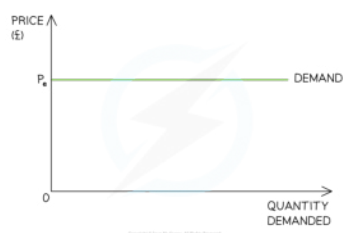
1 → ∞
Relatively Elastic

- The %Δ in QD is **more than** proportional to the %Δ in P (e.g. luxury products)





Your notes

∞	Perfectly Elastic	<ul style="list-style-type: none"> The $\% \Delta$ in QD will fall to zero with any $\% \Delta$ in P (highly theoretical elasticity) 	
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The Determinants of PED

- Some products are more responsive to **changes in prices** than other products
- The factors that determine the responsiveness are called the **determinants of PED** & include:
 - Availability of substitutes:** good availability of substitutes results in a **higher value of PED** (relatively elastic)
 - Addictiveness of the product:** addictiveness turns products into necessities resulting in a **low value of PED** (relatively inelastic)
 - Price of product as a proportion of income:** the lower the proportion of income the price represents, the **lower the PED value will be**. Consumers are less responsive to price changes on cheap products (relatively inelastic)
 - Time period:** In the short term, consumers are less responsive to price increases resulting in a **low value of PED** (relatively inelastic). Over a longer time period consumers may feel the price increase more and will then look for substitutes resulting in a **higher value of PED** (relatively elastic)

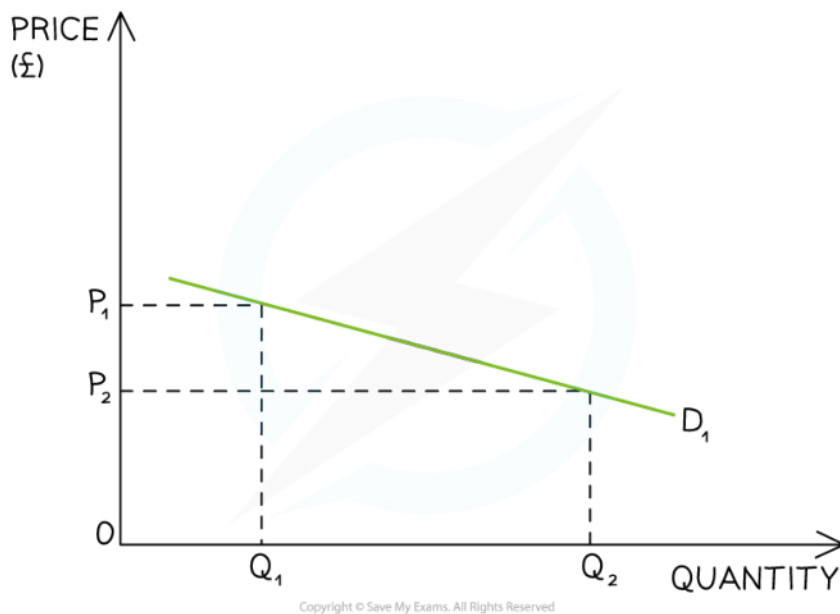


Your notes

2.5.2 The Significance of PED

PED & Total Revenue

- The **total revenue rule** states that in order to **maximise revenue**, firms should **increase** the price of products that are price **inelastic** in demand and **decrease prices** on products that are **elastic** in demand
- The benefits of this rule can be illustrated using a demand curve
 - A shallow curve represents a price-elastic product
 - A steep curve represents a price inelastic product



An illustration of price elastic demand where a small decrease in price from $P_1 \rightarrow P_2$ causes a large increase in quantity demanded from $Q_1 \rightarrow Q_2$

Diagram Analysis

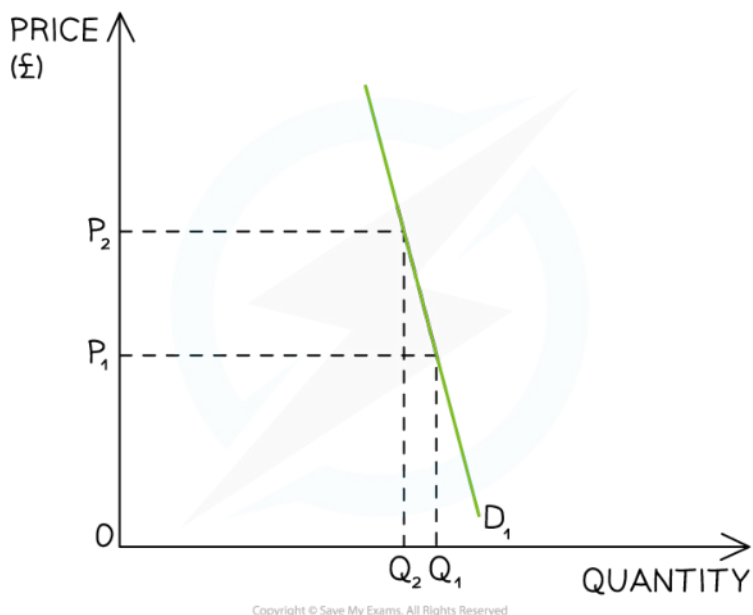
- When a good/service is **price elastic in demand**, there is a greater than proportional increase in the quantity demanded to a decrease in price
- A small decrease in price leads to a larger increase in QD



Your notes

- **TR is higher** once the price has been **decreased**

- $(P_2 \times Q_2) > (P_1 \times Q_1)$



An illustration of price inelastic demand where a large increase in price from $P_1 \rightarrow P_2$ causes a small decrease in quantity demanded from $Q_1 \rightarrow Q_2$

Diagram Analysis

- When a good/service is **price inelastic in demand**, there is a smaller than proportional decrease in the quantity demanded to an increase in price
- A large increase in price leads to a smaller decrease in QD
- **TR is higher** once the price has been **increased**
 - $(P_2 \times Q_2) > (P_1 \times Q_1)$

The Implications of PED for Firms & Governments

- **Knowledge of PED** is important to **firms** seeking to **maximise their revenue**
 - If their product is **price inelastic in demand**, they should **raise their prices**
 - If **price elastic** in demand, then they should **lower their prices**



Your notes

- Firms can choose to use **price discrimination** to maximise their revenue i.e. lower prices for certain segments and higher prices for others
- **Knowledge of PED** is important to **Governments** with regard to **taxation and subsidies**
 - If governments **tax price inelastic in-demand products**, they can raise tax revenue without harming firms too much
 - Consumers are less responsive to price changes so **firms will pass on the tax** to the consumer
 - If Governments **subsidise** price elastic in demand products, there can be a **greater than proportional increase** in the quantity demanded
 - This strategy is especially good for encouraging consumption of **merit goods** such as electric vehicles

The PED of Primary Commodities & Manufactured Products

- The PED of **primary commodities** (agricultural products or raw materials) tends to be **lower than that of manufactured products** (washing machines, phones, cars etc) for several reasons
- The best way to explain the reasons for the differences is to **apply the factors that determine the price elasticity of demand** (see [sub-topic 2.5.1](#))
 - These can be summarised using the acronym SPLAT
 - Substitutes
 - Proportion of income
 - Luxury or necessity
 - Addictiveness
 - Time period

A Comparison of the PED of Primary Commodities & Manufactured Products

PED Factor	Primary Commodities – Inelastic (PED = 0-1)	Manufactured Goods – Elastic (PED = >1)
Availability of substitutes	<ul style="list-style-type: none"> ▪ Few substitutes as the required raw materials are defined by the 	<ul style="list-style-type: none"> ▪ Usually many substitutes e.g. different types of smart phones



Your notes

	product design	
Price of product as a proportion of income	<ul style="list-style-type: none"> Each raw material component tends to be a fraction of the overall cost of the product which means demand is inelastic 	<ul style="list-style-type: none"> Demand for manufactured goods such as cars or washing machines tend to take a larger proportion of the consumers income which makes the PED more elastic
Luxury or necessity	<ul style="list-style-type: none"> Commodities are necessities as they are raw materials used in the production of goods 	<ul style="list-style-type: none"> Many manufactured goods tend to be luxuries e.g Swiss watches
Addictiveness of the product	<ul style="list-style-type: none"> Certain raw materials are highly sought after by manufacturers e.g. iridium is a rare earth metal used to help create the famous Apple Macbook shell 	<ul style="list-style-type: none"> Some manufactured goods can be very addictive e.g. cigarette's However, the availability of substitutes makes them less inelastic than they otherwise would be
Time period	<ul style="list-style-type: none"> The time period to grow or extract primary commodities is much longer than that required to manufacture products 	<ul style="list-style-type: none"> Many products are manufactured in a relatively short time period



Your notes

2.5.3 Income Elasticity of Demand (YED)

Definition & Calculation of YED

- **Changes in income** result in changes to the **demand** for goods/services
 - Economists are interested in **how much** the **quantity demanded will change** for different products
- **Income elasticity of demand (YED)** reveals how **responsive** the change in **quantity demanded** is to a change in **income**

Calculation of YED

- **YED can be calculated** using the following formula

$$\text{YED} = \frac{\% \text{ change in quantity demanded}}{\% \text{ change in income}} = \frac{\% \Delta \text{ in QD}}{\% \Delta \text{ in Y}}$$

WORKED EXAMPLE

A consumer's **income rises** from SG\$ 100 to SG\$ 125 a week. They originally consumed 12 bubble teas but this **increased** to 15 bubble teas a week. Calculate the **YED** of the bubble teas

[2 marks]

Answers:

Step 1: Calculate the % change in QD

$$\% \Delta \text{ QD} = \frac{15 - 12}{12} \times 100$$

$$\% \Delta \text{ QD} = 25\%$$

Step 2: Calculate the % change in Y

$$\% \Delta \text{ Y} = \frac{125 - 100}{100} \times 100$$

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

Step 3: Insert the above values in the YED formula



$$YED = \frac{\% \Delta \text{ in QD}}{\% \Delta \text{ in Y}}$$

$$YED = \frac{25}{25}$$

$$YED = 1$$

(Two marks for the correct answer or 1 mark for any correct working)

Interpreting YED Values

- The YED value can be positive or negative and the value is important in determining the type of good
 - A good with a **positive YED** value is considered to be a **normal good**
 - Normal goods can be classified as **necessities** or **luxuries**
 - A good with a **negative YED** value is considered to be an **inferior good**

Engle Curves

- **Engle curves** are a model used to illustrate the relationship between income and the quantity demanded (QD)
 - **Income** is presented on the Y-axis and **quantity demanded** on the X-axis

The Value of YED Determines the type of good and Response to Changes in Income

Value	Type of Good	Explanation	Engel Curve



Your notes

<p>$0 < YED < 1$</p>	<p>Necessity</p>	<ul style="list-style-type: none"> Normal good - quantity demanded increases when income increases Income inelastic which means that it is relatively unresponsive to a change in income E.g. A 10% increase in income leads to a 3% increase in QD 	
<p>$YED > 1$</p>	<p>Luxury</p>	<ul style="list-style-type: none"> Normal good - quantity demanded increases when income increases Income elastic which means that it is relatively responsive to a change in income E.g. A 3% increase in income leads to a 10% increase in QD 	
<p>$YED < 0$</p>	<p>Inferior Good</p>	<ul style="list-style-type: none"> Quantity demanded decreases when income increases E.g. Consumers switch from purchasing a supermarkets own brand cereal to Kellogg's cereal as income increases 	

EXAMINER TIP



Remember this distinction! With PED values the negative sign is always ignored. However for YED, the sign is integral to understanding if the good is a normal (+) or inferior (-) good.

Factors that Influence YED

- YED is influenced by **any factors in an economy** which change the wages of workers



Your notes

- During a **recession** wages usually fall and demand for **inferior goods** rises while demand for **luxury goods** falls
- During a period of **economic growth** and rising wages, demand for luxury goods increases while demand for inferior goods decreases
- Other influences on income include **minimum wage legislation, taxation, increased international trade**

The Importance of YED

- YED is crucial for firms as it helps them **understand consumer behaviour**, analyse markets, plan strategies, make informed investment decisions, and **adapt to changes in the sectoral structure of the economy**
- By assessing the income elasticity of demand, firms can effectively navigate evolving market dynamics and **position themselves for sustainable growth**

An Explanation of how Firms can use YED Effectively

Factor	Explanation
Understand consumer behaviour	<ul style="list-style-type: none"> ▪ YED helps firms understand how changes in income levels affect consumer demand for their products or services ▪ By examining the income elasticity of demand for different goods and services, firms can identify which sectors are more sensitive to changes in income
Adapt to changes in the sectoral structure of the economy	<ul style="list-style-type: none"> ▪ Changes in the income elasticity of demand can indicate shifts in consumer preferences and patterns of consumption <ul style="list-style-type: none"> ▪ Firms need to adapt to these changes to remain competitive ▪ If a sector experiences declining demand due to a low income elasticity ($YED < 1$), firms may need to consider diversifying their product offerings or exploring new markets to sustain growth ▪ Sectors with high income elasticity ($YED > 1$) can provide opportunities for firms to specialise and cater to the growing demand <p>Example</p>



Your notes

- As income levels increase, consumers' preferences and concerns about **environmental sustainability** may lead to a higher demand for electric vehicle's (EVs)
- The income elasticity of demand for EVs can help firms estimate the potential market growth and **justify investment decisions**
- With a YED > 1, the EV sector is likely to **experience rapid expansion** as income levels rise, prompting firms to **invest in manufacturing facilities**, research and development, and charging infrastructure
- This will further **shift the sectoral structure of the economy**, as the rising demand for EVs can result in the **growth of related industries such as battery manufacturing, renewable energy, and charging networks**