DP IB Economics: SL

Your notes

2.4 Price Elasticity of Demand (PED)

Contents

Definition, Calculation & Determinants of PED

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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

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

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

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Step 2: Calculate the % change in P

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

$$\%\triangle P = 50\%$$

Step 3: Insert the above values in the PED formula

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

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

$$PED = -1.2$$

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 Tips and Tricks

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:

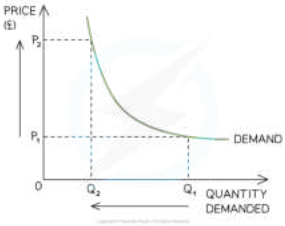
1. Substitute the values provided into the equation

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**	▪ The QD is **completely unresponsive** to a change in P (very theoretical value e.g. heart 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)	

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			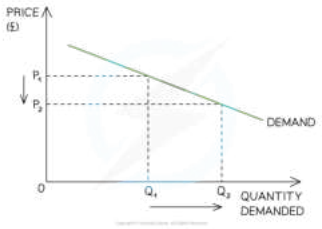
∞	**Perfectly Elastic**	▪ The %Δ in QD will **fall to zero** with any %Δ in P (highly theoretical elasticity)	

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)

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The Significance of PED

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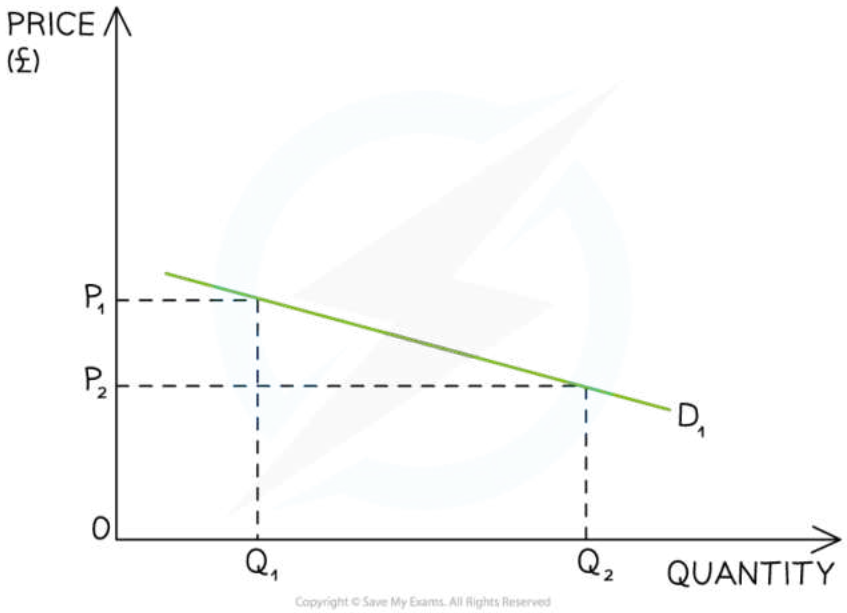
PED & Total Revenue

- 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

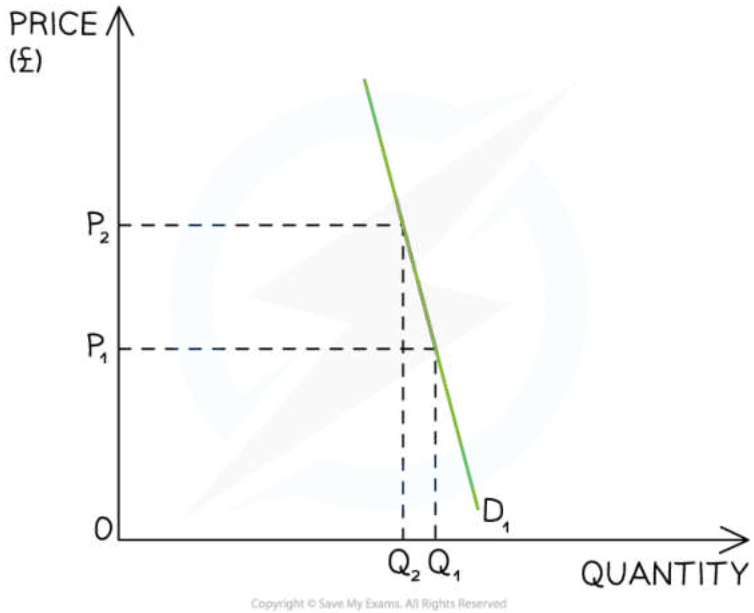


An illustration of price elastic demand where a small decrease in price from $P_1 \rightarrow P_2$ causes a large increase in quantity demanded from $Q_1 \rightarrow Q_2$

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

- **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**

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- 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


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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
    - **S**ubstitutes
    - **P**roportion of income
    - **L**uxury or necessity
    - **A**ddictiveness
    - **T**ime 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	▪ Few substitutes as the **required raw materials** are defined by the product design	▪ Usually **many substitutes** e.g. different types of smart phones
Price of product as a proportion of income	▪ Each raw material component tends to be **a fraction of the overall cost** of the product which means demand if inelastic	▪ 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	▪ **Commodities are necessities** as they are raw materials used in the production of goods	▪ Many manufactured goods tend to be **luxuries e.g Swiss watches**
Addictiveness of the product	▪ 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	▪ 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	▪ The time period to **grow or extract primary commodities is much longer** than that required to manufacture products	▪ Many products are manufactured in a **relatively short time period**


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