TOPIC 4: ELASTICITY AND ITS APPLICATIONS

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1. INTRODUCTION

- Topic 2 established the direction of changes in demand and supply to a change in price
- A further question is the size of the change
- Elasticity measures the sensitivity or responsiveness of these changes

Definition

Elasticity measures the change in one variable in response to a change in another variable

We look at:
- price elasticity of demand
- cross price elasticity
- income elasticity of demand
- price elasticity of supply

2. PRICE ELASTICITY OF DEMAND

Definition

The percentage change in quantity demanded to a one percent change in price

\[ \frac{\% \text{ change in } Q_d}{\% \text{ change in } P} = \frac{-20\%}{+10\%} = -2 \]
Interpretation
For every 1% change in P, there is a x% change in Qd

e.g. If a 8.755% ↑ in P leads to a 11.473% ↓ Qd

\[
\frac{\text{% change in Qd}}{\text{% change in P}} = \frac{-11.473\%}{+8.755\%} = -1.31
\]

So, for every 1% change in P, there is a 1.31% change in Qd

Categories of Price Elasticity
- There are three categories of price elasticity
  - Elastic
    - % change in Qd > % change in P
    - Less than -1
    - Diagram 1: an elastic Demand curve
    - Diagram 2: a perfectly elastic Demand curve
  - Inelastic
    - % change in Qd < % change in P
    - Between 0 and -1
    - Diagram 3: an inelastic Demand curve
    - Diagram 4: a perfectly inelastic Demand curve
  - Unit elastic
    - % change in Qd = % change in P
    - Equal to -1
Determinants of Price Elasticity

What influences a goods price elasticity of demand?

(i) Substitutes

- The availability of substitutes influences elasticity
- A good with a lot of substitutes is likely to be elastic
- A good with few substitutes is likely to be inelastic

(ii) Definition of the Market

- The narrower the definition of the good, the higher its elasticity measure
- The broader the definition of the good, the lower its elasticity measure
- e.g. alcohol v Guinness; cars v Ford Focus’
- Definition of a market a key concept – relevant later in this course and in next years courses

(iii) The Time Period

- Over time a good’s elasticity can change
- Often a good is inelastic in the short-run (less than 1 year) and elastic in the long run (more than 1 year)
- Why?
- Consumers adjust over time
(iv) Proportion of Income spent on the Good
- Inexpensive good: normally inelastic
  - e.g. paper clips
- Expensive good: normally elastic
  - e.g. computers, cars

Elasticity and Total Revenue

Definition
Total Revenue (TR) is calculated as price times quantity demanded

\[ TR = P \times Q_d \]

- We can see TR graphically as the shaded area under the demand curve in *Diagram 5*
- A change in P results in a change in Q_d and can cause a change in TR
- The extent of that change is influenced by the elasticity of the D curve
- This can impact on a firm's pricing policy
- Some examples:
(i) A price fall for a good with an elastic demand

- Diagram 6
- Original Position: P1 Q1
- New Position: P2 Q2
- If demand is elastic, TR decreases as a result of a price increase

(ii) A price fall for a good with an inelastic demand

- Diagram 7
- Original Position: P1 Q1
- New Position: P2 Q2
- If demand is elastic, TR increases as a result of a price increase
- This is in spite of a fall in Qd

(iii) A price fall for a good with an elastic demand

- Diagram 8
- Original Position: P1 Q1
- New Position: P2 Q2
- If demand is elastic, TR increases as a result of a price decrease
(iv) A price \( P \) for a good with an inelastic D

- **Diagram 9**
  - Original Position: \( P_1 Q_1 \)
  - New Position: \( P_2 Q_2 \)
  - If demand is inelastic, TR decreases as a result of a price decrease

- If the aim of a firm is to maximise revenue, producers should:
  - \( \downarrow P \) for an elastic good
  - \( \uparrow P \) for an inelastic good

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**Why this matters: Firm & Policy Implications**

- Will lowering the price really bring in additional revenue?
- Will increasing value-added taxes really bring in more tax revenue? (tax revenue is a share of total revenue)
- Would a subsidy to reduce bus-fares lead people to use buses rather than cars? How much would the subsidy cost?
- Can you incentivise people to change their behaviour/use more or less of a service using price?

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3. **CROSS-PRICE ELASTICITY**

**Definition**

This looks at the effects between goods

Take two goods: A and B

Cross-price elasticity of good A with respect to the P of good B is:

\[
\text{Cross-price elasticity} = \frac{\% \text{ change in } Q_dA}{\% \text{ change in } PB}
\]
Substitutes and Complements

Cross-price elasticities tend to be positive when two goods are substitutes

e.g. Tea and Coffee
→ Pcoffee makes people switch to tea
→ 10% in Pcoffee leads to 5% Qd tea
Cross-price elasticity of tea with respect to coffee =
\[ \frac{+5}{+10} = +\frac{1}{2} \]

Cross-price elasticities tend to be negative when two goods are complements

e.g. Printers and Computers
→ P computers makes people demand less printers
→ 20% in P computers leads to 10% Qd printers
Cross-price elasticity of printers with respect to computers =
\[ \frac{-10}{+20} = -\frac{1}{2} \]

Why this matters: Firm & Policy Implications

- If I am a producer/supplier...what will happen to the demand for my good or service if the price of the 'other' good changes.
- What will happen to illegal tobacco sales if we increase the excise duty on legal tobacco products
- Will people switch over to cleaner fuels if we change the price of 'dirty' fuel?
3. INCOME ELASTICITY OF DEMAND

Definition
Income elasticity of demand measures how much quantity demanded of a good responds to a change in consumer’s income.

It is calculated as:

\[ \text{Income Elasticity} = \frac{\% \text{ change in } Q_d}{\% \text{ change in } Y} \]

e.g. If a 10% \( \uparrow \) in \( Y \) leads to a 5% \( \uparrow \) \( Q_d \)

\[ = \frac{+5\%}{+10\%} = +0.5 \]

Types of Income Elasticity

- **Positive income elasticity**
  - As \( Y \) \( \uparrow \) \( Q_d \) \( \uparrow \)
  - As \( Y \) \( \downarrow \) \( Q_d \) \( \downarrow \)
  - This indicates a good is a normal good

- **Negative income elasticity**
  - As \( Y \) \( \uparrow \) \( Q_d \) \( \downarrow \)
  - As \( Y \) \( \downarrow \) \( Q_d \) \( \uparrow \)
  - This indicates a good is an inferior good
Necessities and Luxuries

- We can distinguish between necessities and luxuries by examining their income elasticity of demand
- Between 0 → 1 = necessity
- Between 1 → infinity = luxury
- For a luxury, \( \frac{\% \Delta Q_d}{\% \Delta Y} > 1 \)

Why this matters: Firm & Policy Implications

- Am I supplying/providing a normal good or service...
- What goods and services will gain most as the economy (and incomes) recover?
- What sectors will decline as incomes grow?

4. Price Elasticity of Supply

Definition

It is the percentage change in \( Q_s \) resulting from a one percentage change in price

\[
\frac{\% \text{ change in } Q_s}{\% \text{ change in } P} = \frac{+15\%}{+10\%} = +1.5
\]

We know it will normally be positive
**Determinants**

- There are two major determinants:

  (i) **The ability of the firm to alter production levels**
  - This depends on:
    - The availability of inputs…the factors of production
    - The state of technology
    - The level of excess capacity

(ii) **The time period under consideration**
- There are three different periods of supply
  (a) **Momentary supply**
    - sometimes called market supply
    - the amount currently available
    - immediately the firm is unable to respond to price changes
    - in effect the supply is fixed
    - a vertical S curve: perfectly inelastic
    - *Diagram 10*

(b) **Short-Run Supply**
- in the short-run some inputs can vary while others remain unchanged
- a factory could increase labour but not expand its premises
- an upward sloping S curve: inelastic supply
- *Diagram 11*
(c) Long-Run Supply
- in the long-run a firm can alter all of its inputs
- it can hire more labour, build an extension, increase technology, ...
- therefore the change in Qs is greater in the LR
- an upward sloping S curve: elastic supply
- flatter than in the short-term
- Diagram 12

NEXT WEEK
- A focus on applications of these concepts
- First:
  - Some discussion of these concepts in an applied setting
- Second:
  - Case studies from book/Economist to read
- Third:
  - Other policy applications of various prices determination and elasticity effects
- Will distribute by e-mail over next few days